A M E R I C A N J O B S P R O J E C T



The Maine Jobs Project

A Guide to Creating Jobs in Offshore Wind

JUNE 2018

AMERICAN JOBS PROJECT

A Letter from the

American Jobs Project

It is no secret that America's middle class is in crisis; of the millions of jobs lost during the recession, most were good-paying, middle-class jobs. Unfortunately, many of the jobs created during the recovery have been in low-skill, low-paying occupations. It is true that the United States is unlikely to attract the traditional manufacturing jobs of the past, but our research shows that with innovative policies and a smart focus on industrial sectors, states can become global hubs of innovation and create new jobs in advanced industries that capitalize on each state's strengths.

Our analysis starts with identifying the biggest market opportunity of our era. The world has embarked on a historic energy transformation, and the growing demand for advanced energy and its enabling technology draws on "the mother of all markets" for U.S. businesses to build and sell those solutions. Strategically minded businesspeople are taking advantage of this accelerating market and seeing returns. In 2016, the private sector reported $1.4 trillion in global advanced energy revenues, which is equal to that of the global apparel industry and nearly twice as much as the global airline industry. And jobs? At least 9.8 million people were employed in the global advanced energy industry in 2016, and the growing market could support over 14 million additional jobs by 2030. The question for the United States is: Where will those new jobs be created?

At least 9.8 million people were employed in the global advanced energy industry in 2016, and the growing market could support 24 million jobs by 2030.

We believe that our states are the answer to this question. If countries across the globe are seeking solutions for growing energy needs, how can U.S. businesses take advantage of this demand and build products locally that can be exported to the world? And how can we equip Americans with the skills those businesses need?

The American Jobs Project gives policymakers the tools to spur economic growth and create good-paying jobs in their states. Our analyses chart pathways designed to accelerate and expand a state's advanced energy economy. We propose innovative solutions built on extensive research and tailored to each state. These solutions are written with an eye towards streamlining bureaucracy and are seasoned with the principles of competition, local control, and fewer regulations.

The American Jobs Project empowers state and local leaders to build prosperous and equitable advanced energy economies that will transform our nation's energy future. If these recommendations are adopted, hard-working Americans will be among the first to benefit.

About Us

The American Jobs Project

The American Jobs Project is a nonprofit, nonpartisan, think-and-do tank focused on creating good-paying jobs in advanced energy and manufacturing through bottom-up, data-driven, 360° economic development. Our experts tailor best practice strategies for bolstering advanced energy and manufacturing, identify assets across the value chain, estimate an industry's job-supporting potential, and support stakeholder-led initiatives by communicating ideas and analyses. Through engagement with a broad cross-section of stakeholders, we develop a shared vision of effective strategies to leverage the unique competitive advantages offered by each state and generate positive economic impacts.

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University of Southern Maine, Center for Business and Economic Research

For over forty years, the Center for Business and Economic Research (CBER) at the University of Southern Maine has been an essential resource in supporting statewide economic development by providing technical assistance and applied research from the University of Maine System to public and private sector organizations helping to shape Maine's economic future. CBER produces long range forecasts of the Maine economy and provides technical assistance and applied research to a variety of state and local agencies concerned with economic development in Maine.

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Environmental & Energy Technology Council of Maine

The Environmental & Energy Technology Council of Maine (E2Tech) seeks to build and expand the state's environmental, energy, and clean technology industries. E2Tech acts as a catalyst to stimulate growth by facilitating networking, serving as a clearinghouse for objective information, and leading efforts to realize the benefits of Maine's clean energy economy. E2Tech is a member-based organization comprised of businesses and organizations that represent renewable power companies, environmental engineers, emerging entrepreneurs, government agencies, and educational institutions.

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BVG Associates

BVG Associates is an independent consultancy with a global outlook, specializing in the technology, industrialization, and economics of wind and marine energy generation systems. They are driven by a desire to make a real difference in the global renewable energy industry, delivering insight that comes from over 140 years of staff experience. Their team has the best objective knowledge of the market and supply chain for offshore wind, wave, and tidal energy. Their significant client base spans government, enabling bodies, investors, developers, turbine manufacturers, and other companies across the supply chain.

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EXECUTIVE SUMMARY

Maine's offshore wind industry is a significant economic opportunity for job growth, having the potential to support an annual average of 2,144 jobs through 2030. Maine can capitalize on this opportunity by bolstering local market growth, value chain build-out, the innovation ecosystem, access to capital, and education and training. State and local leaders who seek to capitalize on state resources to create skilled, good-paying jobs can use this report as a foundation for action.

EXECUTIVE SUMMARY

Maine faces an urgent need for good-paying jobs to address job losses in legacy manufacturing industries, which have disproportionately impacted rural communities. Stagnant population growth, decreased prime-age labor force participation, and a rapidly aging workforce have contributed to a skills gap across critical industries, producing New England's slowest-growing post-recession economy. Efforts to foster good-paying manufacturing jobs, coupled with workforce training, could bolster the state's economy and expand workforce opportunities for Mainers.

Extensive research and more than twenty interviews with stakeholders and experts in Maine have identified offshore wind as a promising economic engine and job creator. Offshore wind turbines harness the power of strong ocean winds by generating energy from faster, more consistent wind speeds and can be leveraged to meet the vast energy needs of coastal states, particularly across the North Atlantic. Given Maine's research in next-generation technologies, local suppliers and expertise, and large offshore wind resource potential, the state is positioned to benefit from long-term market growth in this region. With mass production, electricity rates for offshore wind will decrease to approximately 7.7 cents per kWh.

Through the offshore wind manufacturing industry, Maine can leverage its numerous strengths to take advantage of expanding opportunities, such as:

- **Capitalizing on growing technology demand for offshore wind.** The offshore wind industry is projected to grow 16 percent annually through 2030.
- **Benefiting from regional market growth.** Maine has an opportunity to mobilize the offshore wind market in the Northeast, supplying expertise and products to facilitate the expected build-out of 7.5 GW of installed offshore wind capacity.
- **Harnessing natural resource potential.** Maine has the offshore wind resources to generate about 156 GW of electricity.
- **Leveraging existing resources for manufacturing and production.** Maine is home to concrete production, manufacturing facilities, and other assets that can be used to locally construct wind turbine components, such as floating foundations.
- **Mobilizing cutting-edge research and development.** The state can engage its academic and research networks to capitalize on local innovations in floating foundation technology.
- **Supporting quality, local jobs statewide.** With forward-thinking solutions, offshore wind could support 2,144 Maine jobs annually through 2030.

To realize these opportunities, state and local leaders can pursue strategies that create a strong foundation for industry growth in Maine and help local businesses grow, innovate, and outcompete regional, national, and global competitors. In today's competitive, globalized economy, businesses are more likely to thrive in cities and states that offer clear policy signals, a rich innovation ecosystem, fertile ground for capital investment, and a highly skilled workforce. By having a close network of suppliers and partners, companies in Maine can reap the benefits of increased productivity and operational efficiency, amplifying local job creation and economic growth.

This opportunity offers real benefits for the state economy and Maine residents. Annually through 2030, offshore wind can support a total of 2,144 direct jobs from manufacturing and material development, indirect jobs from suppliers, and induced jobs from spending in the local economy. This industry offers a diverse array of good-paying jobs that cater to different education and experience levels. Policymakers can support these jobs by seizing the opportunity presented by increasing global demand and overcoming barriers to industry growth. Build-out of the offshore wind industry will require clear policy signals, collaborative efforts, continued assessments, policy planning, and steady-handed leadership in order to surmount the unique challenges of this nascent industry.

Summary of Recommendations

The analysis presented in this report culminates in recommendations for Maine's leaders based on best practices in the United States and abroad. Each recommendation identifies strategies to address barriers to industry growth or capitalize on untapped opportunities in the offshore wind industry. Specifically, Maine could target challenges in each foundational building block: local market growth for offshore wind technology, value chain build-out, the innovation ecosystem, access to capital, and workforce development. While the recommendations are intended to be complementary and would be more powerful if adopted as a package, each can also be viewed as a stand-alone option. Maine policymakers and stakeholders should use this guide for collaboration and prioritization of policy actions given the opportunities and challenges that lie ahead in growing the offshore wind industry.

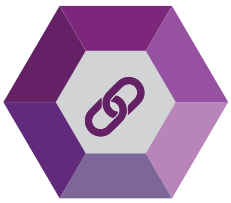


Local Market

Policy 1: Assess Future Procurement Options for Offshore Wind
Exploring future procurement options beyond a standard power purchase agreement (PPA) could ensure that future projects have multiple options for economic viability. Moreover, policymakers could consider procurement requirements that include local labor, as seen in Illinois.

Policy 2: Re-Establish the Maine State Planning Office
To encourage independent analyses, support effective long-term energy planning, and facilitate offshore wind development, Maine policymakers should consider re-establishing the State Planning Office. Given the challenges associated with the development of offshore wind projects, a dedicated staff will need to assess barriers, costs and benefits, and strategies for the proper mobilization of resources to support the industry.

Policy 3: Create an Offshore Wind Production Tax Credit
Maine could create an Offshore Wind Production Tax Credit to send a clear policy signal to foreign and domestic investors that Maine is committed to developing offshore wind and attracting good-paying, middle-class jobs to the state.



Value Chain

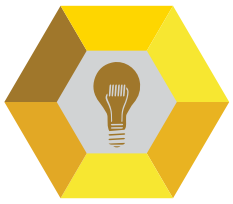
Policy 4: Bolster Foreign Direct Investment
To help support a robust offshore wind cluster in Maine, state officials could leverage foreign direct investment (FDI) programs to provide targeted assistance to international businesses that can act as in-state anchor companies and fill critical gaps in the value chain.

Policy 5: Establish an Anchor Company Tax Credit
Maine could support the build-out of the offshore wind industry by establishing an anchor company tax credit to recruit key component manufacturers needed to meet in-state demand and develop a locally-sourced value chain to ease logistics and operations.

Policy 6: Modernize Economic Development Strategies
Maine could leverage strategic marketing and outreach efforts such as developing modest improvements in the state's brand, website, and media strategy to attract and expand new businesses in the state.

Policy 7: Upgrade Ports and Establish a Port Innovation District
Maine could target investments in strategic offshore wind cluster development around deepwater ports, including upgrading ports and creating nearby innovation districts.

Policy 8: Consider Updates to Tax Increment Financing
Tax increment financing (TIF) is a municipal development financing tool that can yield economic benefits such as the creation of innovation districts or port upgrades. However, Maine could benefit from updates to TIF legislation that ensure proper oversight and stakeholder engagement while also considering additional factors relevant to offshore wind.



Innovation Ecosystem

Policy 9: Establish a Northeast Offshore Wind Innovation Center
Maine could establish a Northeast Offshore Wind Innovation Center to coordinate regional offshore wind R&D efforts, foster engagement with important industry players, leverage investments from federal and state governments, and set and achieve goals related to floating foundation technology.



Access to Capital

Policy 10: Establish an Offshore Wind Business Development Fund for Small Businesses
Maine can help emerging businesses overcome barriers to entry in the offshore wind market by providing targeted support to early-stage manufacturers of wind turbine components such as foundations, towers, and blades as well as assistance to businesses engaged in design and engineering, siting and permitting, transportation, and storage.

Policy 11: Raise or Eliminate the Annual Cap on the Maine Seed Capital Tax Credit Program
To foster an active startup culture and thriving entrepreneurial environment, the Maine Legislature could raise or eliminate the annual cap on the Maine Seed Capital Tax Credit to motivate investors to finance potentially higher-risk, higher-yield ventures and provide more capital than would have otherwise been invested.

Policy 12: Appoint a Foundation Liaison to Target Program-Related Investments and Seek Funding for Advanced Energy Programs
Maine could appoint a Foundation Liaison to develop relationships with and broker support from large national foundations engaging in program-related investments. Maine could leverage foundations' funding mission and resources to facilitate support for in-state advanced energy companies.



Workforce Development

Policy 13: Form an Offshore Wind Workforce Development Fund
By offering financial and technical support to its workforce development organizations, Maine could ensure a strong pipeline of workers at each stage of industry growth, including site survey and development, manufacturing, construction and installation, and operations and maintenance.

Policy 14: Establish Offshore Wind Programs at Community Colleges
Maine could facilitate the growth of its offshore wind industry and help create a qualified workforce by expanding access to wind certificate and degree programs at community colleges. The colleges could provide students with hands-on training in wind turbine maintenance and electrical power production while also emphasizing fundamental electrical and mechanical concepts.

Policy 15: Promote Apprenticeship and Career and Technical Education Programs
Maine could improve its education and employment figures by expanding apprenticeships and career and technical education (CTE) programs, helping residents gain the workforce training needed to participate in emerging industries such as offshore wind.

INTRODUCTION

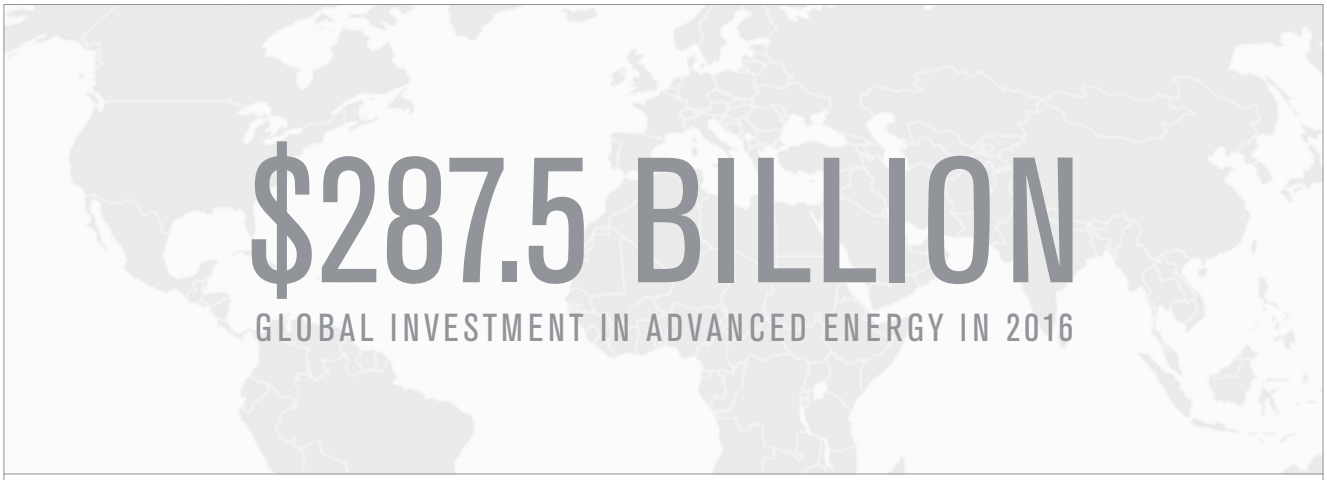
Maine can tap into the growing global advanced energy market to foster and support good-paying jobs for its residents. Through the strategic cluster-based development of the offshore wind industry, Maine could support 2,144 direct, indirect, and induced jobs annually through 2030.

INTRODUCTION

The American Jobs Project aims to spur job creation in the advanced energy sector by identifying state-level economic opportunities and crafting right-fit solutions for in-state growth. This national initiative takes advantage of the accelerating demand for advanced energy and leverages a state's competitive advantages to build robust economic clusters. The American Jobs Project believes that manufacturing is a cornerstone of the U.S. economy—providing workers with good wages and causing a multiplier effect on local revenue and employment—and resolves to support industry jobs that are resistant to offshoring and automation. State and local leaders who seek to capitalize on state resources to create skilled, good-paying jobs can use this report as a foundation for action.

By developing the offshore wind industry in the state, Maine could reasonably support an annual average of 2,144 jobs from 2018 through 2030.

Extensive research and more than twenty interviews with stakeholders and experts in Maine have identified offshore wind as showing particular promise in the state. Given local development of floating foundation technology, interest from cooperative industry associations, a growing network of composites manufacturers, and immense offshore energy resource potential, Maine is well positioned to benefit from the rising demand for offshore wind technology. Opportunities to leverage these strengths to further serve growing regional, national, and global markets offer real benefits for both Maine's economy and its residents. Strategic state-level coordination and collaboration could elevate in-state companies in the marketplace and facilitate middle-class job growth. By fostering growth in the offshore wind industry, Maine could reasonably support an annual average of 2,144 direct, indirect, and induced manufacturing and supply chain jobs from 2018 through 2030.



Advanced Energy Market Opportunity: Demand for advanced energy has soared in recent years and is poised for continued growth. In 2016, investment in the advanced energy sector was $287.5 billion worldwide, nearly five times that of 2004. By 2040, investments are expected to total $7.4 trillion. The advanced energy market is a clear opportunity for increased revenue and job growth.

What is Advanced Energy?

Advanced energy diversifies energy sources, uses energy more productively, and reduces health and environmental costs. All sources, technologies, products, and services that help meet the need for affordable, secure, and clean energy are advanced energy. For example, advanced energy encompasses renewable energy sources, such as onshore and offshore wind, solar, hydro, geothermal, and biofuels. Advanced energy also incorporates technologies and services that improve energy efficiency or make energy available when needed, such as photonics, smart buildings, energy storage, demand response, and smart grids. Other technologies and products that reduce energy consumption include electric vehicles, efficient industrial processes, and airplane bodies made of lightweight composites.

Maine's Need for Good-Paying Jobs

The Great Recession hit Maine's manufacturing sector hard, especially the pulp and paper industry, and the state has since exhibited the slowest-growing economy in New England. This loss has impacted Mainers in counties from Aroostook to York, where the manufacturing sector was once a cornerstone of the job market and provided good-paying, stable jobs throughout the local economy. Although Maine's unemployment rate is relatively low, unemployment varies from county-to-county, with many communities lagging behind the rest of the state. Notably, the prime-age labor force participation rate of Mainers between the ages of twenty-five and fifty-four declined by five percentage points between 2007 and 2017, indicating that at least 30,000 adults are not participating in the job market.

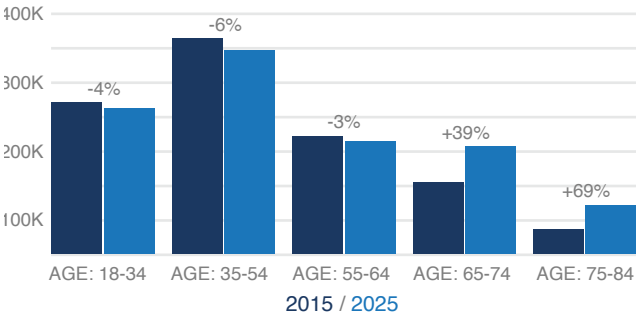
Post-recession economic recovery has also been unequally dispersed between the Greater Portland metropolitan area and the rest of the state, creating a phenomenon known as "the two Maines." As employment disparity grows between rural and urban areas, the availability of middle-class jobs has drastically reduced and job losses have been concentrated in the manufacturing industry, with paper mill closures displacing of thousands of workers. Customizable strategies for workforce recruitment and training will be key to growing the pool of quality jobs in Maine.

As home to the oldest population in the United States, Maine also faces the challenge of stagnant population growth and a rapidly aging workforce. Between 2015 and 2025, the population share of Mainers between the ages of sixty-five and seventy-four will increase by thirty-nine percentage points, while the population of eighteen- to thirty-four-year-olds is expected to shrink by four percentage points.

As the population ages, it could become more difficult for employers to find workers to fill new jobs, which may discourage new businesses from moving into the state. This trend could also cause existing businesses to relocate out-of-state or even shut down operations altogether. In short, this data suggests a need for a robust economic development strategy that equips Mainers with workforce-ready skills but also prioritizes out-of-state talent attraction and improves the standard of living.

MAINE'S AGING POPULATION

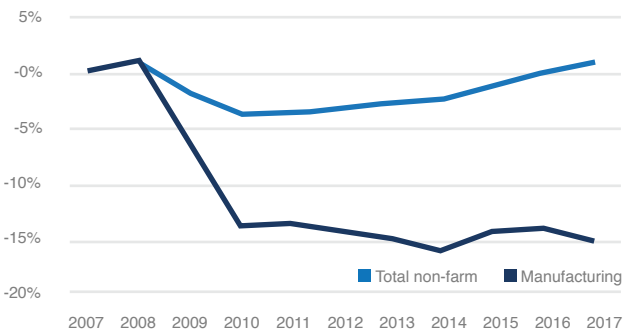
A rapidly aging workforce, coupled with negative population growth, will impact Maine's ability to compete in the 21st century marketplace.



Source: University of Southern Maine

PERCENT CHANGE IN MAINE EMPLOYMENT

Seasonally adjusted, 2007-2007



Source: U.S. Bureau of Labor Statistics

The Benefits of Cluster-Based Development

Economic clusters are regionally situated groups of interconnected companies and institutions organized around a particular industry. In today's competitive, globalized economy, businesses are more likely to thrive in cities and states that cultivate the foundational building blocks of cluster development: clear policy signals, a robust value chain, a rich innovation ecosystem, fertile ground for capital investment, and a highly skilled workforce. In Maine, state legislators have identified seven technology areas with high-growth cluster potential, including composites and advanced materials, precision manufacturing, and environmental technologies. Geographic proximity and repeated exchanges of information help foster an environment of coordination and cooperation among companies and institutions in these industries, leveraging a trained workforce and each actor's unique expertise. By having a close network of suppliers and partners, companies can reap the benefits of increased productivity and operational efficiency, amplifying local job creation and economic growth.

HOW DOES AN ECONOMIC CLUSTER WORK?

An economic cluster is built on the cross-pollination of ideas and resources to bolster the innovation ecosystem, access to capital, workforce development, value chain, and local market for an industry.

Banks & Investors Banks and investors provide capital for technology commercialization and business development in industry and innovation fields.

Labs, Incubators & Accelerators Innovation hubs partner with industry to tackle industry challenges and leverage entrepreneurship and commercialization expertise.

People across these entities can foster connections, strengthen coordination, and encourage collaboration to build a robust cluster.

State & Local Government State and local government offers policy certainty and financing to support and encourage cluster-based development via education and job training, business development and investment, R&D, and market incentives.

Schools, Community & Technical Colleges, Universities Schools and industry partner to ensure students learn STEM concepts and receive skills to meet in-state needs.

Industry Industry partners with innovation hubs to tackle industry challenges, promote entrepreneurship, and support technology commercialization.

Non-Governmental Organizations
Non-governmental organizations, such as economic development and advocacy groups, advance strategies and connections to improve cluster assets.

MAINE'S ECONOMIC OPPORTUNITY IN OFFSHORE WIND

Maine is well positioned to capitalize on rising market demand for offshore wind given the state's vast offshore wind energy resource potential, groundbreaking research in floating foundation technologies, and a thriving network of composites manufacturers and environmental assessors.

MAINE'S ECONOMIC OPPORTUNITY IN OFFSHORE WIND

Offshore wind is a unique opportunity for Maine. Maine is poised to become a leader in offshore wind innovation and manufacturing and capitalize on rising market demand in the Northeast given its local expertise in composites manufacturing and environmental assessment, thriving network of university research and innovation, and development of the first floating foundation demonstration project in the United States. State and local leaders could support these assets through strategies that leverage Maine's competitive advantages and strategically target areas for growth.



What is Offshore Wind?

Offshore wind turbines harness the energy of strong ocean winds. As an emerging sector in the United States, the offshore wind industry generates energy from faster, more consistent wind speeds and can be leveraged to meet the vast energy needs of coastal states. Offshore wind farms that are supported by floating foundations are uniquely suited for deeper waters, allowing turbines to be located further out at sea. As such, floating wind power will be critical to the offshore wind industry's long-term growth potential. This can be observed in Scotland, where Statoil has built the world's first floating wind farm approximately eighteen miles off the country's east coast. In its first three months of production, Hywind Scotland achieved a 65 percent capacity factor, indicating that 65 percent of the turbines operated at maximum output at all times. In contrast, offshore wind turbines with fixed-bottom foundations typically reach a capacity factor of 45 to 60 percent. Capacity from Hywind Scotland has achieved parity with U.S. coal generation, which reached a capacity factor of 64 percent in 2018. By 2030, Statoil expects to reduce the costs of energy from the Hywind Scotland project to $47 to $70 per MWh, which is comparable to the current U.K. market price of $63 per MWh.

Why Offshore Wind in Maine?

Maine could catalyze economic growth and job creation by harnessing its strengths in the offshore wind industry. This objective could be realized through capitalizing on growing regional demand, leveraging existing resources for manufacturing and production, mobilizing cutting-edge R&D, and supporting quality local jobs statewide.

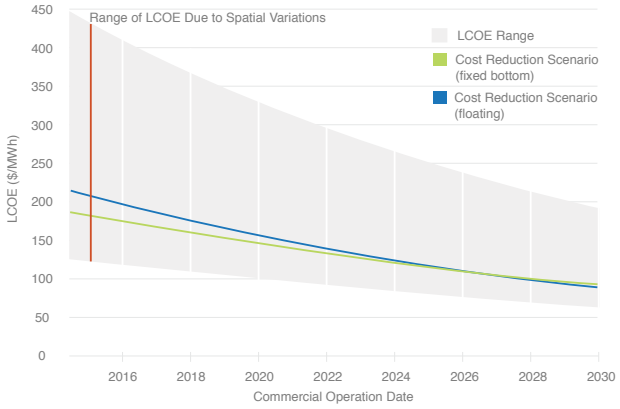
Opportunity to Capitalize on Growing Technology Demand for Offshore Wind

Globally, the offshore wind industry is projected to grow 16 percent each year between 2017 and 2030. Not only is demand rising, but prices are falling: Offshore wind projects have seen record-setting low bids in Europe, and the levelized cost of energy (LCOE) for offshore wind is expected to decrease by 68 percent from 2010 to 2020. In the long term, costs are forecast to decline from 13 cents per kWh in 2015 to 6 cents per kWh in 2030. The United States is poised to enter this market. There are currently more than twenty planned offshore wind projects in the United States with generation capacity potentially exceeding 24 GW, which is enough to power over nine million homes. Because approximately 80 percent of U.S. electricity demand is found in coastal states, Maine is well positioned to capitalize on market opportunities in offshore wind.

Opportunity to Benefit from Regional Market Growth

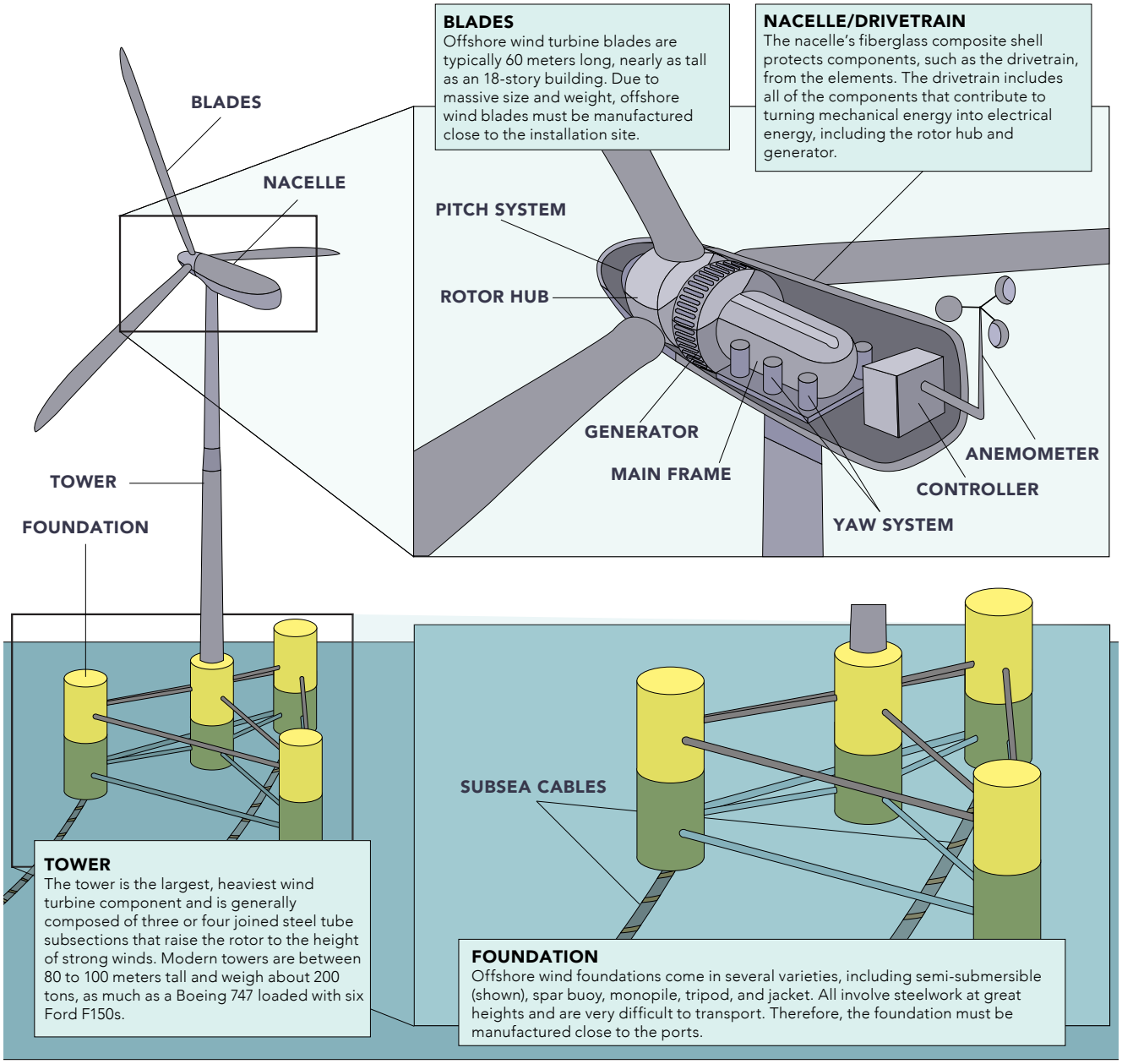
In the Northeast, four states are planning to invest $56 billion in offshore wind projects over the next decade. These states have indicated reliable levels of regional demand to warrant value chain development: Massachusetts alone plans to procure 1.6 GW of offshore capacity and New York is exploring up to 1 GW of offshore production in partnership with Statoil, with a goal of reaching 2.4 GW by 2030. In 2013, Statoil was prepared to invest $120 million in a wind farm off the coast of Maine, but the company decided to abandon the project when the bid process was reopened. However, state legislators have called for a 5 GW carve-out for generation from offshore and coastal waters by 2030, and the Maine Aqua Ventus project will help catalyze further offshore wind development to support this goal. With mass production, electricity rates for offshore wind will decrease to approximately 7.7 cents per kWh. Maine can expect to capture a significant portion of this market growth, as the state is projected to have one of the lowest LCOE sites among all U.S. coastal states.

RANGE OF LEVELIZED COST OF ENERGY FROM 2015 TO 2030



Source: National Renewable Energy Labratory

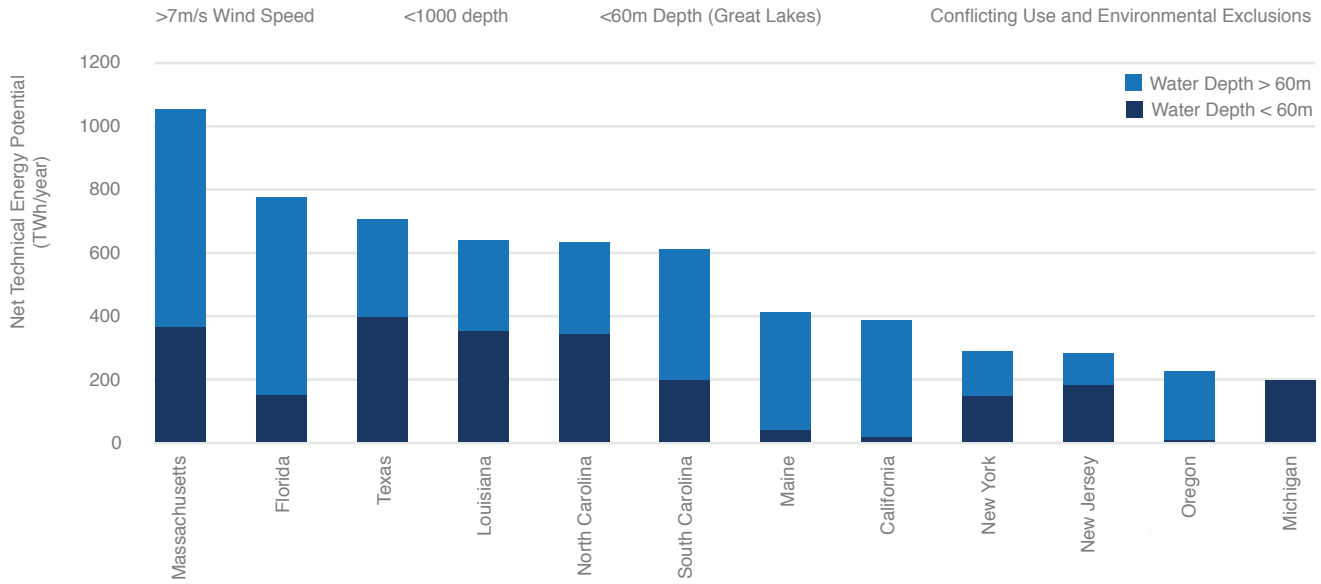
Anatomy of an Offshore Wind Turbine



New England Aqua Ventus I, an offshore wind demonstration project off the coast of Maine, is capitalizing on in-state technological innovations in semi-submersible floating concrete platforms to become the first project of its kind in the United States. When the demonstration project is complete, the University of Maine-designed VolturnUS platform will support two 6 MW wind turbines and could help meet growing demand for deepwater offshore wind in the Northeast. VolturnUS is classified as level three on the Technology Readiness Level (TRL) index. This suggests that, as the technology moves towards full-scale commercialization, the Aqua Ventus project could be looked to as a model for the nation. As the only floating offshore wind demonstration project in the United States, the project represents Maine's significant competitive advantage in the renewable ocean energy industry and signifies past support by the U.S. Department of Energy (DOE) in competitive processes. Local institutes such as the Maine Maritime Academy are collaborating with the University of Maine along with partners Cianbro and Naval Energies. The project's success will depend on continued funding and support from the DOE and the Maine Public Utilities Commission.

STATE SNAPSHOT: OFFSHORE WIND TECHNICAL ENERGY POTENTIAL

Maine's high energy potential includes water depths that are greater than 60 meters, making the state an ideal hub for offshore development.



Source: National Renewable Energy Labratory

Opportunity to Harness Natural Resource Potential

Mainers are poised to benefit from their state's natural resources and unique structural assets for offshore wind development. Given the state's coastal wind speeds of nine to ten meters per second are among the highest on the East Coast, Maine is uniquely suited to grow the floating offshore wind industry. Approximately 80 percent of all U.S. offshore wind potential is located in deep water; Maine's deepest waters can be found near its shores, where depths reach about sixty-one meters at three nautical miles from the coast. In context, water depths that exceed sixty meters cannot support fixed-bottom foundations such as monopiles and jackets, making floating offshore wind a convenient choice for the state. Offshore wind is also a high-value investment for Maine. In an assessment of economic attractiveness by NREL, Maine had the nation's highest unsubsidized net value for offshore development by 2027 due to factors such as large deepwater wind resource potential. The full utilization of offshore wind capacity off the coast of Maine could result in the generation of more than 156 GW of electricity.

Opportunity to Leverage Existing Resources for Manufacturing and Production

Maine's assets in offshore wind development are not limited to natural resources. The state is home to concrete production, manufacturing facilities, and other assets that can be used to construct floating foundations in-state. Dragon Products Company in Thomaston, Maine is the only large-scale cement manufacturer in New England. In the future, existing infrastructure at Maine's deepwater ports and easy access to roads and railways could facilitate the assembly and transportation of large wind turbine components, and full-scale offshore wind industry growth can be catalyzed by associated industries such as marine steel fabrication and composite materials manufacturing. Maine also has a skilled workforce in related industries such as onshore wind and shipbuilding, and expertise could be retooled to benefit the offshore wind industry.

Opportunity to Mobilize Cutting-Edge Research and Development

Maine's research environment is fortified by a booming academic culture and a strong network of innovators, resulting in an unparalleled opportunity to position the state as a global leader in offshore wind innovation, construction, and deployment. The University of Maine is home to VolturnUS, a semi-submersible floating foundation for offshore wind turbines. VolturnUS is the first technology of its kind in the United States. It can decrease offshore wind

costs by potentially driving hull costs down by 50 percent over other floating foundation technologies in the United States. The DeepCwind Consortium, a partnership of regional leaders such as the Maine Composites Alliance and the Advanced Structures and Composites Center at the University of Maine, is working to establish Maine as a pioneer in deepwater offshore wind technology, most notably in wind turbine foundations. Demand for floating offshore technology is growing, with a Northern California county recently establishing its own consortium aimed at furthering offshore wind development. With greater industry engagement, Maine could harness its natural resource potential by leveraging momentum from the University of Maine's Aqua Ventus project and mobilizing in-state R&D to bring other innovative ideas from labs and universities into the market.

Opportunity to Support Quality Local Jobs Statewide

The offshore wind industry could help to address Maine's need for good-paying jobs while offering a diverse array of employment opportunities that cater to different education and experience levels. At commercial scale, offshore wind is capable of creating new jobs in sectors such as construction, operations, products, and services. With forward-thinking strategies and innovative solutions, Maine could leverage the offshore wind industry to support an annual average of 2,144 jobs through 2030. This estimate includes direct jobs from manufacturing and material development, indirect jobs from suppliers, and induced jobs from spending in the local economy. (*See Appendix for jobs modeling methodology.*)

JOB OPPORTUNITIES IN OFFSHORE WIND

Maine can foster a diverse array of employment opportunities that cater to different education and experience levels.



Civil Engineers

Design, build, and operate infrastructure projects and systems in the public and private sector.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
Bachelor's Degree

Wage: $37.65



Electrical & Electronics Engineering Technicians

Assist engineers with design and development.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
Associate Degree

Wage: $31.37



Construction Laborers

Perform physical labor on construction sites.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
On-the-job training

Wage: $14.93



Welders, Cutters, Solderers & Brazers

Join or cut metal parts using hand-held or remotely controlled equipment.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
High-school diploma or equivalent with technical and on-the-job training

Wage: $22.30



Environmental Scientists

Protect the environment by working with industry and advising policymakers.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
Bachelor's Degree

Wage: $29.13



Machinists

Operate a variety of machine tools to produce precision parts and instruments.

TYPICAL ENTRY-LEVEL REQUIREMENTS:
Bachelor's Degree

Wage: $22.10

Source: U.S. Bureau of Labor Statistics

STATE ASSETS TO SUPPORT OFFSHORE WIND CLUSTER DEVELOPMENT

Foundational building blocks are local market growth, value chain build-out, the innovation ecosystem, access to capital, and workforce development. Maine has many assets that can be aligned with cluster-based development, including a robust innovation culture, local expertise in composites manufacturing and environmental assessment, and a strong network of cooperative industry associations.

STATE ASSETS TO SUPPORT OFFSHORE WIND CLUSTER DEVELOPMENT

While the Maine Technology Institute supports high-potential technology industries through its Cluster Initiative Program, the state has an opportunity to bolster these efforts by building a comprehensive cluster development strategy that is centered around the offshore wind industry. Clusters require several foundational building blocks coordinated for growth: a local market for Maine-made goods, a comprehensive value chain, an innovation ecosystem that cultivates new ideas, access to capital for new and expanding businesses, and education and training for a skilled workforce. When fortified by clear market signals and policy certainty, these assets translate into major opportunities for business growth and job creation in the target industry, laying the groundwork to catalyze economic opportunity for thousands of Mainers.

The following visual guides break down the key assets for a robust cluster. This section will use these guides to illustrate the state's strengths in each foundational building block and showcase significant resources for Maine's offshore wind industry.



Local Market: Creating a local market for products sends a market signal to businesses that encourages investment in new facilities and employees. High local demand can build a local company base that could then expand to regional, national, and global markets. Clear utility and business regulatory environments coupled with resources for project development and end-user adoption can create a strong local market.



Value Chain: An industry value chain is composed of an array of companies engaged in the manufacturing, sale, marketing, and distribution of technologies. It also includes organizations that represent business interests across platforms. This base provides a solid foundation from which to attract more companies and customers.



Innovation Ecosystem: Innovation is essential for business and industry competitiveness, and a strong knowledge hub can be a beacon for talent and investment. The innovation ecosystem supports fundamental research across universities and labs, fosters an entrepreneurial culture that seeks to advance and disrupt industries, and brings ideas to market.



Access to Capital: Access to investors or competitively priced non-dilutive capital can be the difference between success and failure for a new or expanding business. It is also important for consistent access to capital across development from the seed and early/growth stages to the late stage. An active investment environment can attract more entrepreneurs and investors to the state.



Workforce Development: Trained and skilled workers are fundamental to industry success, and strategic workforce development can support talent recruitment and retention. Workforce development requires collaboration across schools, businesses, and government offices to integrate STEM education, foster industry-ready skills via apprenticeships and career-integrated curriculum, enable stackable credentials that offer multiple entries and exits, and provide resources that match skills to available jobs.

MAINE'S LOCAL MARKETS ASSETS

Encouraging Investment in Maine-Made Goods

Key components of a strong local market are end-user and project development resources, a favorable energy regulatory environment, and a business-friendly climate. Maine can foster a local market by ensuring firms can easily do business in the state, developers can access financing for advanced energy projects, and state and local policies offer clear, transparent goals, rates, and requirements for advanced energy.



Renewable Portfolio Standard: Requires that electricity providers supply a minimum of 30% of their total sales from current renewables. In 2017, 10% of the total load must be met by new renewable energy sources.

Offshore Wind Goals: Maine has established a wind goal of at least 8 GW of wind by 2030, which includes 5 GW of wind energy produced offshore. The 5 GW offshore wind goal could help Maine capture $20 billion in investments, creating thousands of jobs in the process.

Demonstration Project: In 2009, the state legislature created an offshore wind test site to facilitate floating platform pilot projects.

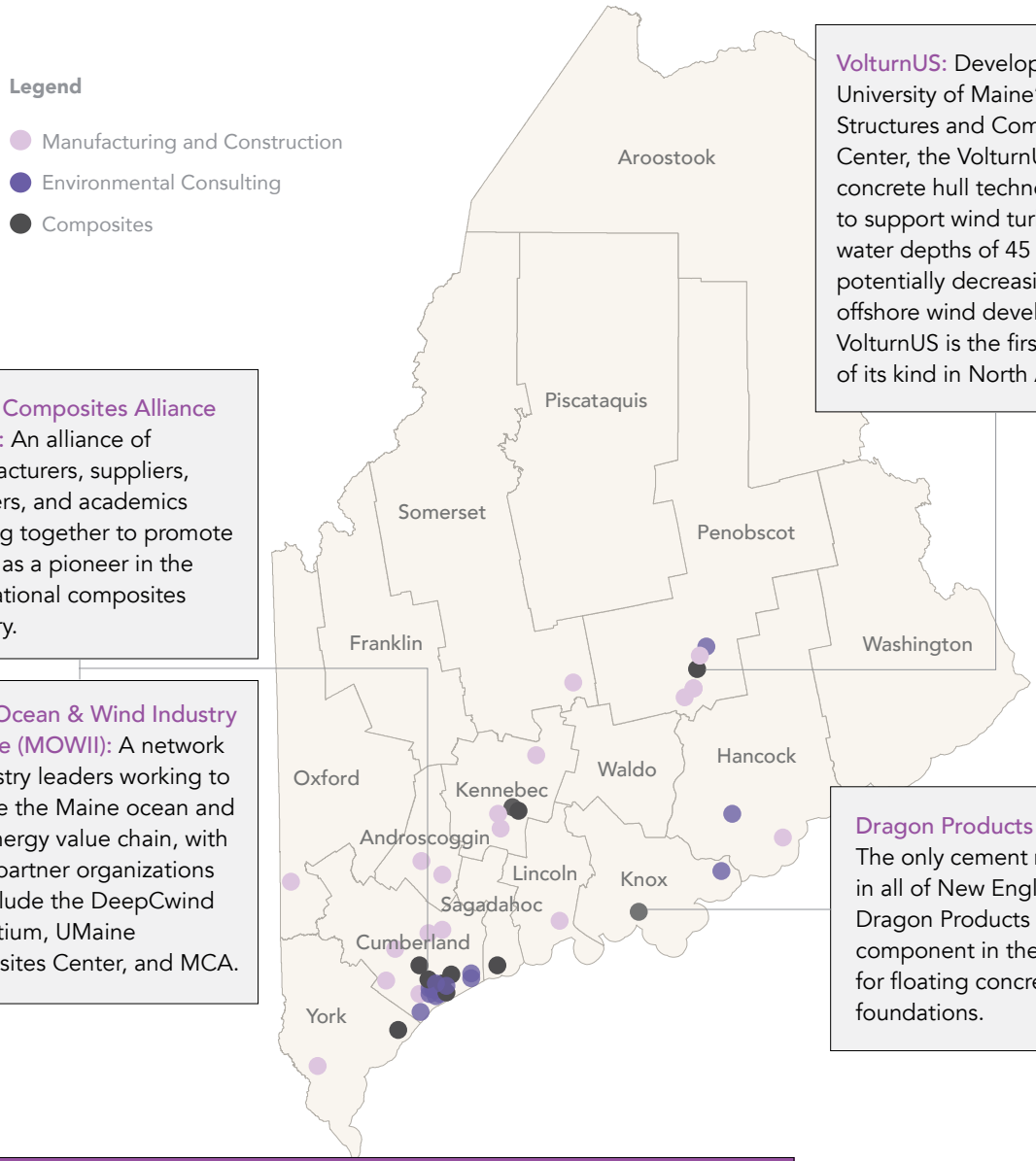
Power Purchase Agreement: In 2013, the Maine Public Utilities Commission (PUC) approved a 20-year Power Purchase Agreement (PPA) with Maine Aqua Ventus, a demonstration project with Maine Central Power, that is located within the test site.

Streamlined Permitting: Efficient siting and permitting processes have contributed to local growth of onshore wind. Maine has more installed onshore capacity than all other New England states combined. Similarly consistent and efficient siting and permitting can spur growth of the offshore market as well.

MAINE'S VALUE CHAIN ASSETS

Expanding In-State Industry Capabilities

Key components of an industry value chain are businesses that anchor manufacturing, supply, installation, operations and maintenance, project development, and construction as well as resources that support business attraction, retention, and advocacy. Although the United States lacks certain elements of a robust offshore wind value chain such as high-voltage subsea cables, Maine is poised for growth in this sector due to in-state innovation in floating foundation technology, manufacturing of advanced composites, local expertise in environmental assessment, and cooperative industry associations.



VolturnUS: Developed at the University of Maine's Advanced Structures and Composites Center, the VolturnUS floating concrete hull technology is able to support wind turbines in water depths of 45 feet or more, potentially decreasing costs for offshore wind development. VolturnUS is the first technology of its kind in North America.

Maine Composites Alliance (MCA): An alliance of manufacturers, suppliers, servicers, and academics working together to promote Maine as a pioneer in the international composites industry.

Maine Ocean & Wind Industry Initiative (MOWII): A network of industry leaders working to advance the Maine ocean and wind energy value chain, with fifteen partner organizations that include the DeepCwind Consortium, UMaine Composites Center, and MCA.

Dragon Products Company: The only cement manufacturer in all of New England, Dragon Products is a crucial component in the value chain for floating concrete hull foundations.

A growing nexus between advanced composites and offshore wind

By 2020, wind energy will comprise nearly 60% of the market for advanced composites. The growth of Maine's offshore wind industry will rely on innovations in composites such as carbon fibers, carbon nanotubes, and graphene. These coatings help increase durability, protecting turbines from corrosion and wear.

MAINE'S INNOVATION ECOSYSTEM ASSETS

Working Together to Bring Ideas to Market

Key components of an innovation ecosystem are technical, financial, and capacity-building resources that support entrepreneurship, research and development, and commercialization. Maine has several assets dedicated to cultivating an entrepreneurial spirit and supporting the growth of new ideas, including universities that are at the forefront of fundamental and industry-related research in offshore wind. Although the state has a nascent entrepreneurial culture, entrepreneurs have access to a number of resources to support their innovations, with a few highlighted below.



Entrepreneurship

- **Maine Accelerates Growth Initiative (MxG):** A capacity-building network of individuals and organizations supporting entrepreneurship and innovation in Maine.
- **Incubation Program at the UpStart Center for Entrepreneurship:** A market-oriented incubator that supports developing firms.
- **Maine Center for Entrepreneurial Development (MCE):** A private, nonprofit business incubator that supports innovative startups in Maine.

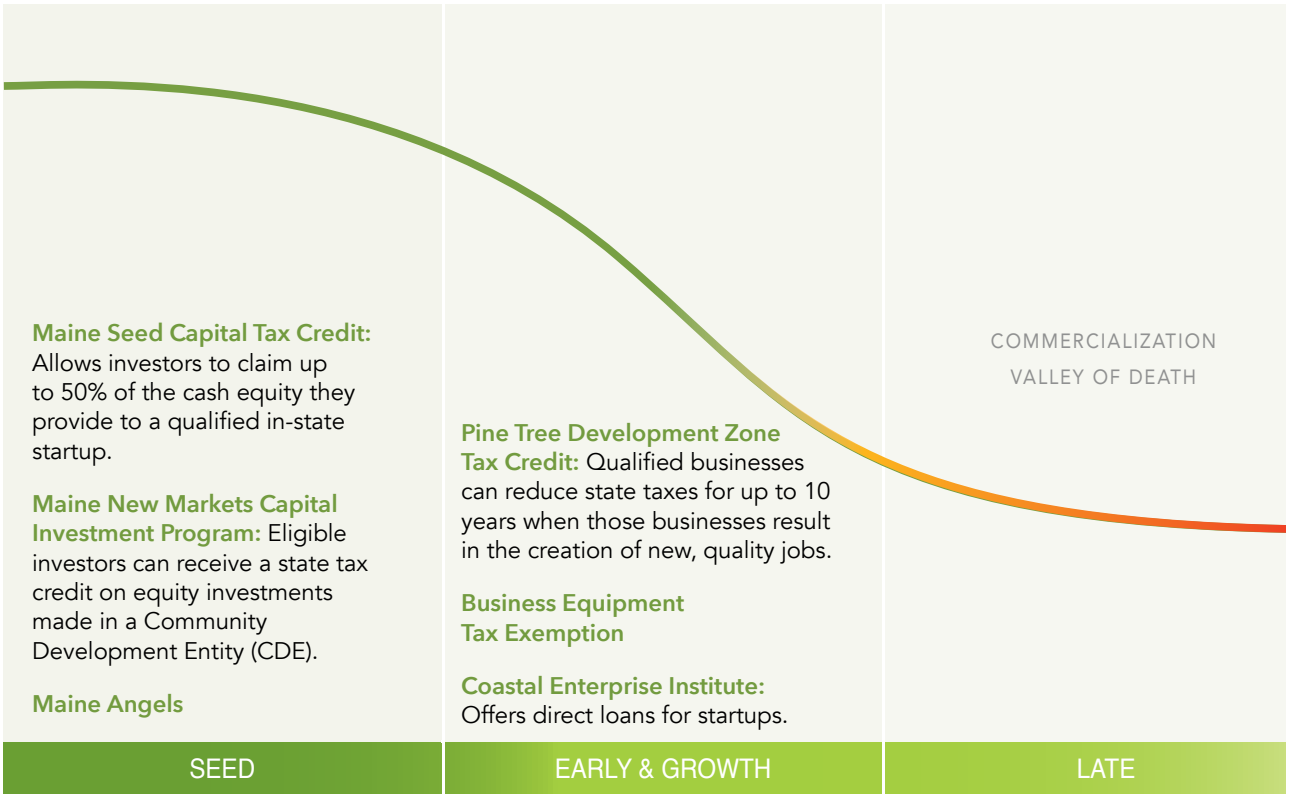
Research & Development

- **Maine Technology Institute (MTI**): A private, nonprofit organization that promotes growth in the R&D of technology-based ventures.
- **Maine Technology Asset Fund (MTAF)**: A $45 million fund that supports infrastructure and equipment upgrades for R&D initiatives.
- **UMaine Advanced Structures & Composites Center:** A renowned center for research, education, and economic development with expertise in ocean energy technologies.

MAINE'S ACCESS TO CAPITAL ASSETS

Investing in New and Growing Businesses

Key components of access to capital are diverse funding sources and robust funding available across the seed, early/growth, and late stages. Maine offers many grants, loans, and investment programs to support businesses at the seed stage; however, in-state companies face a shortfall in funding during the early/growth and late stages, often called the commercialization valley of death.



Maine Seed Capital Tax Credit: Allows investors to claim up to 50% of the cash equity they provide to a qualified in-state startup.

Maine New Markets Capital Investment Program: Eligible investors can receive a state tax credit on equity investments made in a Community Development Entity (CDE).

Maine Angels

Pine Tree Development Zone Tax Credit: Qualified businesses can reduce state taxes for up to 10 years when those businesses result in the creation of new, quality jobs.

Business Equipment Tax Exemption

Coastal Enterprise Institute: Offers direct loans for startups.

Maine Technology Institute: The Equity Capital Fund provides up to $200,000 in grants and loans to support business growth. The Cluster Initiative Program awards up to $50,000 for early-stage planning and up to $500,000 for initiatives that bolster Maine's high-potential technology clusters.

Technology Tax Credits: Include sales tax exemptions for R&D, manufacturing, and more.

SBIR/STTR: Recipients of R&D grants can receive up to $100,000 in Phase I, up to $750,000 in Phase II, and a grant or contract for a product in Phase III.

Venture Capital Funds

Maine Venture Fund: State-funded venture capital investments.

MAINE'S WORKFORCE DEVELOPMENT ASSETS

Building an Industry-Ready Workforce

Key components of workforce development are STEM education, work-integrated learning, flexible career pathways, apprenticeships, skill-matching resources, and interagency cooperation. Maine has a number of educational and job-training programs to ensure a sufficient pipeline of workers to support further development in offshore wind energy.

Educate Maine: Promotes college and career readiness through data analysis and strategic outreach and advocacy.

Competitive Skills Scholarship Program (CSSP): Supports workers seeking to upgrade their skills and prepare for jobs in high-wage, in-demand fields through financial assistance.

Maine Quality Centers (MQC): Award workforce training grants to employers who are seeking to locate or expand their operations in the state. These resources have helped over 230 Maine businesses expand, representing over 15,000 new jobs and $2.5 billion in private investment.

Opportunity Maine Tax Credit: Provides individuals or employers with a tax credit for student loan payments, effectively incentivizing retention of Maine graduates and recruitment of newcomers to the state. Approximately 4,000 graduates claimed the credit in 2014 alone.



POLICY RECOMMENDATIONS

To grow the offshore wind industry, state and local leaders can address barriers and capitalize on opportunities across foundational building blocks, such as reducing the cost of in-state technology deployment, supporting a robust value chain, collaborating with neighboring states to bolster innovation, increasing capital available for startups, and targeting talent retention and recruitment. These forward-thinking policies, programs, and ideas are intended to serve as stepping stones to discussion and collaboration.

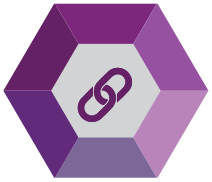
POLICY RECOMMENDATIONS

To help create thousands of jobs and strengthen the state's manufacturing industry, Maine's leaders can capitalize on the state's competitive strengths and demonstrate their commitment to the offshore wind industry by enacting smart, forward-thinking policies and implementing non-legislative solutions. In particular, state and local leaders can apply innovative strategies that address barriers and missed opportunities across foundational building blocks, as noted by the icons. These broad strategies include growing the in-state value chain, fostering technology development and commercialization, increasing business access to financial resources, and improving workforce training. Maine can also catalyze the local market for offshore wind energy as an opportunity for industry growth. Robust demand near manufacturing facilities can help to create synergies that drive innovation, train and retain talent, and draw in out-of-state investors.

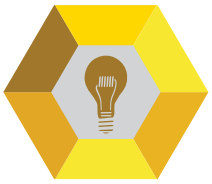
Whether taken as a whole or as piecemeal solutions, the following recommendations could attract private investment, stimulate the state's economy, and create good-paying jobs for Mainers.



Local Market: Incentivizes deployment and reduces the cost barrier of supporting offshore wind development for Maine's utilities and electricity customers.



Value Chain: Encourages strategic collaboration across stakeholders to strengthen Maine's offshore wind industry and attract investments from outside the state.



Innovation Ecosystem: Fortifies the innovation culture in Maine by removing barriers to market participation and increases information sharing and collaboration across industry networks, allowing the state to lead the nation in offshore wind-related R&D.



Access to Capital: Expands available capital for Maine's startups, especially customized, long-term funding opportunities to support commercialization in capital-intensive industries.



Workforce Development: Targets talent retention and recruitment through the development of workforce training programs that emphasize hands-on skills readiness and expanded pathways to careers in Maine's offshore wind industry.

Policy 1: Assess Future Procurement Options for Offshore Wind

OPPORTUNITY

Maine has an established goal of procuring 5 GW of offshore wind by 2030, which could help the state capture up to $20 billion in investments. In an effort to stimulate the floating offshore wind industry, the state legislature established an offshore wind pilot site in 2009. A block power purchase agreement (PPA) was chosen as a vehicle for electricity procurement from the 12 MW Aqua Ventus pilot project to Central Maine Power. PPAs provide investors with a reliable revenue stream in the face of volatile wholesale electricity markets or uncertain local market signals. This detail is especially important for offshore wind projects that have high upfront capital expenditures, but lower operational expenses and no fuel costs. Neighboring states, such as New York and Rhode Island, have offshore wind PPAs signed within their states, and some states require utilities to enter into long-term PPAs. However, leaders in New York and other states have begun to assess if a bundled PPA is the best procurement option. For Maine-based projects beyond Aqua Ventus, the economic viability of long-term procurement would benefit from additional analyses that consider factors such as renewable energy certificate (REC) markets. Moreover, policymakers have an opportunity to explore additional procurement considerations that could benefit Mainers.

SOLUTION

New York policymakers commissioned a report that considered variations on PPAs, variations on RECs such as an offshore wind REC, and innovative project ownership models (*see case study*). Given Maine's unique resource potential and wholesale market conditions, a similar study conducted on behalf of the state would benefit decision makers at the utilities, the Maine Public Utilities Commission, and project developers. Although such an activity was recommended by the 2009 Ocean Energy Task Force, which suggested addressing factors such as fossil fuel volatility, greenhouse gas emissions, and economic benefits of long-term contracts, the state has neglected to follow through on this directive. Moreover, long-term procurement can incorporate requirements for local labor and workforce development. Legislation in Illinois directed long-term procurement strategies to incorporate elements of mandatory training programs and include Illinois workers in new projects, while Maryland requires a cost-benefit analysis that clearly identifies net economic benefits to the state (*see case studies*).

Power Purchase Agreement: A long-term agreement between a credit worthy customer (e.g., utility, municipality, large company) that provides sufficient and predictable revenue stream.

Renewable Energy Certificate: A tradable energy credit that represents 1 MWh of renewable electricity. Even while the price of RECs rises and falls, these credits are bought, sold, and traded between states to satisfy renewable goals. RECs can be valued at higher levels for specific types of generation, such as offshore wind.

Key Players: Maine Public Utilities Commission, Maine Legislature, Utilities, Governor's Energy Office



Case Study: NYSERDA Procurement Options

A report commissioned by the New York State Energy Research Development Authority (NYSERDA) identified additional procurement options for achieving the goal of 2.4 GW of installation by 2030. With the aims of reducing cost and providing long-term certainty for investors, the study assessed key differentiating factors such as involvement by utilities and commodity revenue ambiguity. The study assessed variations on RECs such as a market offshore wind REC and index offshore wind REC, as well as variations on the traditional "bundled" PPA and utility-owned generation. Similar considerations and assessments in the context of Maine's economy would illuminate a path forward for future procurement.



Case Study: Maryland Offshore Wind Procurement Requirements

The Maryland Offshore Wind Energy Act of 2013 stipulated that the Maryland Public Utilities Commission must assess offshore wind projects on a number of criteria beyond electric rates alone. Developers must submit a cost-benefit analysis that clearly demonstrates the positive net environmental, economic, and health benefits for the state. Additional criteria for project approval include the developer's plan to engage local small businesses as well as a commitment to fair wages for skilled laborers. Such procurement criteria could be incorporated into Maine's plan to ensure adequate engagement with local businesses and skilled labor.





Case Study: Illinois Future Energy Jobs Act

The Future Energy Jobs Act directed the Illinois Power Agency to develop procurement plans for new construction of solar and wind generation projects. In addition to setting aside funds for renewable programs in low-income neighborhoods, the act requires that renewable energy training programs be established. Notably, the act requires that RECs procured from new projects come from devices installed by qualified persons and enables the Illinois Commerce Commission to create training programs for installation operators. In other words, the legislation requires that RECs from new build come from projects that employ workers trained and certified in Illinois. A similarly designed requirement could ensure the Maine offshore wind industry trains and employs local residents.

Policy 2: Re-Establish the Maine State Planning Office

BARRIER

From 1968 until 2012, the State Planning Office provided technical assistance, conducted economic analyses, and coordinated resources in support of the state and municipal governments' economic and energy planning needs. Today, there is no executive entity playing these roles in support of the policy-making process. This reduces the importance of objective data and long-term planning relative to political concerns in policy choices and increases policy uncertainty. State legislators, the Maine Public Utilities Commission (PUC), and other government bodies are under-equipped to make sound long-term decisions about the state's energy needs. Without such a planning authority, state authorities cannot plan for energy procurement, maintain a reliable grid, or plan for an evolving economy. Moreover, given the challenges associated with development of offshore wind generation, a dedicated staff will need to assess barriers, costs and benefits, and the proper mobilization of resources to support the offshore wind industry. This will require scrupulous analyses of economic incentives, port infrastructure, procurement strategies, and transmission, among others. Moreover, Maine's offshore wind industry lacks a needed liaison to coordinate with federal authorities on new call areas and siting processes.

SOLUTION

Maine could restore objectivity to its policy process, support effective long-term energy planning, and facilitate offshore wind development by re-establishing the State Planning Office. Research assessments from the planning office could empower the PUC and state lawmakers to plan wisely for Maine's planning and distribution needs, and help the state explore new ideas in energy procurement, energy efficiency management, and other areas.

The Maine State Planning Office provided 44 years of independent analysis, which guided the state's energy and economic strategy. The office was dismantled in 2012, and Maine policymakers have since been unequipped to make sound, long-term plans for the state's evolving energy and economic development needs.

In addition, the planning office could serve as the state's interface with the federal Bureau of Ocean Energy Management (BOEM), which has jurisdiction over the leasing of offshore territories for energy generation in federal waters. The planning office could work to drive BOEM's lease process forward by helping to initiate studies of potential wind generation areas and facilitating stakeholder engagement. By engaging with BOEM, the planning office could play a determinative role in establishing Maine Wind Energy Areas, a prerequisite for the construction of offshore wind farms.

Given the complexity of the global economy, twenty-first century energy markets, and emerging technologies like offshore wind, it is critical to have an independent, objective agency providing the policy planning process with data and logistical support. Such an organization is commonplace for states, as with neighbors New Hampshire and Massachusetts. To capitalize on the economic opportunity presented by offshore wind, Maine should re-establish a state office to conduct research and analysis, engage stakeholders, and coordinate resources for energy planning.

Key Players: Maine Legislature, Maine State Planning Office

Policy 3: Create an Offshore Wind Production Tax Credit

OPPORTUNITY

Maine boasts over 900 MW of installed onshore wind capacity, demonstrating the state's commitment to wind-generated power. However, offshore wind energy is primed for growth and Northeast states are demonstrating their commitment with over $50 billion in offshore wind investments over the next decade. Winds off Maine's coastline could generate 156 GW of electricity, and the state's Aqua Ventus demonstration project is a significant opportunity to spur investment in realizing this potential. However, upfront capital costs are a challenge for the nascent offshore wind industry. Foreign developers seeking to invest in new U.S. markets will look to states that can provide policy certainty and favorable tax policies.

SOLUTION

Creating an Offshore Wind Production Tax Credit would send a clear signal to investors that Maine is serious about offshore wind development and attracting middle-class jobs to the state. State policymakers could allocate proceeds from Maine's Regional Greenhouse Gas Initiative, which supported investments of $15.4 million into state programs in 2015. Although the proceeds mostly fund energy efficiency, with about half benefiting commercial and industrial customers, they can be used to support commercial renewable energy projects, including offshore wind. Additionally, policymakers could consider funding the Offshore Production Tax Credit with revenue garnered from leasing state waters to developers, considering areas that would not interfere with tourism or fishing. Policymakers could consider a cap on total tax credits allocated over a ten-year period and a built-in sunset to ensure funds are used wisely.

Key Players: Maine Legislature, Efficiency Maine Trust



Case Study: New Mexico's Renewable Energy Production Tax Credit (REPTC)

In 2003, New Mexico instituted the REPTC to stimulate clean energy investment. The program was so successful that all available production tax credits for solar have been claimed until 2022. The tax liability for wind and biomass projects are capped at $20 million per year for ten years, a fraction of the money the state will earn by leasing land for renewable energy uses. Those land leases are expected to bring in $574 million to the state, far exceeding the cost of the tax credits. Neighboring states, including Arizona, followed New Mexico's lead and instituted similar policies.

Policy 4: Bolster Foreign Direct Investment

OPPORTUNITY

In 2015, Maine ranked eleventh in foreign direct investment (FDI) jobs per capita in the United States, but the state lacks targeted FDI programs to incentivize growth across sectors within the offshore wind value chain. Since many of the largest companies in the offshore wind value chain are located in Europe, FDI can help catalyze the industry in Maine by bringing new jobs and capital into the state economy. Neighboring states are acting quickly to capitalize on the opportunity to pioneer new development: In 2017, Norway-based Statoil secured a license to develop a wind farm off the coast of New York at the cost of $42.5 million dollars. By providing customized assistance for foreign companies seeking to expand into Maine, highlighting the state's cluster assets to key organizations, and improving relationships with targeted countries, Maine's leaders could fill critical gaps in the value chain and make the state a desirable option for offshore wind companies that are seeking to expand to the United States.

SOLUTION

FDI can help foster a thriving offshore wind cluster in Maine by promoting the role of anchor companies, which are well-connected organizations that can help attract other suppliers in the offshore wind value chain (*see Policy 5: Establish an Anchor Company Tax Credit*). To fulfill this goal, the state legislature should consider providing additional funding to the Invest in Maine Initiative, which coordinates business investments through the Maine International Trade Center and Maine Department of Economic and Community Development (DECD). Their need for additional funds is evident: The initiative's three-year grant from the U.S. Economic Development Administration (EDA) and the DECD expired in September 2017, severely restricting outreach efforts in Europe and Asia. With additional funding, this network could target its efforts towards large-scale turbine blade manufacturers such as LM Wind Power in Denmark, nacelle manufacturers such as Alstom Power in France, or subsea cable manufacturers such as JDR Cables in England.

Mature companies that expand their operations into Maine could further mobilize other cluster members, thereby creating jobs and fortifying the industry.

Key platforms that serve as gateways for connecting U.S. and international companies, such as SelectUSA, the U.S. Cluster Mapping Project, and the European Cluster Collaboration Platform, could also help Maine coordinate its outreach to the global offshore wind industry. State leaders could further these efforts by building relationships with resources for international offshore wind clusters such as the European Clusters for Offshore Wind Servicing (ECOWindS) and Wind Europe.

Maine could also strengthen its global presence by establishing formal ties with potential trading partners. This goal is often facilitated by the efforts of international trade offices: Regrettably, Maine only has two offices overseas, with no presence in Asia. In contrast, Tennessee leverages its outreach efforts through nine international trade offices while Florida has thirteen trade offices. As an alternative to establishing additional overseas trade offices, Maine could choose to forge partnerships with key countries. The Massachusetts–Israel Innovation Partnership demonstrates how these connections can begin as research collaborations and grow into more robust trade relationships (*see case study*).

In addition, Maine could establish a state program to streamline the pathway for foreign firms that desire to invest in the state. Modeled after the Texas International Business Accelerator, this program could assist businesses with investment strategies, economic impact studies, and general advice, guiding these companies through the complex immigration, legal, and business landscape of their new location (*see case study*). While the Invest in Maine Initiative successfully opens up pathways for dialogue between the state and international actors, Maine could benefit from a program that provides strategic assistance to foreign companies. Such a program could allow the state to actively identify and engage with companies that may be interested in locating operations in the state, creating jobs and fortifying the state's value chain.

Key Players: Maine Legislature, Maine International Trade Center, Maine North Atlantic Development Office, Maine Department of Economic and Community Development, University of Maine System



Case Study: Massachusetts–Israel Innovation Partnership

The Massachusetts–Israel Innovation Partnership offers a creative model for facilitating global connections. Launched in 2011 following the governor's trade mission to Israel, the partnership grew from an industry research collaborative to a joint FDI partnership. Major Israeli companies have expanded operations to the state and Massachusetts companies have invested in Israeli intellectual property and R&D operations. As of 2015, more than 200 Israeli-founded companies have made a home in Massachusetts. These businesses accounted for $9 billion in direct revenue, $18 billion in total economic impact, and 4 percent of the state GDP, as well as 9,000 direct jobs and 27,000 indirect and induced jobs.



Case Study: Texas International Business Accelerator (TIBA)

TIBA provides critical assistance to foreign firms looking to invest in the Lone Star State. While the United States is known globally for its open business environment, investing in a new country is always a legal, logistical, and cultural challenge. TIBA eases that transition by providing technical assistance and practical local market knowledge to help clients set up investment projects and succeed at establishing operations. Many of TIBA's clients are small- and medium-sized enterprises that are overlooked by consulting firms. Since its inception in 2011, TIBA has brought over $136 million in FDI to Texas.

Best Practices for FDI and Exporting Programs

The U.S. Department of Commerce commissioned an extensive study of the most successful FDI and exporting programs around the country and found that state leaders of these programs share several key practices. The report found that they do the following:

- Engage universities in making international connections and economic development.
- Foster strong relationships with economic development resources engaged in FDI.
- Collect good data about companies in the cluster.
- Develop contact points at companies overseas.
- Embrace and adapt to cultural differences, e.g., language-specific business cards and marketing materials.
- Commit to long-term involvement in FDI efforts.

Policy 5: Establish an Anchor Company Tax Credit

OPPORTUNITY

As demand for offshore wind rises along the East Coast, states are quickly moving from established offshore wind goals to partnering with developers or receiving bids to develop massive offshore wind projects. Massachusetts plans to procure 1.6 GW of offshore wind and New York is exploring up to 1 GW of offshore production in partnership with Statoil, indicating reliable levels of demand to warrant value chain development. In fact, an annual demand of 500 MW per year for five years is sufficient to justify investment in offshore wind manufacturing facilities. Developers will begin to drive the complex value chain, recruiting firms to manufacture components needed to meet the upcoming demand for offshore wind. A locally sourced value chain will ease logistics and operations due to the massive size of offshore wind components. For instance, an offshore wind tower stands more than ninety meters high, roughly the height of the Statue of Liberty, and has upwards of 8,000 separate components.

SOLUTION

While developers will play a lead role in driving the nature of the offshore wind manufacturing industry, states can incentivize robust value chain build-out to help attract new development. After Maine targets its FDI strategy to recruit anchor companies in the offshore wind industry (*see Policy 4: Bolster Foreign Direct Investment*), the state can further encourage the clustering of companies that support the industry. Clustering companies in close proximity to each other is critical to reducing project costs. In fact, mature offshore wind clusters such as the cluster in Denmark, where over 500 suppliers are located in close proximity to anchor companies, have exhibited long-term economic growth. Maine could support the development of the offshore wind value chain by partnering with anchor companies or developers through incentives such as an Anchor Company Tax Credit, which has been leveraged successfully in Michigan (*see case study*). Notably, Rhode Island replicated Michigan's model, but its tax credit has not been claimed as of January 2018 (*see case study*). By establishing forward-looking tax credits that cluster firms in the offshore wind value chain, Maine can capitalize on impending FDI to bring more firms to the state.

Key Players: Maine Legislature, Maine Department of Administrative and Financial Services, Businesses

Case Study: Michigan Anchor New Jobs Tax Credit and Anchor District Tax Credit

In 2008, the Michigan Legislature passed the Anchor New Jobs and Anchor District tax credits, which aim to grow high-tech value chains. The Anchor New Jobs tax credit is given to a company that encourages a supplier or customer to expand in Michigan, while the Anchor District credit is given to a firm that encourages a customer or supplier to locate within ten miles of its operations. Both tax credits are overseen by the Michigan Economic Growth Authority and can currently be applied to the state corporate income tax. Several firms communicated interest in the tax credits, and Hemlock Semiconductor Corporation received both the Anchor New Jobs and Anchor District tax credits. The credits contributed to Hemlock's expansion in Michigan, which was estimated to create 576 jobs and generate $60 million in net gains for the state.

Case Study: Rhode Island Anchor Institution Tax Credit

Rhode Island, the first state to develop an offshore wind pilot project in the United States, created an Anchor Institution Tax Credit to bolster the offshore wind industry. If a Rhode Island anchor company is responsible for a job-creating supplier locating in the state, the anchor company receives a tax credit. For instance, if a wind developer in Rhode Island lures a manufacturer of subsea cables into the state, the wind developer will receive a tax credit. The credit requires that an in-state business pay for and complete both a preliminary application identifying a potential relocating business and a final application demonstrating its substantial role in the decision to relocate. The supplier must relocate and create at least ten new full-time jobs by 2019 or twenty-five new full-time jobs by 2021. The tax credit can be awarded for up to five years and the amount is based on several factors, including the extent of job creation, whether the jobs are in a state-targeted industry, whether the relocation benefits a disadvantaged area, and the economic return to the state. However, as of January 2018, there were no recipients of the tax credit in Rhode Island.

Policy 6: Modernize Economic Development Strategies

BARRIER

Although Maine is poised to lead the nation in offshore wind development, the state underperforms in overall appeal to new companies. Maine was ranked forty-sixth in a 2017 ranking of most successful state business environments. In fact, entrepreneurs and job creators around the world are often under-informed about Maine's assets. Even business leaders who are interested in moving to the state have expressed concern over issues ranging from recruiting a talented workforce to navigating user-unfriendly incentive programs. While the Live and Work in Maine program is a valuable resource for individuals who are seeking gainful employment, Maine lacks strategic marketing and outreach programs to attract and expand new businesses in the state. Modest investments in Maine's brand, website, and media strategy can demonstrate its value to small- and medium-sized enterprises looking to relocate, bringing additional manufacturing firms into the in-state offshore wind industry.

SOLUTION

State leaders could strengthen Maine's economic development strategies by cultivating a brand that highlights the state's unique quality-of-place advantages. This brand could better address the needs of new and expanding businesses by utilizing a modernized, user-friendly economic development website that features a simplified landing page and easy-to-access information about incentives and potential location sites. To fully deploy a targeted digital media campaign, Maine could create high-quality video content, hire dedicated staff, and make modest investments in digital advertising. Similar models developed in Tennessee and New Mexico show how digital strategies that are built around a cohesive brand that targets small- and medium-sized business leaders can successfully bring jobs and outside investment into the state (*see case studies*).

Key Players: Maine Department of Economic and Community Development, Maine Legislature, Universities, Businesses, Community Leaders, Regional Economic Development Leaders

Case Study: Mastered in Tennessee

In 2015, Tennessee launched its award-winning "Mastered in Tennessee" campaign to showcase the quality of Tennessee's artisanship. This campaign is bolstered by a state-of-the-art website, high-quality video content, and an active presence on all major social media channels. The website employs a visually stunning landing page, easily accessible site selection information, and navigable menus offering a variety of content depending on the site visitor's industry. To first build and then fortify these assets, Tennessee contracted with a local design firm and now supports its initial investment with an annual amount of $600,000 in highly targeted digital advertising. The state's investment paid off: In 2016, Tennessee led the nation in small business job growth. Business leaders also recently rated Tennessee as the third-highest state in "best-in-class" economic development marketing.

Case Study: New Mexico True

In 2012, the New Mexico Tourism Department launched the $2 million New Mexico True campaign to cultivate the state's image as a place of adventure and authenticity. Combating perceptions of a barren, dull, pass-through state, the New Mexico True website features vibrant, visually stimulating photos of the best that New Mexico has to offer, from outdoor activities to local cuisine. The high-impact campaign has delivered strong economic returns since its inception, supporting thousands of jobs and bringing in millions of dollars in state and local taxes. Initially targeting the regional drive market, New Mexico True is estimated to have captured $30 in visitor spending at local businesses and $3 in tax revenue for every dollar spent on advertising in its first year. Between 2013 and 2015, outreach across five key markets increased return on investment to $72 in visitor spending and $7 in tax revenue. The campaign was also effective at changing perceptions: People who had seen the ads were 133 percent more likely to consider New Mexico a good place to start a business and 154 percent more likely to agree that it is a good place to start a career.

Policy 7: Upgrade Ports and Establish a Port Innovation District

OPPORTUNITY

With 8 GW of regional offshore wind capacity expected by 2030, Northeastern states are investing billions into the nascent offshore wind industry. In Europe ports have been critical for cost reduction and serve as hubs of activity for offshore wind with training centers, warehouses, and testing facilities. In the United States, ports will likewise be the nucleus of offshore wind, and local investment in ports, manufacturing, and innovation will catalyze local economic growth. If just one port was upgraded to facilitate the U.S. offshore wind industry, 6,000 full-time equivalent jobs could be created and $449 million added to the state's gross domestic product. Maine's adaptable ports currently provide a competitive advantage in the Northeast offshore wind value chain due to assets such as heavy machinery cranes and available space for new facilities. However, continued port planning and upgrades will be needed facilitate the current needs of offshore wind and the future of the industry. By the early 2020s, it is expected that wind turbine capacity will increase beyond 10 MW and rotor diameters will reach sizes of up to 650 feet. Several of Maine's ports, including Searsport and Eastport, can be further developed to play a supporting role in the regional industry, ranging from large components ports to service and research ports (*see Policy 9: Establish a Northeast Offshore Wind Innovation Center*). Strategic cluster development around the ports, including port upgrades and creation of nearby innovation districts, will best leverage investments to spur in-state growth. For instance, businesses can co-locate to streamline efficiency in the value chain, researchers can test next-generation technologies, and manufacturers can produce components the size of airplanes all in close proximity to each other.

SOLUTION

Upgrade Ports to Meet Offshore Requirements and Encourage Clustering of Firms

While Maine's ports provide a comparative advantage because of their adaptability, Maine will need continued port planning and investments to ensure port infrastructure can support the outsized requirements of offshore wind. Coordination of development among regional ports can ensure that ports provide supplementary roles—for example, large component ports and service ports—and upgrades are optimized to support each port's role in the offshore value chain. Port considerations for offshore wind investments include navigation channel depth, berth lengths, quayside space, dry dock areas, and crane capacity. For instance, Searsport, the location of the Aqua Ventus assembly and a potential hub for offshore wind, will need continued dredging and additional heavy cargo lifting machinery such as heavy weight transfer equipment and a jack-up-and-slide transfer system.

Investments in staging facilities and offices will ensure firms in the industry can co-locate in close proximity to the port, which is a top factor in the siting of manufacturing facilities. Ports in Europe such as Cuxhaven, Emden, and Bremerhaven have been strategically planned to encourage the clustering of firms and supporting institutions, such as educational and research facilities, in proximity to port districts. Investments aimed at clustering companies have resulted in positive economic returns throughout Europe. Denmark's Port of Esbjerg clustered over 200 offshore wind firms and yielded gains from its investments (*see case study*). In Maine, Searsport has the potential to serve as a central hub for offshore wind: It identified potential sites for production and assembly of offshore wind components, as well as proximal 100 acres of industrial property that could be used for an industrial park.

Establish Port Innovation Districts

Not only is proximity to the port a key consideration for business, but proximity to research and innovation is a large factor in where offshore wind firms locate. Innovation districts are geographic areas where anchor institutions and companies cluster, connecting with startups, business incubators, and accelerators. Proximity between these entities has been shown to be a large driver in innovation, especially between networks of manufacturers, logistics firms, customers, and researchers—all key players in the offshore wind value chain. Innovation districts perform well when associated with unique infrastructure, such as ports. Other factors that promote successful innovation districts include on-site university research programs, incubators that provide facilities and support for startups, anchor company facilities, common areas, and flexible office space. Examples of successful

innovation districts include the newly established Rotterdam Smart Manufacturing Innovation District, located at the Port of Rotterdam and CORTEX in St. Louis (*see case studies*). While Maine can establish a port innovation district to capture interest from developers, the state can simultaneously create targeted offshore wind research hubs at its ports (*see Policy 9: Establish a Northeast Offshore Wind Innovation Center*).

Key Players: Maine Department of Economic and Community Development, Maine Legislature, Maine Department of Transportation, Maine Port Authority, Universities, Businesses



Case Study: Port of Esbjerg's Return on Investments

Denmark's Port of Esbjerg is an example of a high-performing offshore wind cluster: More than 260 companies make up the Offshore Center Danmark, an innovation complex for the offshore industry. The port was established in 1868 and is managed by an autonomous port authority, which directs port investments and planning. In preparation for hosting large-scale projects and supporting a growing industry, the port's Board of Directors invested $183 million in facilities over a ten-year period, which created space for wind turbine pre-assembly, servicing, and export. Such investments contribute to Esbjerg's European leadership in logistics and export of wind turbines and continued support from global corporate leaders like Siemens. The Port of Esbjerg witnessed continued economic growth after upgrades: For three consecutive years from 2012 to 2014, the port had its highest profits on record. From 2013 to 2014, wind turbine transports increased by 44 percent and ship calls increased by 21 percent. In 2016, 1.1 GW of offshore wind turbines were shipped from the port, and 80 percent of European capacity overall has traveled through the Port of Esbjerg.



Case Studies: Innovation Districts in St. Louis and Rotterdam

The Rotterdam Innovation District (RID) is a burgeoning entrepreneurial hub located at the Port of Rotterdam. The RID was established by the port and city of Rotterdam in 2015 as a response to a Dutch policy assessment that identified the need for more spending on innovation. Industrial buildings of former shipyards and abandoned waterfronts were redeveloped to form the RID. RID includes an experimental living and working space for innovators in clean tech and medical clusters, as well as a startup accelerator, prototyping facilities, and an investment fund for port-related innovations. Universities and research centers such as Albeda College, Rotterdam University of Applied Sciences, Delft University of Technology, and Yes!Delft have co-located at the RID. If mid-sized manufacturers want to locate at RID, they must engage with researchers and students, as well as use the space actively for production.

St. Louis' thriving innovation district, CORTEX, initiated in 2002 with a collaborative advisory board of leaders from universities, businesses, and government. CORTEX was financed through tax increment financing (TIF), which helped overcome the cost of infrastructure improvement, site preparation, and environmental remediation for developers (*see Policy 8: Consider Updates to Tax Increment Financing*). The project is overseen by a tax-exempt organization that is a collaboration between Washington University in St. Louis, BJC Healthcare, University of Missouri–St. Louis, St. Louis University, and the Missouri Botanical Garden. Over $550 million in investments has helped generate 4,200 technology-related jobs and co-locate 250 firms. Industry leaders such as Boeing and technology firms such as Uber, Pandora, and Square have located in the CORTEX district to capitalize on the innovative culture.

Policy 8: Consider Updates to Tax Increment Financing

What is Tax Increment Financing? Tax increment financing (TIF) originated in the 1950s and is utilized in forty-nine U.S. states and the District of Columbia. While TIF is commonly used as a vehicle for local governments (e.g., municipalities, counties, and port authorities) to finance economic development, there are many variations of TIF implementation and oversight. The process of establishing a TIF begins with outlining the geographic boundaries of the TIF district, then assessing the value of the land within the district. The municipal authority then determines base revenue level based on revenues gained from property and other local taxes. When the district is created, the municipal authority captures the incremental tax revenues above that base value for use in a local development project. The incremental revenues from TIF may be used to fund ongoing expenditures, reimburse a developer for related costs, or negotiate a loan from the developer. Municipal bonds are often used to finance TIFs, which are sometimes pledged to be purchased by the developer.

OPPORTUNITY

Maine's tax increment financing (TIF) program was established in 1977. TIF districts are run by a municipality or plantation and must be approved by the Maine Department of Economic and Community Development. Lasting thirty years, TIFs were traditionally used to finance development projects that were essential for a company to locate and benefited the community, such as expansion of sewer lines. However, TIFs in Maine have come into increasing scrutiny over the past few decades due to lack of public engagement and tax revenues returning to developers without explicit public benefit. With proper oversight and implementation, TIF can be a tool for financing projects that stimulate economic growth and have a positive impact on the local economy, such as innovation districts (*see Policy 7: Upgrade Ports and Establish a Port Innovation District*).

SOLUTION

Maine policymakers should consider updating TIF requirements and oversight. Seventeen states require municipalities to demonstrate that development would not occur without TIF and that property values would likely increase with TIF. In other words, local governments must prove that local economic activity would remain the same without TIF. For instance, Wisconsin requires an intergovernmental review to assess if development would happen in the absence of TIF. Likewise, Minnesota law requires municipalities to undergo a TIF assessment *(see case study)*. In Portland, Oregon, stakeholder assessment ensures that development projects reflect the desires of the community *(see case study)*. Maine lawmakers could consider implementing such common-sense updates that will insure tax revenues boost the local economy and reflect the values of local residents. Moreover, municipalities could incorporate requirements such as TIF-recipient involvement in workforce training programs to further benefit the local community.

Maine lawmakers could consider additional inclusions relevant to the growth of the offshore wind industry, such as extending port authorities the power to establish and oversee TIF districts. Port upgrades will be needed to house activities germane to the offshore wind industry, which is essential for industry growth in Maine. TIF has been noted as a tool for port upgrades in preparation for the offshore wind industry, receiving approval as a financing option in Scotland and being suggested as a potential funding lever in Massachusetts. However, in some locales, ports, in addition to municipalities, can designate TIF districts. Washington State port authorities have the ability to implement TIFs for port upgrades under state law. Maine lawmakers could consider allowing ports to implement TIFs, in addition to municipalities and plantations.

To capture the benefits of TIF, Maine could ensure that coastal and waterfront communities have a

strong voice in matters of local development. Maine policymakers could consider if offshore wind projects are subject to municipal property taxes, which are a defining characteristic of TIF programs. State law does not currently stipulate if ocean energy generation equipment is subject to municipal property tax due to the lack of clarity on municipal boundaries. Clarifying municipal boundaries and/or defining if offshore wind energy equipment will be subject to local taxes will benefit both local governments and project developers. Policymakers could use criteria such as substation interconnection when considering if and how offshore wind energy equipment would be subject to local taxes. Other states have also begun to explore the boundaries of TIF: Floridians considered clarifying TIF to authorize its use for on-water improvements outside a municipal district.

Key Players: **Maine Department of Economic and Community Development, Maine Legislature, Municipalities, Ports**



Case Study: TIF Oversight in Minnesota and Portland, Oregon

To ensure that public subsidies are used productively, Minnesota law directs municipalities to prove that development would not occur "but for" the creation of a TIF district. Minnesota municipalities must demonstrate that no proposed development would happen through private investment alone and that market values of the properties within a TIF district would increase due to TIF investments. The City of Portland, Oregon assesses if a proposed TIF project has constituent support by engaging with residents before a TIF district is established. Each household receives information about the proposed project, including maps and frequently asked questions. Portland residents are informed about public hearings regarding the development, and each project has a citizens committee.

Policy 9: Establish a Northeast Offshore Wind Innovation Center

OPPORTUNITY

As the offshore wind industry emerges in the United States, coastal states can capitalize on local assets such as port infrastructure and proximity to strong ocean winds to drive commercial offshore wind development. States in the Northeast are primed to launch the nascent industry, and Maine can ensure that it leads the charge by facilitating dialogue between partners in industry, academia, and government and moving innovative ideas from lab to market. While Maine's public universities have excelled at research into offshore wind floating foundations, the Northeast lacks a strategic coordinating body with a strong focus on high-impact and applied R&D in offshore wind, limiting potential growth of the innovation ecosystem.

SOLUTION

Maine could establish a Northeast Offshore Wind Innovation Center to coordinate regional offshore wind R&D efforts, foster engagement with important industry players across the North Atlantic, leverage investments from federal and state governments, and set and achieve goals related to floating foundation technology. The state could build the center near its deepwater ports, which will serve as critical innovation and supply hubs for offshore activity (*see case study*). Offshore wind research requires a location that replicates offshore farm conditions as well as infrastructure that handles the size and weight of large offshore components and enables transportation of massive research items with ease, making proximity to ports a foundational element for innovation capacity. By collaborating with regional interests, Maine can cultivate a pipeline of R&D and send a policy signal that the state is ready for offshore wind investment activity. Funds for the center could be leveraged from national labs such as the National Renewable Energy Laboratory, industrial partners in the offshore wind value chain, or neighboring states such as Massachusetts and New York, where state officials have already indicated their commitment to realizing offshore wind potential through clear policy cues.

In December 2017, the U.S. Department of Energy issued an $18.5 million funding opportunity announcement for a public-private offshore wind R&D consortium. An additional $2 million will be allocated to national labs to conduct research in partnership with the consortium. The consortium's objective is to improve offshore wind technology and seek strategies to reduce industry costs. The consortium location will be announced in June 2018.

Key Players: Universities, Entrepreneurial Community, Maine Legislature, Governor's Office, U.S. National Labs, Global Business Community

Case Study: Innovation to Push Offshore Wind Energy Regions (Inn2Power)

Europe's Inn2POWER project was created in 2016 with the goal of expanding offshore innovation capacity and business collaboration across borders. This four-year project, funded by the European Union's European Regional Development Fund, coordinates relationships between key offshore wind clusters in the United Kingdom, Denmark, Germany, Belgium, and the Netherlands. Objectives include facilitating access to demonstration facilities as well as creating forward-thinking port logistics. In 2017, Inn2POWER began hosting a networking forum, where partners engage in an ongoing series of idea- and information-sharing sessions, and started developing an international MBA module program to identify problem-solving strategies and address potential growth areas. The MBA program is being designed with tailored guidance from an advisory board of offshore wind experts and will incorporate feedback from major firms as well as small- and medium-sized businesses in the offshore wind value chain.

Case Study: Bremerhaven's R&D Port

The German Port of Bremerhaven is a global hub for offshore wind R&D, supporting over 5,000 workers and 120 firms in the offshore wind value chain in its immediate vicinity. The facility has over 400 acres of dock facilities, operations and logistics centers, and research facilities. Moreover, the "R&D mile" upgrades in 2015 include labs, research centers, and a research pier where vessels can unload supplies. In addition to space and infrastructure for testing large offshore wind components, Bremerhaven established partnerships between national research organizations, industry, and academics. Germany's Fraunhofer Institute established the Wind Energy and Energy System Technology (IWES) center at Bremerhaven to research nacelles, next-generation materials, and other technologies. Industry players including Adwen, Senvion, and Siemens Gamesa test the latest technologies at Bremerhaven's facilities.

Policy 10: Establish an Offshore Wind Business Development Fund for Small Businesses

BARRIER

The offshore wind value chain is complex and globalized, and has high barriers to entry, which include outsized administrative costs and capital expenditures. Although the value chain includes large multinational corporations, suppliers and participants in the value chain can be smaller firms specializing in a niche product or service. However, barriers to entry for small and growing firms exist, including high administrative costs for bidding on specific supply chain opportunities and capital expenditures related to retooling operations for offshore wind. While researchers at the University of Maine have driven innovation in offshore wind foundations, the state can create opportunities to provide targeted support to early-stage manufacturers of wind turbine components such as foundations, towers, and blades as well as assistance to businesses engaged in design and engineering, siting and permitting, transportation, and storage.

SOLUTION

To ensure that Maine firms participate in the offshore wind industry, the state could assist emerging businesses in overcoming barriers to market entry, such as high administrative costs and capital expenditures needed to retool operations. Encouraging early participation by local firms in the offshore wind industry will ensure economic growth associated with offshore development benefits homegrown firms, not just foreign investors. Maine could create a business development fund to support market entry for emerging businesses in the state. The Maine Legislature could work with the Governor's Energy Office to establish a grant program modeled after the fund in Maryland (*see case study*).

Key Players: Governor's Energy Office, Maine Legislature, Maine Technology Institute, Small Businesses



Case Study: Maryland Offshore Wind Business Development Grant Program

Managed by the Maryland Energy Administration (MEA), the Offshore Wind Business Development Grant Program provides financial assistance to companies seeking to enter the emerging offshore wind industry. The program, which was established by the Maryland Offshore Wind Energy Act of 2013, awards grants to help defray the costs of market entry along with capital expenses and facility upgrades. At market entry, businesses can use capital to offset bidding costs and administrative expenses, and funds for capital expenses and facility upgrades can be used for acquisition costs resulting from offshore wind-related exports. In 2018, MEA awarded $700,000 in funds from the Offshore Wind Business Development Program to businesses specializing in welding and fabrication, as well as development and construction. This infusion of capital is helping to catalyze offshore wind development across the 1,300 businesses located around the Port of Baltimore.

Policy 11: Raise or Eliminate the Annual Cap on the Maine Seed Capital Tax Credit Program

OPPORTUNITY

Access to capital is critical for emerging firms to successfully bring new technologies to market, especially in the globalized and capital-intensive offshore wind industry. Historically, Maine has promoted investments in emerging industries through the Maine Seed Capital Tax Credit, which bolsters equity investments in homegrown startups both directly and through private venture capital financing. The program was crafted to appeal to a broad range of investors: Qualifying companies must either be a manufacturing business, a company that develops or applies advanced technologies, a certified visual media production company, a value-added natural resource enterprise, or a product or service provider that generates approximately 60 percent of its revenues outside Maine. Investors can claim up to 50 percent of the cash equity they invest for investments up to $500,000, provided that the annual credit cap of $5 million is not depleted. In the eight-year period from 2004 to 2011 alone, this incentive enabled the creation of more than 1,800 jobs and helped retain an additional 5,000 jobs at businesses already receiving the credit. For every dollar extended on the Maine Seed Capital Tax Credit, the state has captured an average of nine additional dollars of investment.

However, in recent years, the program's impact has been blunted largely due to an inadequate funding mechanism. The $5 million annual limit on tax credits is exhausted well before the end of year. In 2018, the credit had already been subscribed prior to the end of April. As a result, investors are postponing investment activity until the following fiscal year. Due to the early depletion of tax credits, many companies may delay fundraising to allow potential investors an opportunity to access the untapped fund of $5 million in credits. This delay can ultimately depress the business environment in Maine, leading to decreased startup activity.

For every dollar extended on the Maine Seed Capital Tax Credit, the state has captured an average of nine additional dollars of investment. However, the $5 million annual limit is exhausted early in the year, causing investors to postpone contributions.

SOLUTION

In order to cultivate homegrown firms in the offshore wind value chain and other growing industries, Maine policymakers can strengthen investments through the Maine Capital Seed Tax Credit. The early depletion of seed tax credits suggests that the level of investment interest in Maine companies is not being sufficiently met. Eliminating the $5 million ceiling or increasing the number of tax credits available each year could encourage greater investment in Maine startups and attract more value-added capital funds that focus on energy investments. A raised annual cap could lower the risk profile of an investment, leading investors to take interest in more high-risk and potentially high-yielding ventures and to invest more capital than they otherwise would have. Furthermore, Maine policymakers could consider raising the current $500,000 investment limit for investors supporting capital-intensive industries such as offshore wind.

Key Players: Maine Legislature, Finance Authority of Maine

Policy 12: Appoint a Foundation Liaison to Target Program-Related Investments and Seek Funding for Advanced Energy Programs

Program-Related Investment: A program-related investment is an investment made by a foundation in the pursuit of its charitable mission, not primarily to generate income. The investment can be a loan, equity investment, or guarantee in a for-profit business or a nonprofit organization. Because these are mission-related investments and generating returns is not a significant purpose, they can be treated by the IRS as similar to grants to not jeopardize the foundation's tax status.

OPPORTUNITY

Maine's entrepreneurs encounter a number of barriers when trying to access the necessary capital to start or grow their business, from creditworthiness to eligibility. Emerging firms entering the offshore wind industry face additional barriers such as high administrative costs and capital expenditures. Large national foundations have substantial resources to invest across the country, and many are looking to spur advanced energy growth, yet foundation investments typically take the form of grants to nonprofit entities. To align foundation spending with the needs of capital-strapped Maine companies, Maine can direct a foundation liaison to develop relationships with program-related investment (PRI) vehicles established by foundations to direct that spending into Maine. A PRI is a tool that allows philanthropic foundations to make atypical investments that would otherwise be subject to a tax penalty.

Major philanthropic organizations such as the Rockefeller Foundation, MacArthur Foundation, and F.B. Heron Foundation now frequently incorporate formal PRI programs into their broader philanthropic strategies. In some instances, foundations provide PRI funding to independent investment vehicles which re-invest those resources into early-stage companies. Maine could look to establish relationships with these foundations and intermediary investment vehicles to help invest in local advanced energy companies.

SOLUTION

To support growing advanced energy businesses, Maine could appoint a foundation liaison to connect with foundations to target their investments toward the advanced energy industry. A growing number of PRIs are targeting the advanced energy sector. For instance, PRIME Coalition is a national nonprofit organization that serves as an intermediary investment vehicle for PRIs in the advanced energy space. PRIME solicits investments from major philanthropic organizations and re-invests that capital in early-stage energy technology companies.

By liaising with interested foundations and soliciting PRIs, Maine could reduce barriers to capital for small, early-stage companies. The foundation liaison could oversee this network of PRI organizations. Additionally, by serving as a specialized screen for applicant companies, the liaison could reduce investor concerns by ensuring that funding recipients are viable and that they will promote their funders' social goals. By increasing PRIs, Maine could help early-stage advanced energy companies raise capital and create jobs at minimal cost to the state.

Moreover, the foundation liaison could connect with and broker support from regional philanthropic foundations on issues related to advanced energy economic development. The Governor's Office could reach out to leading foundations in the state and enlist their help in appointing a foundation liaison and contributing a portion of the liaison's salary. The foundation liaison could further engage with charitable organizations from within Maine and from outside of the state. Maine is home to 365 charitable foundations: In 2014 alone, these organizations contributed a total of nearly $150 million. As of 2014, New York had over 9,700 foundations and Massachusetts had over 3,000 foundations. In 2017 alone, Boston-based charitable organizations contributed $900 million in philanthropic giving. Utilizing these resources could allow the foundation liaison in Maine to prioritize funding for energy-focused incubators and accelerators, education and workforce training, and targeted cluster growth. The foundation liaison could ultimately help Maine and

the grantmaking community leverage one another's investments and efforts, working together to support in-state business, innovation, and jobs in emerging fields like offshore wind.

Key Players: Governor's Office, Philanthropic Community

Case Study: Michigan Governor's Office of Foundation Liaison

As the first of its kind in the nation, the Michigan Governor's Office of Foundation Liaison (OFL) builds funding partnerships and strategic collaborations between the state government and the philanthropic community to support programs that improve education and health for all Michigan residents. Foundations are actively engaged throughout OFL activities. The Foundation Liaison and OFL staff come to the state on loan from participating foundations, while contributing funders and nonprofits partly comprise the OFL Advisory Committee. Since 2003, OFL has brokered investments from seventeen foundations, totaling more than $150 million.

Case Study: Newark Philanthropic Liaison

Based on the success of Michigan's OFL, the Council of New Jersey Grantmakers and the City of Newark established the city's first foundation liaison in 2007. In close partnership with the Mayor's Office, the Office of the Newark Philanthropic Liaison garners and leverages support for public projects from the grantmaking community. From 2007 to 2016, the office brokered over $50 million in philanthropic investments for initiatives such as expanding summer youth employment and improving community literacy.

Case Study: PRIME Coalition

Launched in mid-2015, PRIME Coalition encourages more foundations to prioritize PRIs by connecting them with budding companies. PRIME is a charity that facilitates investments by working with both philanthropic organizations and early-stage, for-profit clean energy companies. PRIME reduces the barriers that make PRIs difficult for foundations by providing industry expertise and connections to best-in-class companies. Although PRIME has started small, it has already facilitated investment in six companies and is currently working on funding an additional three firms.

Policy 13: Form an Offshore Wind Workforce Development Fund

OPPORTUNITY

As the offshore wind industry takes root in Maine, the state can ensure that it is a hub for deployment by supporting comprehensive workforce training programs. Approximately 78 percent of European wind power companies have reported challenges in recruiting qualified staff, signifying the importance of offshore wind technical training and career development for local Mainers. While Maine is already home to three regional workforce development boards, the state has an opportunity to support targeted, industry-specific education and training by providing financial and technical assistance to training centers, nonprofits, and governmental organizations serving hard-working Mainers in the emerging offshore wind sector. By broadening the capacity of its workforce development organizations, Maine could ensure a strong pipeline of workers at each stage of industry growth, including site survey and development, manufacturing, construction and installation, and operations and maintenance. With additional resources, Maine's workforce training programs could prioritize technical skills such as composites and advanced materials manufacturing, machining, hydraulics, rigging and material handling, data analysis, and understanding of electromechanical systems.

SOLUTION

The Maine Legislature could create an offshore wind workforce development grant program to facilitate workforce training for the offshore wind industry. This fund could allow workforce training centers to provide customized training from qualified instructors, using modern equipment in state-of-the-art classroom and lab facilities. To mobilize interest from developers, the fund could emphasize technical skills that are required at each stage of offshore wind deployment and are most relevant to Maine's economy, such as manufacturing and construction. Maine could model this initiative after Maryland's Offshore Wind Workforce Development Grant Program (*see case study*).

Key Players: Governor's Energy Office, Maine Legislature, Maine Workforce Development Boards, Maine Quality Centers, Universities



Case Study: Maryland Offshore Wind Workforce Development Grant Program

In addition to the Offshore Wind Business Development Grant Program, the Maryland Energy Administration (MEA) oversees the Offshore Wind Workforce Development Grant Program. The program was created to support workforce training in the construction, installation, and operations and maintenance of offshore wind farms. Eligible training centers may offer training in fields such as welding, metal fabrication, and electrical work. To receive a grant, applicants must support outreach and recruitment to communities facing employment barriers, such as veterans. These applicants are evaluated on their ability to mobilize a skilled workforce for businesses in Maryland's offshore wind value chain. In 2018, MEA awarded $300,000 to two training centers aiming to have an impact on the nascent offshore wind industry.

Policy 14: Establish Offshore Wind Programs at Community Colleges

BARRIER

The availability of skilled labor is critical to the success of the offshore wind industry. Private sector leaders in Europe have stressed the importance of training and education, noting the need for standardized technical instruction. Vocational skills needed for production, installation, maintenance and operation in the offshore wind industry range from machining to power engineering to electrical fitting. Maine could bolster the scope and quality of in-state wind power education through the establishment and expansion of wind certificate or degree programs at community colleges around the state. Currently, Maine's only related program is offered at Northern Maine Community College (NMCC) in Presque Isle. Students enrolled in NMCC's Wind Power Technology Program are trained in basic principles of electricity, electrical mathematics, wind turbine operations, and more. Regrettably, this much-needed program is at least a three-hour drive from Maine's population centers and from the regions where offshore wind energy has the greatest potential. Large-scale offshore wind deployment will require qualified technicians to live on or near the coast.

SOLUTION

In the ten-year period from 2007 through 2017, wind power generation in Maine grew from 1 percent of the state's total electricity production to approximately 24 percent. As offshore wind developers seek to capitalize on this trend and develop additional in-state projects, Maine could support industry growth by expanding access to wind certificate or degree programs. These programs could teach students the electrical, electronic, and mechanical concepts that are fundamental to the wind industry, while emphasizing training in wind turbine maintenance and electrical power production. By establishing wind energy programs in close proximity to the coast, Maine could help ensure the offshore wind industry has the skilled workforce necessary for success. Maine workforce leaders could consider partnering with the German-based BZEE, a European model for offshore wind training that has now expanded to twenty-nine locations in multiple countries. BZEE offers training modules on the service and maintenance of offshore wind farms, as well as a number of other certificates ranging from topics such as logistics and rotor blade servicing. Such programs could be established in collaboration with community colleges in Portland, Calais, or York.

Key Players: Maine Community College System, Maine State Workforce Board, Maine Legislature, Governor's Office

Case Study: Bristol Community College

Bristol Community College (BCC) in New Bedford, Massachusetts has offered a wind technician program since 2013. The core program combines classroom instruction with on-the-job training, imparting students with a wide range of problem-solving skills in turbine construction, installation, maintenance, and more. In light of the U.S. Department of Energy's projections that offshore wind will create 43,000 jobs on the East Coast by 2030, BCC is planning to expand its course offerings to reach additional students. This goal is supported by state funds: The Massachusetts Clean Energy Center's Renewable Energy Trust awarded BCC a $198,000 grant for the purpose of helping meet demand for a skilled labor force. Although BCC is still updating its curriculum, the college plans to design future programs in collaboration with industry partners, concentrating on training in operations and management in addition to installation.

Case Study: Germany's BZEE Wind Training Academy

The Education Centre for Renewable Energies (BZEE) was established due to the lack of trained personnel in the growing offshore wind industry and the need for industry-wide technical and safety standards. BZEE's objective is to provide flexible, personalized training programs that comply with international standards. Since its inception in 2004, BZEE has trained approximately 3,500 wind turbine technicians and issued 18,000 certificates. BZEE is known as an industry model because of its comprehensive training, focus on learning outcomes, and high proportion of hands-on practical training. Students can earn a variety of certificates, such as the Service Technician for Wind Turbine Certificate, which has more than forty modules taken over a six-month period, a six-week internship, and practical and written exams. Modular courses allow for industry professionals to sharpen their skillsets and are structured around topics such as health and safety, wind turbine electronics, rotor blades, and operations management.

Policy 15: Promote Apprenticeship and Career and Technical Education Programs

BARRIER

While Maine has the fourteenth-highest high school graduation rate in the nation, the state lags behind in college matriculation: Only 61 percent of Mainers enroll in college within one year of graduating high school, below the national average of 64 percent. Notably, less than 50 percent of adults between the ages of twenty-five and forty-four have an associate degree or higher, yet 66 percent of in-state job occupations will require post-high school education by 2020. Mainers who are caught in the gap will face significant barriers to employment, underscoring the need for the state to offer programs for career development through hands-on work experience. The offshore wind industry represents a diverse range of job opportunities that cater to different education and experience levels, helping bridge this gap.

Yet, Maine lacks the capacity to build a strong pipeline of work-based learning opportunities for students, especially in critical industry sectors such as machining, welding, and rigging. The U.S. Department of Labor currently ranks Maine forty-ninth on a list of states by highest participation in Registered Apprenticeship (RA) programs, which are programs that provide advanced technical skills and on-the-job training to individuals seeking employment in specific occupations. Participation in career and technical education (CTE) programs that help high school students gain academic and technical workforce training before entering the job market is similarly low. Only 6 percent of Maine high school students are enrolled in a CTE program, compared to 12 percent enrollment nationwide.

SOLUTION

As emerging industries such as offshore wind begin to grow and create demand for skilled workers in good-paying positions, state policymakers could consider expanding apprenticeships and CTE programs to help Mainers capture the resulting economic benefits. Both local workers and businesses in Maine can profit from these programs. While CTE programs are designed to give high school students an opportunity for career exploration, apprenticeships typically provide adults with specialized training in particular fields. Both programs combine classroom instruction with work experience.

The U.S. Department of Labor currently ranks Maine forty-ninth on a list of states by highest participation in Registered Apprenticeship (RA) programs, which are programs that provide advanced technical skills and on-the-job training to individuals seeking employment in specific occupations.

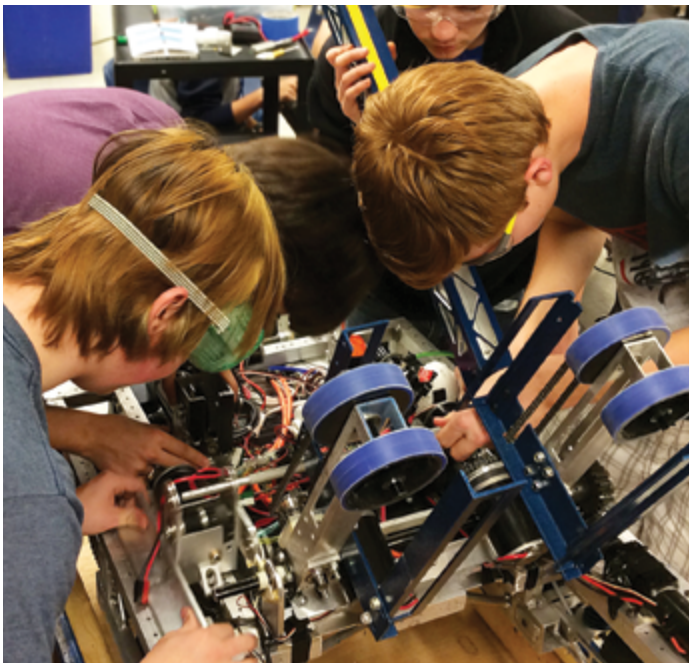
Apprenticeship programs are typically sponsored by employers, labor organizations, community-based organizations, or community colleges. These sponsors pay apprentices during on-the-job training and provide workplace mentors for them throughout the process. As many apprenticeships are in skilled trades with job security and relatively high wages, these programs can be a launchpad for stable, lucrative careers for Mainers in the offshore wind industry. For employers, apprenticeships offer the opportunity to evaluate potential hires by their workplace performance before extending a long-term offer. Apprenticeship programs can benefit older populations as well. With more than half of the manufacturing workforce being over the age of forty-five, apprenticeship programs can shore up Maine's supply of skilled labor. Maine can support a stronger pipeline of skilled workers for the offshore wind industry by expanding apprenticeships and CTE programs across the state, as seen in Wisconsin and Tennessee (*see case studies*).

Key Players: Maine Department of Education, Maine State Workforce Board, Maine Legislature, Governor's Office



Case Study: Wisconsin Youth Apprenticeship Program

With its program originating in the early 1990s, Wisconsin was one of the first states to support youth apprenticeships. Participating students enroll for one or two years and must complete 450 hours of work-based learning annually. As part of the work-based component, students are assigned a worksite mentor who provides them with regular feedback on their work and progress. Many programs also take place year-round, so it common for students to participate in work over the summer while they are not in school. Supplementary classroom learning is provided by trained instructors with relevant field expertise, and apprenticeships are offered in a wide variety of workplaces, from agriculture to information technology. Each program has learning goals established by local consortia comprised of employers and educators, and is overseen by a regional coordinator. With $3.9 million in state funding, matching funds from local consortia, and a cost limit of $900 per student, Wisconsin's Youth Apprenticeship Program will have supported over 4,300 students in the 2017-2018 school year. However, implementation of the program has not been without its challenges. Despite launching in 1991, the program did not graduate its first class until 1994. Since then, state agencies have made many modifications to the program, responding to changes in enrollment and fluctuating levels of state funding. Today, the program is remarkably successful in driving outcomes: In 2013 alone, it resulted in offers of employment to 83 percent of students who completed an apprenticeship.



Case Study: Tennessee's Career and Technical Education Programs

Tennessee's Career and Technical Education Programs is organized around sixteen career clusters, allowing students to receive targeted training in high-impact fields such as advanced manufacturing, STEM, transportation, distribution, and logistics. In 2012, state leaders revised the programs to ensure that high school students were being prepared for both college and careers, modernizing their efforts to match the complex needs of the twenty-first century marketplace. The CTE programs were funded primarily by a $15 million grant from the Tennessee Department of Education in 2017 as well as $2 million in grants from private organizations. These programs have made a noticeable impact across Tennessee: The number of enrolled students rose by approximately 40 percent between 2015 and 2017. In 2018, the Tennessee Department of Education announced it would begin offering twenty-one new certificates in careers such as welding and applied technologies.

Call to Action

Maine's emerging offshore wind cluster is a solid foundation upon which the state can grow its economy, support 2,144 jobs, and become a leader in the production and deployment of advanced energy technology. The policies recommended in this report are complementary and intended to help Maine manufacture products within the state, foster entrepreneurship for technological advances, fund innovation with accessible capital, equip workers with needed skills, and grow demand for offshore wind technology.

To fully realize Maine's potential in the offshore wind sector and position the state for continued growth, policymakers will need to make a concerted effort to seize the opportunity presented by increasing global demand. Strong leadership plays an important role in promoting Maine's competitive advantage in the industry and creating quality jobs. State and local economic development depend on the collective work of many partners across government, universities, industry, and other stakeholders. This report recommends actions that each group can take to support the offshore wind sector. Continued collaboration is necessary to address barriers to cluster growth and demonstrate that the state is ripe for investment.

Maine has the opportunity to support over 2,144 direct, indirect, and induced jobs in the offshore wind industry from 2018 through 2030. This cluster is well positioned to serve a significant portion of national demand, especially considering the state's vast offshore wind energy resource potential, groundbreaking research in floating foundation technology, and thriving network of composites manufacturers and environmental assessors.

Maine's leaders can draw from among dozens of innovative strategies that city, county, and state governments across the country and abroad have implemented to create job opportunities in the advanced energy sector. Examples of these best practices and a fully cited version of this report can be found on the American Jobs Project website at http://americanjobsproject.us/. Furthermore, the American Jobs Project can continue to serve as a partner to Maine by organizing working groups and conducting deeper analyses, such as identifying value chain gaps, exploring policy strategies, and evaluating the state's comparative advantage in other advanced industries.

When a state succeeds in building an economic cluster, the benefits are felt throughout the state: a more resilient state economy, a skilled twenty-first century workforce that is trained for the jobs of tomorrow, a firm base of young people optimistic about job opportunities close to home, and a rich hub for innovation and collaboration.

Growing the Offshore Wind Cluster, Growing Jobs

- Assess Future Procurement Options for Offshore Wind
- Re-Establish the Maine State Planning Office
- Create an Offshore Wind Production Tax Credit
- Bolster Foreign Direct Investment
- Establish an Anchor Company Tax Credit
- Modernize Economic Development Strategies
- Upgrade Ports and Establish a Port Innovation District
- Consider Updates to Tax Increment Financing
- Establish a Northeast Offshore Wind Innovation Center
- Establish an Offshore Wind Business Development Fund for Small Businesses
- Raise or Eliminate the Annual Cap on the Maine Seed Capital Tax Credit Program
- Appoint a Foundation Liaison to Increase Funding for Essential Programs
- Establish an Offshore Wind Workforce Development Fund
- Establish Offshore Wind Programs at Community Colleges
- Promote Apprenticeship and Career and Technical Education Programs

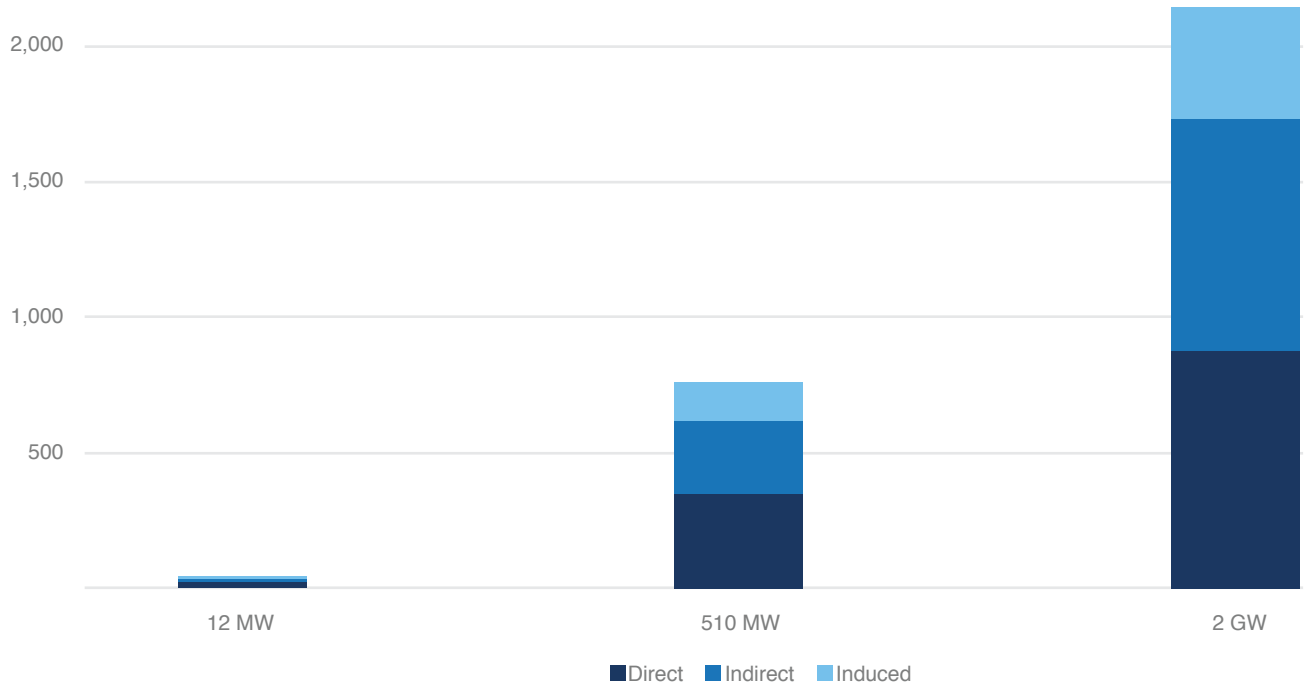
APPENDIX: JOB ESTIMATES AND ECONOMIC IMPACT METHODOLOGY

From 2018 through 2030, Maine's offshore wind industry could support an annual average of 2,144 direct, indirect, and induced jobs from the development, construction, and operation of offshore wind farms in Maine. The American Jobs Project believes the key to job creation lies in local action. Our job estimates are intended to start a conversation about how state and local leaders can work together to set goals and evaluate potential economic impacts.

The American Jobs Project and BVG Associates (BVGA) worked together to create realistic scenarios based on research and interviews with local partners. BVGA performed the economic analysis, employing a proprietary methodology that was created in partnership with Steve Westbrook from the University of the Highlands and Islands. This methodology is based on specific offshore wind industry and supply chain data, and is informed by BVGA's extensive experience in this industry; therefore, it is more accurate than conventional economic impact methodologies.

Conventional Economic Impact Methodologies: Conventional modeling of economic impacts typically relies on government statistics and are often based on industry classification codes. However, this methodology is ill-suited for the nascent U.S. offshore wind industry, as industry classification codes do not easily correspond to the offshore wind industry. The development of new codes for newer sectors, such as offshore wind, takes time. Conventional economic analyses of offshore wind would need to map existing classification code data onto offshore wind activities, which is subject to error. Offshore wind is ideally suited to a more robust approach that considers current and future capability of local supply chains because individual offshore wind projects tend to (1) be large and have distinct procurement processes, and (2) use similar technologies and share supply chains.

MAINE OFFSHORE WIND AVERAGE ANNUAL JOBS SUSTAINED 2018-2030



Definitions

Job-Year: A full-time equivalent job, or any combination of work that is equal to a full-time job, over one year. For example, two people working half-time for a full year would equal one job-year.

Direct Jobs: Jobs created or sustained by project developers or their main contractors in the target state industry.

Indirect Jobs: Jobs created or sustained due to demand from developers or contractors for equipment, materials, and services for the target state industry.

Induced Jobs: Jobs created or sustained due to increased local spending by developers or contractors in the target state industry and their suppliers.

Multiplier Effect: Refers to when the economic impact generated is larger than the initial investment due to cascading spending from target state industry to its supplying industries and workforce to products and services in the local economy.

Modeling Approach

We model economic impacts across several deployment scenarios. The three deployment scenarios are derived by industry experts and based on existing projections. The first scenario only accounts for the 12 MW New England Aqua Ventus I pilot project while the second scenario assumes an additional 498 MW of deployment. The third scenario is based on Maine's deployment goal of 5 GW by 2036 and assumes the state could install 2 GW by 2030. We assume an increased multiplier effect in the 2 GW scenario, as we believe a market signal of this scale would entice more businesses in the offshore wind supply chain to locate operations within Maine.

To calculate economic impacts, we first analyze the value of goods and services sourced from within the state for each deployment scenario. We calculate this value by assessing potential sales in the local supply chain across six activities—project management and development; turbine supply; balance of plant supply; installation and commissioning; and operations, maintenance, and service—and eighteen sub-elements. To get annualized data, we estimate the proportion of each activity that will be carried out annually over the lifetime of the wind farm deployments. For example, we assume a constant annual expenditure per turbine for operations, maintenance, and service. The value of the local supply chain is measured as earnings from employment and business profits, which makes it a function of current estimated employment and firms.

We then convert the value of the local supply chain into job-years using data on typical profit margins, costs of employment, and annual salaries. This analysis accounts for direct and indirect job impacts. Induced job impacts are calculated using appropriate multipliers from generic industry analyses.

Model Outputs

We present job estimates as the average number of jobs that the state can sustain on an annual basis. These economic impacts are based on the total job-years, or one full-time equivalent job sustained for one year, that exist within the timeframe of our analysis. Jobs in any given year can vary greatly within the timeframe. Additionally, job losses in industries that compete with those in our analysis are not evaluated. Models do not perfectly predict behavior, so job estimates could vary based on the reality of what is purchased locally and the impact of foreign and domestic competition. The estimates presented in this report are highly dependent on sustained local action towards developing and maintaining the offshore wind industry in Maine.

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