Maine Offshore Wind Roadmap

February 2023

Executive Summary

maineoffshorewind.org

Letter from Co-Chairs

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Admiral Gregory G.
Johnson, USN-Ret.

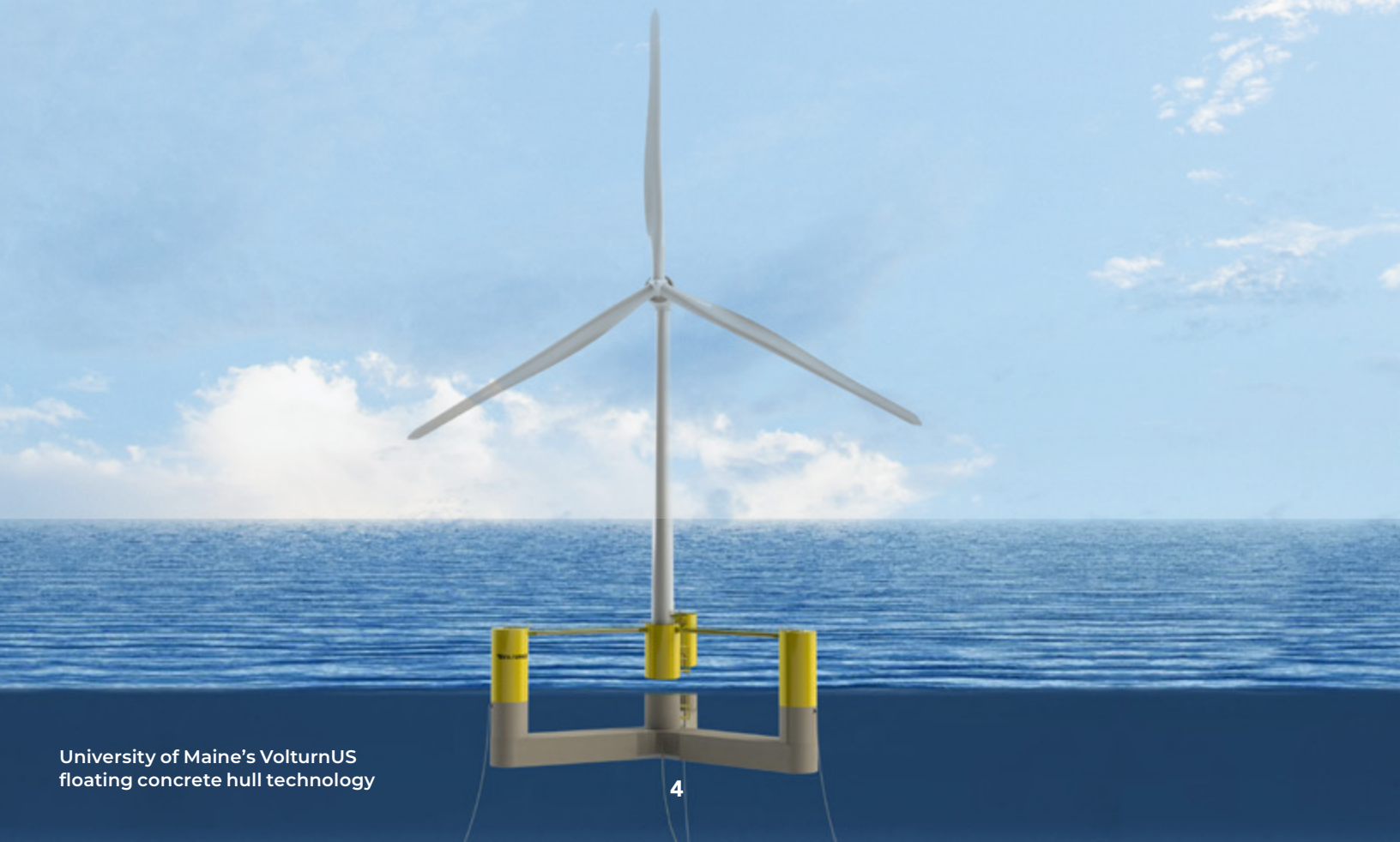
Executive Summary

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

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

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

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



University of Maine's VolturnUS floating concrete hull technology

An Opportunity for Maine

Create Jobs and Economic Growth

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

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

Harness Renewable Energy and Fight Climate Change

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

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

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

Maine's Commitment to Responsible Offshore Wind

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

Preserving Maine's Thriving Marine Economy

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

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

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

Preserving Maine's Traditions & Culture

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

Cross-Cutting Themes

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

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

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

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

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

Roadmap Overview

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

Objectives

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

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

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

Supporting recommendations and technical reports from experts

Working Group Recommendations and Technical Reports

Working Groups:

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

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

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

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

Cross-Cutting Themes

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

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

Technical Reports:

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

Maine Offshore Wind Roadmap Proposed Milestones

2023-2024

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

2025-2030

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

2030 and beyond

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

Ongoing Stakeholder Engagement and Communication

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

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

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

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

Ongoing Stakeholder Engagement and Communication

Advisory Committee & Working Group Members

Advisory Committee

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Working Group Co-Chairs

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Amanda Rector, State economist

Ruth Kermish-Allen, Maine Mathematics and Science Alliance

Mike Williams, Center for American Progress

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Craig Durant, F/V Marie Ann, Groundfish Fishery

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

Appendices

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

Working Group Full Recommendations:

Energy Markets And Strategies Working Group

Environment And Wildlife Working Group

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

Fisheries Working Group

Technical Articles:

State of the Offshore Wind Industry: Today through 2050

Offshore Wind Energy Needs Assessment

Maine Offshore Wind Supply Chain Assessment

Offshore Wind Supply Chain Diversification and Attraction

Offshore Wind Supply Chain - Partnership Building

Maine Offshore Wind Talent Analysis

Offshore Wind Transmission Technical Review - Initial Report

Socioeconomic Analysis of Offshore Wind in the Gulf of Maine

Market Deployment Strategies for Offshore Wind in Maine

Supplemental Materials:

Summary of Maine Aviation Assets for Offshore Wind

Summary of Maine Manufacturing Assets for Offshore Wind

Stakeholder Engagement Summary

Additional External Reports Consulted

DOE Offshore Wind Vision

DOE Offshore Wind Strategy

**Reports available at maineoffshorewind.org*

Acknowledgements

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Fisheries Working Group: Department of Marine Resources: Meredith Mendelson, Deputy Commissioner and Melissa Smith, Resource Management Coordinator; Terry Alexander, F/V Jocka

Environment and Wildlife Working Group: Inland Fisheries and Wildlife: John Perry, Biologist and Lauren McPherson, Information and Education Specialist; Wing Goodale, Biodiversity Research Institute

Energy Markets and Strategies Working Group: Jeremy Payne, Maine Renewable Energy Association

Supply Chain, Ports, and Marine Transportation Working Group: Department of Transportation: Matt Burns; Department of Economic and Community Development: Jonathan Poole; Maine International Trade Center: Wade Merritt; Steve von Vogt, Maine Composites Alliance

Consultants

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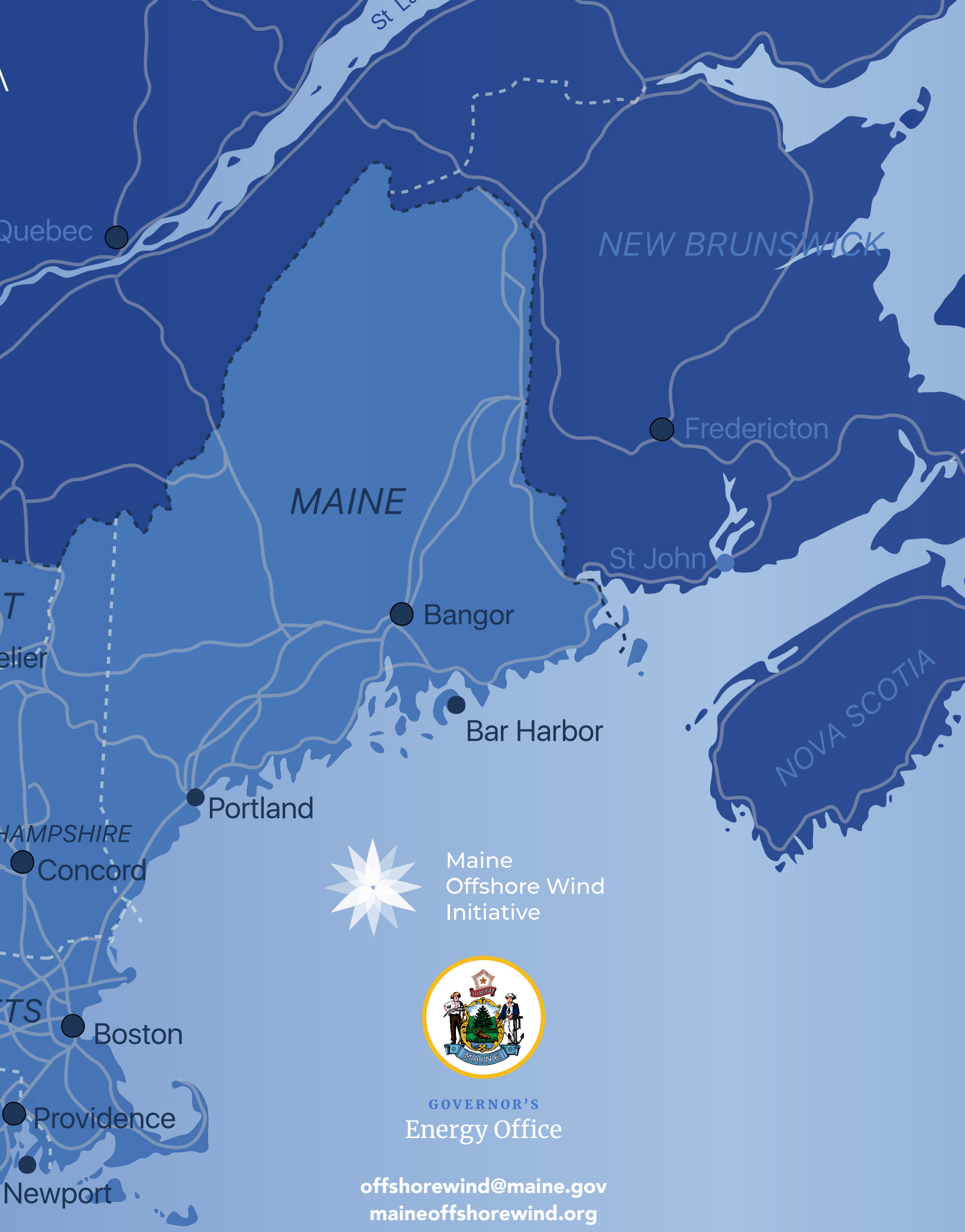

Maine
Offshore Wind
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