Maine Offshore Wind Research Consortium Research Strategy

February 2024

Contents

Purpose of this Document

This document outlines the priority research ideas and questions identified by the Maine Offshore Wind Research Consortium and describes the prioritization process. It is envisioned that the Research Consortium will undergo a priority setting process on an annual basis to generate and/or update an evolving list of research topics and questions. This dynamic list will signal to funders, researchers, and other interested parties the most pressing questions identified through an open and transparent process by a cross-section of experts and interests in floating offshore wind in the Gulf of Maine.

Introduction and Background

Maine has had over a decade of experience researching and planning for floating offshore wind to serve as an alternative to the high cost of fuel oil and a source of renewable energy. In 2019, Governor Mills launched the Maine Offshore Wind Initiative, which focuses on how to best responsibly advance offshore wind in a manner that minimizes impacts to the Gulf of Maine and existing users while strategically taking advantage of the significant economic opportunity that offshore wind holds for the state and region. As part of the initiative, the Governor's Energy Office (GEO) led an 18-month strategic planning process that resulted in the Maine Offshore Wind Roadmap. The development of the Roadmap signaled Maine's desire to realize the economic, energy, and climate benefits from offshore wind while protecting the environment and existing ocean users.

With only a few floating offshore wind turbines operating in the world, wide-ranging research is needed to address important technological, operational, and scientific

questions and inform future floating offshore wind projects. Maine announced plans for the Maine Research Array in November 2020 to establish a platform for collecting information and offer critical firsthand experience with a multi-turbine array; unlocking greater understanding of how future commercial-scale floating wind farms will integrate with the marine environment and existing ocean uses.

About the Maine Offshore Wind Research Consortium

In July 2021, the Maine Legislature established the Maine Offshore Wind Research Consortium and directed the GEO to serve as the coordinating agency. The governance structure of the Research Consortium was developed based on the enabling legislation and a series of interviews with individuals who have a variety of interests, perspectives and expertise. The structure includes an *Advisory Board* with representation from the commercial and recreational fishing industries, research scientists with relevant expertise, coastal community leaders, Maine-based environmental groups, marine wildlife researchers, commercial offshore wind industry experts, and state agencies. The Advisory Board makes formal recommendations on research priorities and project selection to a steering committee. The *Steering Committee* comprised of the GEO, Maine Department of Marine Resources (DMR), Maine Department of Inland Fish and Wildlife (MDIFW), and two Advisory Board Co-Chairs elected by their peers (one for fisheries, one for non-fisheries) provides oversight and overall direction around budget allocation and project selection. The Research Consortium also solicits input from *Collaborators* who represent other states, federal partners and related regional and national organizations to ensure the research aligns with broader efforts. The Collaborators contribute to discussions, share relevant updates and provide technical review as needed, but are not part of the decision-making. The Research Consortium is supported by a project management team. (See Appendix for a list of members).

The Advisory Board established the following goals and objectives and outlined key strategies to implement their work.

Goal

The Maine Offshore Wind Research Consortium aims to create a common understanding of the local and regional impacts (positive and negative) of floating offshore wind in the Gulf of Maine. The consortium may prioritize, scope, commission, and/or find collaborative partners to implement scientific studies on the ecological, technological, economic and social impacts to achieve this goal.

Objectives

- Explore opportunities and challenges that floating offshore wind poses to current and future uses in the Gulf of Maine, including how to best support co-existence with the fishing industry.
- Identify methods to avoid and minimize impacts on ecosystems and existing uses of the Gulf of Maine.

- Investigate ways to realize cost efficiencies in commercialization of offshore wind to reduce potential costs to ratepayers.
- Support conservation actions and projects that support species and habitats impacted by OSW development.

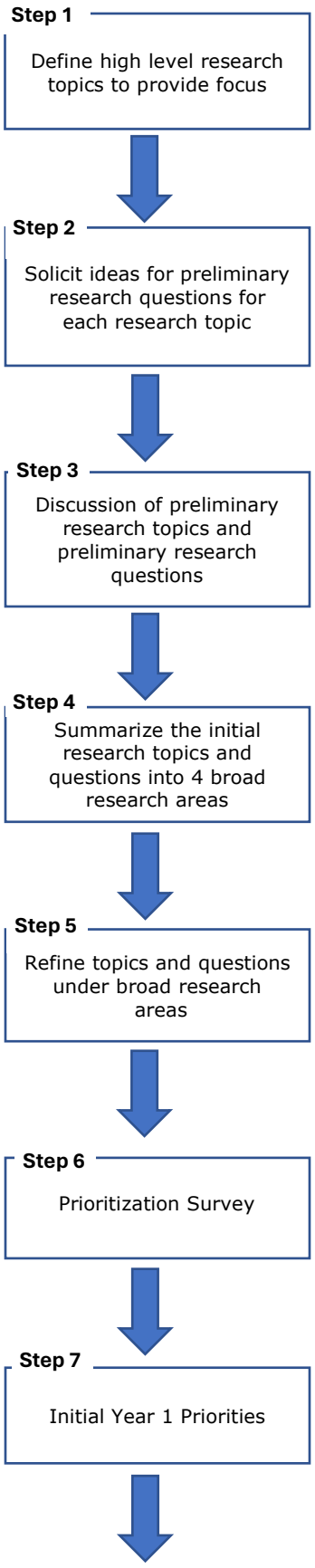
Strategies to Achieve Objectives

- Identify priority data gaps and research needs to achieve the above objectives, building off other initiatives.
- Share knowledge and promote joint learning about floating offshore wind technology, the Gulf of Maine ecosystem, and the current ocean users.
- Collaborate and partner with government entities and other organizations focused on floating offshore wind research and monitoring in the Gulf of Maine.
- Coordinate, support and leverage funds to commission research and monitoring.
- Promote communication and implementation of research results and data in a timely manner.

Establishing Research Priorities

The Research Consortium developed research priorities over a series of meetings from January to September 2023 through an iterative process. The process was designed to build upon recent work to identify priorities through the Maine research array conversations, Roadmap working group recommendations and other regional organizations as applicable to the Gulf of Maine and floating offshore wind projects. These included relevant work products from the Responsible Offshore Science Alliance (ROSA), the Regional Wildlife Science Collaborative (RWSC), National Offshore Wind Research & Development Consortium (NOWRDC), and New York State Energy Research & Development Authority (NYSERDA) technical working groups. Input on the research priorities was received through Advisory Board discussions, on-line surveys and smaller meetings among content experts. The following flow chart outlines the steps taken to arrive at the research projects recommended for funding in the fall of 2023.

Research Consortium Prioritization Process



January: Review of Existing Research Priorities

A review of existing material (e.g. from sources such as legislation, research array and working group summaries) was conducted to identify a list of 12 high level research topics to focus the initial discussion.

Late-January: Solicit Additional Research Topics and Preliminary Research Questions

A standard template was circulated to Advisory Board members to gather missing research topics and ideas for preliminary research questions in line with the Consortium's goal. Template covered: research question/ key idea (what), objective (why) and potential approach (how). The research questions/key ideas were compiled and sorted by the program team.

February: Advisory Board Meeting

At the inaugural Advisory Board meeting, a workshop was held to discuss the 12 research topic areas, preliminary research questions, and begin to discuss the process and desired criteria for prioritizing research questions. Additional research questions/topics were raised during the workshop and topics refined.

March: Program Management Team Summary

Following the workshop, the research topic areas were further refined based on the input at the Advisory Board meeting The list of research topic areas was grouped into four broad research areas: • Reduce co-use conflicts • Impacts on wildlife • Socio-economic impacts and community benefit • Technology Development

April: Advisory Board Meeting

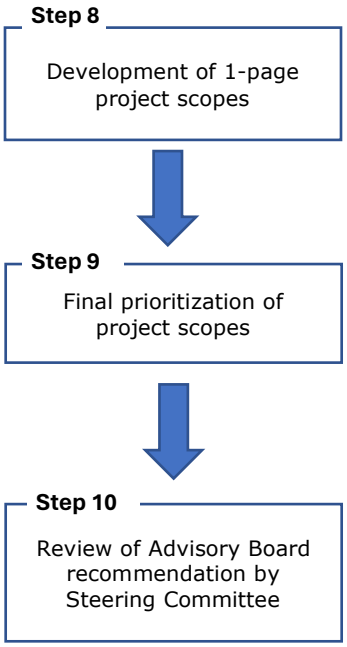
The Advisory Board and Collaborators worked through breakout groups to discuss and refine the types of research questions under each of the four broad research topics.

June: On-line Prioritization Survey

The Advisory Board and Collaborators were asked to review and prioritize among 13 research topics through an online spreadsheet based on two key criteria: 1) Urgency of and Importance for Maine [*Studies that require pre-construction and construction data; help inform siting or project design decisions and/or address protected/sensitive species or habitats, species that are valuable for commercial fisheries or studies that have a specific relevance for Maine]* and 2) Research Gap [*What is the level of knowledge already? Are there already several studies to address this question or information need?]*

June: Advisory Board Meeting

The initial rating of research topics from the prioritization survey was reviewed and discussed by the Advisory Board and there was consensus to move forward with development of the 5 highest ranked research topics as potential Year 1 projects.



June – August: Information Gathering and Small Group Meetings

Each of the 5 research topics was developed into a 1-page project idea outlining high level scope for an RFP based on further exploration of data gaps and a series of small group discussions with content experts. Details included an estimated cost, duration, objectives and expected benefits.

September: Advisory Board Meeting

The Advisory Board reviewed the 1-page descriptions of the 5 project ideas and met to discuss the merits of moving forward with each. A vote was taken to determine the highest priority projects and the top 3 were selected to forward as a recommendation to the Steering Committee.

September: Steering Committee

The Steering Committee discussed the recommendation from the Advisory Board and agreed by consensus with the Advisory Board recommendation. GEO was forwarded the Steering Committee's decision for development of an RFP.

Floating Offshore Wind Research Priorities

The priority list consists of "research areas" which are cross cutting themes addressing the overall Consortium objective and goals. "Research topics" provide more detailed direction and assist the Consortium partners to proactively seek and respond to funding opportunities in addition to designing "research ideas and questions" in-line with the overarching goals.

The list of research ideas and questions is not definitive, but is intended as a living document that is updated annually.

RESEARCH AREAS	*RESEARCH TOPICS*	*RESEARCH IDEAS and QUESTIONS*
Reduce co-use conflicts	**Collection of baseline data to inform siting and understanding of the impact on commercial and recreational fisheries and ecosystems currently and historically happening in areas where arrays and transmission are proposed or sited.**	*Analysis of siting and location (macro(location of wind farm)/micro (layout of wind farm).*
		Identifying areas that have a significant impact on fishing.
		Spatial impacts of climate change. Which areas might be less/more important in the future as fish stock moves.
		Spatial operation needs for operating around turbines and within wind arrays for commercial fisheries.

	Technology assessment/methods to reduce co-use conflicts	*Wind farm technology (i.e. cable protection, mooring and anchor configuration, sensors on fishing gear) to minimize conflict.*
		Alternative or novel fishing gear to minimize conflict and enable greater use of mobile or fixed gear operations.
		Navigation and safety.
		What anchoring and transmission systems are compatible with co-location of offshore aquaculture?
		Edge effects. How close can we fish around a find farm?
		Best practice on effective communication between different parties.
Impact on ecosystems	**Investigate interactions of floating offshore wind at various stages (i.e. site assessment, construction, and operations and maintenance) in regards to developing an interdisciplinary understanding of change and impact over time and space on Gulf of Maine species (baseline data and site assessment to better understand species composition, distribution and cumulative effects).**	*Living marine resources. Specifically, potential compositional (distribution, abundance, and sizes) changes post construction in context to other drivers such as climate change and understanding prey resources for the GoM for seabird and marine mammals.*
		Marine mammals. Specifically, understanding prey resources and opportunistic data to improve the performance of coastwide habitat density models for the Gulf of Maine.
		Environmental conditions. Specifically, sea bottom, water column, and hydrodynamic assessment before and after construction and modelling of sea surface currents.
		Explore which bird/bat species are most at risk (where and why? Above and below sea level) from floating offshore wind energy development in the Gulf of Main and what are effective methods to monitor/mitigate risk.
	Examine potential sensory stressors (sound, vibration, EMF) on wildlife from OSW transmission infrastructure, including pre-deployment, construction and	*Impact of lighting on wildlife.* *EMF. Specifically, the effects of EMF on predators and predatory-pray interactions and better understand the components of EMF emissions and their interactions and update existing models.*

	operation, and how they can be avoided or minimized.	*Understanding the potential behavioral effects of particle motion and substrate vibration on species of concern.*
		Best practice on minimizing noise from geophysical and technical surveys as well as construction and operation.
	Methods to integrate and advance wildlife deterrent and ecological monitoring technology with floating offshore wind projects to minimize impacts.	*Monitoring nature-based design structures to enhance habitat value.*
		Methods to understand reduce risks of secondary entanglement including design and technologies for removal.
Socio-economic impacts and community benefit	**Socio-economic impacts of offshore wind industry development on Maine coastal communities**	*Economic analysis of the potential cost of incorporating ecological and community benefits requirements in the scoring criteria for procurement.*
		Economic analysis on the impact on tourism, shore-side infrastructure, real estate value.
		Potential displacement on fishing jobs/opportunities and communities .
		Job creation and stability (types, location, supporting existing industries to transition).
	Necessary preparation for Maine's supply chain and workforce to support floating offshore wind.	*Skills and workforce development. Exploring unique offshore wind job opportunities, skills required and training programs needed.*
Technology development	**Explore advancements in mooring and anchoring concepts for floating foundations.**	*Alternative materials which can be employed by mooring lines, components and anchor systems which can enable low cost solutions that are locally produced.*
		What mooring and anchor design is most optimized for the Gulf of Maine in terms of geological, met-ocean loads, water depth etc.
	Floating wind operations and maintenance approaches to reduce costs, improve safety and increase efficiency.	*Monitoring/maintenance technology integration with wind turbine technology development.*
	Assess shoreside infrastructure and other requirements to advance industrialization of the floating supply chain.	*Evaluate current port infrastructure and identify potential gaps for Maine.*
		Assess opportunities for automation within Maine's supply chain.
		Assess Maine's grid requirements.

	Consider methods to optimize integration of renewable energy into the grids.	*Evaluate need to grid enforcements that will enable integration of OSW into the grid system. Alco co-location for the backbone/cable corridor.*
		Assess opportunities of energy storage / hydrogen / system services to optimize grid integration.
	Develop technologies to monitor and minimize impacts to wildlife.	
	Autonomous systems and validation of new technology	*Assess potential for digital twins to improve floating wind structure component reliability and extend operational life.*

Appendix: Maine Offshore Wind Research Consortium Advisory Board, Collaborators and Program Management Team - 2023

Advisory Board

- Commercial and recreational harvesting interests
  - **Patrice McCarron, Maine Lobstermen's Association**
  - **Jack Cunningham, Maine Lobster Union**
  - **Ben Martens, Maine Coast Fishermen's Association**
  - **Terry Alexander, F/V Jocka****
  - **Mary Beth Tooley, O'Hara Corp**
  - **Chris Weiner, F/V Elizabeth Ames, American Bluefin Tuna Association**
  - **Bob Humphrey, Sport-Ventures**
- Scientist from private and public research institutions with various expertise
  - **Alison Bates, Colby College****
  - **Damian Brady, University of Maine**
  - **Wing Goodale, Biodiversity Research Institute**
  - **Nick Record, Bigelow Laboratory for Ocean Sciences**
  - **Graham Sherwood, Gulf of Maine Research Institute**
  - **Sean Todd, College of the Atlantic**
  - **Gayle Zydlewski, Maine Sea Grant**
- Offshore wind industry experience and engineering experience
  - **Dave Cowan, Diamond Offshore Wind**
  - **Laura Morse, Invenergy**
  - **Walter Musial, National Renewable Energy Laboratory**
  - **Anthony Viselli, UMaine Advanced Structures & Composites Center**
  - **Wojciech Wiechowski, RWE**
- Coastal community members
  - **Bill Needelman, Portland Waterfront Coordinator**
- Maine-based environmental groups
  - **Jocelyn Runnebaum, The Nature Conservancy Maine**
  - **Sarah Haggerty, Maine Audubon**
- State agencies
  - **Carl Wilson, Department of Marine Resources***
  - **John Perry, Department of Inland Fisheries and Wildlife***
  - **Stephanie Watson, Governor's Energy Office***
- At large
  - **Daniel Salerno, Fisheries Scientist, Limington, Maine**

* Steering Committee members
** Advisory Board Co-Chair

Collaborators

- **State and Federal Entities**
  - MA Coastal Program and Clean Energy Center
  - NH Department of Environmental Services
  - NY State Energy Research and Development Authority
  - California Energy Commission
  - US Fish & Wildlife Service
  - National Oceanic and Atmospheric Administration
  - New England Fisheries Management Council

- **Regional Organizations**
  - Regional Wildlife Science Collaborative
  - National Offshore Wind Research and Development Consortium
  - Responsible Offshore Science Alliance
  - Responsible Offshore Development Alliance
  - Northeastern Regional Association of Coastal Ocean Observing Systems

Program Management Team

- Olivia Burke, Senior Manager, Offshore Wind, Carbon Trust
- Jan Matthiesen, Director, R&D Offshore Wind, Carbon Trust
- Laura Taylor Singer, Principal and CEO, SAMBAS Consulting LLC
- Meghan Suslovic, Offshore Wind Energy Policy Analyst, Governor's Energy Office