Floating Offshore Wind Shot™ Overview

Jocelyn Brown-Saracino, Offshore Wind Lead,
Wind Energy Technologies Office, DOE
May 16th, 2024

Federal Advisory Committee Act (FACA) Notice

The purpose of today's meeting is to ask for your input regarding floating offshore wind topics. To that end, it would be most helpful to us if, based on your personal experience, you provide us with your individual advice, information, or facts regarding this topic. The objective of this session is not to obtain any group position or consensus. Rather, Floating Offshore Wind Shot federal partners are seeking as much input as possible from all individuals at this meeting. To most effectively use our limited time, please refrain from passing judgment on another participant's recommendations or advice and instead concentrate on your individual experiences.

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Global Floating Offshore Wind Deployment and U.S. Potential

Over 100 GW in global pipeline for floating offshore wind projects

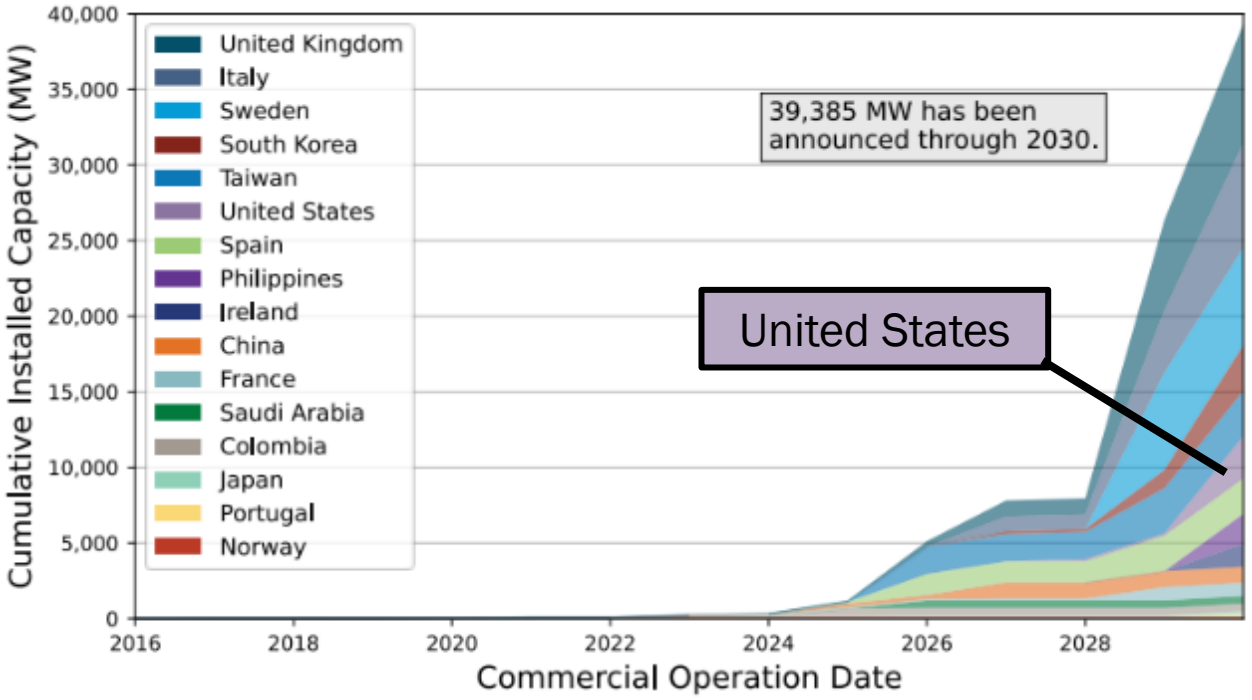


Figure: *US DOE Offshore Wind Market Report 2023 Edition*

U.S. wind resource is over 4 TW, with 2/3 over deep waters, requiring floating technologies

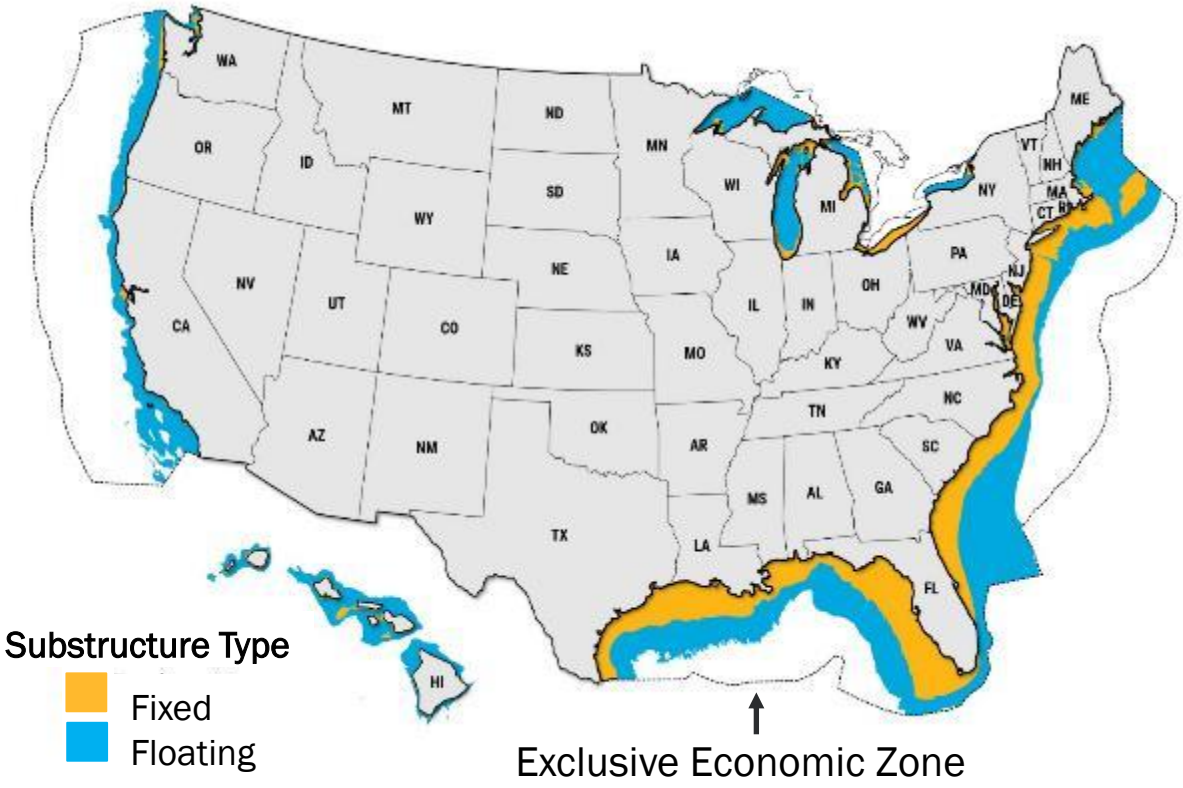


Image: NREL

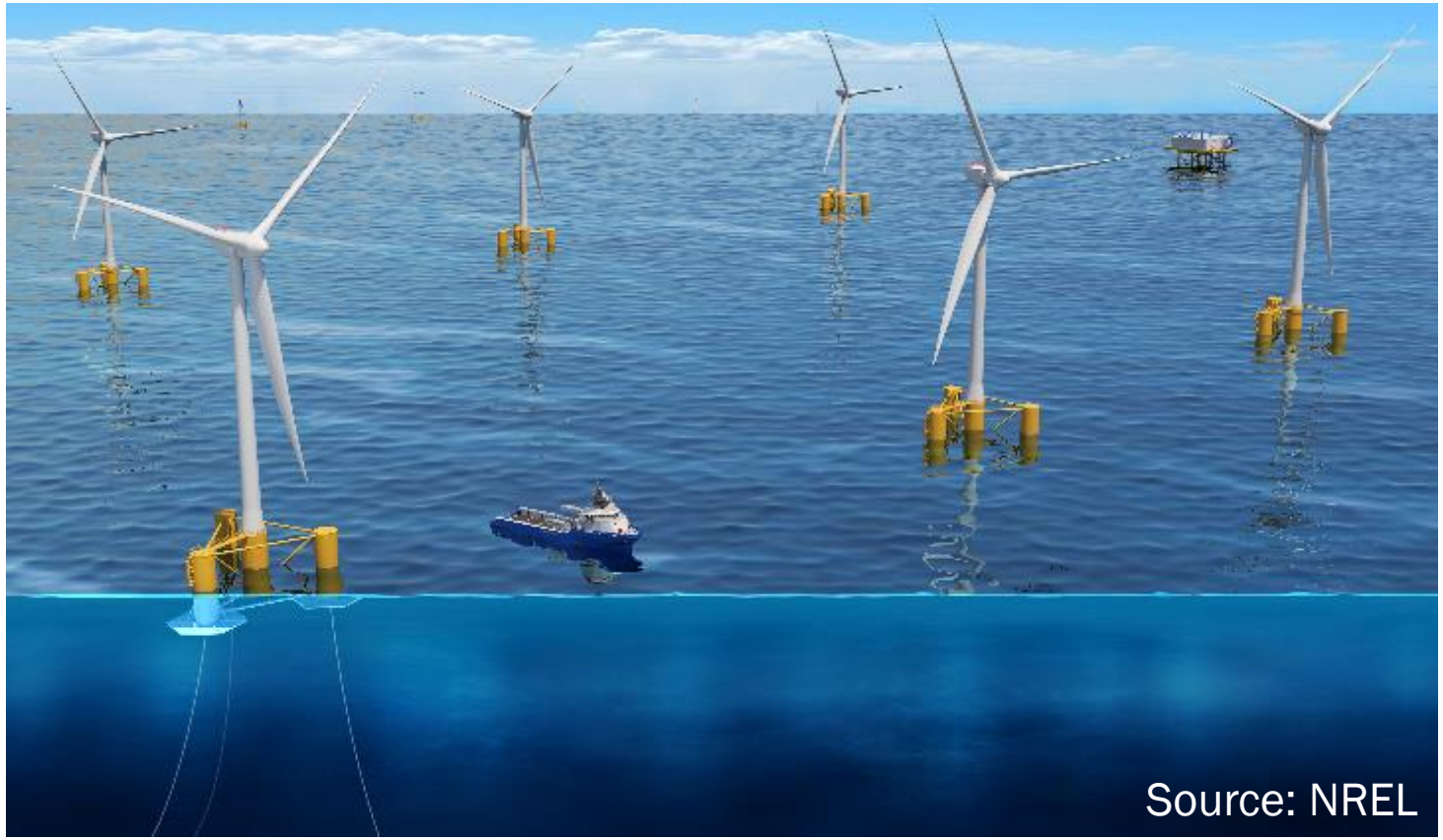
Floating Offshore Wind – The Opportunity

Why Floating Offshore Wind?

- 2/3 of US offshore wind resource
- Regional & economy-wide decarbonization
- Coastal and national economies
- Potential for U.S. innovation & leadership

Why Now?

- Cusp of commercialization
- Rapid period of growth around the world



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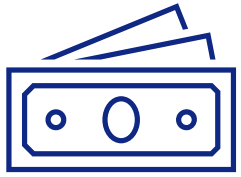
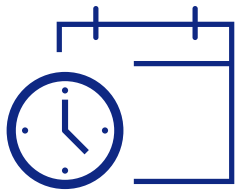
Floating Offshore Wind™

The ***Floating Offshore Wind Shot™*** will drive U.S. leadership in floating offshore wind design, manufacturing, and deployment to decarbonize our economy and revitalize our coastal economies.

Reduce the cost of floating offshore wind electricity by >70% in deep waters by 2035



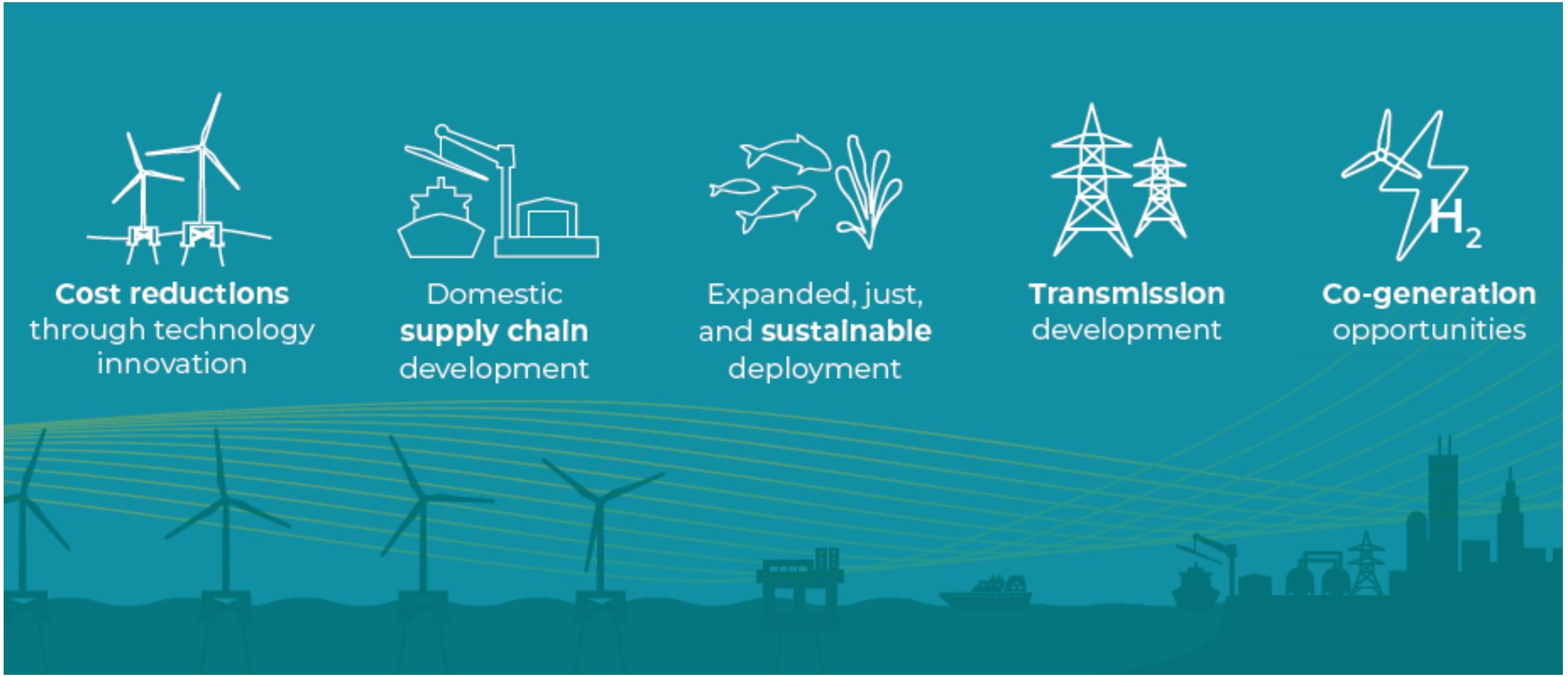
>70% Reduction



2035

BOEM also announced an associated deployment goal of 15 GW floating offshore wind by 2035.

Key Needs for Floating Offshore Wind Development



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Stakeholder Feedback Collected Since Inception of Shot

- **Floating Offshore Wind Shot Summit - February 2023**
- **Floating Offshore Wind Shot Workshop - May 2023**
- **Conference panels and workshops**
  - AFLOAT 2023
  - Offshore WINDPOWER 2023
  - BNOW International Partnering Forum 2023
  - Pacific Offshore Wind Summit 2023
  - Floating Wind Solutions 2024
- **Floating Offshore Wind Shot Pathways Workshop - April 2024**
- **Transmission Convenings (Atlantic and West Coast) - 2023-2024**
- **Requests for Information**
  - Anchoring and Mooring - October 2022
  - Centers of Excellence and Aquaculture Co-Location - February 2023
  - Offshore Wind Research and Development Needs - January 2024
  - Blade Manufacturing - April 2024

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Floating Offshore Wind Shot: Priorities and Progress

This report seeks to characterize Shot goals, stakeholder feedback, accomplishments, and near-term priorities developed since the establishment of the Shot.

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Support For Floating Offshore Wind Shot™

SHOT SUPPORT TO DATE

over **$950** million

- Cost reductions
- Supply chain development
- Expanded, just, and sustainable deployment
- Transmission development
- Co-generation opportunities

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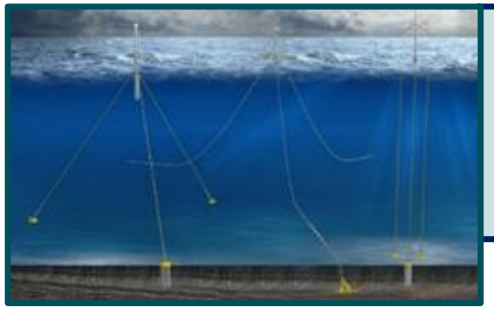
Technology Innovation Goal and Highlighted Progress

Goal: Lower costs, expand market potential, reduce risk, and address US design conditions

FLoating Offshore Wind ReadINess Prize
$6.85 million

ATLANTIS Phase II
$38 million

Manufacturing Awards for Wind Energy
$45 million



Anchoring and Mooring Systems FOA
$6.4 million

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Supply Chain Goal and Highlighted Progress

Goal: Global leadership in floating offshore wind through domestic supply chain development and community involvement

Port of Humboldt DOT Award
$427 million

BOEM Bidding Credits
Over $117 million

Federal-State Offshore Wind Implementation Partnership

West Coast Ports Study

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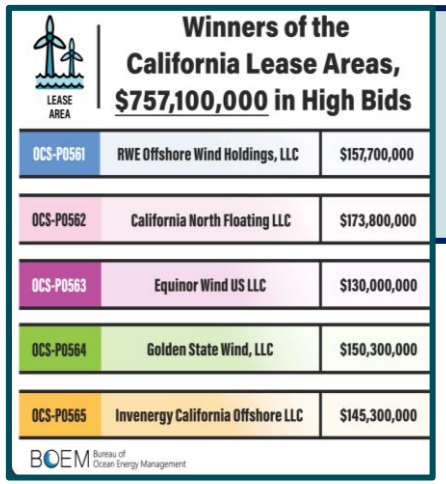
Expanded, Just, and Sustainable Deployment Goal and Highlighted Progress

Goal: Achieve just and sustainable deployment in cooperation with marine co-users and coastal communities.

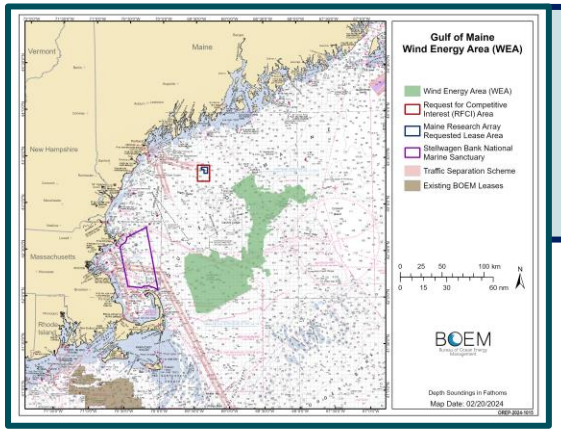


California Floating Offshore Wind Lease Auction

Social Science & Community Engagement Awards
$6.5 million

Sea Grant

Expansion of Sea Grant Partnership to West Coast



New Wind Energy Areas in Oregon and Maine Deep Waters

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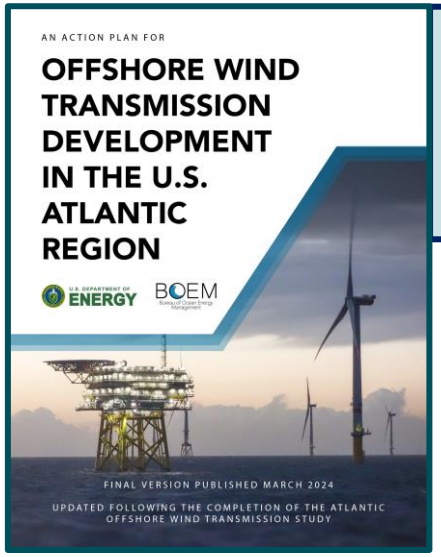
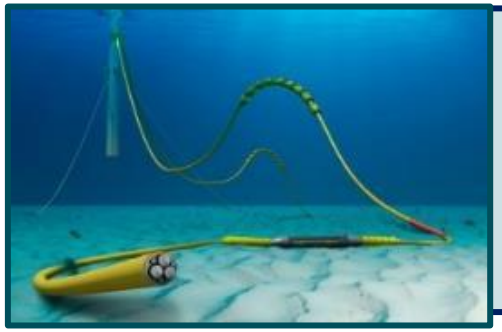
Transmission Goal and Highlighted Progress

Goal: Efficient and robust bulk electric grid that accommodates long distance power transmission and high penetrations of variable generation.



The Atlantic Offshore Wind Transmission Action Plan

West Coast Offshore Wind Transmission Study & Convening



HVDC Voltage Source Converter Transmission Systems FOA
$10 million

HVDC Standards, Controls, and Curriculum Awards
$8.5 million

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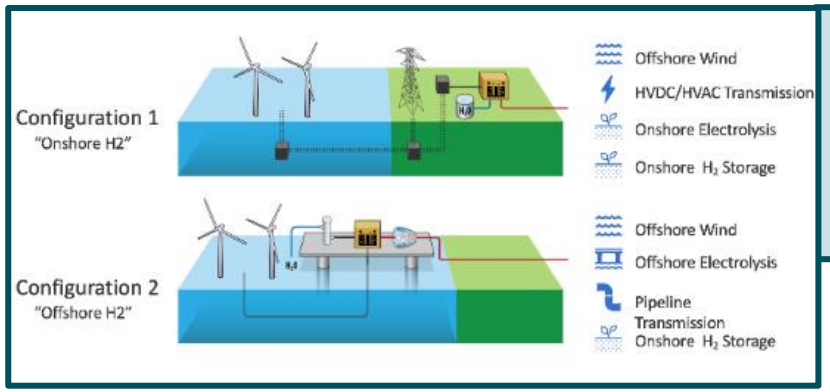
Co-Generation Goal and Highlighted Progress

Goal: Floating offshore wind is an integral component of power generation that shapes broader economy-wide decarbonization



Offshore Wind and Hydrogen Use-Case Study

SBIR/STTR on Compact Long Duration Storage for Wind

IEA Topical Expert Meeting on Hydrogen

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Recent Announcements

FLoating Offshore Wind ReadINess Prize (FLOWIN) Phase Two Winners

Teams receive $450,000 cash and $100,000 in vouchers for technical support and advance to the final competition phase.

Offshore Wind Operations & Maintenance Roadmap

Assesses current practices and future challenges to the operation and maintenance of U.S. offshore wind farms.

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National and Regional R&D of Offshore Wind Technologies NOI

	Topic Area	Funding
	Floating Offshore Wind Platform R&D - Refinement and Innovation in Floating Platform Design, Manufacturing, and Deployment - Next-Generation Integrated Turbine/Platform Research	$20 million
	Innovation for Fixed-Bottom Offshore Wind Foundation Types and Supporting Infrastructure	$7.5 million
	Technology Advancement for Bird and Bat Research Offshore	$8 million
	Development of a Manufacturing and Supply Chain Offshore Wind Consortium in Great Lakes Region	$5 million
	Floating Offshore Wind Center of Excellence	$3.5 million
	Protecting the Future Offshore Wind Fleet Against Lightening	$4 million

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Other NOIs

- The DOE Wind Energy Technologies Office and Innovation Fund Denmark announced an intent to release a $4.2 million opportunity to advance floating offshore wind energy systems toward cost-effective commercialization and wide-scale deployment.

- The DOE Wind Energies Technologies Office announced plans to invest $5.1 million from the Bipartisan Infrastructure Law in research and technology development to advance modeling and analysis for next-generation offshore wind turbine blades.

Recent Announcements

Solicitation Title	Due Date
Environmental Protection Agency Clean Ports Program	Full Applications: May 28
Qualifying Advanced Energy Project Tax Credit (§ 48C) Program Round 2	Concept Paper Portal opens NLT May 28
2025 Collegiate Wind Competition Applications	Applications: June 13, 2024
Notice of Intent: DOE and Innovation Fund Denmark Research to Advance Floating Offshore Wind	Not Applicable
Notice of Intent: National and Regional Research and Development of Offshore Wind Technologies	Not Applicable
Notice of Intent: Research to Improve Aerodynamic Performance of Offshore Wind Turbines	Not Applicable

Near-Term Priorities for Each Pillar

PILLAR	PRIORITY
Cost Reductions	• Advance research into resource assessment, floating system designs and modeling, manufacturing techniques, and operations and maintenance systems.
Supply Chain Development	• Identify gaps and solutions to inform decision making and develop robust, regional supply chains, while mobilizing critical investment through federal programs and lease bidding credits.
Expanded, Just, and Sustainable Deployment	• Advance siting and leasing of floating offshore wind, while increasing tribal leasing engagement and the understanding of floating offshore wind impacts on the environment, fisheries and communities, and building opportunities for workforce development.
Transmission Development	• Complete in-depth offshore wind transmission studies. Improve planning tools and models to support the development of strategic and equitable offshore transmission; advance critical offshore HVDC transmission components.
Co-Generation Opportunities	• Conduct techno-economic analyses for floating offshore with hydrogen generation and energy storage options, and develop effective reference designs and demonstrations.

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BOEM BUREAU OF OCEAN ENERGY MANAGEMENT

Outer Continental Shelf (OCS) Renewable Energy

May 16, 2024

Floating Offshore Wind Shot Summit

Doug Boren

Regional Director, Pacific Regional Office

Floating Offshore Wind

- Can help us reach areas once thought unattainable
- Can drive U.S. leadership in floating offshore wind design, development, and manufacturing
- **BOEM** is pursuing Interior's goal to deploy 15 GW of floating offshore wind by 2035 – *enough to power more than 5 million American homes!*
- Collaboration and development efforts are underway in the Pacific Region and the Gulf of Maine

Creating Good Paying, Union Jobs

Achieving the Floating Offshore Wind Shot target will spur billions of dollars of economic opportunities

BOEM is finding opportunities to:

- incentivize the sourcing of major components domestically
- develop a highly skilled and well-trained domestic workforce
- develop lease stipulations that encourage project labor agreements

Potential Areas for Floating Wind

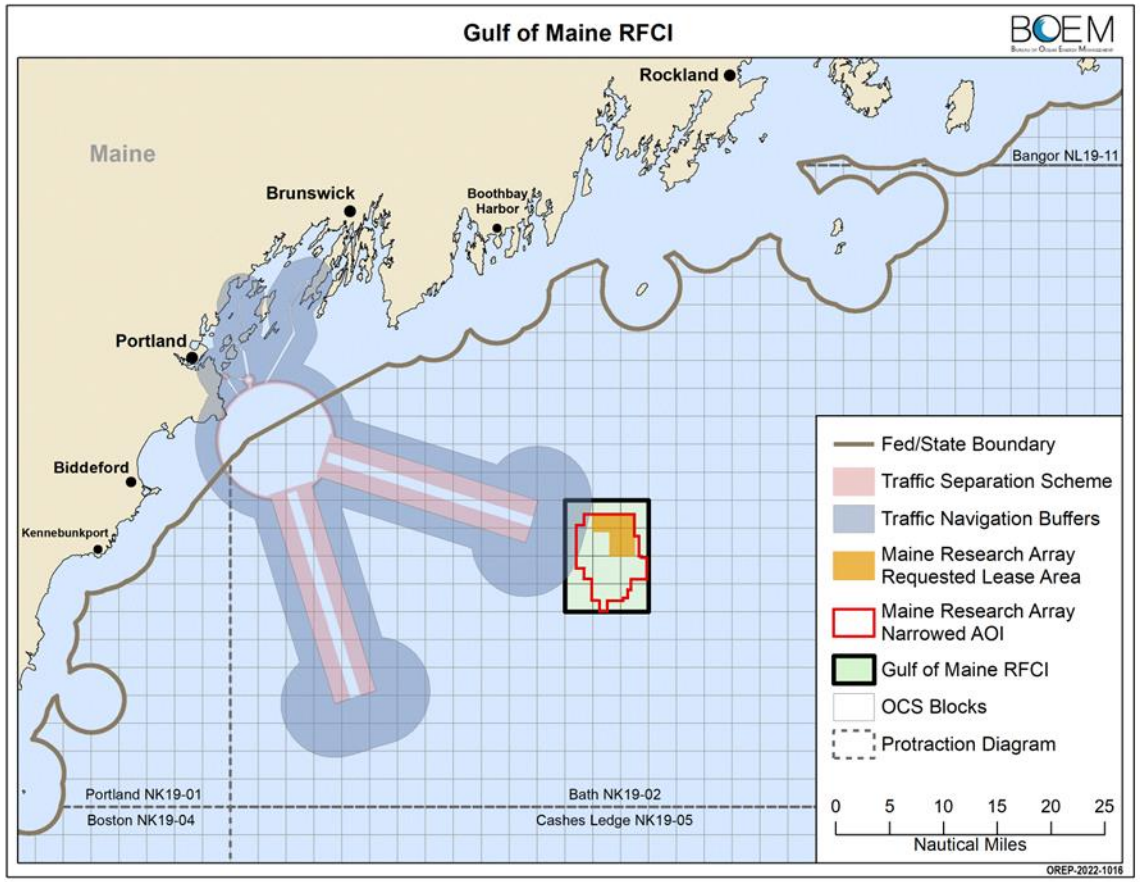
California

Oregon

Gulf of Maine

Maine Research Lease

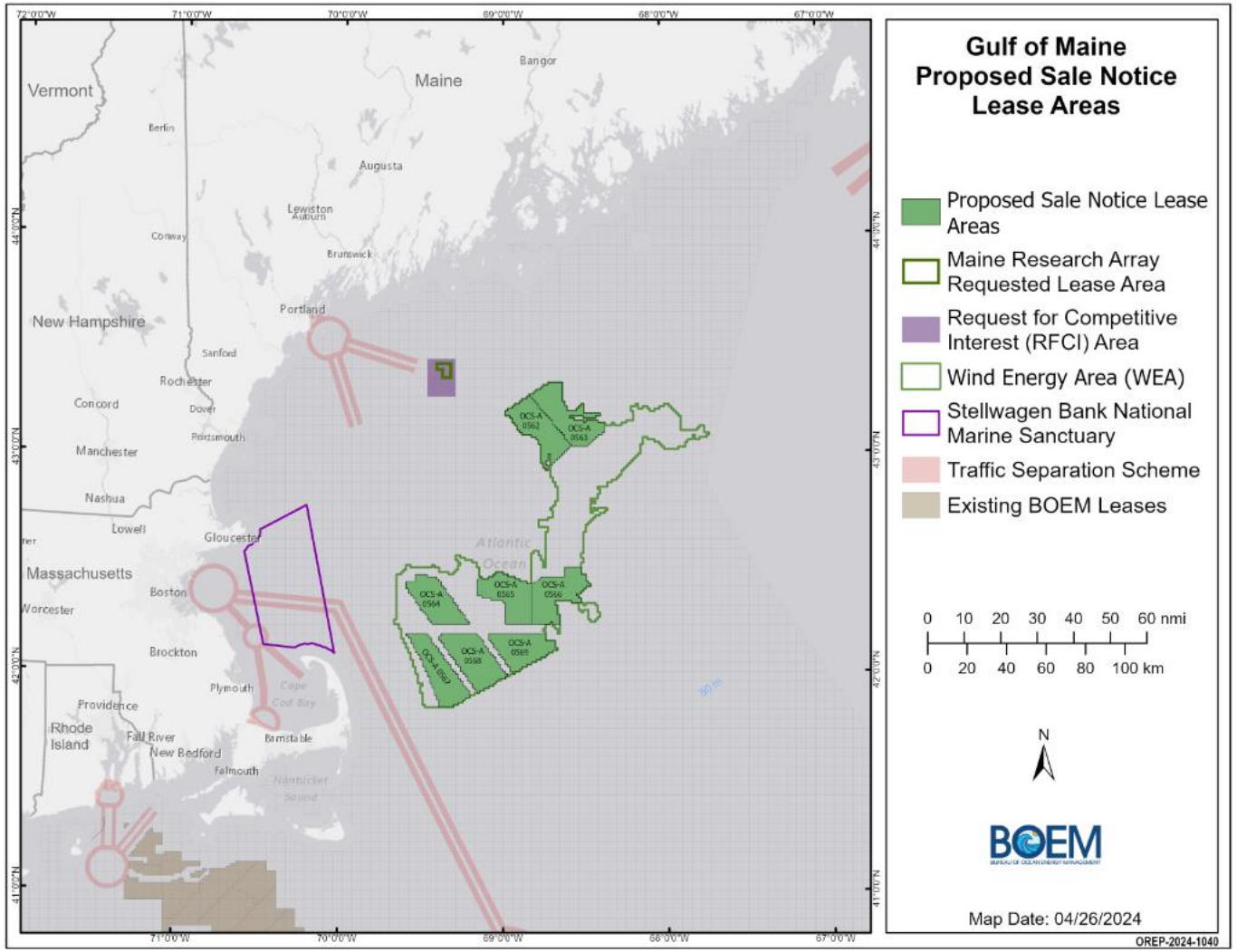
- **October 1, 2021 –** Application received from Maine
- **August 19, 2022 –** Request for Competitive Interest (RFCI) issued by BOEM
- **March 20, 2023 –** Determination of No Competitive Interest in the RFCI is published enabling leasing negotiations to begin
- **July 19, 2023** – Draft Environmental Analysis for the Research Lease RFCI Area is published
- **Spring 2024** – Target for Final EA publication and lease execution



Renewable Energy Leasing: Gulf of Maine

Gulf of Maine Proposed Sale Notice (PSN)

- ~ 1 million acres
- Potentially 15 GW of clean energy
- **April 30, 2024** – BOEM announced its proposal for a first offshore wind energy auction in the Gulf of Maine
  - 8 lease areas that avoid many sensitive habitats and potential ocean use conflicts (e.g., important areas for North Atlantic right whales, avian species, and key Tribal and commercial fishing grounds).
- **Next step:** Public comment on PSN is open until July 1, 2024



Offshore Wind Energy Planning in Oregon

- BOEM Oregon Intergovernmental Renewable Energy Task Force established in 2011 to coordinate federal, state, local and tribal governments and provide input to BOEM renewable energy leasing decisions
  - 2011-2014: 6 Task Force meetings, 2019-2023: 5 Task Force meetings
- Oregon Department of Land Conservation and Development (DLCD) and BOEM developed OroWindMap planning tool to provide a publicly accessible data platform
- Call for Information and Nominations (Call) published in April 2022 identified two call areas offshore southern Oregon (1,159,298 acres) for public comment
- Based on comments received during the Call, BOEM partnered with NOAA's National Centers for Coastal and Ocean Science (NCCOS) to use suitability modeling to identify the least conflicted areas within the Call Areas
- Coos Bay and Brookings Draft Wind Energy Areas (WEA) and draft NCCOS report published August 2023 (219,568 acres)
- Final WEAs (195,012 acres), Final NCCOS report and Notice of Intent (NOI) to prepare an Environmental Assessment announced February 2024
- Proposed Sale Notice (PSN) published in Federal Register on May 01, 2024; requests nominations of interest from developers and 60-day public comment period (until July 1, 2024)
- BOEM published Draft Environmental Assessment on May 01, 2024; to assess potential impacts from offshore wind leasing activities, including site characterization and assessment activities

Outlook and Next Steps

Proposed Sale Notice (PSN) - May 1, 2024

- 60-day comment period ends July 1, 2024

Draft Enviromental Assessment (EA) - May 1, 2024

- 30-day comment period ends May 31, 2024

Publish Final Environmental Assessment

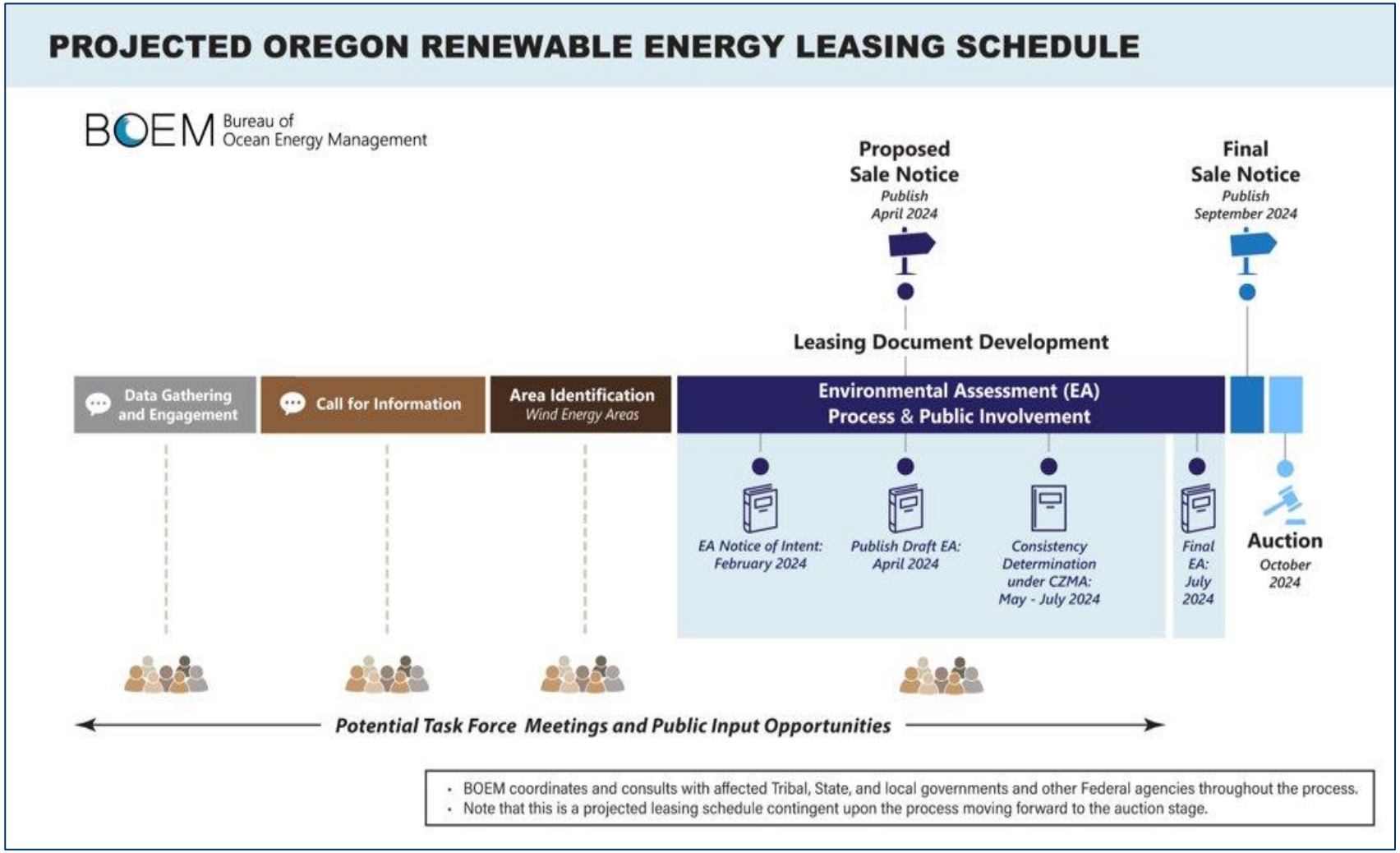
- July 2024

Publish Final Sale Notice

- September 2024

Lease Auction

- October 2024



*https://www.doi.gov/pressreleases/interior-department-proposes-offshore-wind-sales-oregon-gulf-maine

Renewable Energy Leasing: Oregon

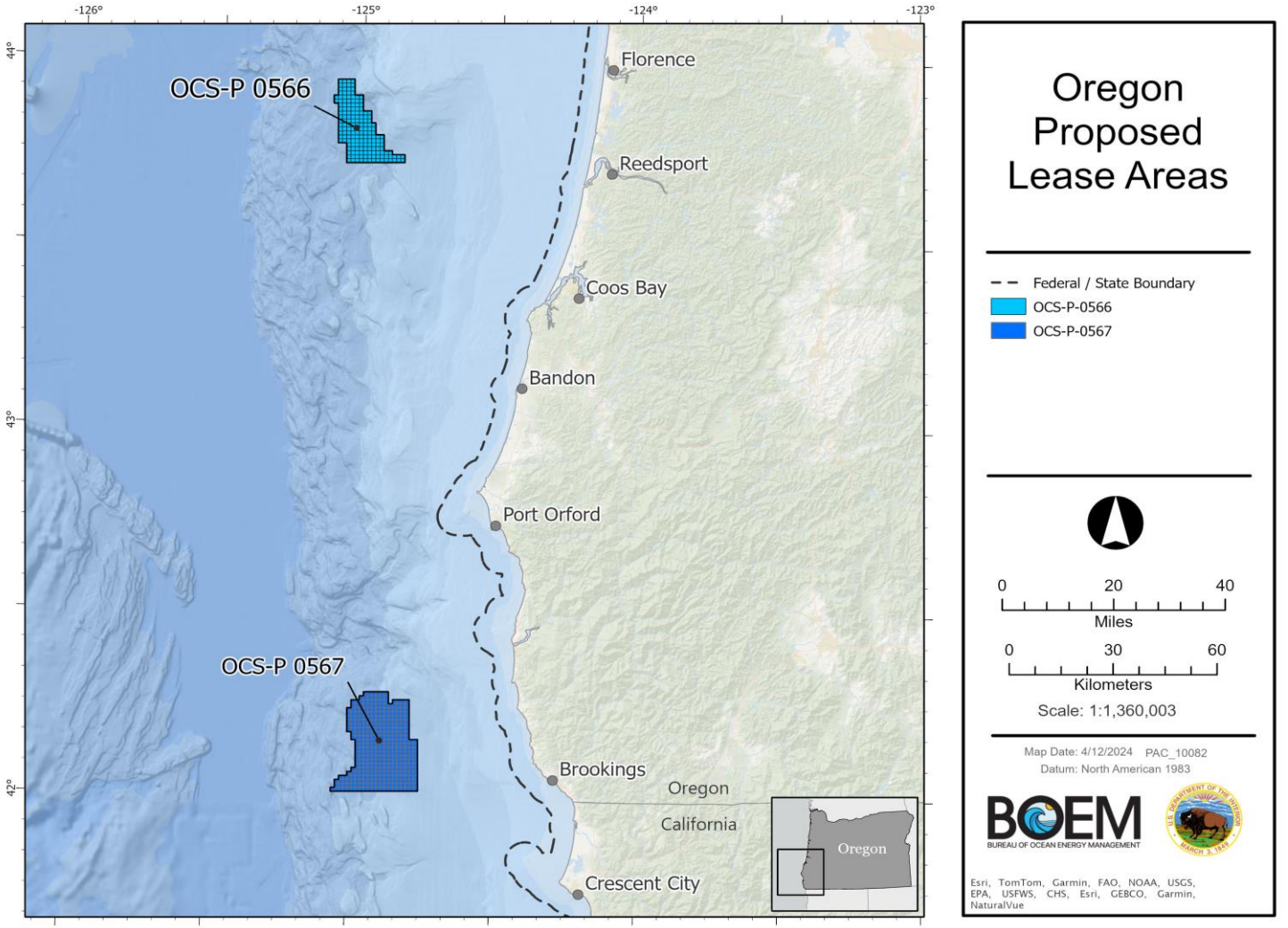
Proposed Lease Areas (BOEM now uses 4 MW/sq km for capacity estimates)

Coos Bay Lease Area

- Capacity: 1 GW
- Acres: 61,203
- Depth: 635 – 1,414 meters

Brookings Lease Area

- Capacity: 2.2 GW
- Acres: 133,792
- Depth: 567 – 1,531 meters



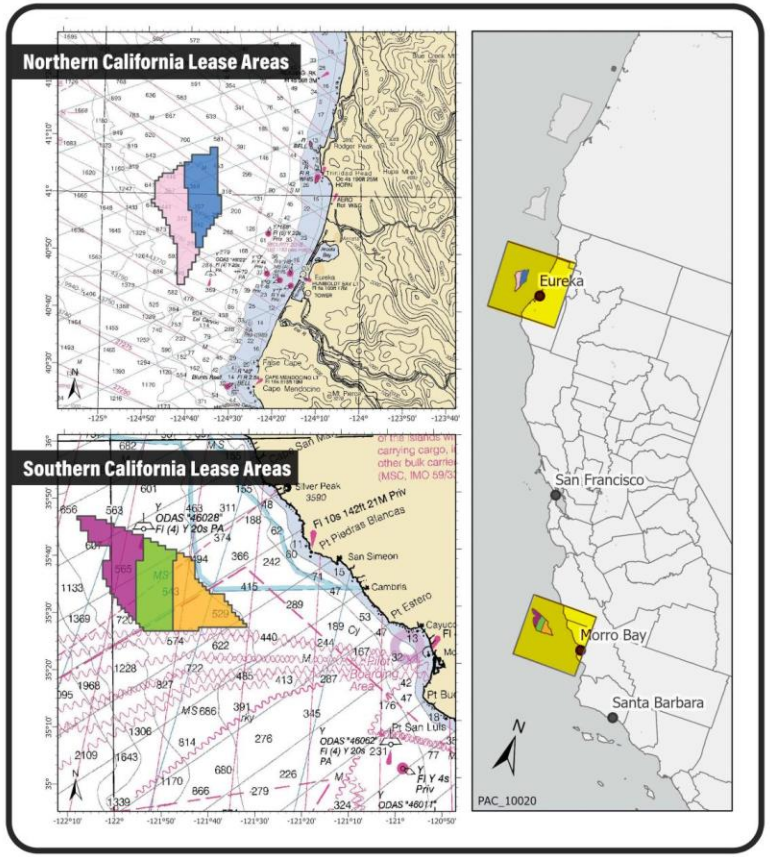
Renewable Energy Leasing: California

- Lease Effective Date June 1, 2023
- Programmatic EIS for lease areas

Provisional Winners of the California Lease Areas, $757,100,000 in High Bids

LEASE AREA		
OCS-P0561	RWE Offshore Wind Holdings, LLC	$157,700,000
OCS-P0562	California North Floating LLC	$173,800,000
OCS-P0563	Equinor Wind US LLC	$130,000,000
OCS-P0564	Central California Offshore Wind LLC	$150,300,000
OCS-P0565	Invenergy California Offshore LLC	$145,300,000

BOEM Bureau of Ocean Energy Management



California Updates: Active Leases

Communication Plans from Lessees

- 5 Agency Communication Plans (ACP) and 5 Fisheries Communications Plans (FCP) submitted and posted to Lessee websites
- Native American Tribes Communication Plans (NATCP) have been submitted currently under review

Survey Plans

- Three lessees have submitted survey plans, and one lessee has started surveys

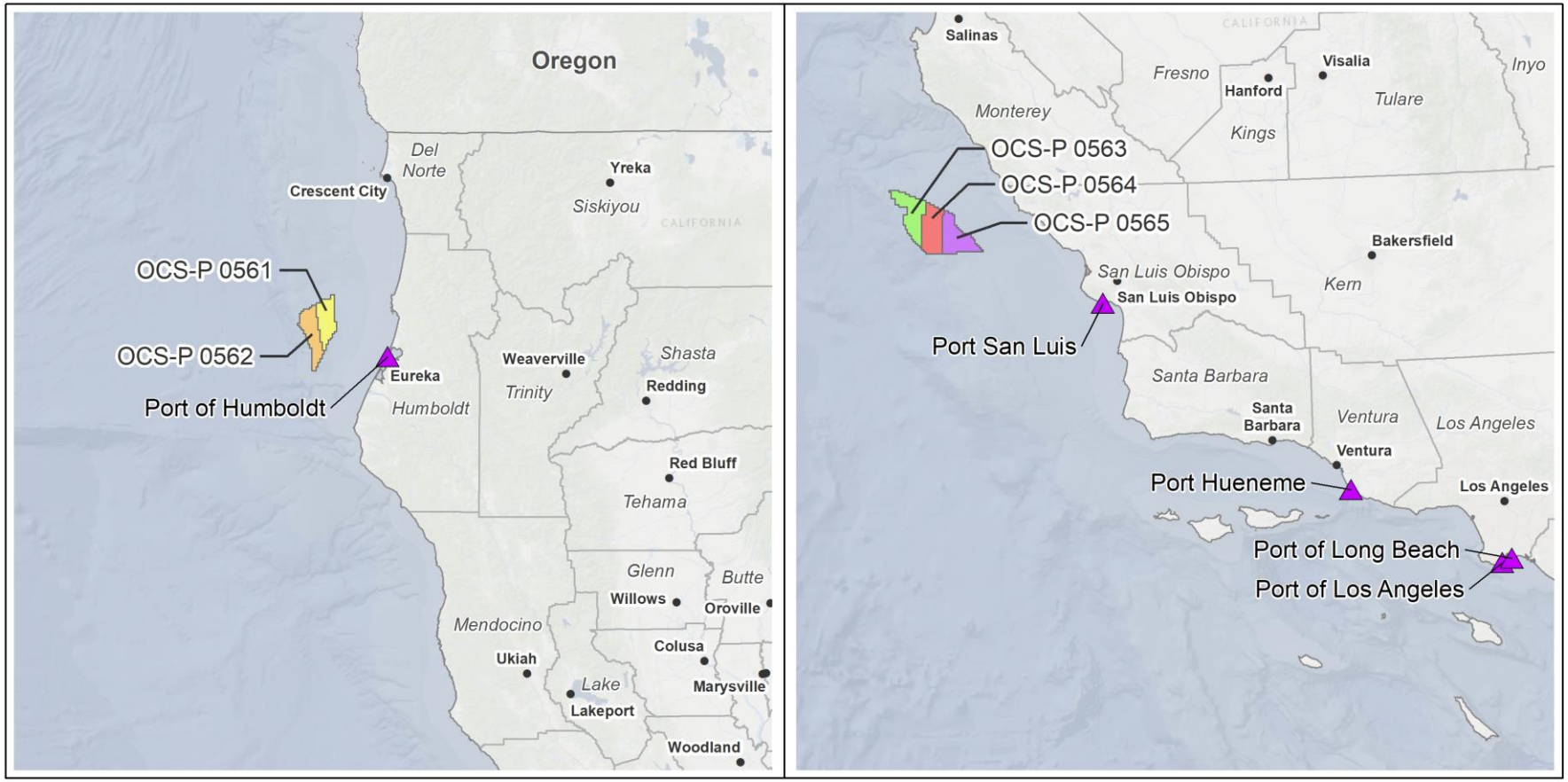
Progress Reports

- All lessees have provided their first progress reports, which have been posted to the BOEM website

More information available at www.boem.gov/california

California Updates: Programmatic Environmental Impact Statement (EIS)

- Identify, analyze, and adopt potential **mitigation measures** for use in future **Construction and Operations Plan (COP)** reviews on the five leased areas.



Programmatic EIS:

- Includes high level analysis of potential impacts, not project-specific
- Considers programmatic mitigation measures that could be applied across all five leases
- Includes cumulative impact analysis

Other BOEM Updates

- **Future California Leasing Areas**
  - Continuing to collaborate with the State of California on AB 525 Strategic Plan and identify additional areas for potential leasing
  - Engage with Tribal governments
  - Collect data and information in partnership with NOAA's National Centers for Coastal Ocean Science (NCCOS) to inform any future decision-making
- **Renewable Energy Modernization Final Rule**
  - Rule to Streamline and Modernize Offshore Renewable Energy Development
  - Increases certainty associated with the deployment of offshore wind projects
  - Streamlines processes and removing unnecessary ones
  - Clarifies ambiguous regulatory provisions, and
  - Enhance compliance requirements

Other BOEM Updates

- BOEM to potentially hold up to twelve new offshore lease sales over the next 5 years
- The leasing schedule includes four potential offshore lease sales in 2024, one each in 2025 and 2026, two in 2027, and four in 2028
- More details on OSW leasing path forward are here: https://www.doi.gov/pressreleases/secretary-haaland-announces-new-five-year-offshore-wind-leasing-schedule

Year	U.S. Outer Continental Shelf Region
2024	Central Atlantic, Gulf of Maine, Gulf of Mexico, and Oregon
2025	Gulf of Mexico
2026	Central Atlantic
2027	Gulf of Mexico and New York Bight
2028	California, a U.S. Territory, Gulf of Maine, and Hawaii

BOEM

BUREAU OF OCEAN ENERGY MANAGEMENT

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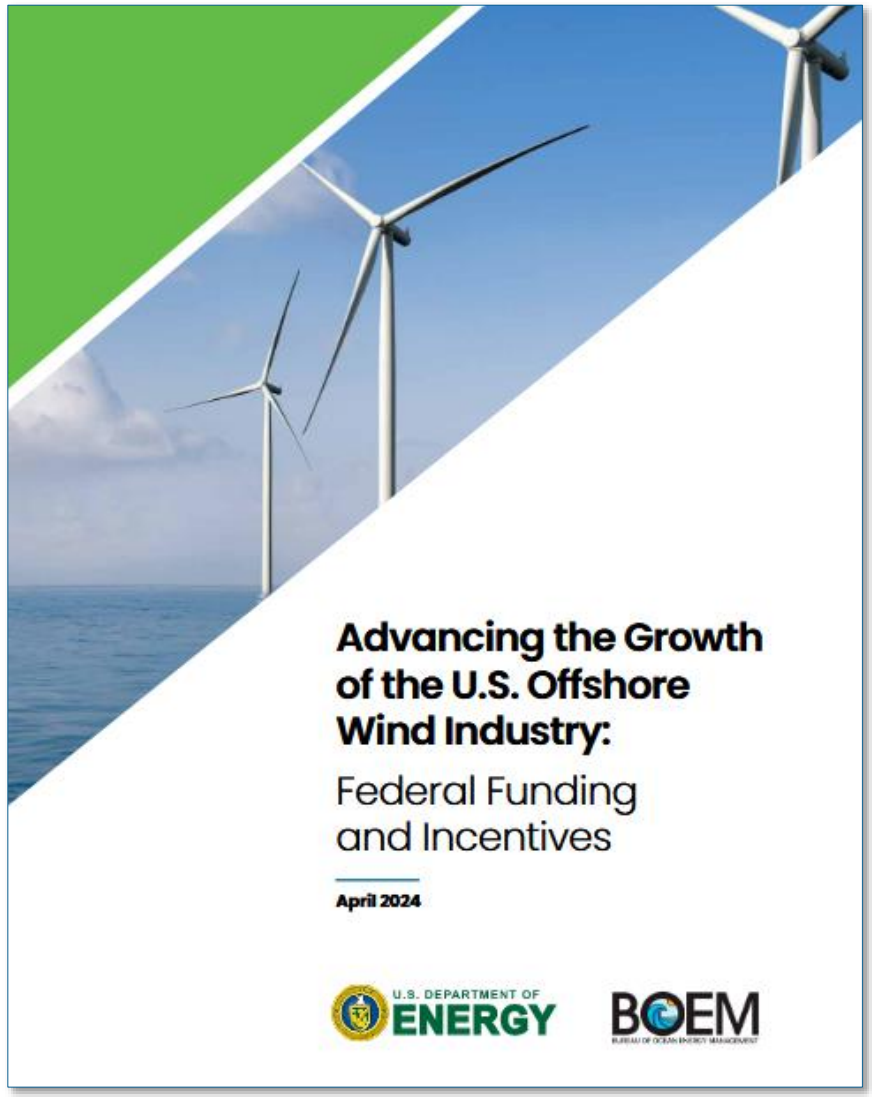
Doug Boren | Douglas.boren@boem.gov | (805) 384-6384

Floating Offshore Wind Shot ™
Federal Resources Panel

Jennifer Arrigo, Director for Science and Energy Crosscuts, DOE

11:00-11:50am PT May 16th, 2024

Federal Offshore Wind Resources Summary



Source: Advancing the Growth of the U.S. Offshore Wind Industry: Federal Funding and Incentives

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Afternoon Breakout Sessions

- **1:00-2:30pm PT**
  - Option 1: Technology Innovation
  - Option 2: Transmission and Co-Generation Development
- **2:30-2:45pm PT Break**
- **2:45- 4:15pm PT**
  - Option 1: Supply Chain Development
  - Option 2: Expanded, Just, and Sustainable Deployment

Elements of Breakout Sessions

- **Goals**
- **Stakeholder Feedback**
- **Federal Programs and Accomplishments**
- **Partner Programs and Accomplishments**
- **Near-Term Priorities**

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Floating Offshore Wind Shot ™
Technology Innovation Session

Nathan McKenzie, Offshore Wind Technology Manager,
Wind Energy Technologies Office, DOE
1:00-2:30pm PT May 16th, 2024

Federal Advisory Committee Act (FACA) Notice

The purpose of today's meeting is to ask for your input regarding floating offshore wind topics. To that end, it would be most helpful to us if, based on your personal experience, you provide us with your individual advice, information, or facts regarding this topic. The objective of this session is not to obtain any group position or consensus. Rather, Floating Offshore Wind Shot federal partners are seeking as much input as possible from all individuals at this meeting. To most effectively use our limited time, please refrain from passing judgment on another participant's recommendations or advice and instead concentrate on your individual experiences.

Breakout Session Agenda

1) Major goals and areas of focus for this work
2) Update on Floating Offshore Wind Shot Pathways Analysis
3) Stakeholder feedback
4) Discussion of federal accomplishments, major initiatives underway
4) Discussion of partners accomplishments, major initiatives underway
5) Discussion of near-term priorities
6) Audience Q&A

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Technology Innovation Goals and Mechanisms

Lower costs, expand market potential, reduce risk, and address US design conditions through technology innovation

- Enable more efficient and larger turbine designs, while exploring pathways to standardization.
- Optimize design through improved understanding of wind resource and environmental conditions.
- Develop domestic serial manufacturing capabilities.
- Advance systems engineering and controls co-design.
- Research into new mooring, anchoring, dynamic cable and substation concepts.
- Automate operations and maintenance technologies.

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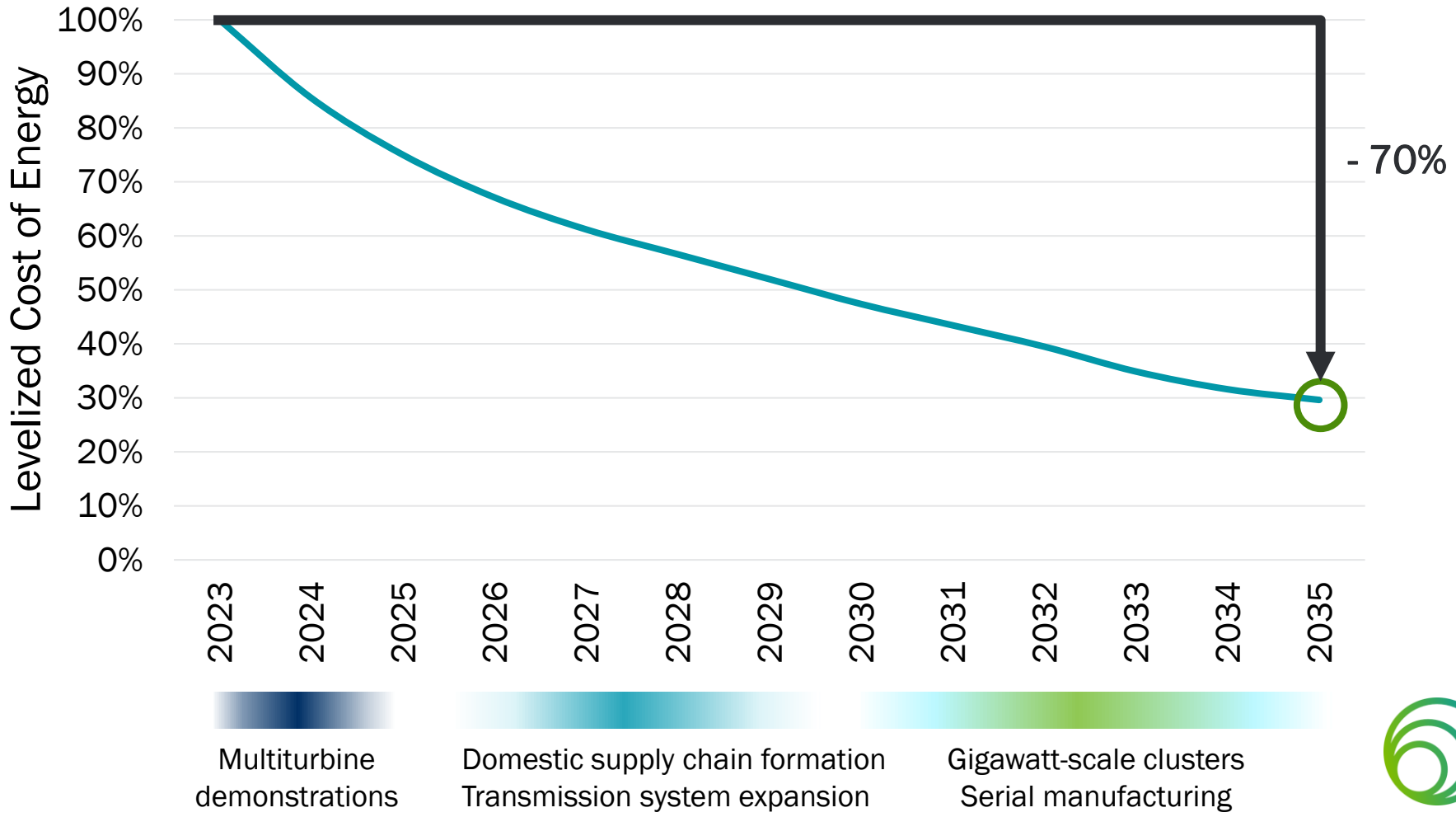
Floating Offshore Wind Shot™ Pathways

Aubryn Cooperman, Analyst,
National Renewable Energy Laboratory

May 16th, 2024

Cost Reduction Target

- **Goal: Reduce the cost of floating offshore wind energy in deep waters by more than 70% by 2035.**



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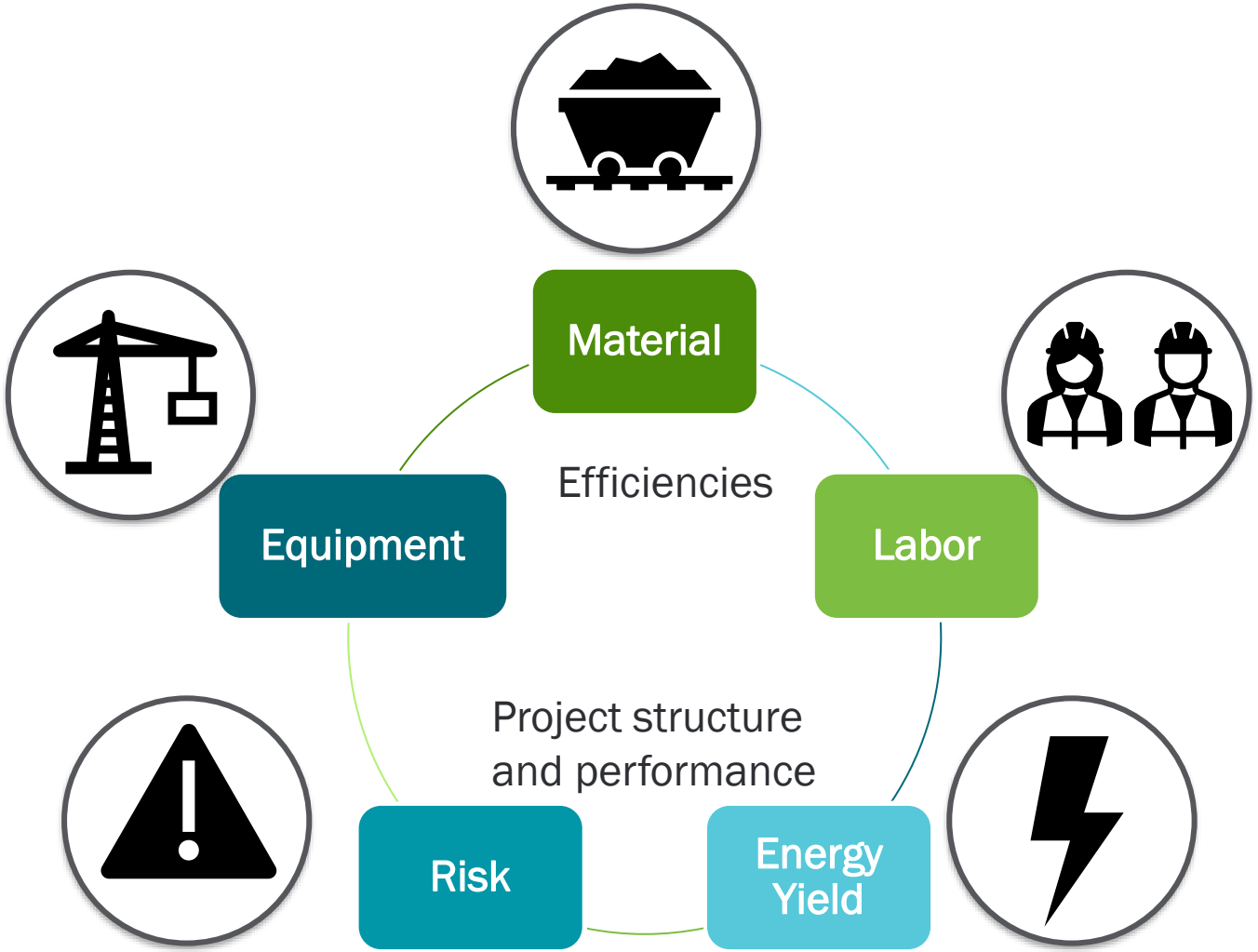
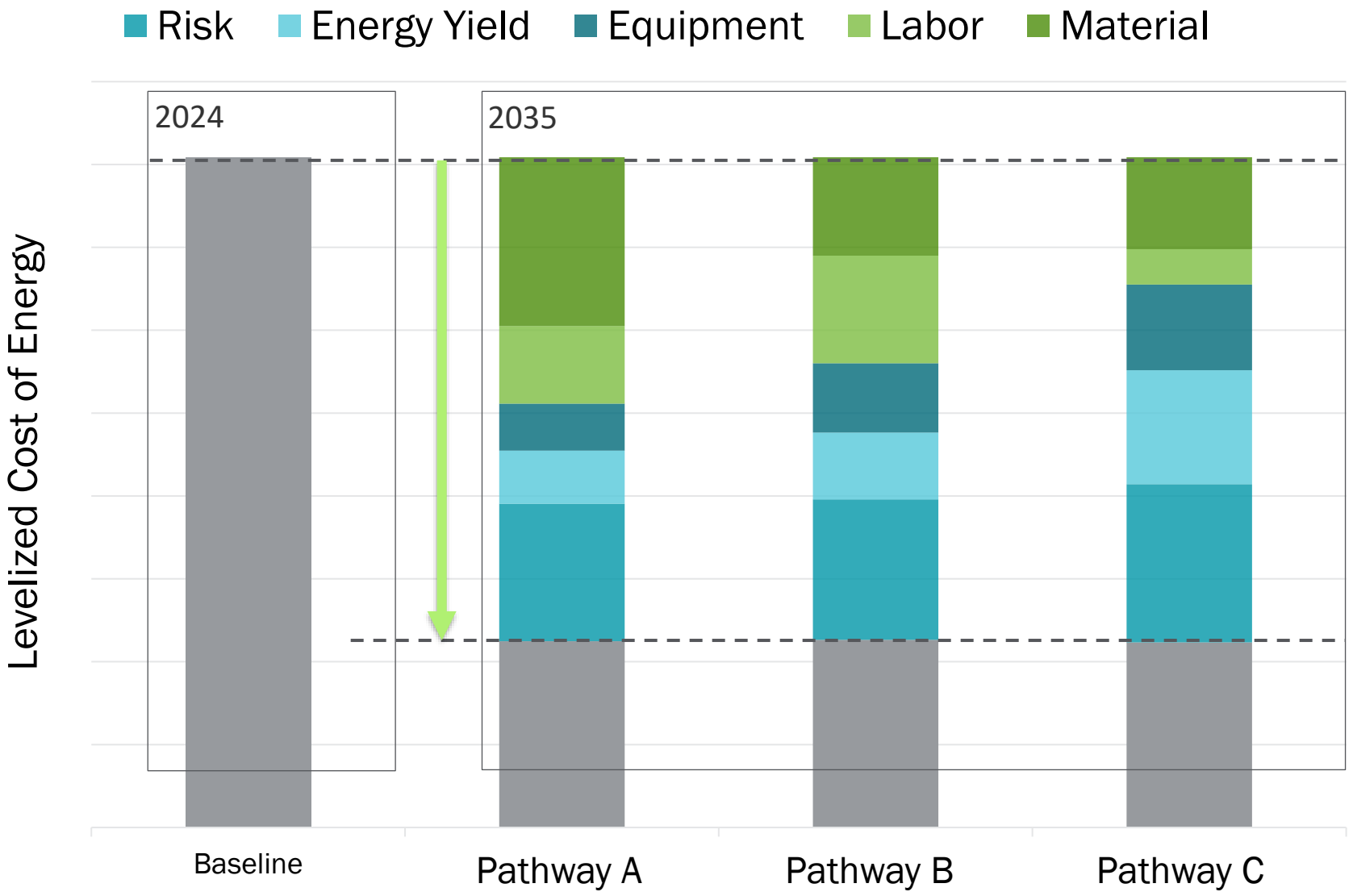
Five Primary Cost Reduction Mechanisms



Pathways to Cost Reduction



Industry Engagement

- **Virtual workshop on April 1, 2024**
- **60+ participants including technology developers, project developers, researchers, insurers, port operators**
- **Discussion topics**
  - Current strategies to enable cost reduction
  - Transformative technology innovations

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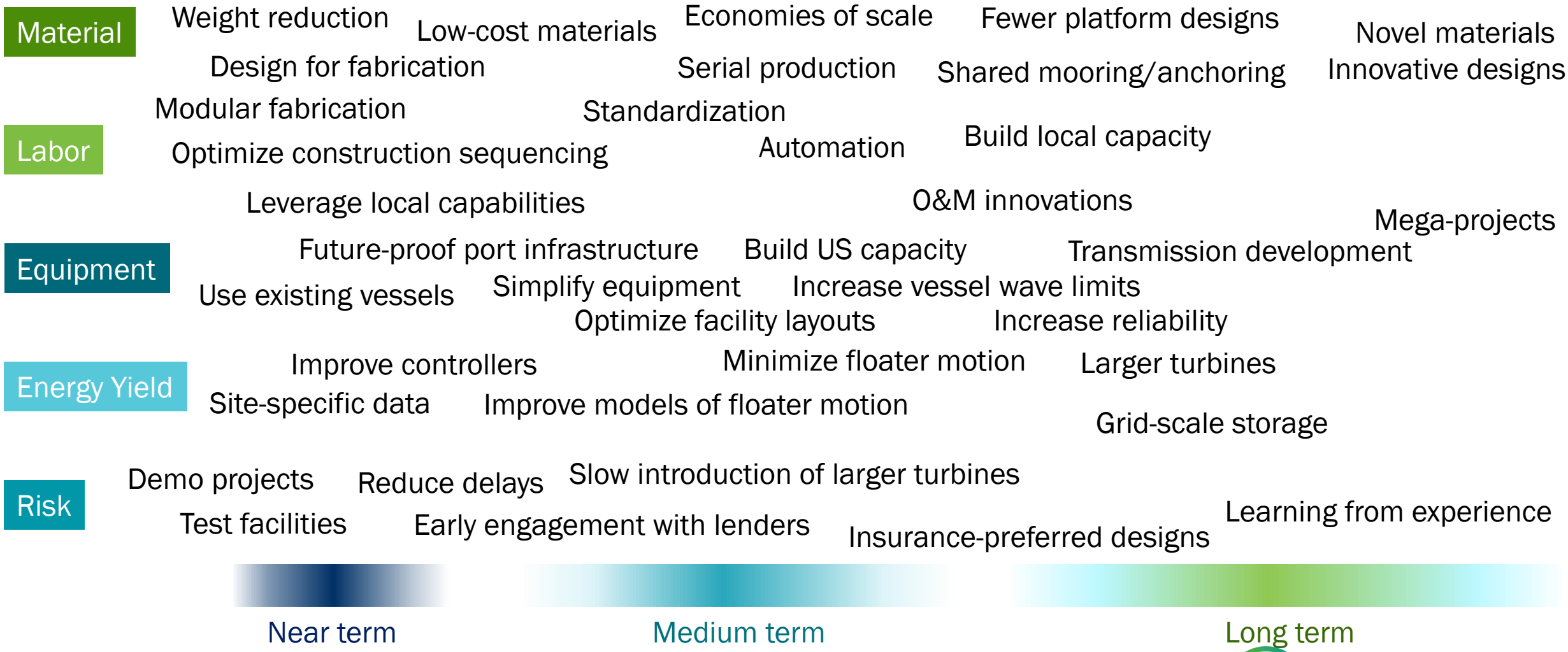
Cost Reduction Activities



Takeaways from Industry Feedback

Certainty	• Pipeline • Technology
Scale	• Projects • Efficiency
Integrated approach	• Design • Engagement
Enabling ecosystem	• Ports, vessels • Supply chain, workforce • Transmission

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Thank you!

Aubryn.Cooperman@nrel.gov

Technology Innovation Feedback on Priority Needs

Port development (government funding)

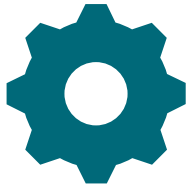
Increased certainty in leasing/permitting timelines

Vessels (availability, decarbonized)

Data availability (geotechnical, metocean)

International collaboration

Anchoring/mooring lines (shared)



Turbine optimization (not always bigger)

Floating Offshore Wind Shot™ Technology Innovation Federal Panel

Nathan McKenzie, U.S. Department of Energy
Dr. Christopher Saldaña, U.S. Department of Energy
Dr. Christian Vandervort, U.S. Department of Energy
May 16th, 2024

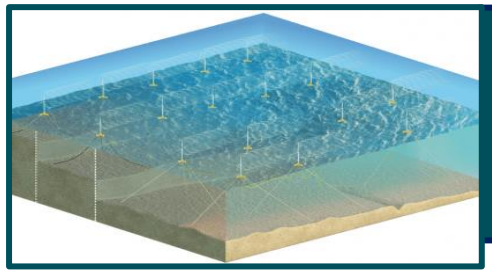
Projects and Programs to Facilitate Technology Innovation Goals

FLoating Offshore Wind ReadINess Prize
$6.85 million

Energy Earthshot Research Centers Awards

Anchoring and Mooring Systems FOA
$6.4 million

Lidar Buoy Deployment in Hawaii



Floating Offshore Wind Array Design Project

Offshore Wind Resource Assessment

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Floating Offshore Wind Shot Technology Innovation Breakout Session

Christian Vandervort, PhD, PE

May 16, 2024

*"**A**erodynamic **T**urbines **L**ighter and **A**float with **N**autical **T**echnologies and **I**ntegrated **S**ervo-control"*

Floating Offshore Wind Shot Technology Innovation Breakout Session

May 16th, 2024

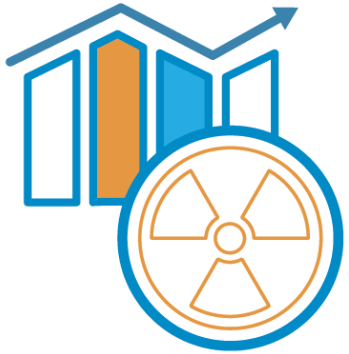
Sacramento, CA

DOE ARPA-E "Our Mission"

REDUCE
imports

REDUCE
emissions

IMPROVE
efficiency



IMPROVE
radioactive waste management

IMPROVE
energy infrastructure resilience

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TM

arpa·e
CHANGING WHAT'S POSSIBLE

ATLANTIS

"Aerodynamic Turbines Lighter and Afloat with Nautical Technologies and Integrated Servo-control"

Floating Offshore Wind Turbines (FOWT).
Phases I and II. Plus-Ups.
International collaboration.
~$100MM+, 20 States

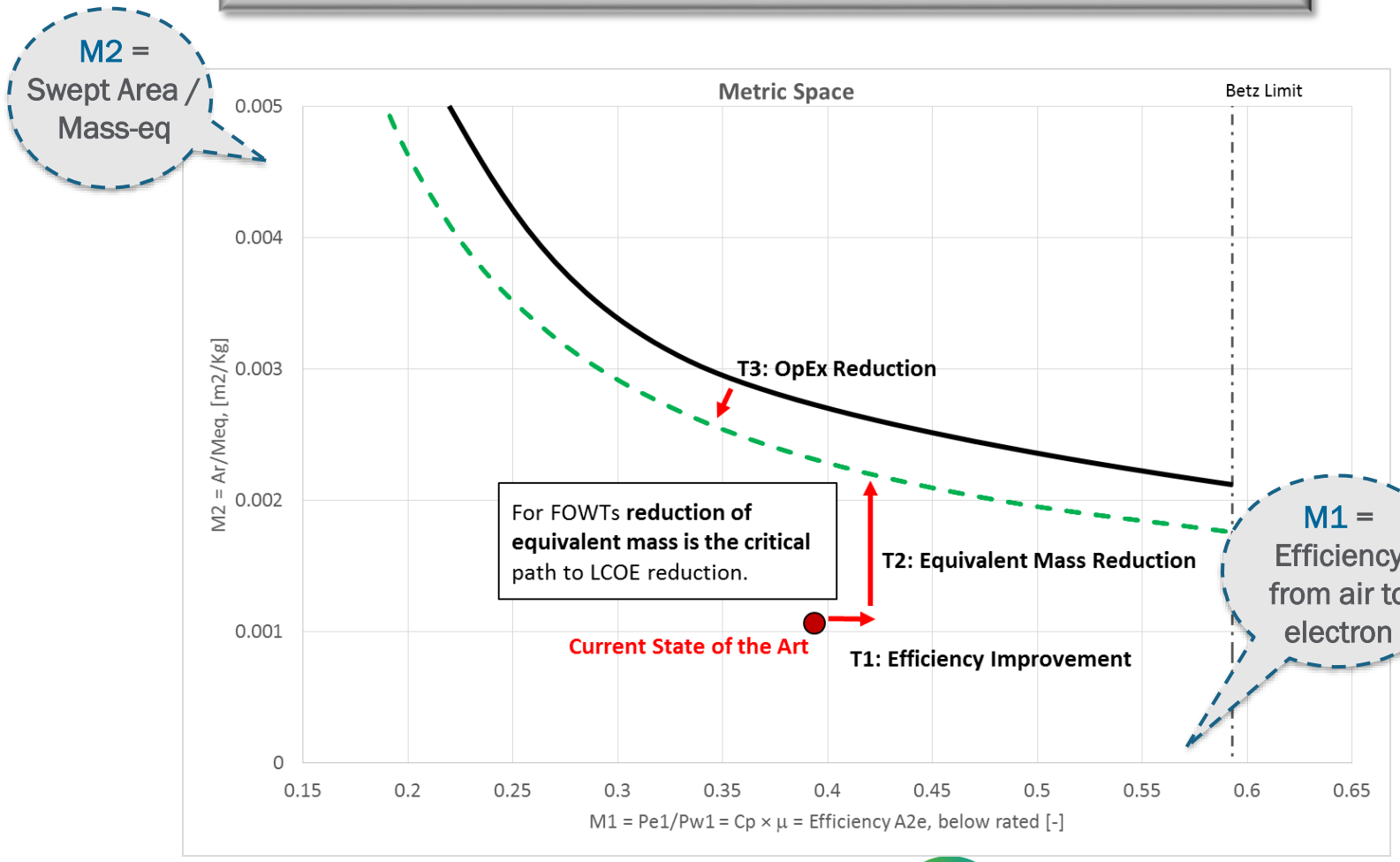
Mario Garcia-Sanz
ARPA-E Program Director

ARPA-E ATLANTIS Program

Develop FOWT systems with dramatically less platform mass to reduce LCOE and enable the U.S. industry to be the world leader in floating wind.

Multi-Pronged Approach to Accelerate the State-of-the-Art for the U.S. Wind Industry.

1. *Fund new **transformational FOWT designs** informed by a CCD paradigm.*
2. *Develop the **tools to enable** the new design approach.*
3. *Perform **experiments to validate** those tools.*
4. *Build **new components** for a new generation of FOWTs.*



Advanced Materials & Manufacturing Technologies Office

Supporting Clean Energy Manufacturing

Wind turbines and wind blades
Hydropower components
Castings/forgings
Batteries and long duration storage
Industrial motors
Hydrogen storage
High efficiency conductors
Power electronics / Microelectronics
…

Platform Manufacturing Technologies, Advanced Materials, Workforce

- Manufacturing Technologies: smart manufacturing, AI/ML, cybersecurity, high performance computing, roll-to-roll manufacturing, additive manufacturing, circularity
- Advanced Materials: advanced composites/metals/ceramics, critical materials, high conductivity metals, harsh service condition materials
- Manufacturing workforce: training, curricula, entrepreneurship

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Advanced Materials & Manufacturing Technologies Office

AMMTO Programs

NEXT-GENERATION MATERIALS & PROCESSES	SECURE & SUSTAINABLE MATERIALS	ENERGY TECHNOLOGY MANUFACTURING & WORKFORCE
Advanced Manufacturing Processes and Systems	Circular Economy Technologies and Systems	Energy Conversion and Storage Manufacturing
High Performance Materials	Critical Materials	Semiconductors, Electronics, and Other Technologies Manufacturing
		Entrepreneurial Ecosystems and Advanced Mfg. Workforce

AMMTO Consortia

The Institute for iacmi Advanced Composites Manufacturing Innovation

CESMII THE SMART MANUFACTURING INSTITUTE

CYMANII cybersecurity manufacturing innovation institute

PowerAmerica

REMADE INSTITUTE

MDF

Oak Ridge National Laboratory | Carbon Fiber Technology Facility

CMI Critical Materials Institute AN ENERGY INNOVATION HUB

bottle changing the way we recycle™ U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY | LEEP Lab-Embedded Entrepreneurship Program

HPC4 MANUFACTURING

ENERGY earthshots U.S. DEPARTMENT OF ENERGY

AMMTO RD&D programs for OSW applications

Large Wind Turbine Materials & Manufacturing

- Develop manufacturing platform technologies and address barriers that limit composite materials in wind energy applications
- Enable additive manufacturing processes for rapid prototyping, tooling, fabrication, and testing of large wind blades
- Apply additive manufacturing to non-blade wind turbine components
- Mature nascent technologies and processes, and methods that improve one or more aspects of advanced composites manufacturing, including automation, and sustainability (including recycling) of these materials

Domestic Near Net Shape Manufacturing

- Accelerate the development of innovative manufacturing routes to competitively produce large (10+ tons) components
- Establish technical and economic viability of the manufacturing methods by producing a full-scale component using the proposed technology
- The full-scale component must be relevant to carbon-free power generation or clean energy manufacturing and be fabricated utilizing innovative advanced manufacturing technologies

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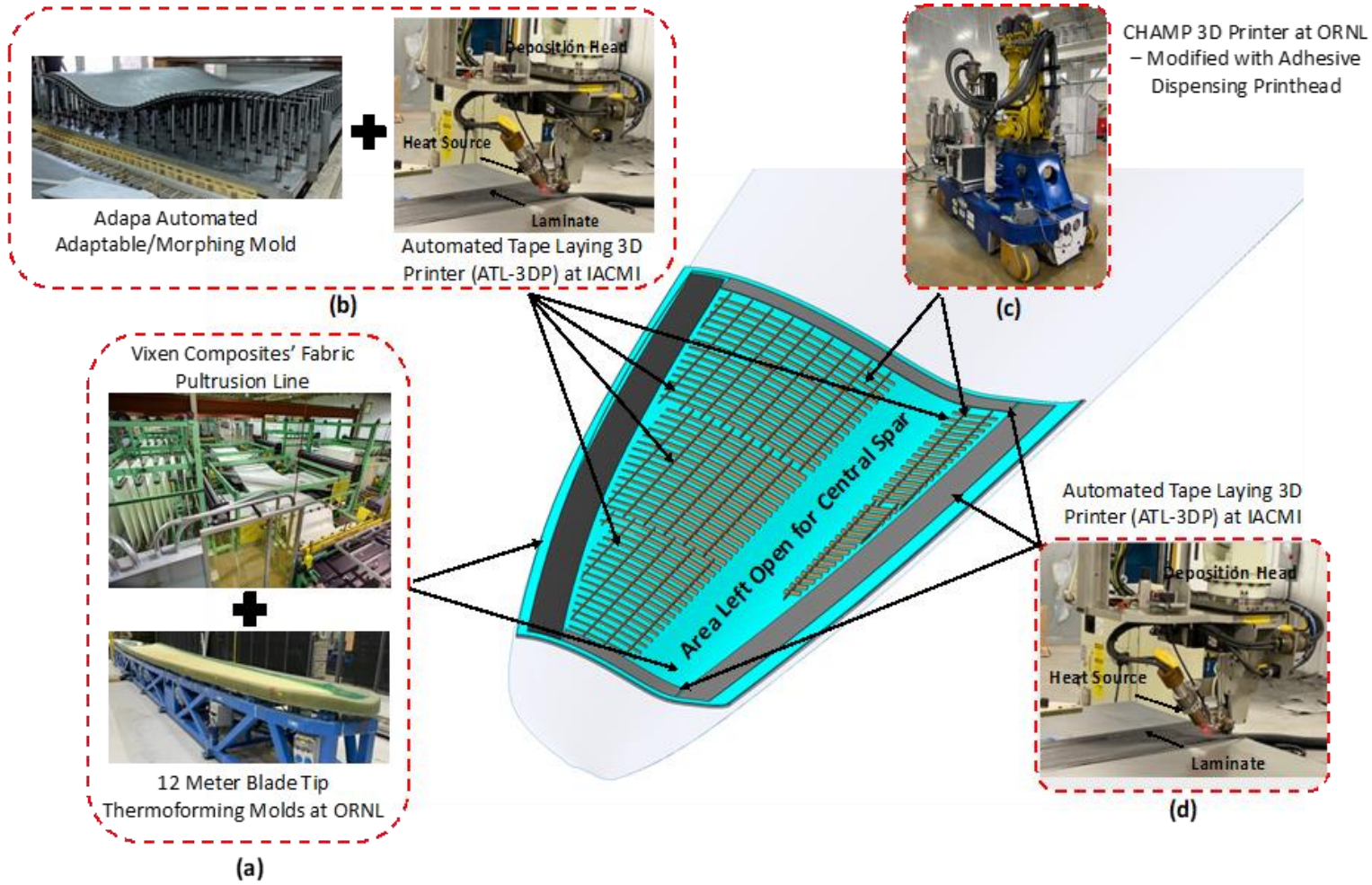
Innovations for Large Wind Blade Manufacturing

Project Overview ($2M)

- **Goal:** Demonstrate automated manufacturing of modular mid-span wind blade shells using thermoforming of pultruded fiberglass skins and continuous fiber 3D printed anti-buckling grids suitable for large blades
- **Partners**: ORNL, IACMI, TPI Composites, Arkema, Vixen Composites, METYX USA, Adapa
- **Technical Effort:**
  - Develop adaptable morphing mold and integrate with automated tape laying composite printer
  - Leverage pultrusion line to produce 12 meter blade tip thermoforming molds
  - Develop CHAMP 3D printer to use modified adhesive dispensing printhead
- **Technical Goals:** production capability, labor/LT reduction

Manufacturing Innovation – Automated and Adaptable Manufacturing

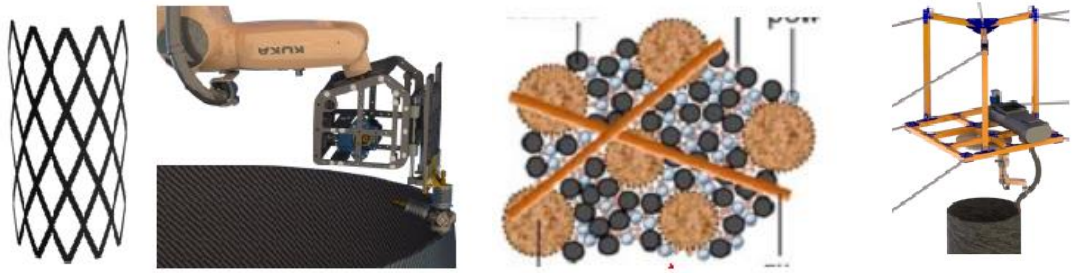


Innovations for Manufacturing OSW Structural Systems

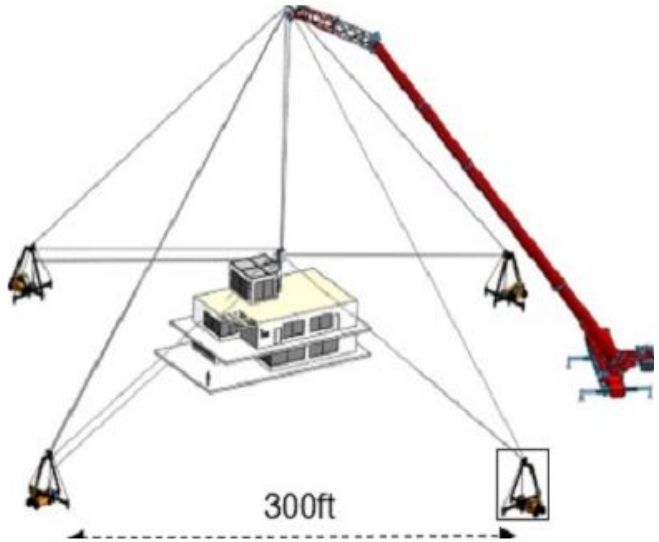
Project Overview ($2.5M)

- **Goal:** Enable rapid and cost-effective deployment of OSW technologies by additive manufacturing of lightweight concrete floating foundations at the port using US-made materials and equipment.
- **Partners**: Orbital Composites
- **Technical Effort:**
  - Optimize VolturnUS hull by combining a novel additive manufacturing (AM) system (SkyBAAM) with ultra-high-performance concrete and carbon fiber reinforced polymer reinforcement.
  - This integrated AM approach will achieve the following: (1) significant improvement in structural performance; (2) guaranteed cost-reduction; and (3) significant reduction of used materials per MW rating.
- **Technical Goals:** structural performance, cost reduction, material reduction

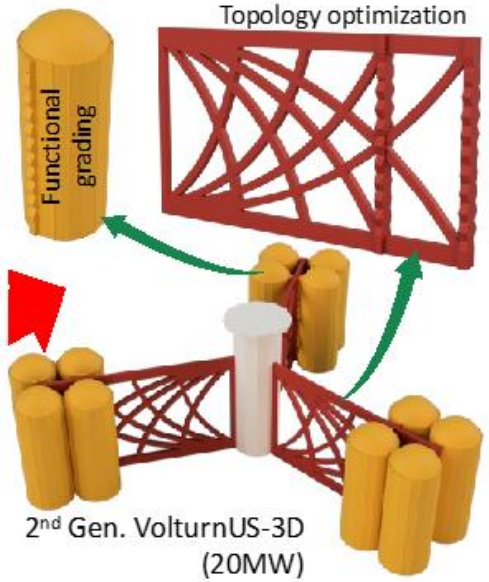
Manufacturing Innovation – Large Scale Additive Manufacturing



Folding *Continuous extrusion* *3d printing UHPC* *Robotic manipulation*



SkyBAAM AM platform

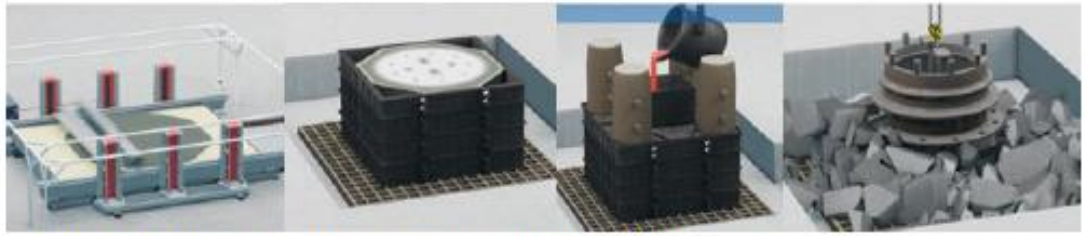


Innovations for OSW Castings by Near Net Shape Manufacturing

Project Overview ($15M)

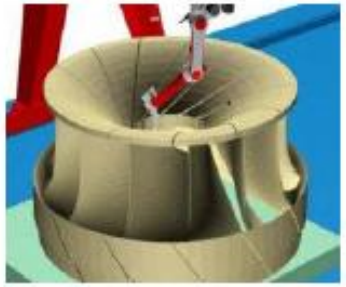
- **Goal:** Develop and demonstrate advanced sand casting mold printing for large-scale, high complexity structures
- **Partners**: General Electric, voxeljet USA, GE Verona, GE hydro, ORNL, Clemson University, Hodge/Elyria Foundry
- **Technical Effort:**
  - Develop a sand binder jet 3D printer at Voxeljet for printing 29.5ft x 23ft x 4ft sand-casting molds
  - Sand mold design via Digital Foundry, end-to-end suite of tools including monitoring, topology optimization
  - Casting at Hodge Foundry of a 16-ton GE ONW Sierra 3x rotor hub using ACC molds
  - Robotic welding assembly of castings for > 10-ton hydropower Francis turbine
  - Workforce development
  - Techno-economic analysis for foundry of the future
- **Technical Goals:** direct material cost, labor/LT reduction
- **Technology Readiness Level**: TRL3 (start), TRL8 (end)

Manufacturing Innovation – Large Scale Binder Jetting



(a) The Advance Casting Cell production process for casting.

(b) The Advanced Casting Cell (ACC), a sand binder jet printer for castings molds. Build volume to be 29.5' x 23' x 4'.



(c) Hybrid casting and robotic welding assembly of hydro runner.

Target Demonstration – GE Sierra platform

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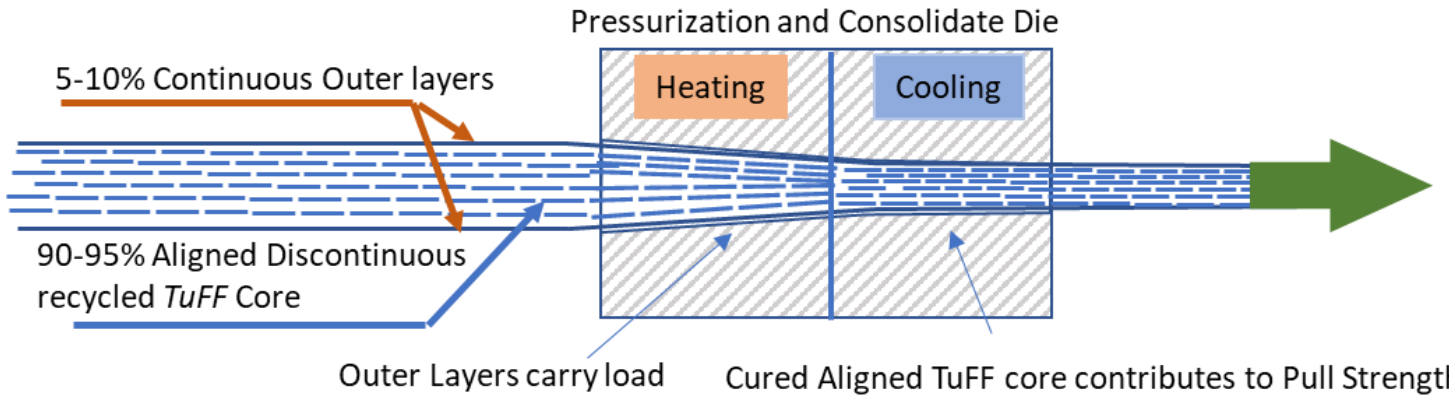
Innovations for Large Wind Blade Materials

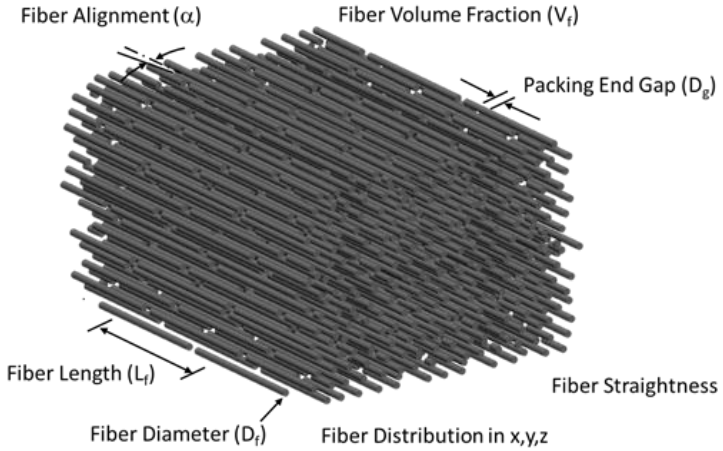
Project Overview ($3M)

- **Goal:** Develop advanced and sustainable materials and processes to support manufacture of large OSW blade spar caps
- **Partners**: ORNL, IACMI, TPI Composites, Arkema, Vixen Composites, METYX USA, Adapa
- **Technical Effort:**
  - Develop novel pultrusion approach enabling processing with discontinuous fiber material
  - Substitute virgin carbon fiber content with recycled, discontinuous fibers (rCFs) @ high fiber volume fraction with aligned, discontinuous fiber feedstock
  - Replace petroleum-based polymers with bio-derivable resin systems
- **Technical Goals:** material cost reduction, weight reduction, material performance increase

Materials Innovation – Hybrid Composite Material Pultrusion



Major Objectives of Sustainable Spar Cap Program		
	Goal	Stretch Goal
Embodied Energy Reduction	>50%	>80%
Spar Cap Weight	<110%	<100%
Material Cost	<100%	<50%
Material Performance	>90%	~100%



Floating Offshore Wind Shot™ Technology Innovation Partners Panel

Daphne Molin, California Energy Commission

Kori Groenveld, National Offshore Wind Research and Development Consortium

May 16th, 2024

The National Offshore Wind Research and Development Consortium (NOWRDC)

NOWRDC is a nationally-focused, not-for-profit organization collaborating with industry to fund prioritized R&D activities to:

- Accelerate the deployment of offshore wind energy in the U.S.
- Address challenges and obstacles facing the offshore wind industry and maximize economic and social benefits.
- Reduce the levelized cost of energy (LCOE) of offshore wind in the U.S.

NOWRDC's Core Activities:

Fund innovation directly responsive to the technical and supply chain barriers faced by offshore wind project developers in the U.S.

Convene strong networks (and solicit input from) connecting technology innovators, research institutions, project developers, supply chain companies, utilities, and state and federal government agencies

Increase U.S. content and job opportunities

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NOWRDC Members and Board

Government & Utilities

Offshore Wind Developers

Independent Offshore Wind Industry Members

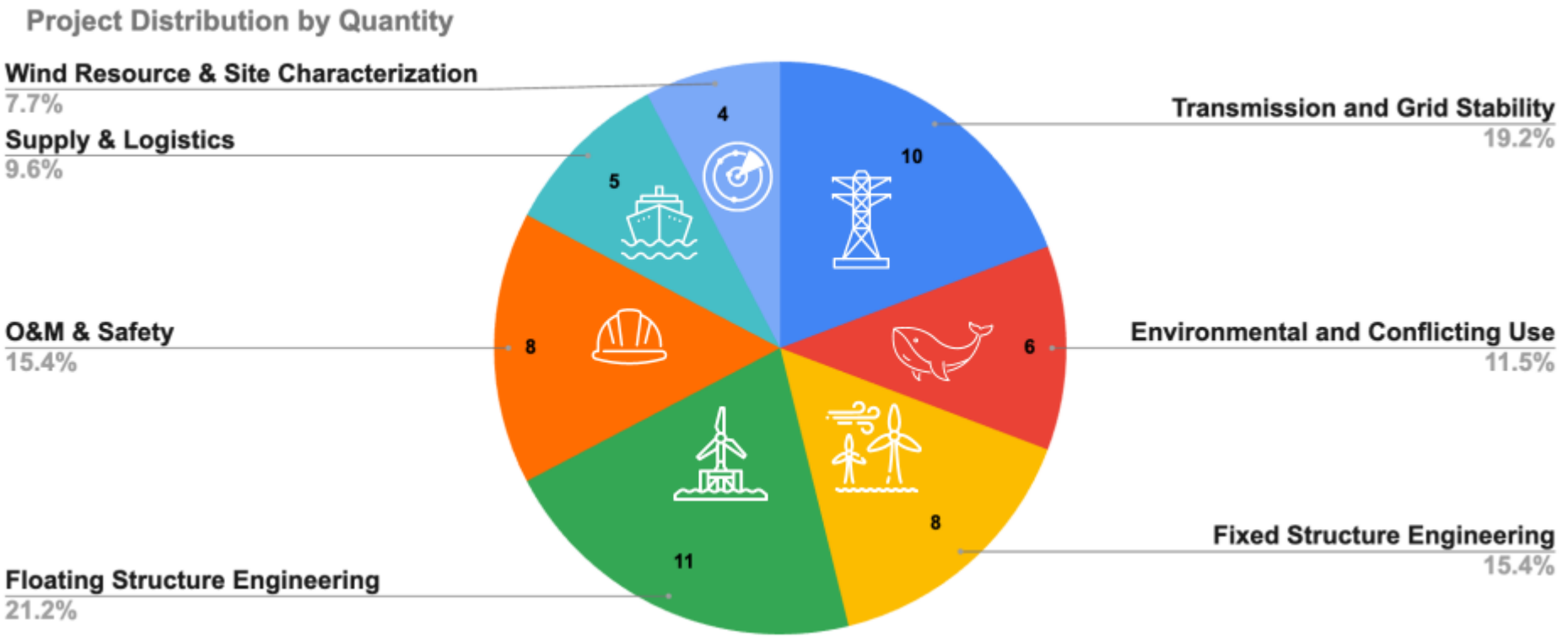
NOWRDC Competitive Solicitation Summary

3 competitive solicitations to date

55 project awards

Totaling $34M in core R&D grant funding

And $15M in cost share funding by project partners leveraged



Deploying Project Results

NOWRDC has created effective means for sharing project results with the offshore wind industry:

- **Project Advisory Boards**
  - Approximately 125 project advisors across NOWRDC's project portfolio, primarily SMEs within OSW developers
  - An average of 6 external industry advisors on each project
- **Project Database - https://nationaloffshorewind.org/project-database/**
  - Accessible repository on NOWRDC's website with key info on all projects for industry to use
- **Annual National Offshore Wind R&D Symposium**
  - Hybrid, multi-day conference showcasing NOWRDC's project portfolio and fostering solution-oriented discussion on US offshore wind challenges

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Floating Offshore Wind LCOE Impact Analysis

- NOWRDC projects are now reaching completion. Through analysis of project results and tracking their ongoing commercial and technical progress, NOWRDC is able to evaluate the project portfolio's efficacy in achieving its stated mission of lowering the levelized cost of offshore wind energy in the US.
- NOWRDC has worked together with the Carbon Trust to develop several theoretical windfarms representative of the US market → then applying the cost implications of several NOWRDC-funded innovations to evaluate the hypothetical impact of the innovation on LCOE.
- NOWRDC has developed a modelling process that utilizes several baseline and deployment assumptions.
- NOWRDC is working through the modelling process now, and anticipates full impact analysis and aggregate LCOE impact statement will be released in Q3 2024.

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California Energy Commission: R&D Division

- **Electric Program Investment Charge (EPIC)**
  - Technology development to advance market adoption of clean energy solutions
  - Provide California electricity ratepayer benefits

- **EPIC floating offshore wind objectives:**
  - Reduce levelized cost, technical and financial risk
  - Inform environmental mitigation, deployment planning, permitting

- **$30M in OSW grants awarded**

CEC Coordination on Offshore Wind R&D

- State agency coordination on environmental planning and monitoring
- Discussions with U.S. DOE and BOEM on research needs
- Member of the National Offshore Wind Research and Development Consortium (NOWRDC)
- Stakeholder engagement via technical conferences, meetings, requests for information

Recent Investments

- **Advancing Environmental Monitoring Technologies for Floating Offshore Wind (GFO-22-401 Funding: $8.9M)**

  –Fiber optic sensors and advanced vector hydrophones to monitor marine mammals

  –Sensing technologies to monitor seabird interactions

  –Sensing technologies and remotely operated vehicles to detect collisions and entanglement hazards

Recent Investments

- **Advancing Designs for Floating Offshore Wind Mooring Lines and Anchors (GFO-22-402 Funding: $11.9M)**
  - Low-cost 3D-printed concrete suction and torpedo anchor designs.
  - High vertical uplift capacity anchoring system using helical piles and exterior skirt.
  - Comprehensive shared mooring and anchoring system analysis and design.
  - Taut-synthetic mooring line system development for Humboldt Wind Energy Area.

RCAM Technologies

Triton Anchor

NREL National Renewable Energy Laboratory

1865 The University of Maine

Energy earthshots U.S. Department of Energy

Upcoming EPIC Offshore Wind R&D Investment Areas

- **Scope includes:**
  - Optimizing Designs for Cost and Operational Efficiency
  - Cost-Effective Installation and Operations and Maintenance Developments
  - Grid Integration Innovations and Port Infrastructure Readiness Strategies
  - Environmental Impact Assessment and Minimization

~$20M UPCOMING
OFFSHORE WIND AND SOLAR THROUGH 2025

$5M PLANNED
FOR NATIONAL OFFSHORE WIND R&D CONSORTIUM

Technology Innovation Near-Term Priorities

ACTIVITY AREA	PRIORITY
Wind resource and site characterization research	Support wind resource characterization and modeling
Turbine system innovation (including platform)	Apply smart manufacturing techniques to wind
	Advance high-fidelity modeling
	Support continued mooring & anchoring innovations
	Support operational environment research (load cases and design considerations)
	Develop new designs for platforms lowering costs
Installation, operations and maintenance	Advance operations and maintenance systems
	Develop automated monitoring technology
Industrial-scale manufacturing	Floating Platform innovations to improve manufacturability and cost
Other	Validation and commercialization of full floating systems
	Provide financing and loan opportunities for infrastructure (ports, vessels, factories) and projects.

Audience Q&A and Comments

- How well do initiatives underway and near-term priorities mesh with our sense of near-term needs?
- What's missing?
- What priorities have changed or shifted over the 18 months since the Shot was announced?

Federal Advisory Committee Act (FACA) Notice

The purpose of today's meeting is to ask for your input regarding floating offshore wind topics. To that end, it would be most helpful to us if, based on your personal experience, you provide us with your individual advice, information, or facts regarding this topic. The objective of this session is not to obtain any group position or consensus. Rather, Floating Offshore Wind Shot federal partners are seeking as much input as possible from all individuals at this meeting. To most effectively use our limited time, please refrain from passing judgment on another participant's recommendations or advice and instead concentrate on your individual experiences.

Provide additional feedback to offshorewindevents@ee.doe.gov

Floating Offshore Wind Shot ™
Transmission and Co-Generation Session

Jian Fu, Systems Integration Program Manager,
Wind Energy Technologies Office, DOE
Alissa Baker, Offshore Wind Transmission Lead,
Grid Deployment Office, DOE

1:00-2:30pm PT May 16th, 2024

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Breakout Session Agenda

1) Co-Generation major goals and areas of focus for this work
2) Discussion of federal co-generation accomplishments, major initiatives underway
3) Discussion of near-term co-generation priorities
4) Audience Q&A
5) Transmission major goals and areas of focus for this work
6) Discussion of federal transmission accomplishments, major initiatives underway
7) Discussion of near-term transmission priorities
8) Audience Q&A
9) West Coast Convening Series (overview and breakouts)

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Co-Generation Goals and Mechanisms

Floating offshore wind is an integral component of power generation that shapes broader economy-wide decarbonization.

- Complete techno-economic analyses, and identify required research across a number of technical disciplines including:
  - Storage and wind-to-fuel technologies from offshore wind energy
  - Offshore wind energy hubs
- Develop pathways to accelerate the transition from oil and gas to a clean fuel economy.

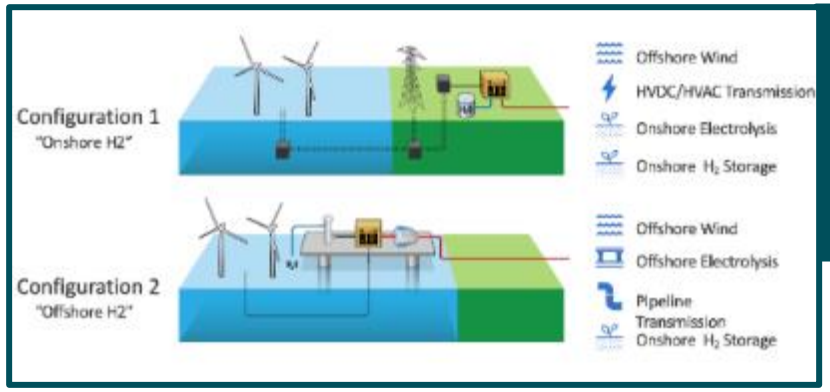
Co-Generation Feedback on Priority Needs

Co-generation feasibility and economic viability

Energy storage

Community engagement

Projects and Programs to Facilitate Co-Generation Goals



Offshore Wind and Hydrogen Use case Study

SBIR/STTR on Compact Long Duration Storage for Wind

IEA Topical Expert Meeting on Hydrogen

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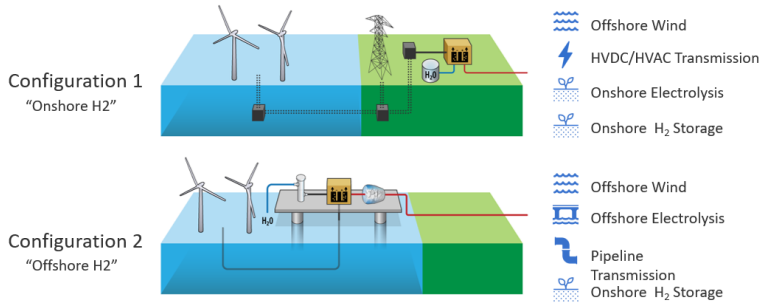
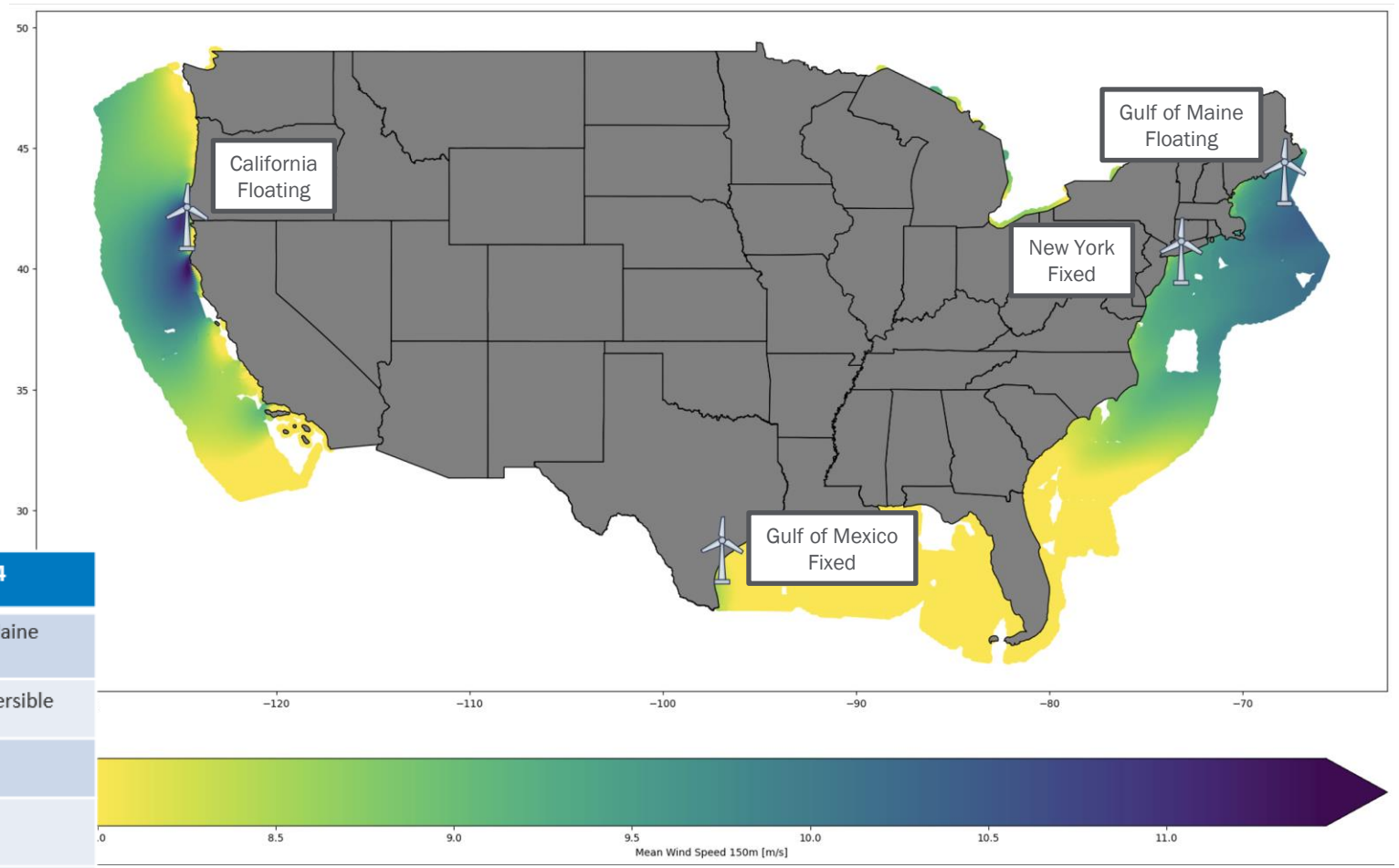
U.S. Offshore Wind H2 Use Case Study





Site	Site 1	Site 2	Site 3	Site 4
Region	Gulf of Mexico	New York Bight	California	Gulf of Maine
Substructure	Monopile	Monopile	Semisubmersible	Semisubmersible
Depth (m)	45	40	850	180
Port distance (km)	80	100	55	245
Export cable length (km)	85	100	45	250
Avg Wind Speed (m/s)	8.45	9.63	9.45	9.91

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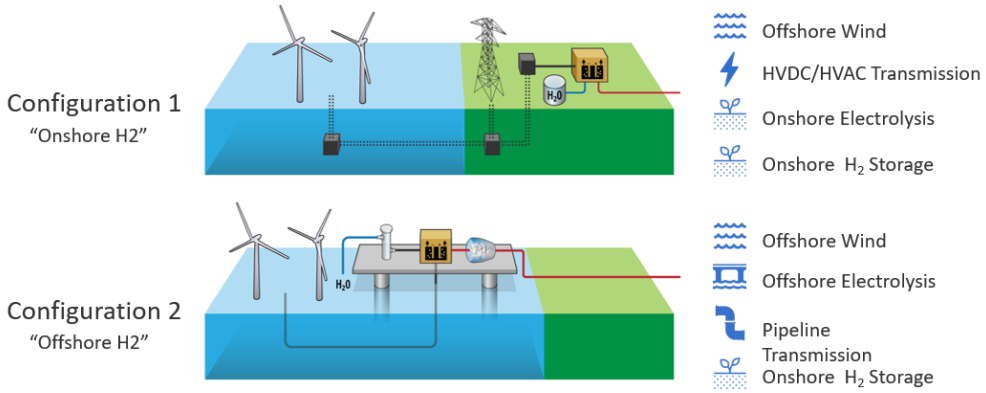
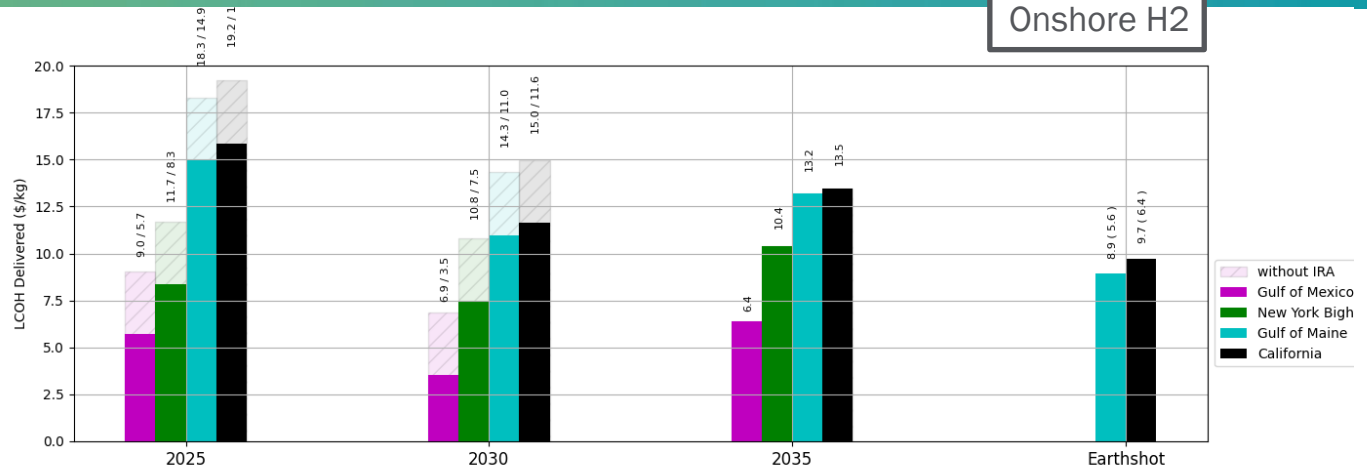
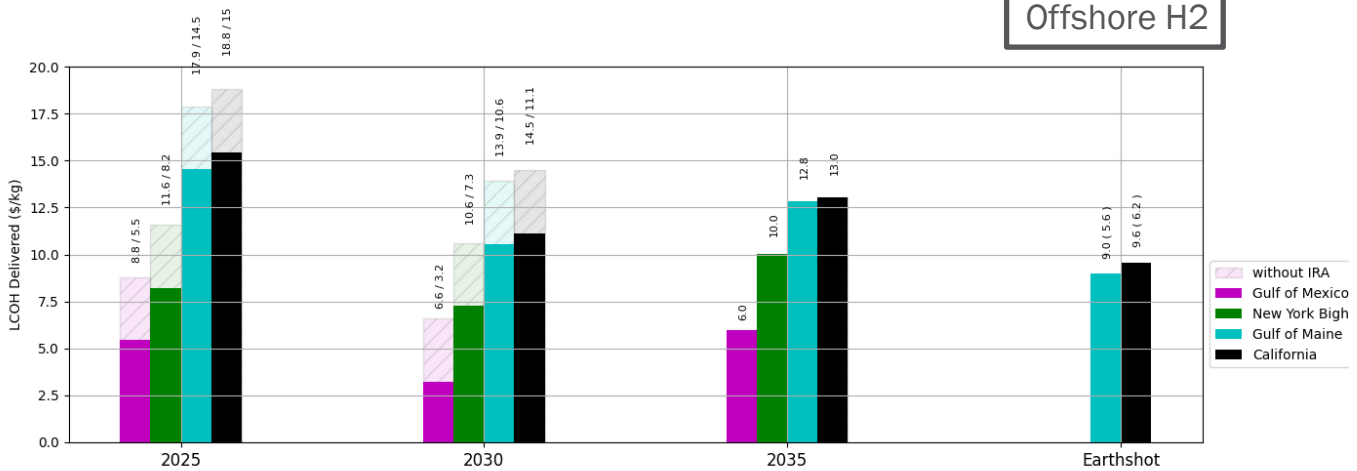
U.S. Offshore Wind H2 Use Case Study



Onshore H2



Offshore H2



- **Fixed:** Gulf of Mexico, New York Bight
- **Floating:** Gulf of Maine, California

Key Takeaways:

- Gulf of Mexico, with policy, achieves the lowest LCOH delivered due to access to salt caverns.
- Pressure vessel storage applied everywhere else.

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Co-Generation Near-Term Priorities

ACTIVITY AREA	PRIORITY
Advance wind storage solutions	Compact long-duration storage for offshore wind energy
Advance wind-to-X solutions	Offshore wind hydrogen co-generation economic analysis and reference design
	Offshore wind hydrogen co-generation lab demonstration
	Offshore wind alternative fuels co-generation for ports and vessels (maritime decarbonization planning)
	Offshore wind hydrogen co-generation field demonstration
Evaluate offshore energy hubs	Explore offshore wind+ marine energy applications

Audience Q&A and Comments

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- What's missing?
- What priorities have changed or shifted over the 18 months since the Shot was announced?

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Provide additional feedback to offshorewindevents@ee.doe.gov

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Transmission Goals and Mechanisms

Efficient and robust bulk electric grid that accommodates long distance power transmission and high penetrations of variable generation.

- Support offshore wind integration into the west coast of the US grid through analyses, convening and technical assistance.
- Support technology innovation and R&D to increase grid reliability, resilience and interoperability.
- Support expansion and reinforcement of the bulk electric grid through various mechanisms, including critical transmission investment and financing where possible.

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Projects and Programs to Facilitate Transmission Goals

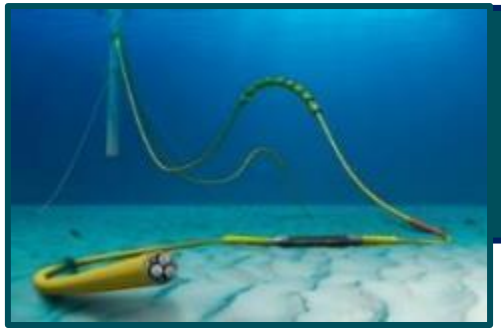
HVDC Standards, Innovative Controls, and Curriculum Awards
$8.5 million

NOWRDC Ocean Co-Use and Transmission Research Awards for research on subsea cables, grid stability, and power forecasting
$1.5 million

HVDC Voltage Source Converter Transmission Systems FOA
$10 million

The Atlantic Offshore Wind Transmission Action Plan

Tribal Nation Technical Assistance Program



West Coast Offshore Wind Transmission Study & Convening

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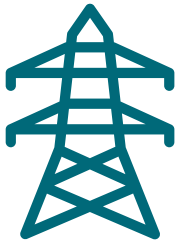
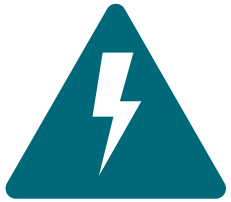
Transmission Feedback on Priority Needs



Corridors onshore

State coordination, right-of-way, federal land, permitting

Coastal community benefits



HVDC (standards, technology development, dynamic cables)

Transmission planning

Community engagement

Transmission Near-Term Priorities

ACTIVITY AREA	PRIORITY
Coordinate and inform transmission development	Develop action plan addendums for West Coast and Gulf Coast
	Complete transmission planning studies West Coast and Gulf
	Lead West Coast & Gulf Coast Transmission Convenings
	Facilitate modeling tools improvements (including climate modeling)
	Support convenings & transmission studies for state energy offices
	Maintain tribal technical assistance program
	Create additional public educational resources
	Support state energy programming (SEP, EERLF, EECBG, etc)
Transmission infrastructure solutions	Promote transmission standardization
	Loans and loan guarantees under DOE Title 17
	Support market rules research (Wholesale Electricity Market & Western interstate Energy Board Cooperative)
	Support cable conductor manufacturing and insulator materials research
Cybersecure, reliable, and resilient grid	Develop security tools to asset risk and detect intrusions
Develop critical technologies	Support HVDC breakers, dynamic cable, and floating substation research and development
	Facilitate HVDC Technology Gap Analysis
	Support HVDC converter technology research and development
	Support HVDC testing, validation & certification capability research and development
	Facilitate roadmapping effort and support research and development for power electronics industry

Audience Q&A and Comments

- How well do initiatives underway and near-term priorities mesh with our sense of near-term needs?
- What's missing?
- What priorities have changed or shifted over the 18 months since the Shot was announced?

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Provide additional feedback to offshorewindevents@ee.doe.gov

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Feedback & Table Discussions
West Coast Offshore Wind Transmission

Floating Offshore Wind Shot Summit

May 16, 2024

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

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West Coast Region Activities

Prior Activities

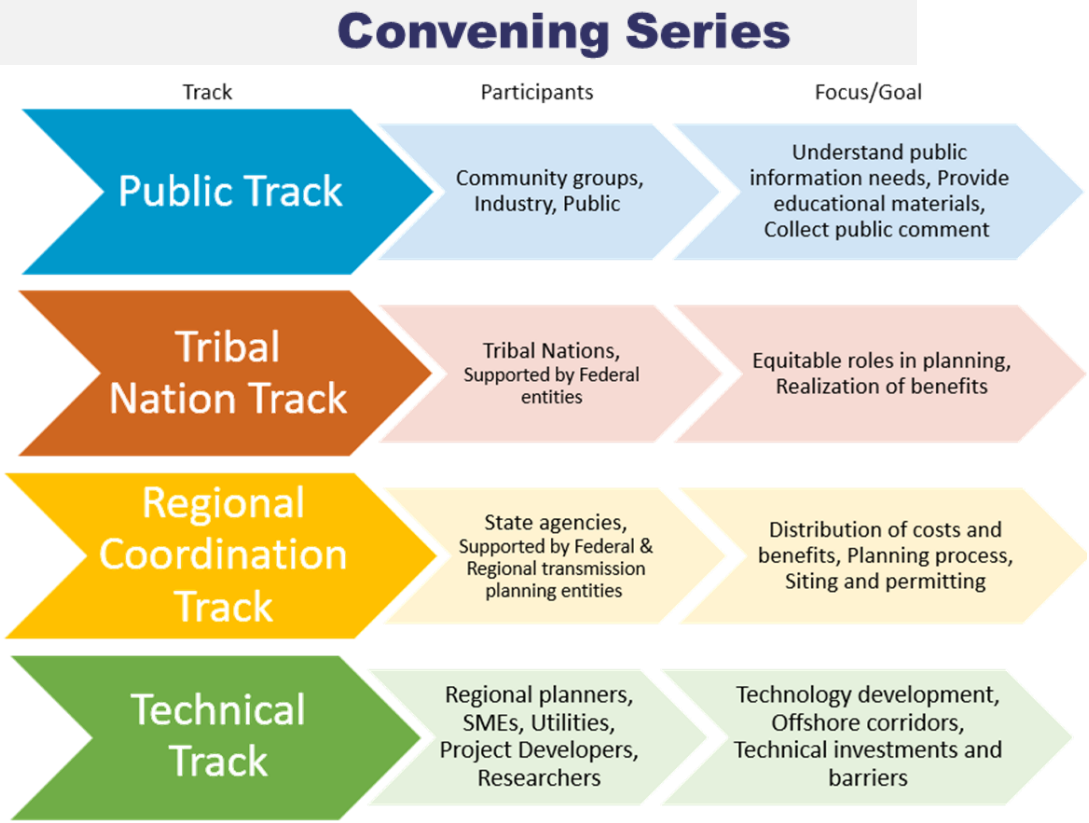
- DOE Literature Review and Gaps Analysis
- DOE Scoping Call

Ongoing Activities

- DOE West Coast Offshore Wind Transmission Study
- DOE-BOEM Convening Series
- DOE-BOEM development of recommendations

Future Activities

- Action Plan publication
- Implementation of Action Plan



- Workshops to hear from a wide range of entities
- Leverage existing meetings and conferences
- Timeframe: 2024 - early 2025

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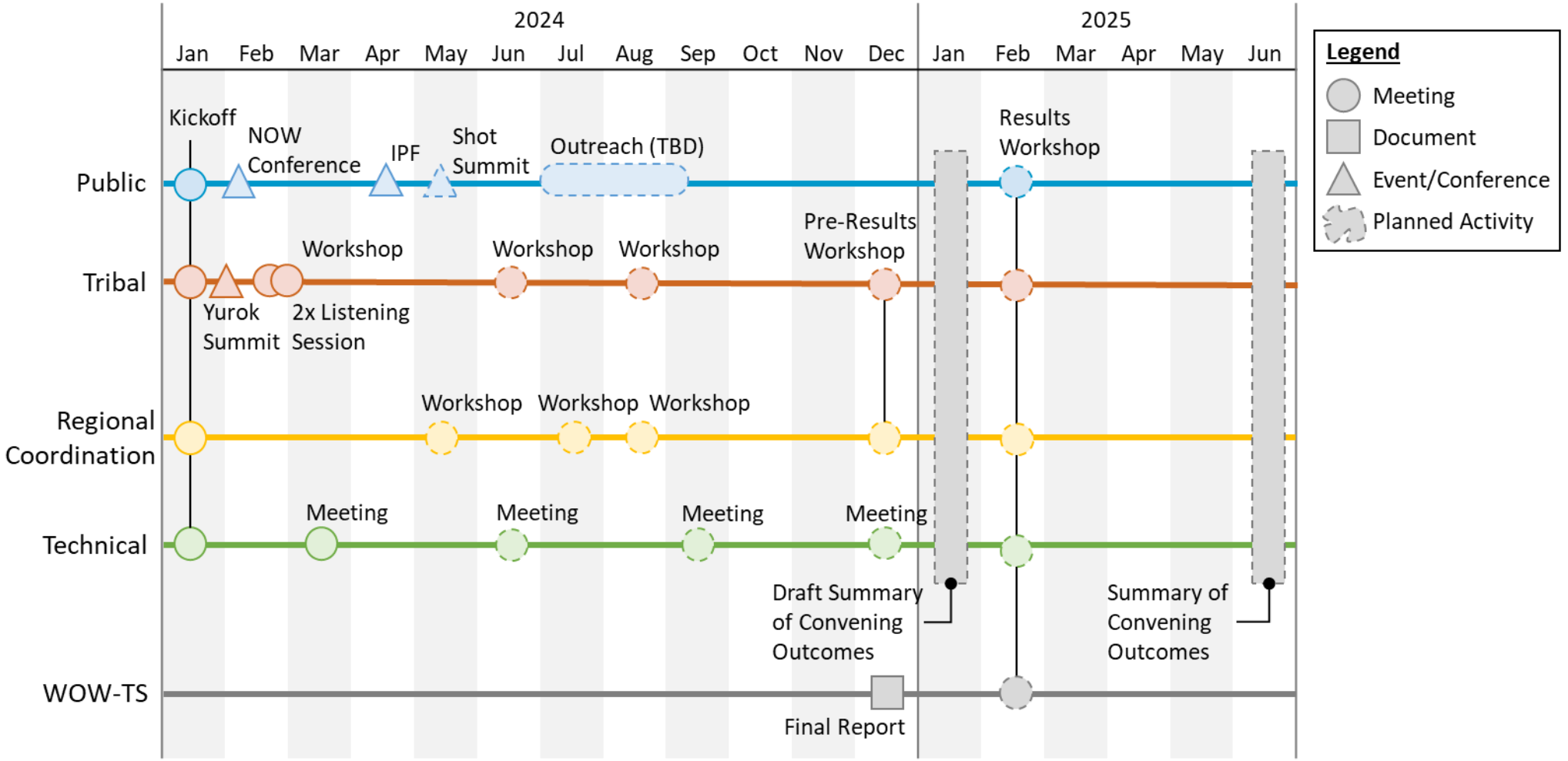
West Coast Convening Series Schedule



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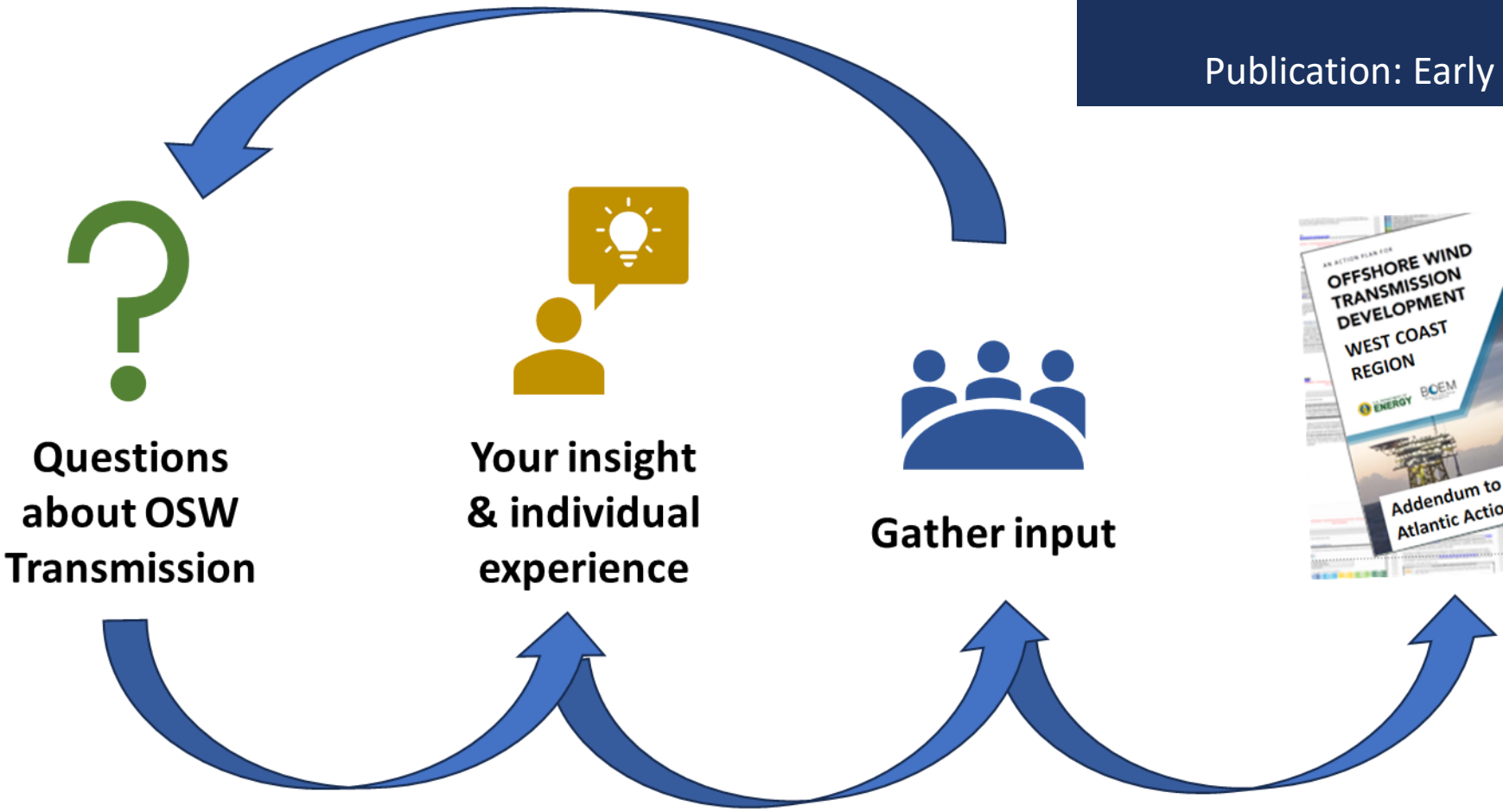
OSWTransmission@hq.doe.gov

Goal for today

Convening series and any input gathered will inform eventual Action Plan recommendations made by DOE and BOEM

Publication: Early 2025



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Paperwork Reduction Act

This data is being collected to gather feedback from attendees about offshore wind transmission topics as part of the Department of Energy's West Coast Offshore Wind Transmission Convening Series. The data you supply will be used for shaping conversation during today's workshop and helping DOE and BOEM think about these topics as they develop recommendations. This data will be collected through Slido (online tool), which is free for users.

Public reporting burden for this collection of information is estimated to average 3-5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of the Chief Information Officer, Enterprise Policy Development & Implementation Office, IM-22, Information Collection Management Program (1910-5160), U.S. Department of Energy, 1000 Independence Ave SW, Washington, DC 20585; and to the Office of Management and Budget (OMB), OIRA, Paperwork Reduction Project (1910-5160), Washington, DC 20503.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB control number.

Submission of this data is voluntary.

Today's Discussion

Series of questions

- Interregional Planning
- State of Floating Transmission Technologies
- Siting and Permitting
- Community Benefits & Ocean Co-use

Discuss at your table *30 min*

- Designate a notetaker
- Notes recorded via Slido survey

Report out *20 min*

- Designate a table representative
- Share ideas from your table with the room

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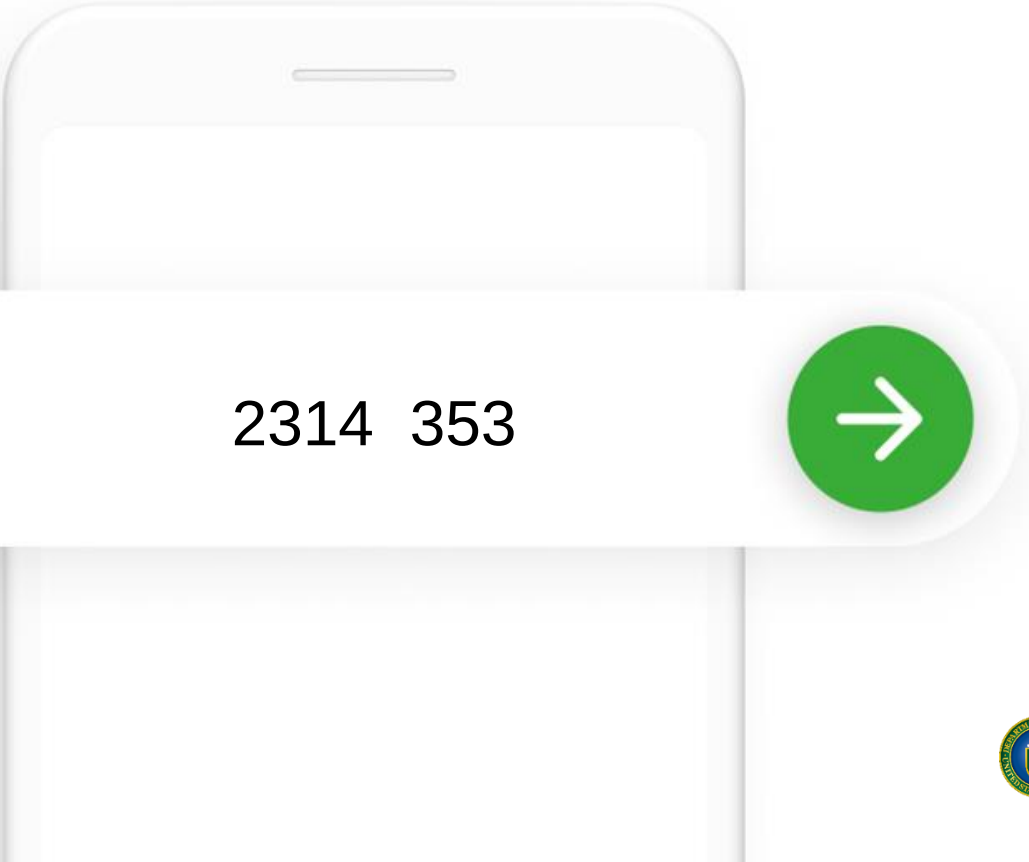
Join at **slido.com**
with code



slido

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#2314 353

Discussion Topic #1:
Interregional Planning

What is the ideal outcome you would like to see?
What are critical barriers?
What are gaps for further federal work?

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Discussion Topic #2:
State of Floating Offshore Wind Technologies

What is the ideal outcome you would like to see?
What are critical barriers?
What are gaps for further federal work?

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Join at

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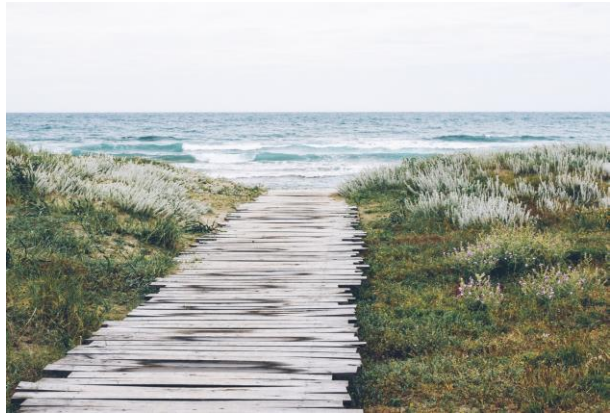
#2314 353

Discussion Topic #3:
Siting and Permitting



What is the ideal outcome you would like to see?
What are critical barriers?
What are gaps for further federal work?

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Join at

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#2314 353

Discussion Topic #4:
Ocean Co-use and Community Benefits

What is the ideal outcome you would like to see?
What are critical barriers?
What are gaps for further federal work?

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Thank You

www.energy.gov/gdo/offshore-wind-transmission-federal-planning-support

OSWTransmission@hq.doe.gov

U.S. DEPARTMENT OF ENERGY
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

GDO GRID DEPLOYMENT OFFICE

LPO LOAN PROGRAMS OFFICE

U.S. Dept. of the Interior
BOEM BUREAU OF OCEAN ENERGY MANAGEMENT

NREL Transforming ENERGY

Pacific Northwest NATIONAL LABORATORY

Floating Offshore Wind Shot ™

Supply Chain Session

Isaac Ward-Fineman, Offshore Wind Supply Chain Lead,
Wind Energy Technologies Office, DOE

2:45-4:15pm PT May 16th, 2024

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Breakout Session Agenda

1) Major Goals and Focus Areas
2) Federal Supply Chain Panel
3) State Supply Chain Panel
4) Near-Term Priorities
5) Audience Q&A

Supply Chain Goals and Mechanisms

Global leadership in floating offshore wind through domestic supply chain development and community involvement.

- Conduct floating offshore wind analyses and establish roadmaps for supply chain needs.
- Convene stakeholders and enable collaboration to fill high-priority gaps.
- Tailor design of floating systems to align with US infrastructure and manufacturing capabilities.
- Accelerate filling gaps through financing mechanisms where possible.

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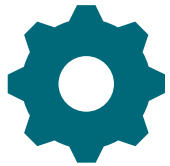
Supply Chain Feedback on Priority Needs

Port development/ refurbishment (government funding)

Vessels (availability, decarbonized)

Sustainability and recycling (materials research and sourcing)

Local content requirement concerns



Industrialization of major components for mass production

Environmental Justice and Community Benefits

Workforce Development

Projects and Programs to Facilitate Supply Chain Goals

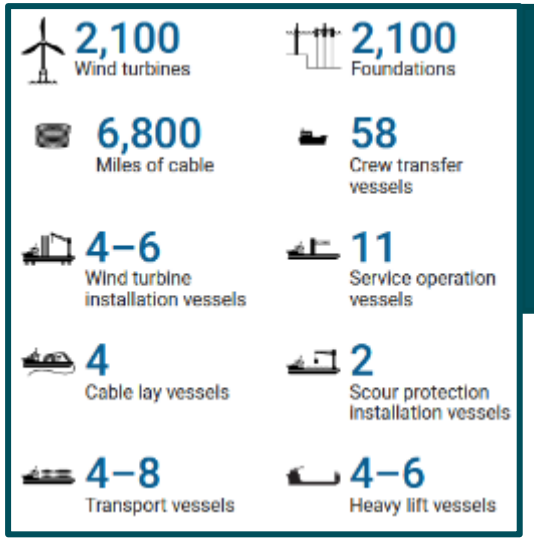
Port of Humboldt DOT Award
$427 million

Federal-State Offshore Wind Implementation Partnership

East Coast MOU on Offshore Wind Supply Chain Collaboration

Manufacturing Tax Credits

BOEM Bidding Credits



Supply Chain Road Map for Offshore Wind Energy in the United States

The Impacts of Developing a Port Network for Floating Offshore Wind Energy on the West Coast of the United States

Floating Offshore Wind Shot™ Supply Chain Federal and National Lab Panel

Isaac Ward-Fineman, U.S. Department of Energy

Walt Musial, National Renewable Energy Laboratory

Necy Sumait, Bureau of Ocean Energy Management

Celeste Zumwalt, U.S. Department of Transportation Maritime Administration

Jake Higdon, U.S. Department of Energy

May 16th, 2024

Wind Energy Technologies Office, DOE

- **Analysis Funding and Support** (e.g., Atlantic Transmission Study, West Coast Ports Study, Offshore Wind Supply Chain Roadmap)

- **Stakeholder Engagement and State Convening** (Federal-State Implementation Partnership)

- **R&D Funding** (e.g., FLOWIN Prize, ongoing funding opportunities, international collaboration)

- **Broad Interagency Engagement** (e.g., Floating Offshore Wind Shot, Technical Assistance to IRS)

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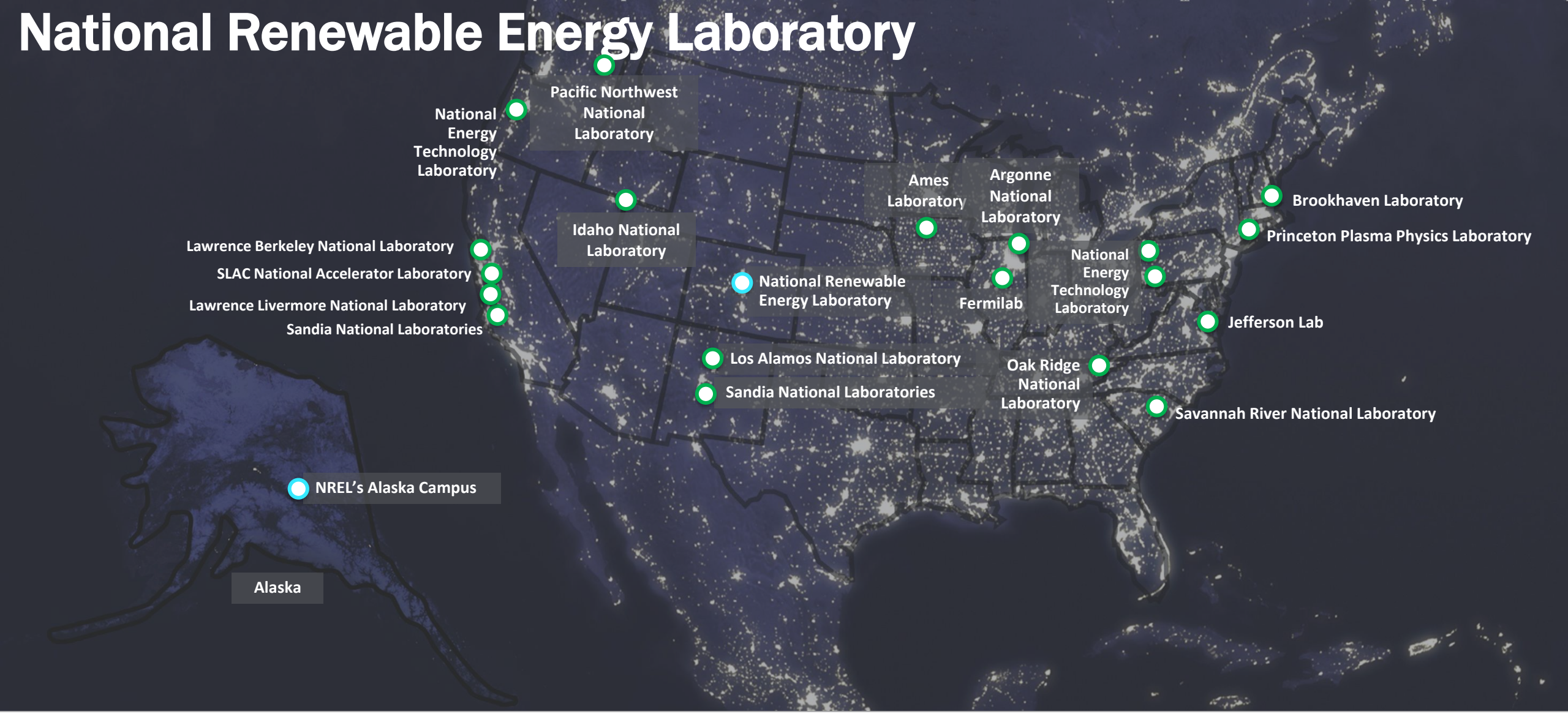
National Renewable Energy Laboratory



- Only National Laboratory focused on Renewable Energy
- Longstanding floating offshore wind research program
- Close coordination with federal/state governments, industry, community stakeholders, workforce/organized labor, environmental researchers

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West Coast Ports Strategy Study

Port investment

Deployment

Supply chain

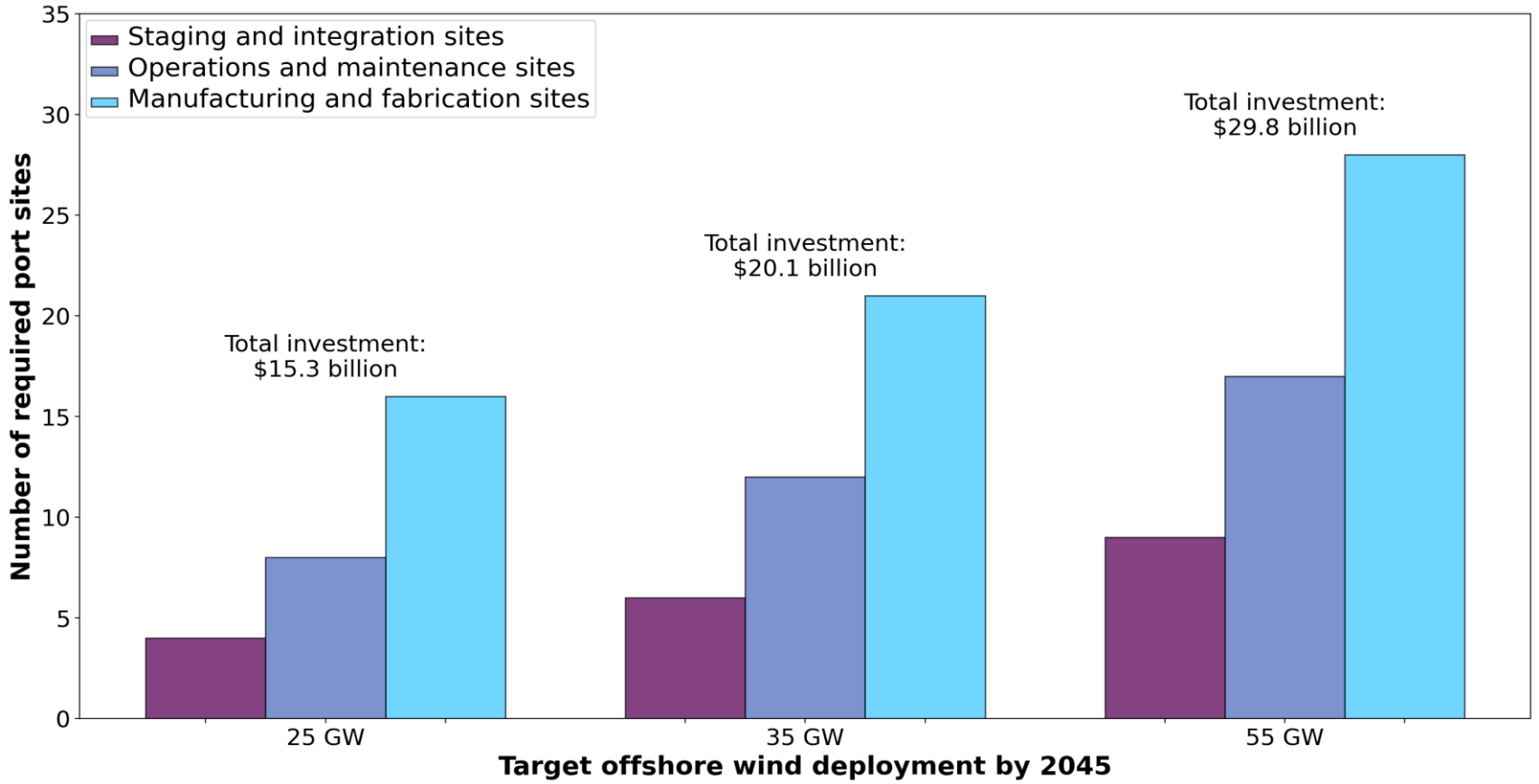
Project cost

Energy justice

Gaps, challenges, and opportunities for developing a collaborative West Coast ports network

Photo courtesy of the Windfloat Atlantic project / Principle Power. Artist: DOCK90

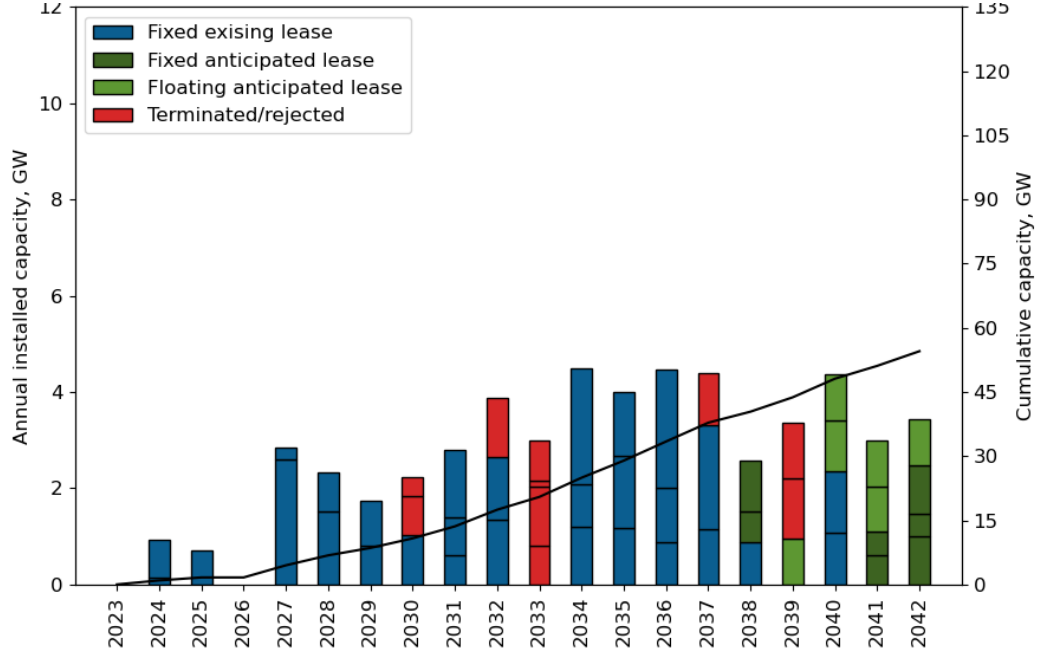
A port network* would likely require an investment of $15 - $30 billion to enable 25 – 55 GW of deployment (worth $125 - $275 billion) along the West Coast by 2045

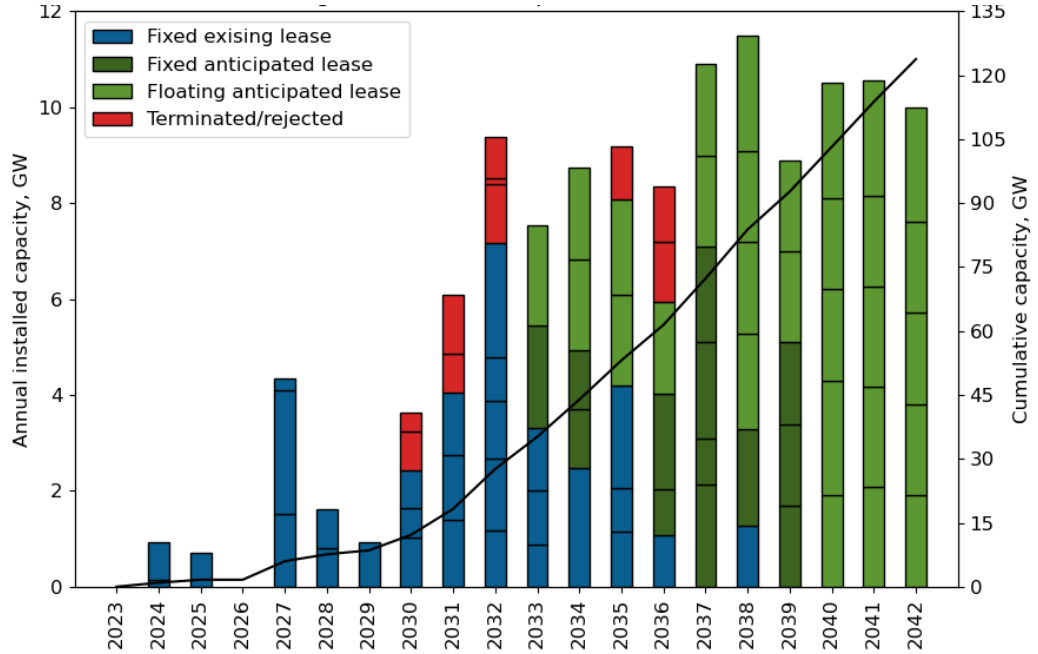


*Includes manufacturing sites to localize a supply chain. Installation and O&M ports comprise ~$5 - $11 billion

Technical Support Activities Related to the Floating Offshore Wind Shot

- **Federal/State Offshore Wind Implementation Partnership**
  - East Coast port and vessel needs
- **FLOWIN**
  - Supply chain assessments
  - Project logistics evaluations
- **Critical material tracking and gaps assessments**





BOEM Supply Chain and Workforce Training for Floating Offshore Wind

- **BOEM funded port studies in Oregon (Coos Bay), California, and Hawaii to inform port infrastructure needs:**
  - Port of Coos Bay Port Infrastructure Assessment for Offshore Wind Development (October 2022)
  - California Floating Offshore Wind Regional Ports Assessment (January 2023)
  - California Floating Offshore Wind Regional Ports Feasibility Analysis (June 2023)
  - Hawaii Floating Offshore Wind Regional Port Assessment (Draft April 2024,Final Expected June 2024)

- **BOEM is finding opportunities to:**
  - Incentivize the sourcing of major components domestically (like blades, turbines and foundations)
  - Develop a highly skilled and well-trained domestic workforce, and
  - Develop lease stipulations that encourage project labor agreements to ensure workers benefit from good paying union jobs.
  - Provide incentives to bidders to make contributions to advance the floating offshore wind industry
    - California lease sale included a 20 percent credit [$117 million] for bidders that agreed to contribute to programs or initiatives that support workforce training programs and development of a domestic supply chain for floating offshore wind

California Lease Sale and Stipulations - Workforce

- The Contribution for workforce training must result in a better trained and/or larger domestic floating offshore wind workforce that would provide for more efficient operations via an increase in the supply of fully trained personnel.

- Workforce training contributions must support the development of skills for the general workforce (i.e., not only the developer's workers) used in the planning, design, construction, operation, maintenance, or decommissioning of floating offshore wind energy projects

- Any benefits provided should not duplicate benefits or mitigation measures imposed on the Lessee through, or pursuant to, statutes other than the Outer Continental Shelf Lands Act (OCSLA).

California Lease Sale and Stipulations – Domestic Supply Chain

- **The Contribution for domestic supply chain must result in:**
  - overall benefits to the U.S. floating offshore wind supply chain available to all potential purchasers of offshore wind services, components, or subassemblies, not solely the Lessee's project;
  - either the demonstrable development of new domestic capacity (including vessels) or the demonstrable buildout of existing capacity; or
  - a more robust floating offshore wind domestic supply chain by reducing the upfront capital or certification cost for manufacturing offshore wind components, including the building of facilities, the purchasing of capital equipment, and the certifying of existing manufacturing or assembly facilities.

- **Supply chain development Contributions can be made to programs supporting the development of the supply chain or can be direct Contributions or incentives for manufacturing or other services supporting the floating offshore wind industry.**

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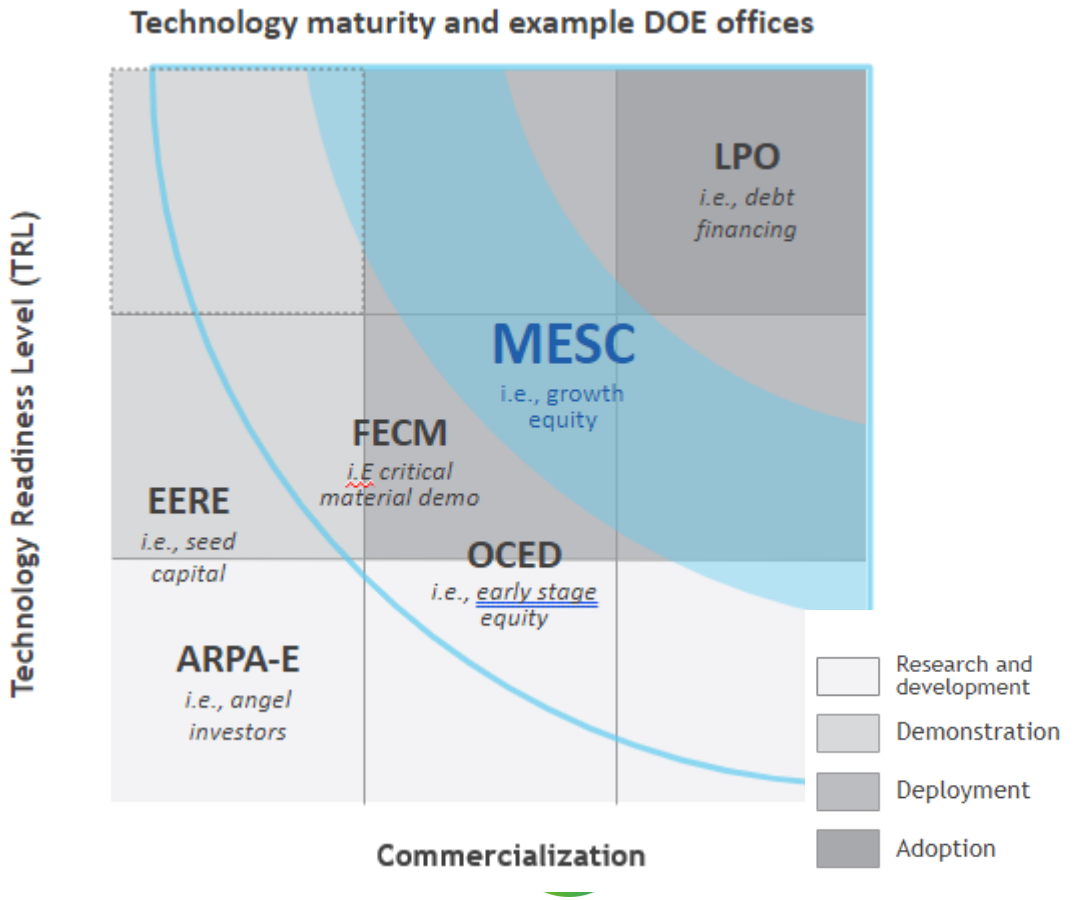
DOE Office of Manufacturing and Energy Supply Chains

MESC supports the **re-shoring, skilling, and scaling of U.S. manufacturing across energy supply chains.** MESC pursues this mission through three programmatic activities with roughly **$20 billion** in funding.

- **Workforce Capacity and Competitiveness**
- **Manufacturing Capacity and Competitiveness**
- **Supply Chain Modeling, Mapping, and Analysis**



Floating Offshore Wind Shot Programs

- Advanced Energy Manufacturing and Recycling Grants program ($750 million)
- Section 48C Advanced Energy Production Credit ($10 billion)
- Rare Earth Element Demonstration Facility grant program ($140 million)
- Modeling, Mapping, and Analysis Consortium
- Clean Energy and Manufacturing Workforce Training and Technical Assistance Awards (IACs)
- Technical assistance to IRS on key tax credits (Section 45X, domestic content)

Wind-relevant priorities

- Neodymium (Nd) and Dysprosium alloys and magnets
- Large castings
- Forged rings and shafts
- Offshore and onshore wind turbine blades and other components

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Floating Offshore Wind Shot™
Supply Chain State Panel

Carrie Sessions, Washington Governor's Office
Trelynd Bradley, California Governor's Office
Stephanie Watson, Maine Governor's Office
Karin Power, Oregon Governor's Office
May 16th, 2024

Washington State

- **State law & commitment to 100% clean energy by 2045.**
  - No goals or targets for offshore wind.
- **2 unsolicited lease requests submitted to BOEM.**
  - Floating facilities 20 & 40 miles offshore from southwest WA.
  - Potential to generate 3 to 10 GW energy.
  - Concern on impact to treaty-reserved fishing rights, marine ecosystem, and impact and to commercial fishing.
- **BOEM is reviewing; a Task Force has not been initiated.**
- **State evaluating best way to proceed.**

Washington Supply Chain Development

- With Governor support, state & private funding, a Washington NGO launched the *Blue Wind Collaborative* to support the development & activation of Washington's participation in the supply chain.
- Recent legislative funding & directive to study Washington's supply chain opportunities.
- Engaging with ports, local governments, industry, neighboring states, and international partners to identify needs, gaps, and areas for coordination.

Offshore Wind Supply Chain Development

Offshore Wind in California

OSW Goals + Overview

+ Assembly Bill 525 Report 2-5GW by 2030
+ Assembly Bill 525 Report 25GW by 2045
+ NREL identified capacity of 116GW
+ Dec. 2022 BOEM five lease areas = two in Humboldt Coast and three off the Central Coast
+ Multiple state agencies + departments with touch points including CEC, CPUC, State Lands, Coastal, CA Fish & Wildlife, Labor, Air Board, CALEPA, Resources, Gov Office, State Transportation Agency, Finance, Workforce Boards, Treasurer's Office

Offshore Wind Supply Chain Development

Key Supply Chain Considerations

+ Infrastructure and deployment assets
+ Ports (12 in California, spoke and wheel system)
+ Workforce and labor including regional trades analysis
+ Materials development
+ Assembly and manufacturing
+ Goods movement and freight
+ Research and Development
+ Energy and transmission (recent study and need)
+ Financing and capital stack
+ Network effects and market integration

Offshore Wind Supply Chain Development

Existing Supply Chain Investments

+ Historic state investment in port and freight infrastructure (2021-2022)
+ State investments in planning and infrastructure analysis
+ Federal and state investments in port analysis and staging
+ Federal INFRA award
+ Federal and state investments in R&D
+ CEC awards in FOSW demonstration
+ Environmental monitoring procurement

Existing Supply Chain Assets

+ Nation-leading goods movement ecosystem (land, air, and sea)
+ Leading state for construction aggregate production as well as only state for rare earth production = permanent wind turbine magnets
+ Existing steel mill and fabrication assets including largest West Coast
+ Existing pivot industries in composite materials, maritime, electronics, and energy development (defense, aerospace, semi/micro, ports)
+ Research and development. Labor. Innovative finance options.

Offshore Wind Supply Chain Development

California OSW Supply Chain Incentive Opportunities

Manufacturing and Assembly

+California Competes
+Partial Sales & Use Tax Exclusion
+Full Sales & Use Tax Exclusion (CAEATFA)
+Capital Investment Incentive Program (Property Tax Incentive, includes specified eligibility for wind)
+Research and Development Tax Credit
+Industrial Development Bonds
+Economic Development Rate (Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison)
+IBank & STO Guarantees and Capital Access
+New Market Tax Credits
+Opportunity Zones

Workforce

+Employment Training Panel
+High Road Training Partnerships
+New Employment Tax Credit
+Work Opportunity Tax Credit
+Homeless Hiring Tax Credit

State Entities / Grant Programs

+CPUC
+CEC
+Calfiornia Grants Portal

Maine Governor's Energy Office

- Wide range of responsibilities relating to state energy policies, planning, and development
- Ambitious climate and clean energy goals
- Offshore wind is essential part of the mix

Maine Offshore Wind Initiative

  - Planning, policy, and procurement
  - Regional coordination and research
  - Ports

MAINE GOVERNOR'S ENERGY OFFICE

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Floating Offshore Wind Shot Projects

- Signed Federal-State MOU on East Coast Offshore Wind Supply Chain Collaboration; actively partnering with the Northeast states
  - 4 federal agencies from the Shot and 9 east coast states (ME to NC)
- UMaine has been competing in the DOE FLOWIN prize
- Floating offshore wind demonstrations/research array – early supply chain and workforce development opportunity
- Advancing our OSW energy procurement (3 GW by 2040) – RFI open for input on the nation's first floating OSW procurement from commercial projects in the Gulf of Maine
- Developing the port of Searsport for floating OSW; regional coordination

UMaine, DOE - VolturnUS Concrete Floating Hull Technologies

Locally produced foundations at low cost

VolturnUS

Semisub

VolturnUS+

Damped Cruciform Barge

ARPA-E Pilot 2024

Commercial Floating Offshore Wind Port at Searsport, Maine

MaineDOT

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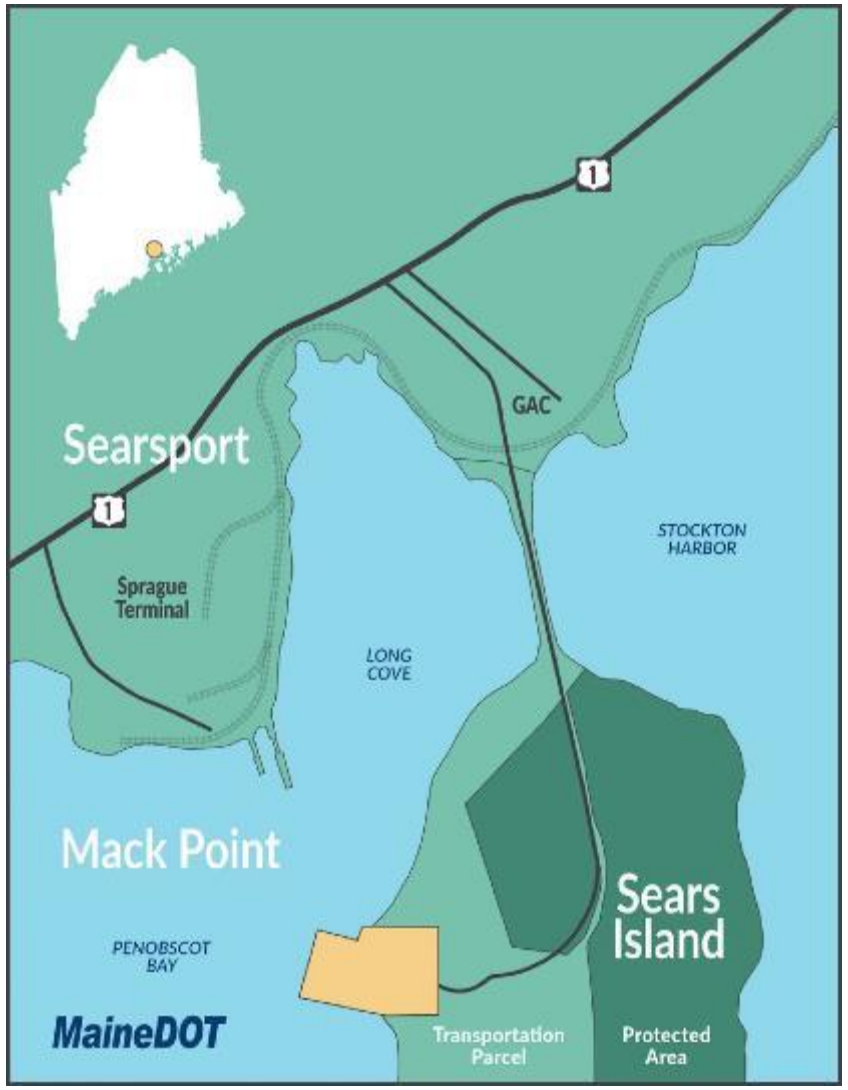
Commercial Floating Offshore Wind Port at Searsport, Maine

Location



Milestones

Key Milestones	Completion Date
MaineDOT File Permits	Q3 2024
Draft Environmental Impact Statement (EIS) Published	Q1 2025
Secure Additional State and Federal Funding	Q3 2025
Complete Design	Q4 2025
Final EIS Submitted	Q4 2025
MaineDOT Obtain Permits	Q3 2026
Advertise for Construction Phase I	Q4 2026
Construction Phase I	Q3 2029
Closeout	Q4 2029

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Contacts

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Offshore Wind Program Manager, Maine Governor's Energy Office

Stephanie.Watson@maine.gov

Matt Burns

Executive Director, Maine Port Authority

Matthew.burns@maineports.com

Supply Chain Near-Term Priorities

ACTIVITY AREA	PRIORITY
Supply chain assessment	Convene states to collaborate on regional supply chain cooperation
	Explore the feasibility of a supply chain funding pool
	Leasing and procurement timeline transparency
	Establish resource/funding availability reference
	Support regional supply chain development
	Increase diversity within the supply chain
Vessel and port development	Support port and vessel development

Audience Q&A and Comments

- How well do initiatives underway and near-term priorities mesh with our sense of near-term needs?
- What's missing?
- What priorities have changed or shifted over the 18 months since the Shot was announced?

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Thank You

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Floating Offshore Wind Shot ™

Expanded, Just, and Sustainable Deployment Session

Rick Yarde, Regional Supervisor, Office of Environment,
Bureau of Ocean Energy Management

1:00-2:30pm PT May 16th, 2024

Federal Advisory Committee Act (FACA) Notice

The purpose of today's meeting is to ask for your input regarding floating offshore wind topics. To that end, it would be most helpful to us if, based on your personal experience, you provide us with your individual advice, information, or facts regarding this topic. The objective of this session is not to obtain any group position or consensus. Rather, Floating Offshore Wind Shot federal partners are seeking as much input as possible from all individuals at this meeting. To most effectively use our limited time, please refrain from passing judgment on another participant's recommendations or advice and instead concentrate on your individual experiences.

Breakout Session Agenda

1) Major goals and areas of focus for this work
2) Stakeholder feedback
3) Discussion of federal accomplishments, major initiatives underway
4) Discussion of partners accomplishments, major initiatives underway
5) Discussion of near-term priorities
6) Audience Q&A

Expanded, Just, and Sustainable Deployment Goals and Mechanisms

Achieve just and sustainable deployment in cooperation with marine co-users and coastal communities.

- Identify and support workforce development needs, while promoting workforce diversity, equity, inclusion and accessibility.
- Standardize workforce training and qualifications to ensure transferable skills.
- Science-based, stakeholder-informed process to identify future lease areas.
- Advance research to understand effects, and develop techniques to avoid, minimize, and mitigate impacts on marine ecosystems and co-users.
- Support community engagement and socio-economic research to understand impacts on communities.
- Develop offshore wind monitoring technologies.
- Support planning mechanisms that help affected communities and promote environmental justice.

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Expanded, Just, and Sustainable Deployment Feedback on Priority Needs

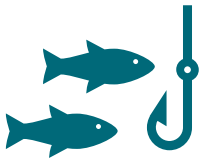
Baseline data collection and project lifetime monitoring

Sustainability and recycling opportunities

Early and consistent engagement with co-managers (local, state, tribal)

Data sharing and availability

Community benefits and readiness



Fisheries engagement and research

Early workforce development and public education

Floating Offshore Wind Shot™ Expanded, Just, and Sustainable Deployment Federal Panel

Rick Yarde, Bureau of Ocean Energy Management
Joy Page, U.S. Department of Energy
Katie Westfall, National Oceanic and Atmospheric Administration
May 16th, 2024

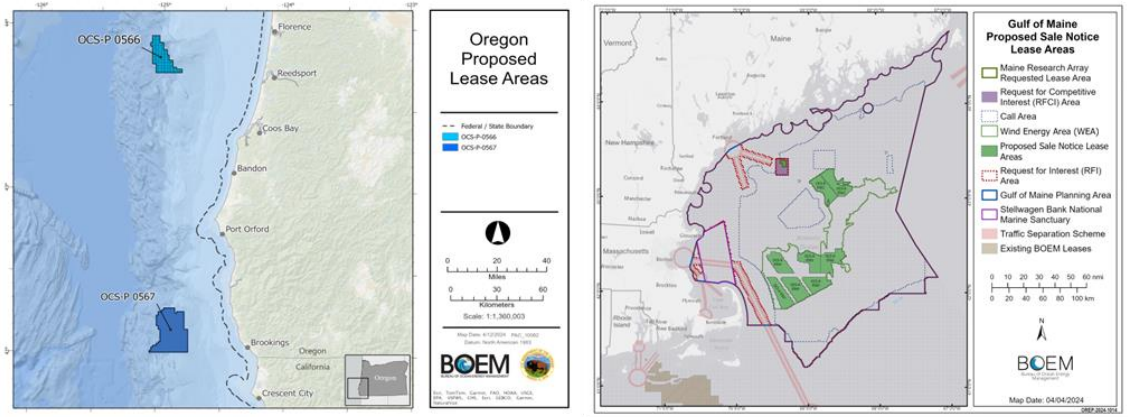
BOEM Projects and Programs to Facilitate Deployment Goals

LEASE AREA	Winners of the California Lease Areas, $757,100,000 in High Bids	
OCS-P0561	RWE Offshore Wind Holdings, LLC	$157,700,000
OCS-P0562	California North Floating LLC	$173,800,000
OCS-P0563	Equinor Wind US LLC	$130,000,000
OCS-P0564	Golden State Wind, LLC	$150,300,000
OCS-P0565	Invenergy California Offshore LLC	$145,300,000

BOEM Bureau of Ocean Energy Management

California Floating Offshore Wind Lease Auction

West Coast Cultural Landscapes
Cultural & Ancient Submerged Landforms Studies
$2.3 million



Proposed Lease Areas in Oregon and Maine Deep Waters

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BOEM Culture Landscapes Studies and Tribal Capacity Support

- BOEM provided $2.3 million to conduct studies to improve understanding of cultural landscapes and ancient submerged landforms off the West Coast

- BOEM funded two Indian Small Business Economic Enterprises with $350,000 each to support Tribal participation and engagement during environmental reviews of proposed offshore wind activities on the Outer Continental Shelf offshore California and Oregon.

DOE Projects and Programs to Facilitate Deployment Goals

Environmental

Develop informed technical solutions to address wind energy effects on wildlife

- Prioritize research needs through engagement and synthesis
- Develop monitoring tools
- Develop mitigation tools
- Conduct research to fill knowledge gaps

Community Engagement and Social Science

Enable collaborative research to understand wind energy impacts and support community clean energy transitions

- Research on economic impacts
- Identify community needs and concerns
- Understand impacts of wind development over time
- Research on benefit agreements
- Communications and engagement to support decision making

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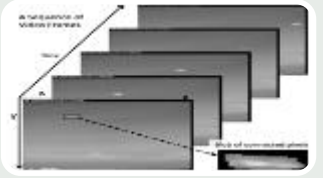
DOE Environmental Projects

Environmental Challenges	Projects to Address Challenges		
Limited baseline data given no US floating projects and few fixed-bottom	 East coast wildlife impacts (Duke U)	 West coast wildlife surveys (OSU)	 West coast Bat baseline data (EPRI)
Monitoring technology needs offshore	 Bird and bat monitoring technology NOI	 Autonomous monitoring platforms (WHOI)	 Thermal Tracker 3D bird tracking (PNNL)
Synthesis and awareness of fast-emerging science across stakeholder groups	WREN Working Together to Resolve Environmental Effects of Wind Energy WREN International (NREL)	 Tethys Knowledge Hub (PNNL)	SEER Synthesis of Environmental Effects Research (NREL, PNNL)

DOE Community Engagement and Social Science

	 Image: URI	 Image: DOE	 Image: Sandia	 Image: GMRI	 Image: DOE
Highlighted Projects:	**NOAA Sea Grant Wind Extension**	**Wind Community Benefits Guide**	**Toolkit for Frontline Communities**	**Fostering Capacity for Fishing Communities**	**Yurok Tribe Capacity for Offshore Wind**
Challenges	Provides extension, training, and a community of practice for coastal communities and offshore wind.	Focuses on community benefit agreements that provide benefits for communities impacted by wind energy projects.	Equips communities to engage in capacity building and site planning for offshore wind development.	Builds capacity for fishing communities to engage in the offshore wind development process.	Conducts research and leverages Traditional Ecological Knowledge to understand the impacts of wind on the local community.
Foundational Knowledge Gaps			X	X	
Information and Resource Availability and Accuracy	X	X	X		
Community Capacity and Informed Decision-Making	X	X	X	X	X
Equitable Distribution of Benefits and Impacts		X			X

Other DOE Efforts to Facilitate Deployment Goals

Offshore Wind Social Science & Community Engagement Awards
$6.5 million

NOWRDC Ocean Co-Use (marine mammal and fisheries research) Awards
$2 million

Offshore Wind Centers of Excellence FOA
$4.75 million

Aquaculture Development with Offshore Wind FOA
$750 thousand

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National Oceanic and Atmospheric Administration

Protections for Coastal & Marine Resources

- Work with applicants and federal agencies to incorporate appropriate conservation measures for important coastal and marine resources

Interagency & Stakeholder Engagement

- Multi-scale engagement with State, Tribal, Federal partners and constituents

Environmental Intelligence

- Data, tools, science, modeling, mapping and services to inform offshore wind siting and decision making

Research & Operations

- Understand and monitor impacts; provide and improve wind forecasts

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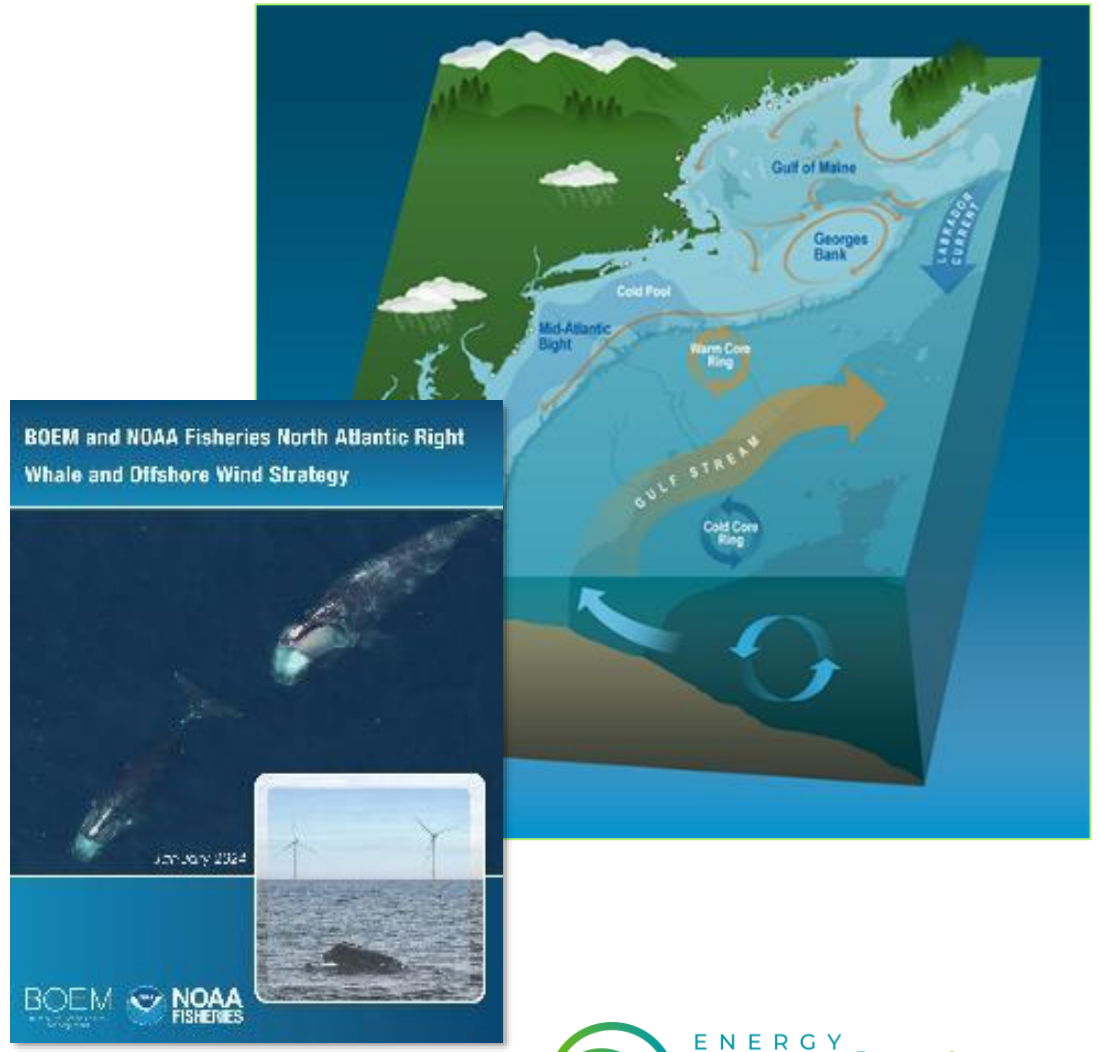
Floating Offshore Wind Shot Supporting Projects

NOAA Fisheries

- Final NOAA/BOEM North Atlantic Right Whale and Offshore Wind Strategy
- National Oceanographic Partnership Program initiative with DOE and BOEM
- Integrated ecosystem assessment (IEA) for offshore wind in the Gulf of Maine
- Developing monitoring efforts to understand impacts to the CA Current Ecosystem and pelagic upwelling

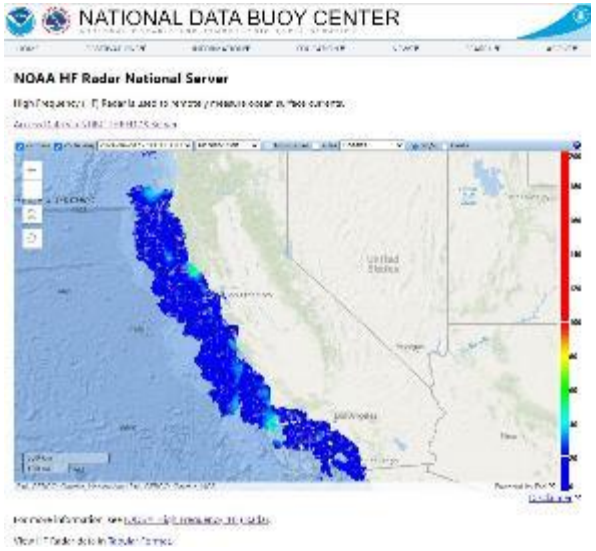


Floating Offshore Wind Shot Supporting Projects

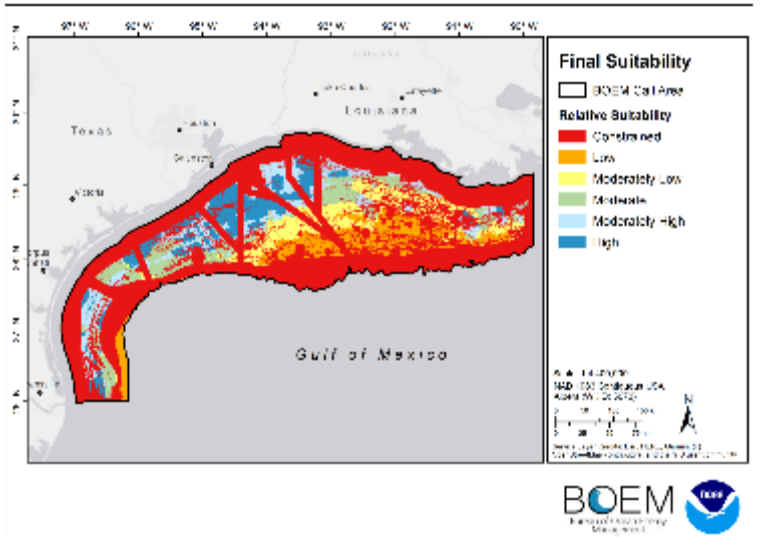
National Ocean Service (NOS)

- NOAA's Integrated Ocean Observing System (IOOS) Office - Software Tools for Mitigating Wind Turbine Interference with High Frequency Radars
- NOAA's National Centers for Coastal Ocean Science (NCCOS) - Marine Spatial Planning, biogeographical assessments, social science

IOOS | Integrated Ocean Observing System



NCCOS



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Floating Offshore Wind Shot Supporting Projects

NOAA Research (OAR)

- Wind Forecast Improvement Project (WFIP-3)
- National Sea Grant Offshore Wind Energy Liaison Initiative

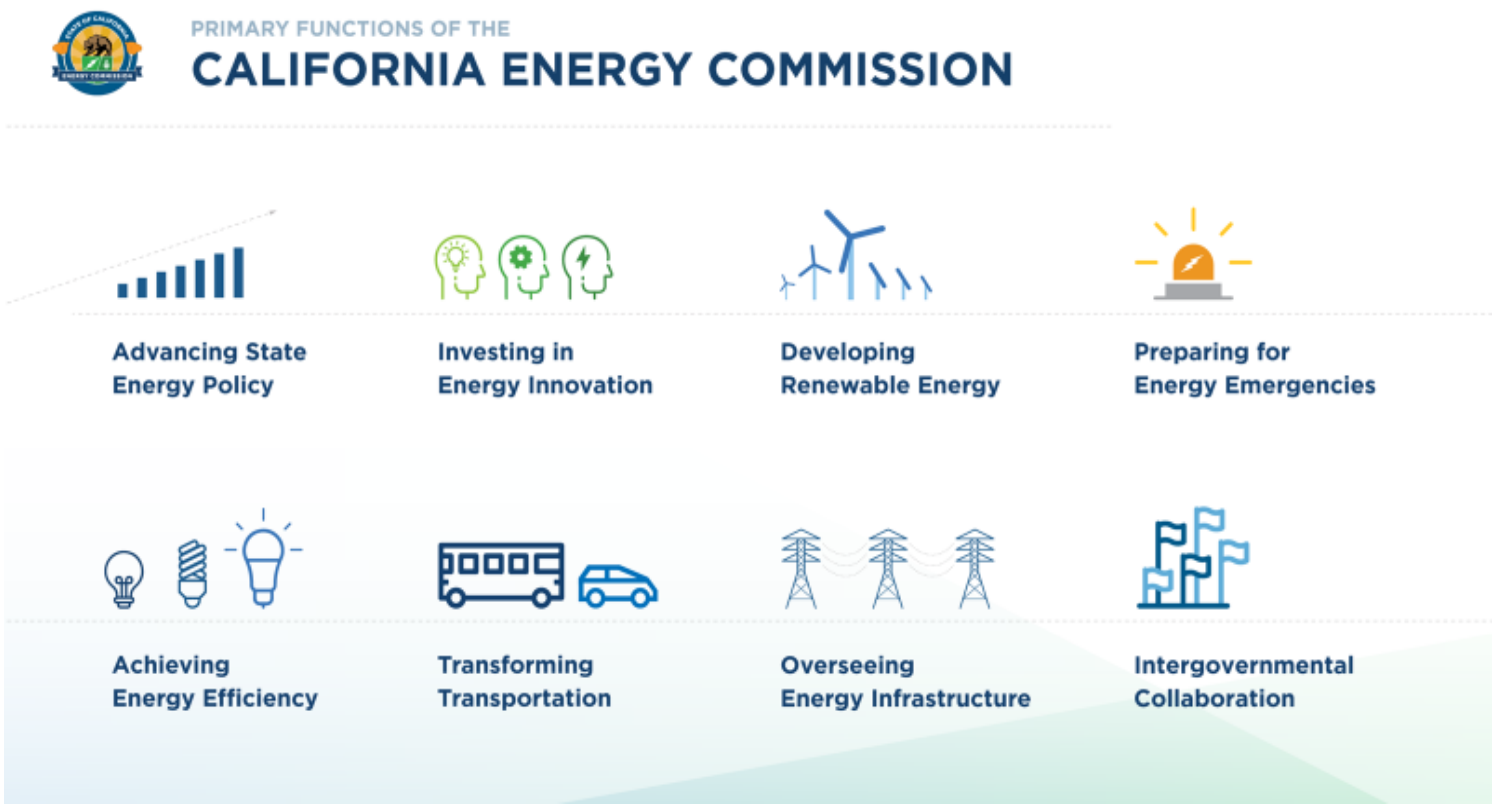
Photo credit: RI Sea Grant and URI Coastal Resources Center

Floating Offshore Wind Shot™ Expanded, Just, and Sustainable Deployment Partners Panel

Eli Harland, California Energy Commission
Eleanore Humphries, Monterey Bay Aquarium
Karina Nielsen, Oregon Sea Grant
John Hansen, West Coast Ocean Alliance

May 16th, 2024

California Energy Commission



CEC Floating OSW Initiatives

- Assembly Bill 525 Strategic Plan and offshore wind planning goals
- Senate Bill 100 energy resource/transmission planning and assessments
- Statutory requirements
- Research and development
- Agency convenings
- Stakeholder engagement and tribal consultation

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Floating Offshore Wind Shot Projects

The shot partners and opportunities to create a sustainable industry

- **Department of Transportation:** ports and waterfront facility infrastructure
- **Department of Energy:** R&D, national laboratories, technology assessments, market facilitation, supply chain
- **Department of Interior:** collaboration with BOEM on current leased areas and future planning for wind energy areas
- **Department of Commerce:** coordination with NOAA on ocean and coastal planning

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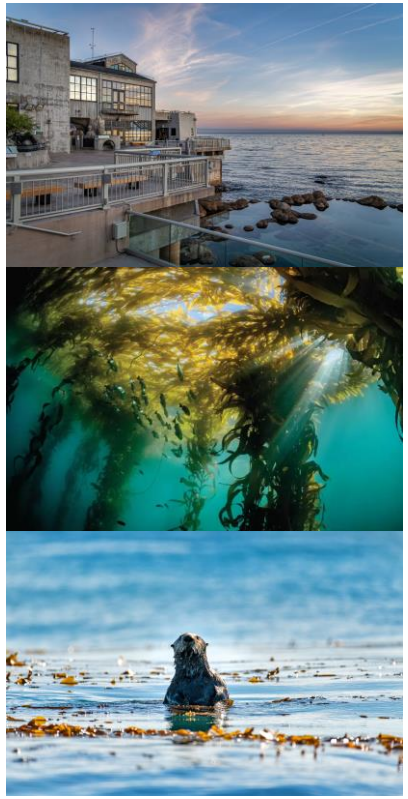
Monterey Bay Aquarium



The mission of the nonprofit Monterey Bay Aquarium is to **inspire conservation of the ocean.**

We envision a future where the ocean flourishes and people thrive in a just and equitable world. We create extraordinary experiences that inspire awe and wonder, champion science-based solutions, and connect people across the planet to protect and restore the ocean.

Monterey Bay Aquarium

GOAL: As offshore wind is developed and operated off California, it poses the least possible impact to ocean wildlife and ecosystems.

Collaboration: MBARI, eNGOs, Electeds, Researchers, State of CA, WCOA, NOAA, BOEM, USFWS, USGS, SEER/DOE

MBARI
Monterey Bay Aquarium Research Institute

Capacities: advocacy, research, communication and public education

Key Focus: Decision makers use the **best available scientific** and technological data to ensure **science-based** and stakeholder-informed decision making.

- **Monitoring, transparency, ecosystem approach**

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Floating Offshore Wind Shot Projects

- **SYNCHRO (MBARI & IOOS)**
  - A Co-designed Testbed to Synchronize and Evolve Technology Solutions for Industry, Ocean Science, and Conservation
    - Accelerate progress to bring emerging marine technologies into wider use that help us better understand, manage, and sustainably access resources in an ever-changing ocean
    - Use **co-design** principles to provide a testbed for marine technology developers to deploy, **evaluate, and improve** systems in **real-world** conditions.
  - Offshore Wind as Pilot Study; DOE, DOC Advisory Roles
- **Passive Acoustic Monitoring: Evolution of Sanctuary Sound & West Coast Network**
  - Monterey Bay and Morro Bay focused effort to date (MBARI, DOC, BOEM, … growing network, MBA small support role)

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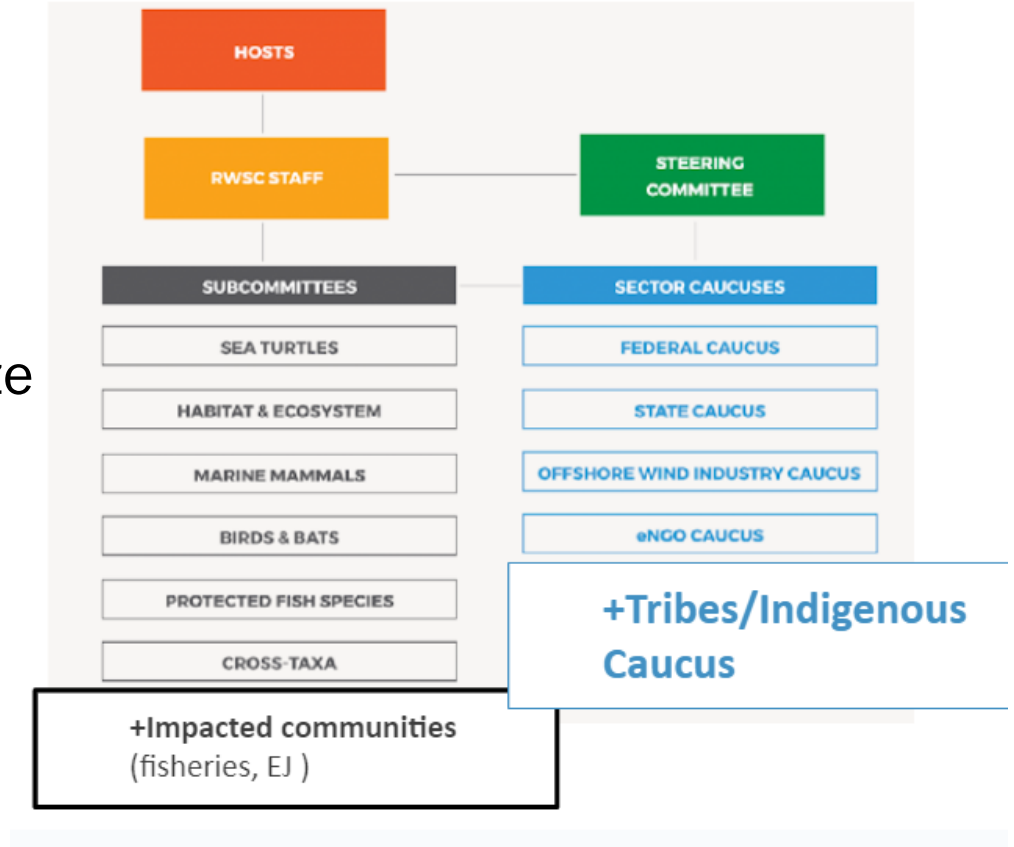
Floating Offshore Wind Shot Projects

What's Next: West Coast Offshore Wind & Ecosystem Science Entity

- Opportunity for collaboration with Windshot partners
- Understand information necessary for effective decisions and adaptive management to minimize ocean impacts in the Pacific marine ecosystem
- Procure the "best available science" needed to make safe, long-lasting decisions at state and federal, and even local levels
- Streamline, de-duplicate effort, maximize time, minimize costs



Oregon Sea Grant

- **Sea Grant is a Federal-University partnership program that brings science together with communities for solutions that work.**
- **Oregon Sea Grant is one of 34 programs in the NOAA Sea Grant College Program.**
- **Our mission is to spark discovery, understanding, and collaboration to foster healthy, inclusive, and resilient coastal communities and ecosystems.**
- **We have four Focus Areas**
  - Environmental literacy & workforce development
  - Healthy coastal ecosystems
  - Sustainable fisheries & aquaculture
  - Resilient communities & economies

Sea Grant OREGON

NOAA

Oregon State University

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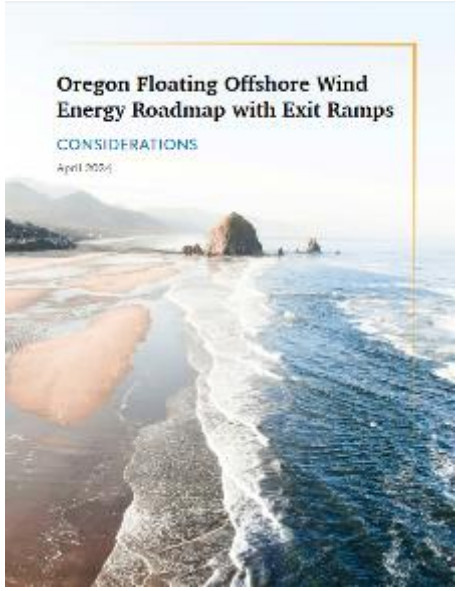
Oregon Sea Grant - Floating Offshore Wind Shot Projects

- **Department of Energy and National Sea Grant Office partnership**
  - National Sea Grant Offshore Wind Energy Liaison
  - Oregon & California Sea Grant hire offshore wind energy specialists
    - Oregon Sea Grant Extension specialist in marine renewable energy and communities
      - Sara Swett, based at Oregon State University, OSU Extension Service
    - California Sea Grant economic analyst and offshore wind extension specialist
      - Tanner Etherton, based at Schatz Energy Research Center, CalPoly Humboldt

Oregon Sea Grant - Floating Offshore Wind Shot Projects

- **Oregon Offshore Wind Work Group**
  - Oregon Sea Grant advisor to OR Consensus work group
    - Oregon Floating Offshore Wind Energy Roadmap with Exit Ramps: Considerations
    - Oregon House Bill 4080 - Oregon Offshore Wind Roadmap



- **Oregon Community Engagement and Education**
  - Developing community-focused education programs focused on floating offshore wind energy and civic engagement opportunities
  - Coordinating with Oregon Coastal Zone Management Program
    - OR Department of Land Conservation and Development

Sea Grant OREGON

NOAA

Oregon State University

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West Coast Ocean Alliance – West Coast Regional Ocean Partnership

States

California

- California Ocean Protection Council (Lead Agency)
- California State Lands Commission (Lead Agency)
- California Coastal Commission
- California Energy Commission
- California Dept. of Fish & Wildlife

Oregon

- Department of Land Conservation & Development (Lead Agency)
- Oregon Department of Fish & Wildlife (Lead Agency)

Washington

- Department of Natural Resources (Lead Agency)
- Department of Agriculture
- Department of Ecology (Lead Agency)
- Department of Fish and Wildlife
- Department of Commerce

Federal Agencies

- National Oceanic and Atmospheric Administration (Lead)
- Bureau of Ocean Energy Management (Lead)
- U.S. Coast Guard (Dist. 11, Dist.13)
- U.S. Department of Defense
- U.S. Department of Energy
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Safety and Environmental Enforcement
- National Park Service
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Department of Transportation
- U.S. Environmental Protection Agency (Region 9, Region 10)
- U.S. Joint Chiefs of Staff

Tribal Governments

- Blue Lake Rancheria
- Coastal Band of Chumash Nation
- Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- Confederated Tribes of Grand Ronde
- Confederated Tribes of Siletz Indians
- Confederated Tribes of Umatilla Indian Reservation
- Coquille Tribe
- Elk Valley Rancheria
- Hoh Tribe
- Kashia Band of Pomo Indians
- Makah Tribe
- Ohlone Costanoan-Esselen Nation
- Quileute Tribe
- Quinault Indian Nation
- Resighini Rancheria
- Tolowa Dee-ni' Nation
- Trinidad Rancheria
- Shoalwater Bay
- Santa Ynez Band of Chumash Mission Indians of the Santa Ynez Reservation
- Yurok Tribe

West Coast OCEAN ALLIANCE

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West Coast Ocean Alliance

- **Convene Federal, State, and Tribal governments to discuss existing and emerging ocean uses on the U.S. West Coast.**
- **BIL Funding: 2023-2027 (via NOAA)**
- **WCOA Priority Issue: Offshore Wind Planning**
  - Offshore Wind Working Group
  - 2024 Offshore Wind Member Summit (April 2-3 2024 – Sacramento, CA)
  - WCOA Fellowship Program (Three OSW-focused projects)
- **Additional Engagement:**
  - West Coast OSW Transmission Study – Community Values Subgroup
  - Pacific Passive Acoustic Monitoring Network Workshop
  - DOE Grid Deployment Office
  - DOE West Coast Ports Strategy

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West Coast Ocean Alliance

- **Emerging Regional Themes**
  - Value of regional convening to share West Coast updates and lessons
  - More efficient connection of regional science and data efforts & needs
  - Coordination of management authorities and staff to support OSW planning
  - **States**
    - Connect state OSW leads to share & strengthen engagement
    - Identify approaches to adaptive management in OSW planning;
  - **Feds**
    - Leverage Fed interagency coordination w/ state, Tribal, other partners
    - Continue to improve Fed efficiencies to build stronger Fed partnerships
  - **Tribes**
    - Tribal engagement and consultation need to be improved
    - Tribal authorities, processes, and timelines need consideration
    - Engage Tribal co-managers as co-leaders, not stakeholders

Expanded, Just, and Sustainable Deployment Near-term Priorities

ACTIVITY AREA	PRIORITY
Workforce Development	Increase floating OSW curriculum, fellowships, internships, apprenticeships, ambassadors etc. to meet demand and increase opportunities for minority owned businesses etc.
Community engagement and ocean co-use	Advance our understanding of impacts of offshore wind on communities, and how to minimize negative impacts, and maximize positive impacts to communities equitably and justly, including through meaningful participation
	Elevate Tribal involvement and consideration throughout planning processes, and build capacity for tribes through federal resources
	Lead meaningful and diverse engagement and effective communication
	Understand and mitigate negative impacts of offshore wind on commercial, recreational and subsistence fishing
Environmental Research	Improve monitoring technology, data collection, modeling, and collaboration in deepwater environments
	Increase understanding of interactions between FOSW and wildlife, fisheries, and habitat and advance strategies to avoid, minimize and mitigate interactions of concern.
	Develop and deploy new fishery-related survey technologies and approaches to meet long-term regional monitoring requirements
Lease Area Delineation	Support delineation of lease areas through wind energy feasibility studies

Audience Q&A and Comments

- How well do initiatives underway and near-term priorities mesh with our sense of near-term needs?
- What's missing?
- What priorities have changed or shifted over the 18 months since the Shot was announced?

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Provide additional feedback to offshorewindevents@ee.doe.gov

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Thank You

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