U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Offshore Wind Turbine Radar Interference Mitigation (WTRIM) Webinar

#2 of a Series of Technical Interchange Meetings (TIMs)

Patrick Gilman, DOE Wind Energy Technologies Office

May 18, 2020

OSW Turbine Radar Interference Mitigation Webinar Series

Objective

- Building relationships between key industry stakeholders and federal agencies
- Sharing perspectives on potential impacts of wind turbine induced radar interference on critical radar missions and offshore wind development
- Identifying research and development (R&D) needs to address these impacts

Webinar attendees will

- Achieve a better understanding of agency perspectives on potential impacts of offshore wind on radar missions and industry perspectives on offshore wind development
- Hear about government and industry-led wind-radar interference research, including potential impacts of offshore wind on radar missions and technical mitigation options
- Share perspectives on the strengths and weaknesses of the current state of knowledge of potential technical impacts and mitigations
- Help identify research needs for offshore wind-radar mitigation and assist in identifying a pathway forward for future government-industry collaboration
- Network with professionals representing domestic and European offshore wind developers, OEMs, radar vendors, the WTRIM Working Group, and technical radar experts.

Agenda

Monday, May 18, 2020	
11:00 a.m.	Welcome, Meeting Objectives *Speaker: Patrick Gilman | U.S. Department of Energy's Wind Energy Technologies Office (WETO)*
11:10 a.m.	Bureau of Ocean Energy Management: Offshore Wind Project Review and Approval Process in the U.S. *Jim Bennett | Bureau of Ocean Energy Management (BOEM)*
11:25 a.m.	Wind Turbine Radar Interference Mitigation Perspectives: U.S. Offshore Wind Project Review Process and Implementing Mitigation Solutions *Moderator: Patrick Gilman | WETO* *Panelists:* *Jennifer Miller | BOEM* *Steve Sample | Department of Defense, Military Aviation and Installation Assurance Siting Clearinghouse* *George Detweiler | U.S. Coast Guard, Customs and Border Protection* *Tom Vinson | American Wind Energy Association* *Derrick Snowden | National Oceanic and Atmospheric Administration, U.S. Integrated Ocean Observing System*
12:55 p.m.	Closing and Information for Next Webinar *Patrick Gilman | WETO*

Tentative Future Webinar Agenda & Information

June 29, 2020 (Webinar #3)

State of Understanding of U.S. Offshore WTRIM Issues from an Agency Perspective

- *Key radar systems most likely to be impacted*
- *Technical and operational issues regarding each system in an OSW environment*

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TBD, Fall, 2020 (TBD)

Forward Looking Research & Collaboration and Government/Industry Roundtable

Submit Your Input

We are taking feedback and future webinar topic suggestions

Lillie.Ghobrial@ee.doe.gov

BOEM
Bureau of Ocean Energy Management

U.S. Outer Continental Shelf Renewable Energy

James Bennett
Office of Renewable Energy Program Manager

Offshore Wind Turbine Radar Interference Mitigation Webinar Series

May 18, 2020

Outer Continental Shelf (OCS) Energy

OCS Lands Act: "… vital national resource … expeditious and orderly development … environmental safeguards"

Energy Policy Act of 2005: "… energy from sources other than oil and gas …"

Outer Continental Shelf (OCS) Energy

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Energy Policy Act of 2005: "… energy from sources other than oil and gas …"

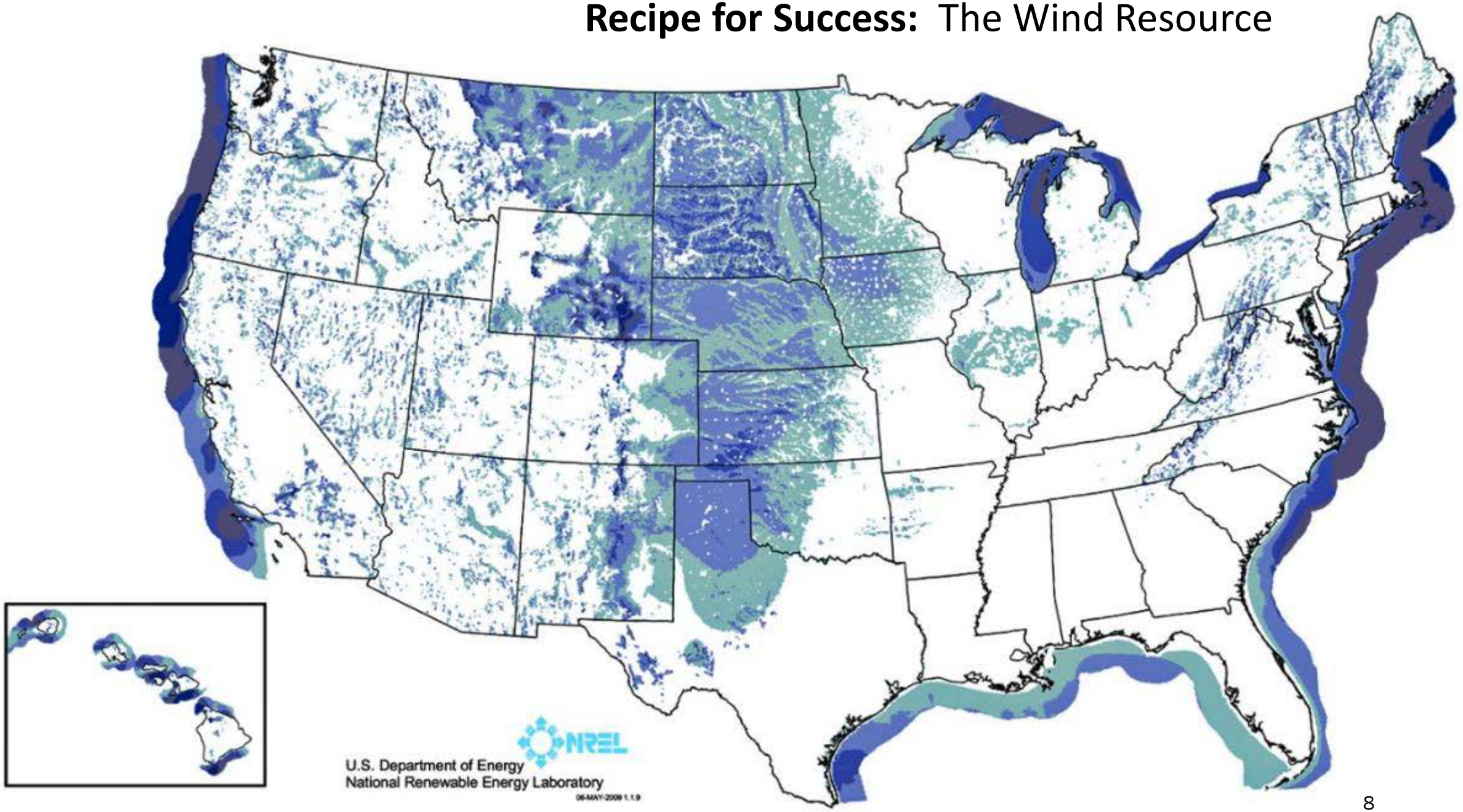
Alaska OCS

Pacific OCS

Gulf of Mexico OCS

Atlantic OCS

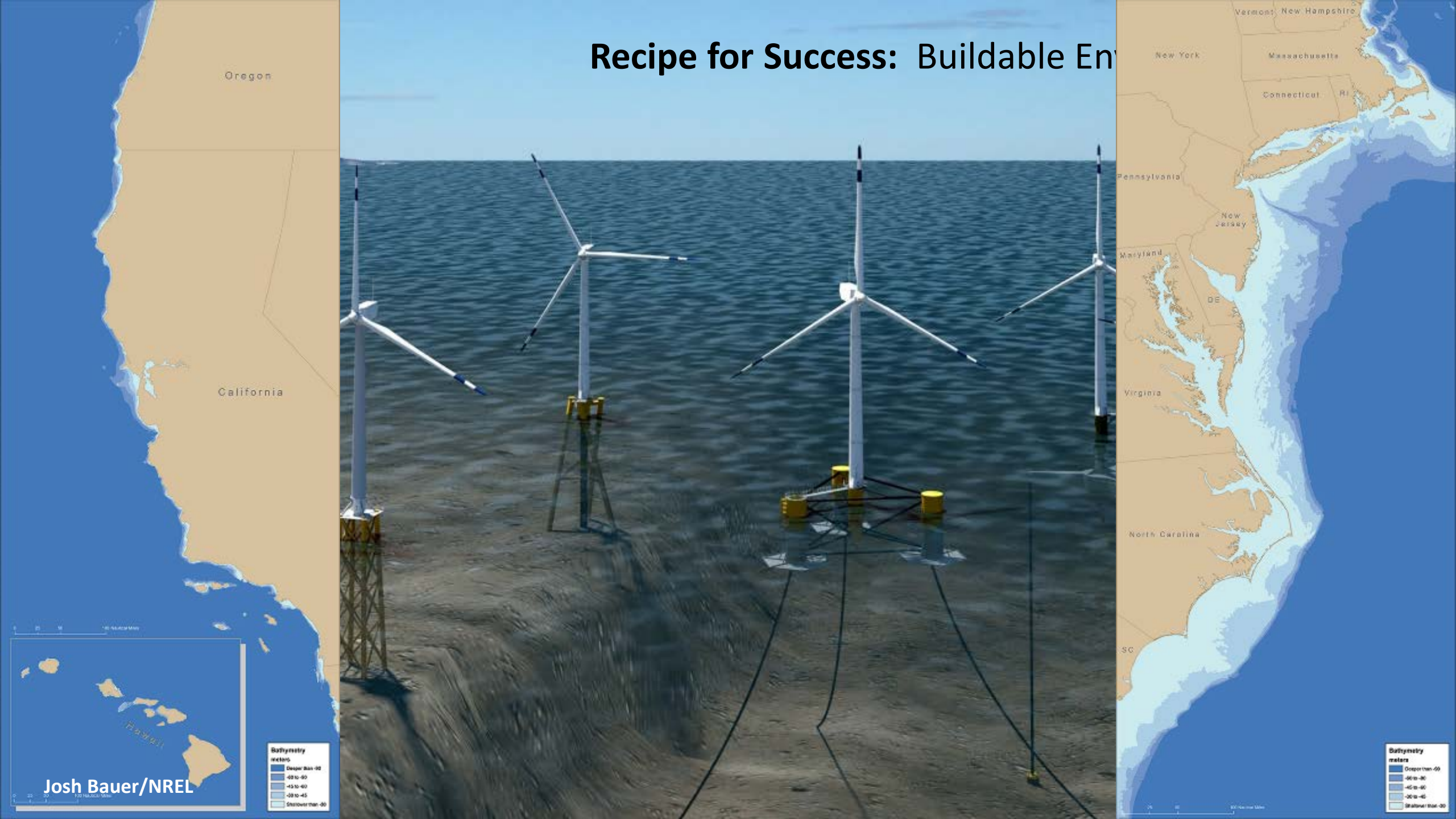
Recipe for Success: The Wind Resource



Recipe for Success: Buildable Environment

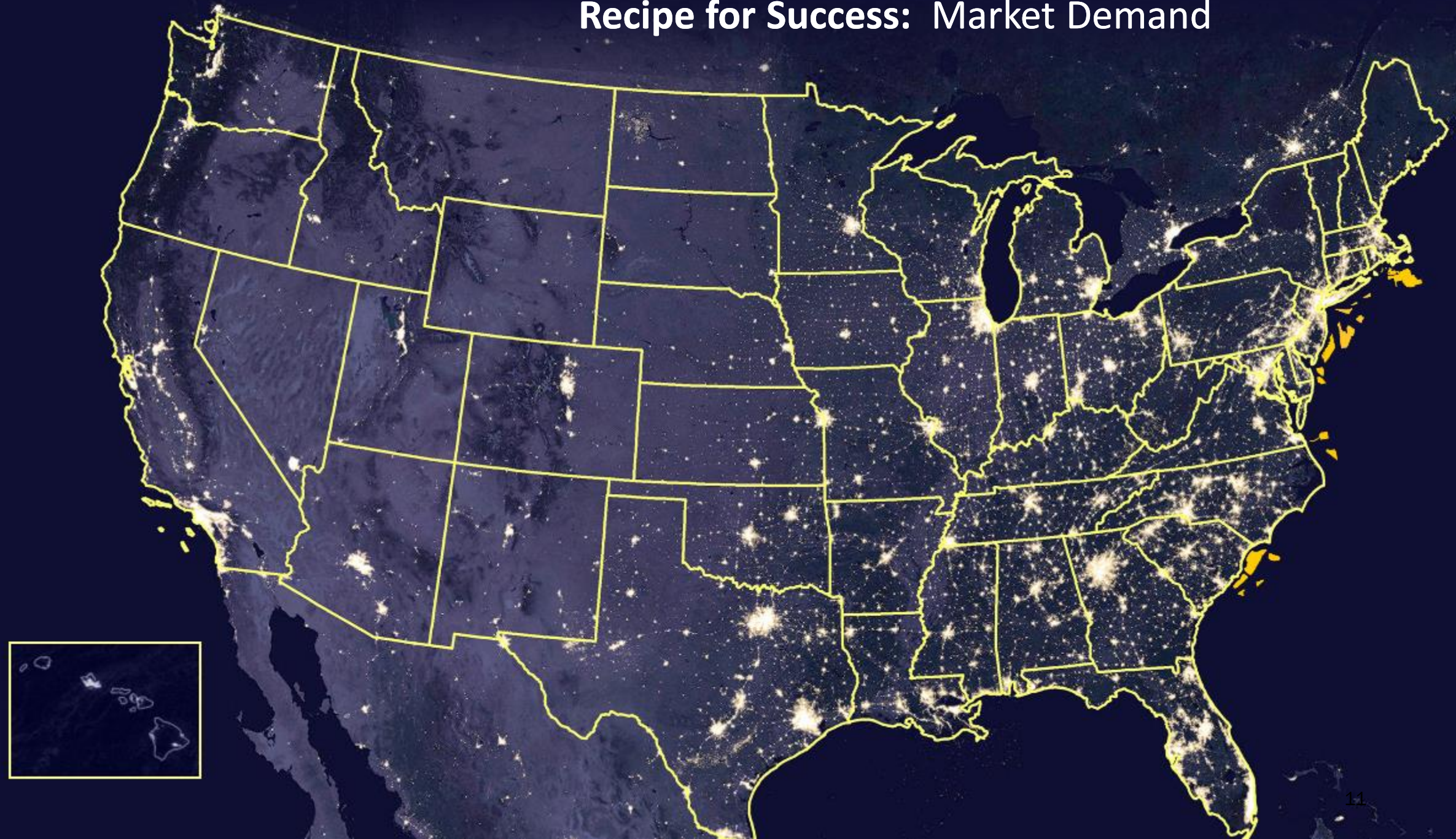
Josh Bauer/NREL

Recipe for Success: Buildable En



Josh Bauer/NREL

Recipe for Success: Market Demand



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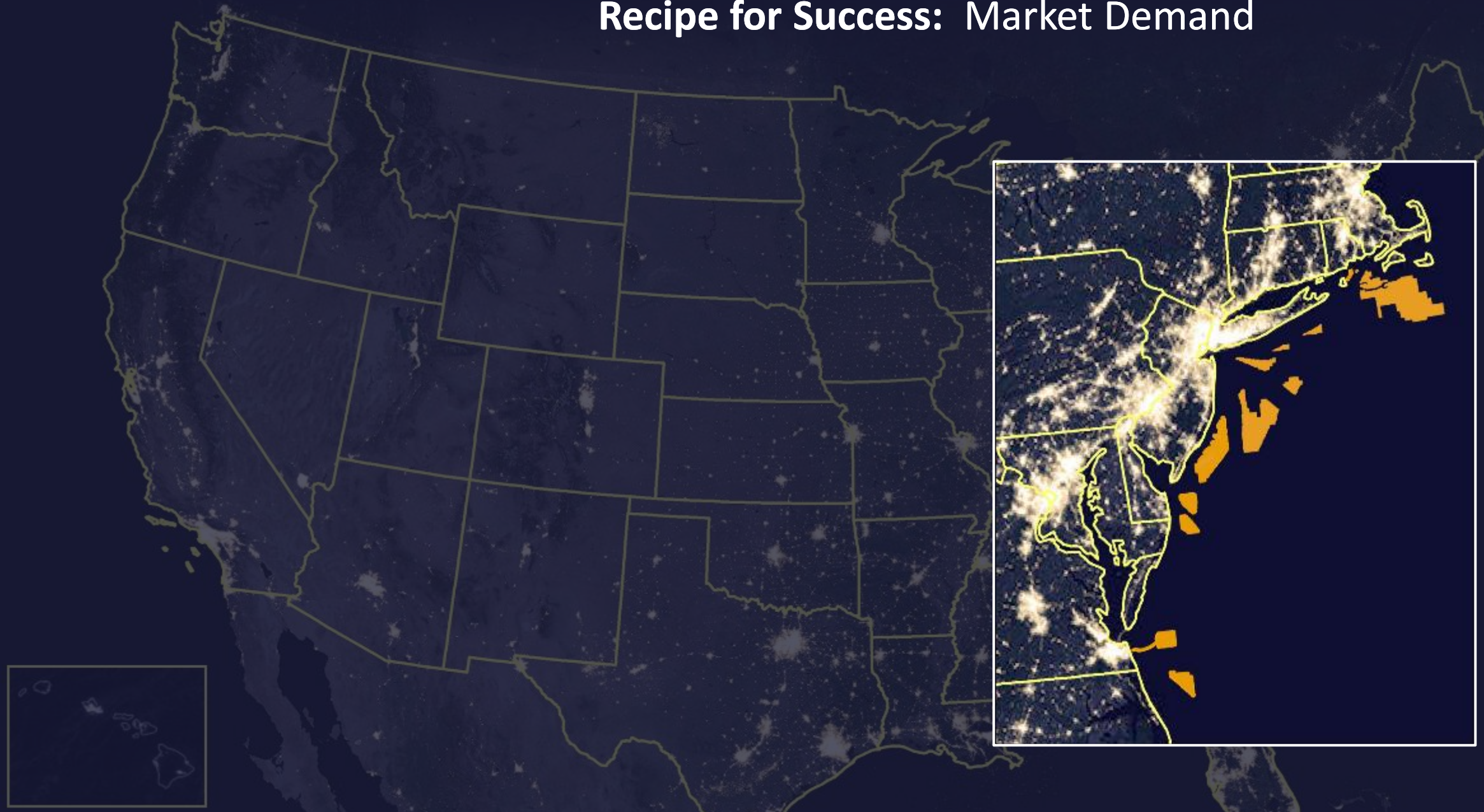


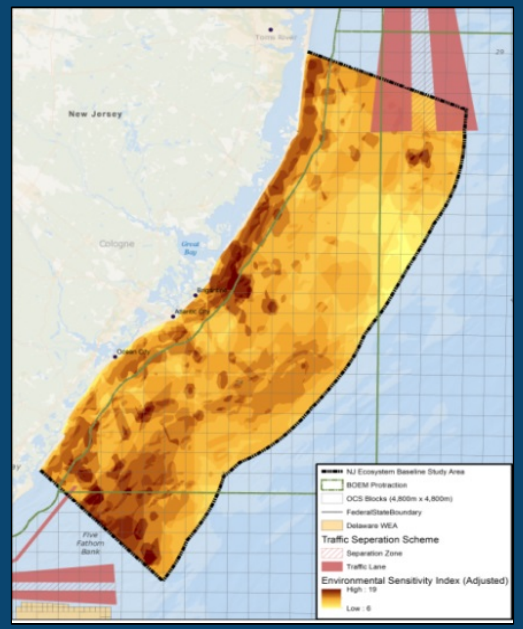
Atlantic OCS Renewable Energy: State Leadership

Atlantic OCS Renewable Energy: State Leadership

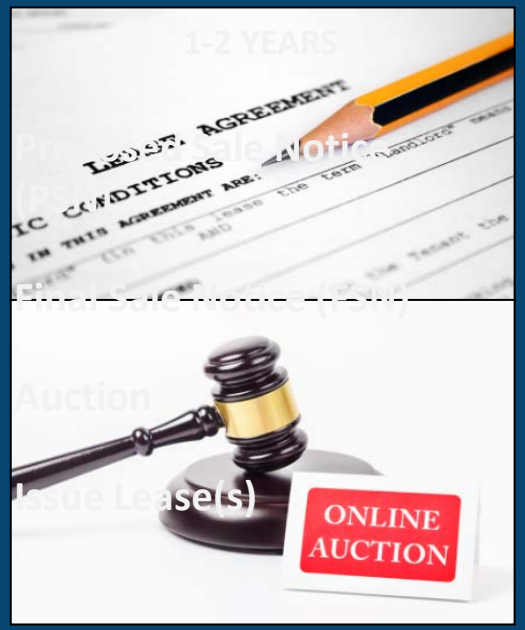
	Renewable Goals	Offshore Wind Goals (MW)	Offshore Wind: "Offtake" Awarded (MW) + Scheduled (MW)
Massachusetts	35% by 2030	3,200	1,600 + 0
Rhode Island	100% by 2030	unspecified	430 + 0
Connecticut	48% by 2030	2,300	1,108 + 0
New York	70% by 2030	9,000	1,826 + 2,500
New Jersey	50% by 2030	7,500	1,100 + 2,400
Maryland	50% by 2030	2,000	368 + 1,200
Virginia	30% by 2030	5,212	12 + 0
TOTAL	--	**28,612** MW	**12,544** MW

OCS Renewable Energy Authorization Process

Planning & Analysis



Leasing



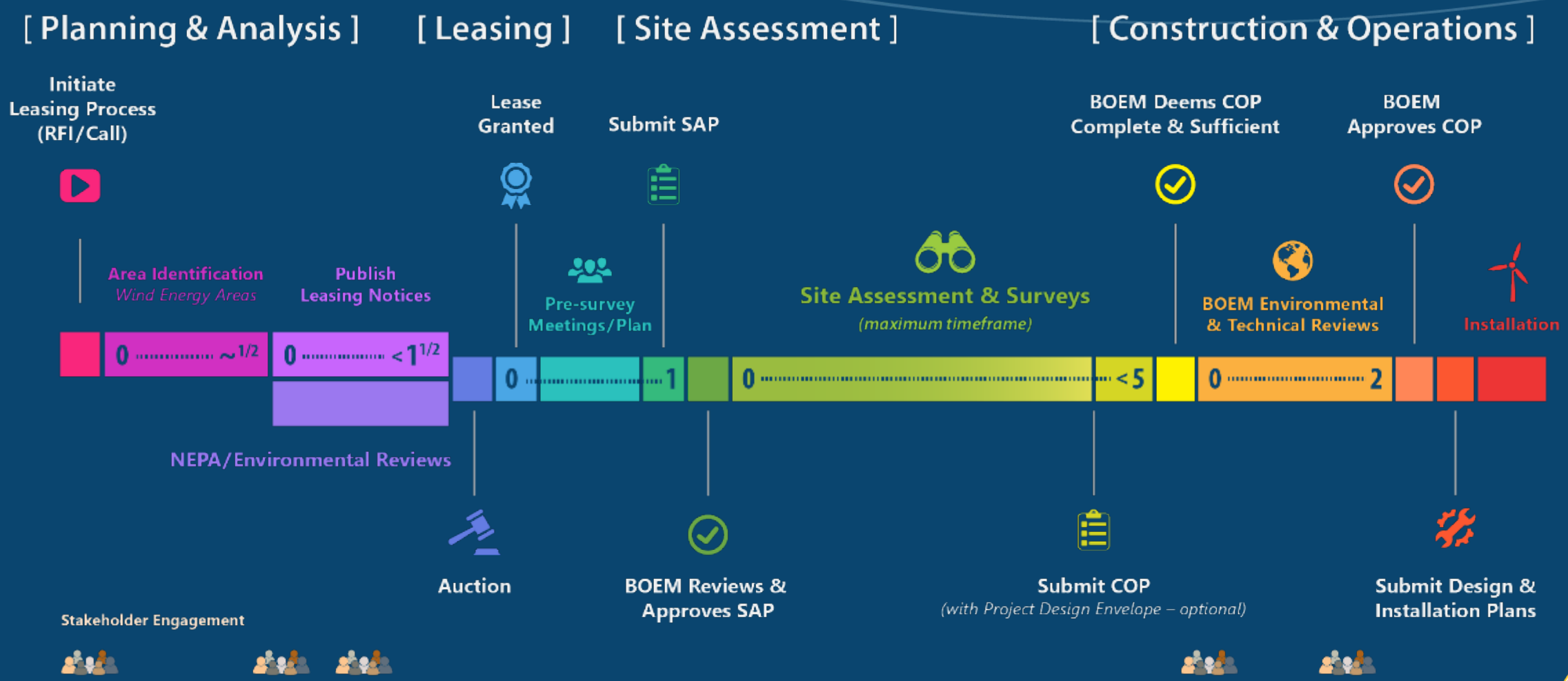
Site Assessment

Construction & Operations

OCS Renewable Energy Authorization Process

Planning & Analysis	Leasing	Site Assessment	Construction & Operations
2 YEARS	1-2 YEARS	5 YEARS	2 YEARS (+25)
Intergovernmental Task Force	Proposed Sale Notice (PSN)	Site Characterization	Construction & Operations Plan (COP)
Call for Information & Nominations (Call)	Final Sale Notice (FSN)	*(i.e. Geophysical & Geological Surveys, Biological Surveys, etc.)*	Facility Design Report (FDR)
Area Identification	Auction	Site Assessment Plan (SAP)	Fabrication and Installation Report (FIR)
Environmental Reviews	Issue Lease(s)	*(i.e. Meteorological buoy or tower)*	Decommissioning

OCS Renewable Energy Authorization Process Timeline



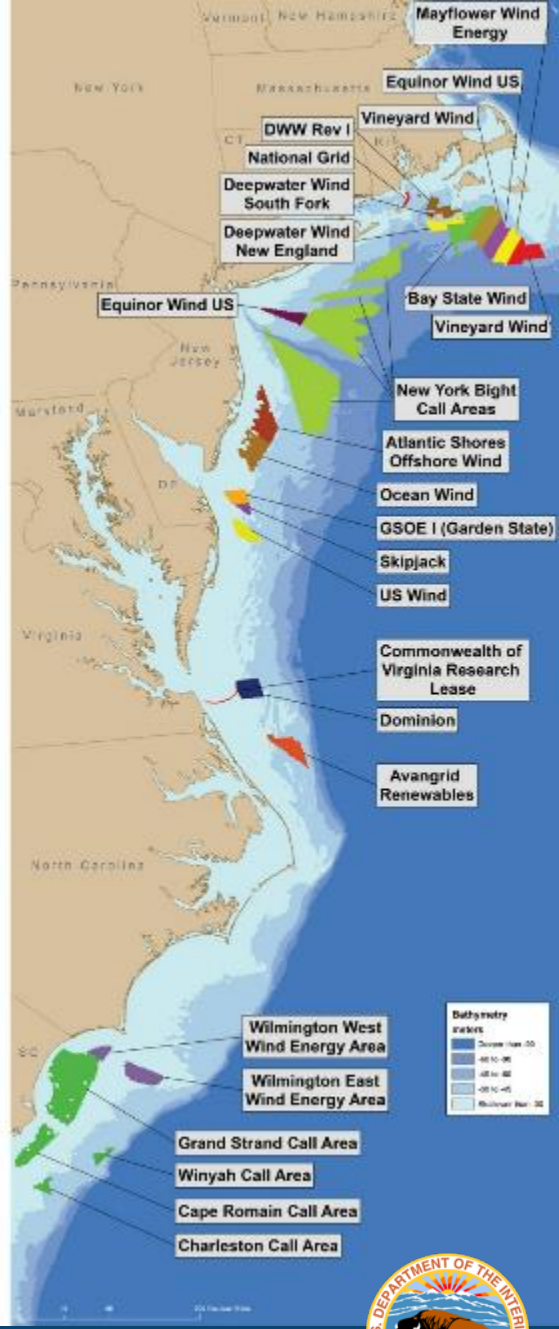
Atlantic OCS Renewable Energy: "Projects in the Pipeline"

	Project	Company
2020	Coastal Virginia Offshore Wind Pilot	Dominion Energy, DMME, Ørsted
	South Fork	Deepwater Wind
	Vineyard Wind I	Vineyard Wind
	Revolution Wind	Deepwater Wind
	Skipjack Windfarm	Ørsted, Deepwater Wind
	Empire Wind	equinor
	Bay State Wind	Bay State Wind
	U.S. Wind	US Wind
	Sunrise Wind	Ørsted, Eversource
	Ocean Wind	Ørsted
	Coastal Virginia Offshore Wind Commercial	Dominion Energy
	Park City Wind	Park City Wind
	Mayflower Wind	Mayflower Wind
	Atlantic Shores	Atlantic Shores offshore wind
	Kitty Hawk	Avangrid
2030	OCS-A 0522	Vineyard Wind

BOEM Bureau of Ocean Energy Management

Renewable Energy Program by the Numbers

Competitive Lease Sales Completed:	8
Active Offshore Leases Issued:	16
Site Assessment Plans (SAPs) Approved:	8
General Activities Plans Approved:	1
Construction and Operations Plans (COPs):	
• Under Review	7
• Anticipated in Coming Year	3 - 5
Guidance:	10
Leasing Under Consideration:	5
Steel in the Water:	2020

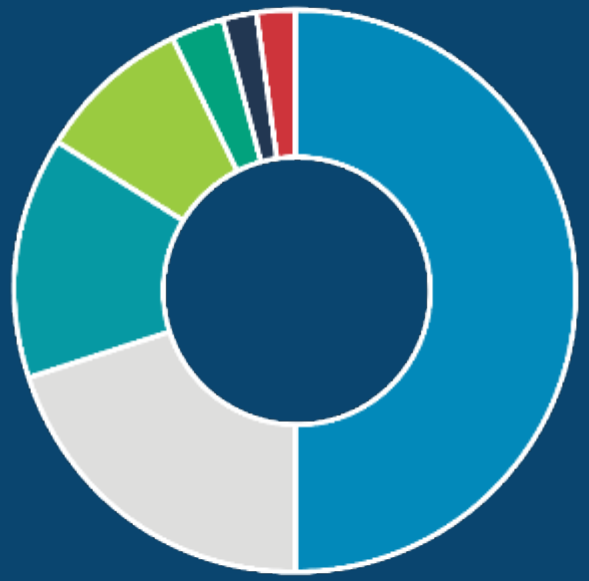


Issues & Opportunities

- Employment
- Industrial Synergies
- Technology
- Commercial and Recreational Fishing
- Viewshed / Visual impact
- Navigation and Safety
- Wildlife
- Transmission

Environmental Studies

Funds for Renewable Energy Information Needs | FY 2011-18 Cumulative (~$47M)



- Habitat & Ecology **(50%)**
- Marine Mammals & Protected Species **(20%)**
- Fates & Effects **(14%)**
- Information Management **(9%)**
- Physical Oceanography **(3%)**
- Social Science & Economics **(2%)**
- Air Quality **(2%)**

Includes obligations for all regions supporting environmental information needs for renewable energy, totaling $47.3 million

BOEM Radar Studies

BOEM Atlantic Lease Areas Interference and Mitigation Study:

- BOEM Lease Areas within Radar Line of Sight (LOS)
- Mitigations: Infill/Curtailment
- Developer/Radar Operator Coordination
- Ducting

WIND FARM	NUMBER OF RADAR SYSTEMS WITHIN LOS				
	ARSR-4	ASR-8/9	NEXRAD	SeaSonde	Totals
Skipjack	0	1	1	5	7
South Fork	0	1	0	8	9
Grand Strand	0	0	0	2	2
Mayflower	0	2	0	6	8
Vineyard Wind	0	2	0	6	8
Bay State Wind	0	3	0	7	10
Ocean Wind	1	1	0	9	11
Empire Wind	1	2	2	8	13
RI/MA Cumulative	0	3	0	10	13
TOTAL AFFECTED*	2	6	3	25	36

*Total radars affected per radar type may not equal the sum of each column because a single radar can be within LOS of multiple wind farms

High Frequency Coastal Radar:

Impact Assessment and Mitigation of Offshore Wind Turbines on High Frequency Coastal Oceanographic Radar *(Phase 1: mitigation possible, 2018; Phase 2: developing an algorithm, ongoing)*

BOEM

Bureau of Ocean Energy Management

U.S. Department of the Interior

BOEM.gov

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Panel Session: Wind Turbine Radar Interference Mitigation Perspectives: U.S. Offshore Wind Project Review Process and Implementing Solutions

Patrick Gilman
DOE Wind Energy Technologies Office

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Department of Defense, Military Aviation and Installation Assurance Siting Clearinghouse

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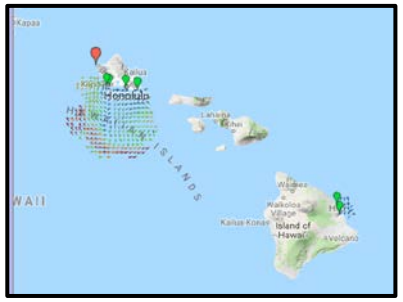
Introduction to DoD Siting Clearinghouse (SCH) & Functions

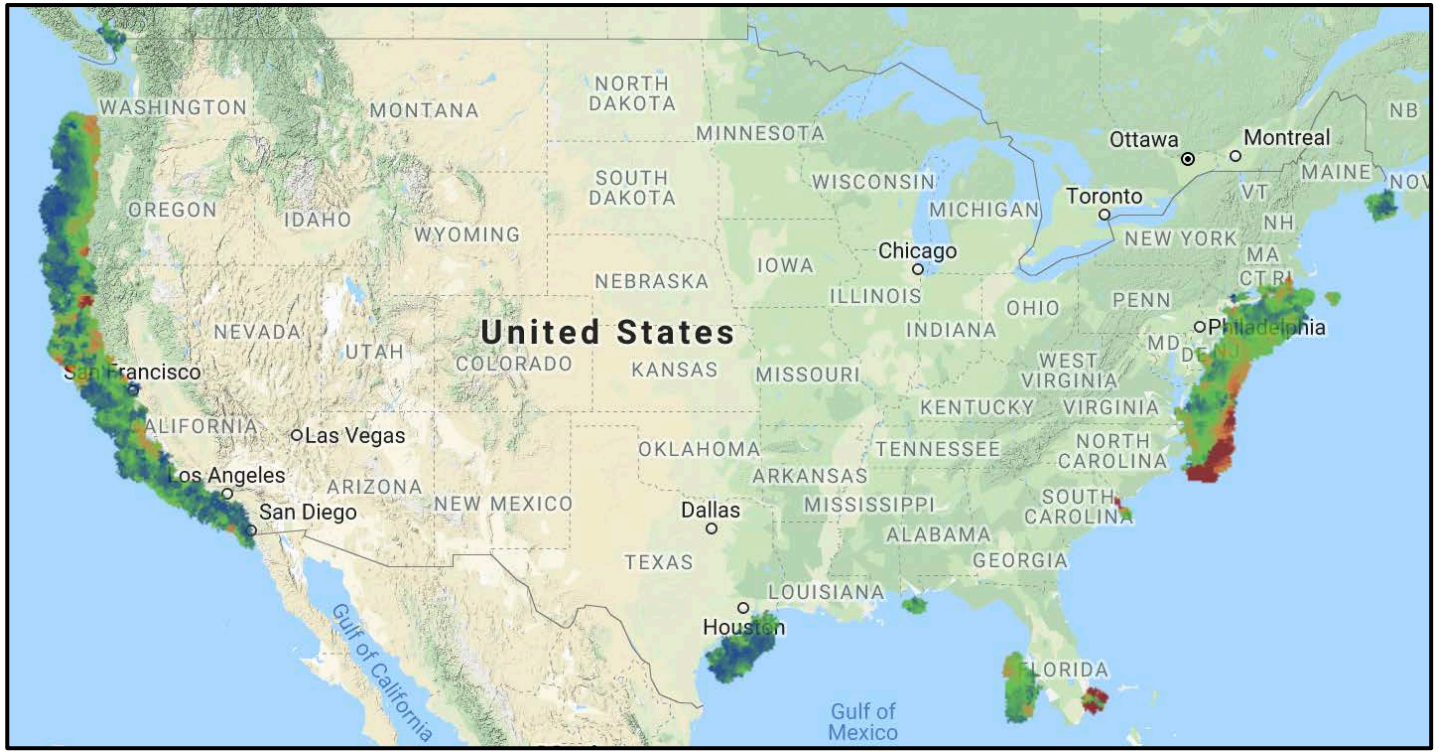
Established in 2011 by NDAA Section 358

- ***A Single DoD Voice***
  - *Parallel multi-service review of energy projects*
  - *Timely, repeatable, predictable process*
  - *Support renewable energy where compatible with military missions*
  - *Oversight and coordination of mitigation negotiation*
  - *Decisions based on empirical data and rigorous science*
  - *Outreach and early consultation with industry, local, state, and Federal stakeholders*

- ***Functions***
  - *Mission Compatibility Evaluation Process*
    - *Formal & Informal Reviews*
  - *Notice of Presumed Risk and identification of mitigation options*
  - *Finding of Unacceptable Risk*
    - *Limited authority to object to projects*
  - *Ability to accept voluntary developer contributions for mitigation*
  - *Mitigate adverse impacts on acquisitions of new systems*
  - *Conduct early outreach to energy developers*
  - *Identify geographic areas of concern and request public comment*
  - *Support Research and Development projects to mitigate impacts to military operations and readiness.*

National HF Radar Network





IOOS | EYES ON THE OCEAN

U.S. Coast Guard and DASA: Offshore Wind Turbine Equities

- **US COAST GUARD**
  - Protection of all mariners, property (wind farms), environment
  - Promote/maintain the marine transportation system (MTS) and ensure safe/efficient navigation routes to/from us major ports
  - Coop agency w/ BOEM for NEPA purposes: Provide recommendations:
    - On safety of navigation for the maritime community,
    - The traditional uses of the particular waterway (MTS),
    - Other Coast Guard missions (SAR, MEP, Security)
  - Structures impact radars by producing radar reflections, blind spots, shadow areas
- **DOMAIN AWARENESS STANDARDS & ANALYSIS (DASA)**
  - Formerly Long Range Radar Joint Program Office (LRR JPO)
    - Performs evaluations and vetting of wind turbine applications, ensuring the protection of DHS's air domain awareness equities
    - Persistent wide area surveillance down to 100' ft. AGL
  - CBP-USCG collaborate on impacts to maritime domain awareness
  - CBP Is expanding persistent maritime wide area surveillance capabilities
    - Great Lakes, GOM, Caribbean, East & West coasts

Panel Q & A

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DOE Wind Energy Technologies Office

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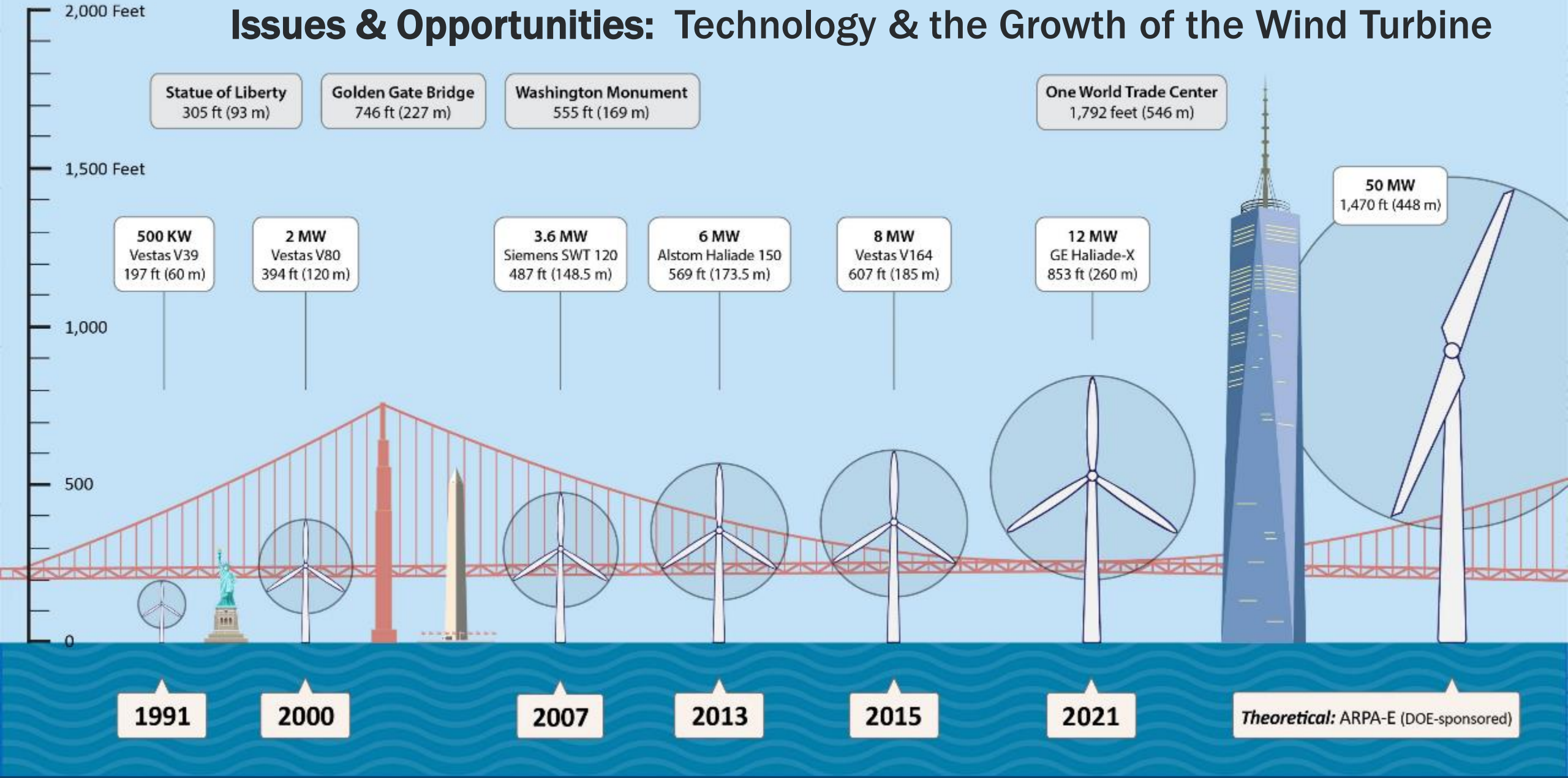
Questions or Comments?

Send additional questions to: Lillie.Ghobrial@ee.doe.gov

Backup Slides

Issues & Opportunities: Technology & the Growth of the Wind Turbine



Offshore Wind Technologies Market Report: Summary

- The U.S. offshore wind energy project development and operational pipeline grew to an estimated potential generating capacity of 25,824 megawatts (MW), with 21,225 MW under exclusive site control
- Four U.S. regions experienced significant development and regulatory activities
- State-level policy commitments accelerated, driving increased market interest
- Increased U.S. market interest spurred strong competition at offshore wind lease auctions
- Several U.S. projects advanced in the development process
- Industry forecasts suggest U.S. offshore wind capacity could grow to 11–16 gigawatts by 2030
- Offshore wind interest accelerated in California
- New national R&D consortium aims to spur innovation
- Global offshore wind annual generating capacity installed in 2018 set a new record of 5,652 MW
- Industry is seeking cost reductions through larger turbines with rated capacities of 10 MW and beyond
- Floating offshore wind pilot projects are advancing
- *2018 Offshore Wind Technologies Market Report*.

LCOE forecasts for offshore wind indicate fixed bottom wind may be near $50/MWh and floating wind may be as low as $60 MWh by 2032 (COD)

Additional Resources

2018 Wind Market Reports

- 2018 Offshore Wind Market Report
- 2018 Wind Technologies Market Report

WINDExchange Wind Turbine Radar Interference

- Wind Turbine Radar Interference Mitigation Fact Sheet
- All public OSW-Radar Summaries
- Federal Interagency Wind Turbine Radar Interference Mitigation Strategy

American Wind Energy Association

Bureau of Ocean Energy Management Renewable Energy Fact Sheet