

# ***The Emerging Offshore Wind Industry***

## *Briefing for Fairhaven Economic Development Committee*

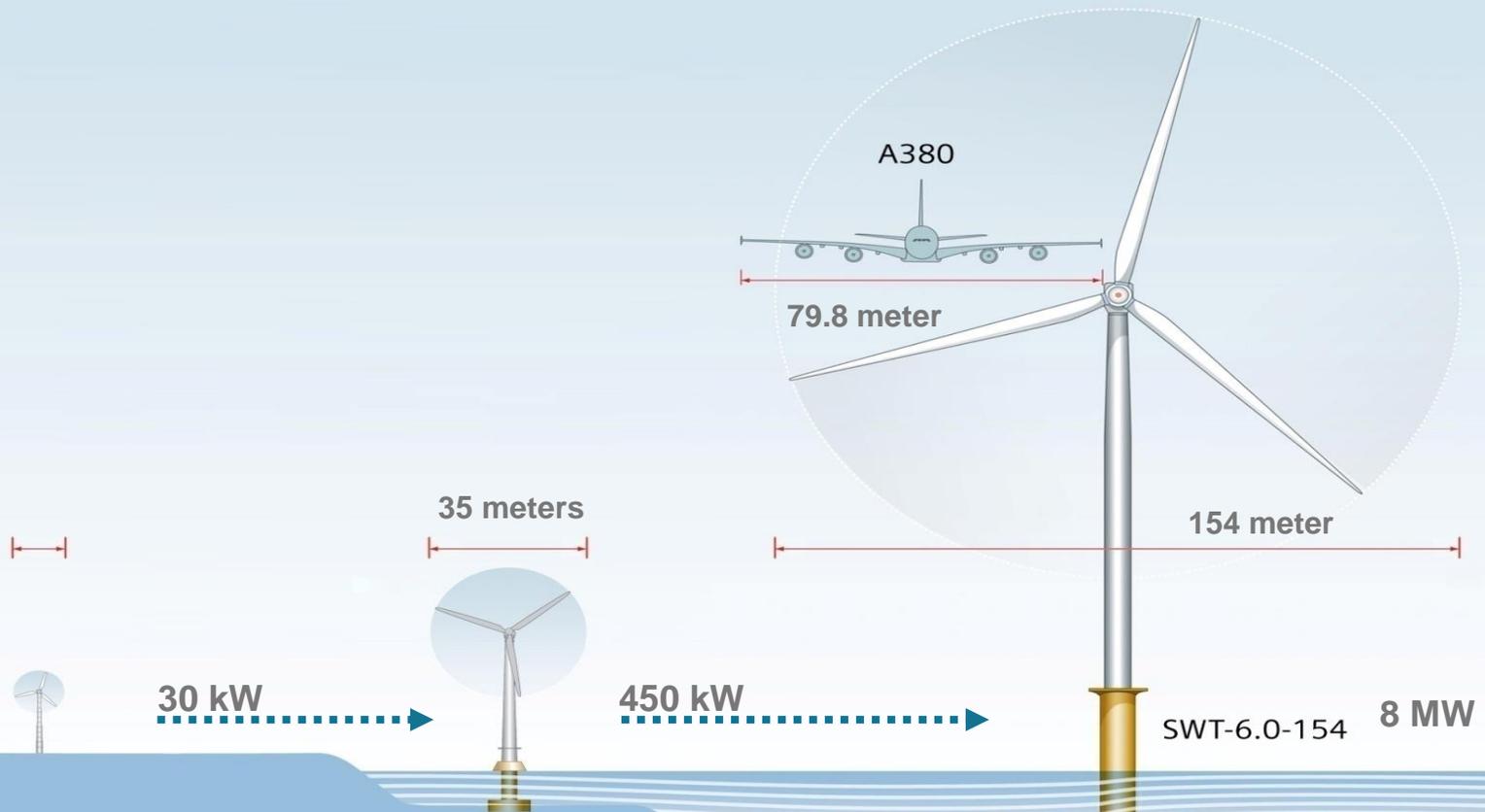
*Fairhaven, Massachusetts  
June 20, 2019*



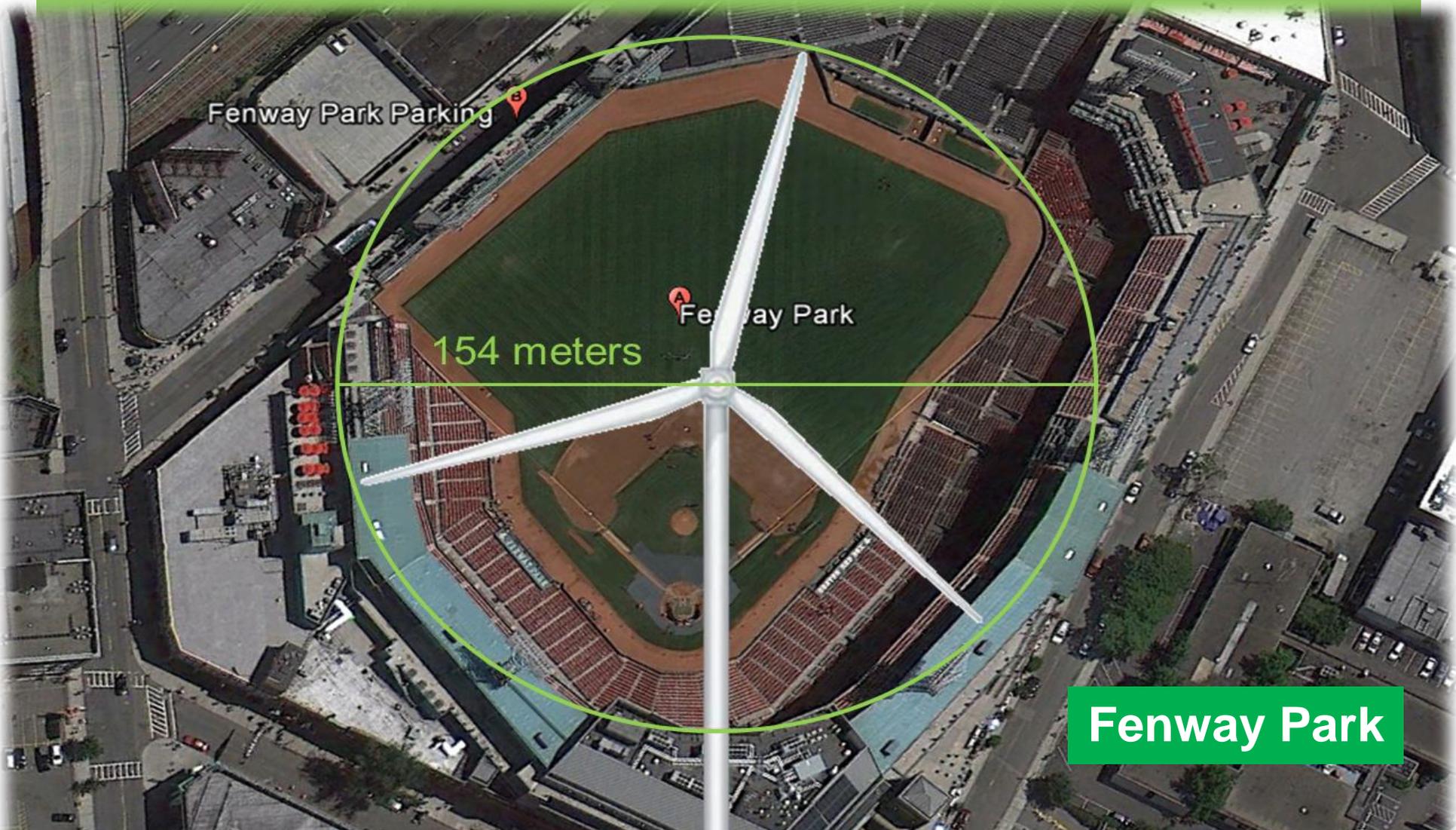
# Key Facts about EU Offshore Wind

- \* 1991 - first offshore wind park: Vindeby, Denmark; (11) 450kW turbines
- \* Currently 12.6GW of offshore wind operating in Europe creating 84,000 jobs; ~ 3,700 towers producing power
- \* Enough to power 13 million homes
- \* 81 offshore wind farms in 10 European countries
- \* OSW now 13% of the annual EU wind energy market
- \* By 2020, this number is expected to reach 24.6 GW

# Technology Development From 30 kW to 8 MW in 30 years



# How big is that?



Fenway Park Parking

Fenway Park

154 meters

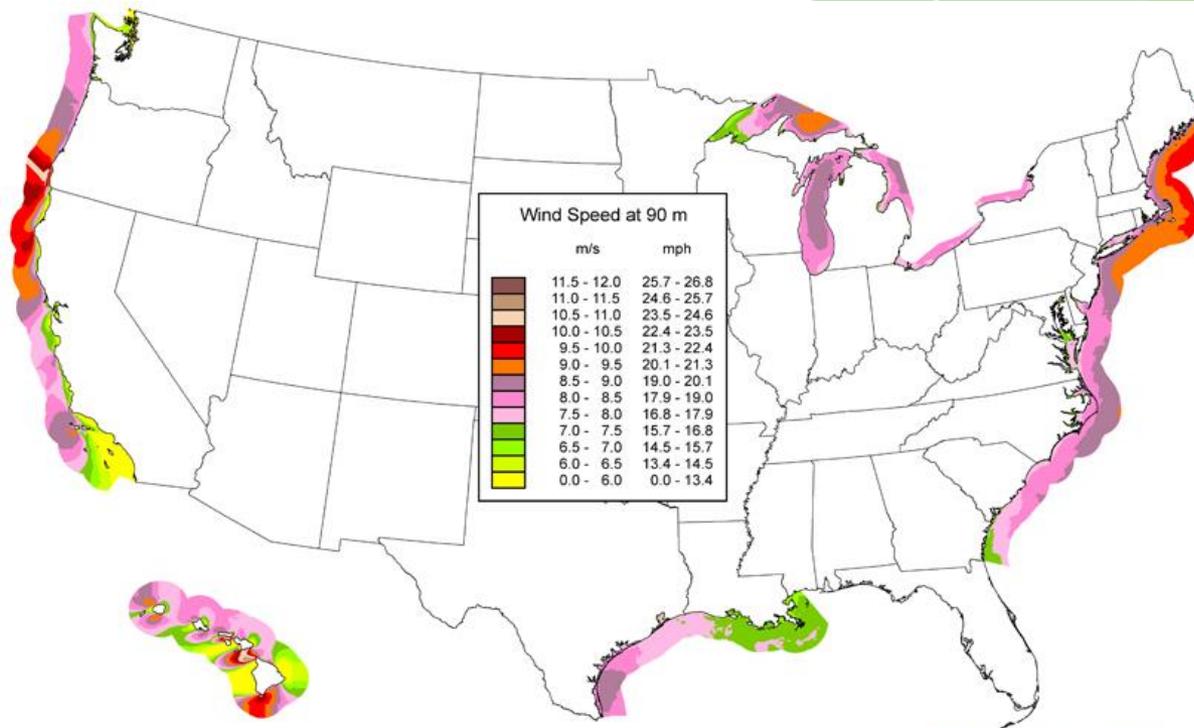
Fenway Park

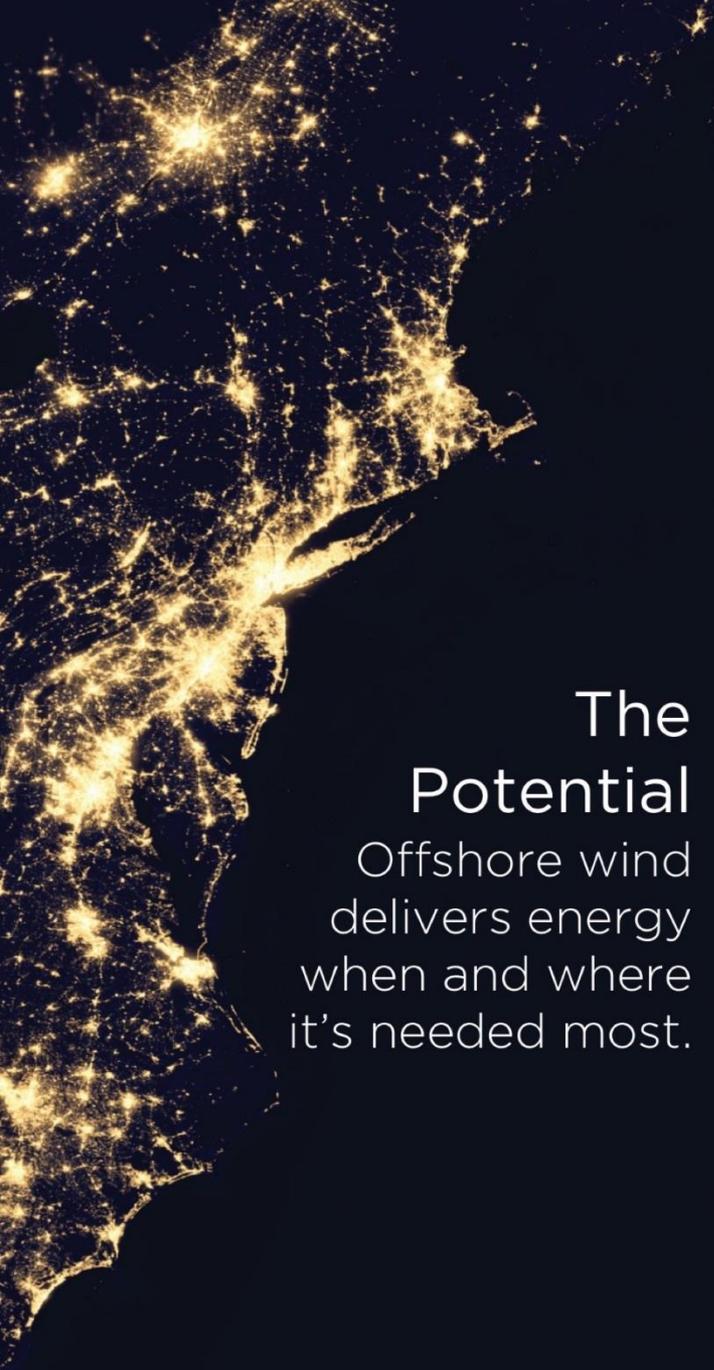




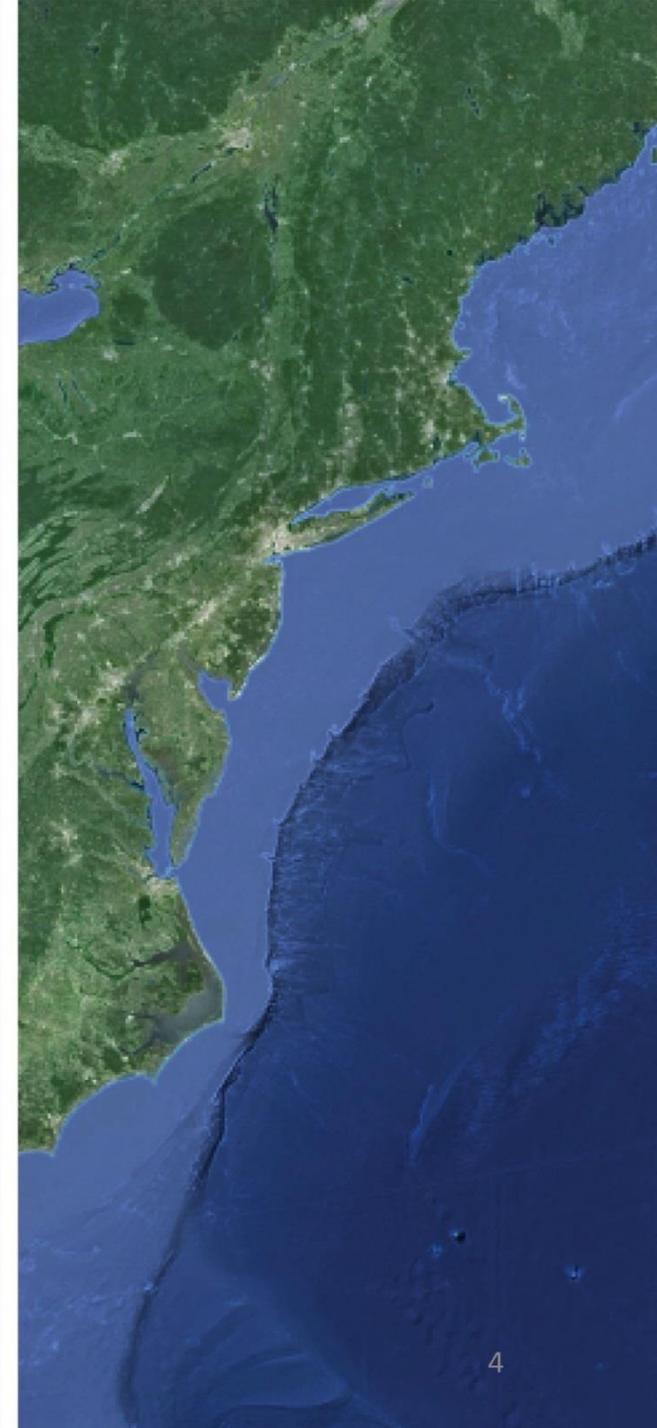
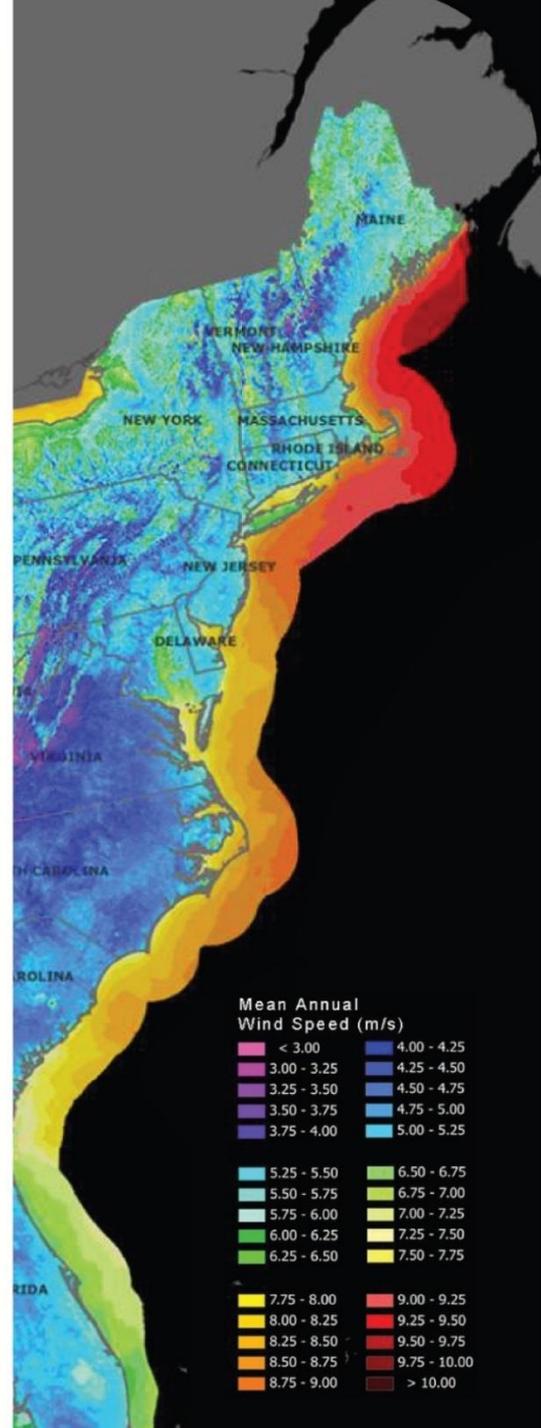


# US Offshore Wind Resources





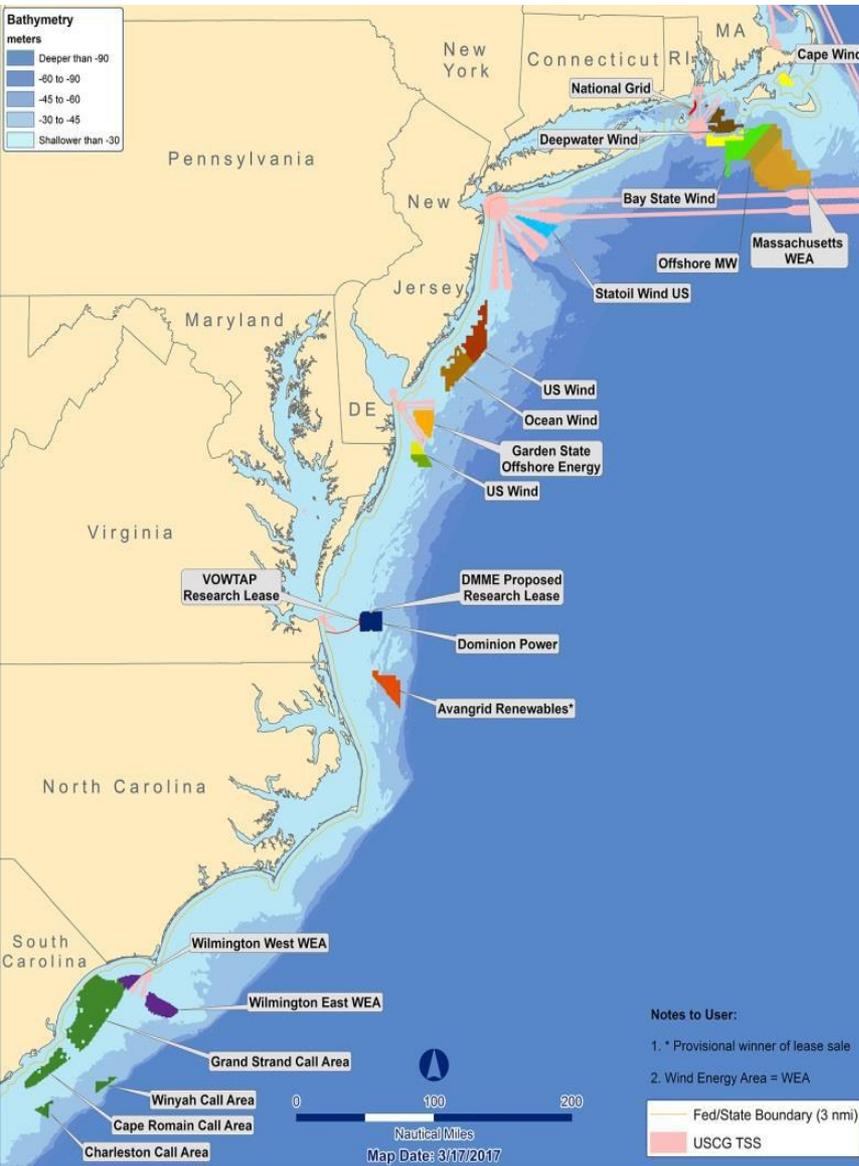
The  
Potential  
Offshore wind  
delivers energy  
when and where  
it's needed most.



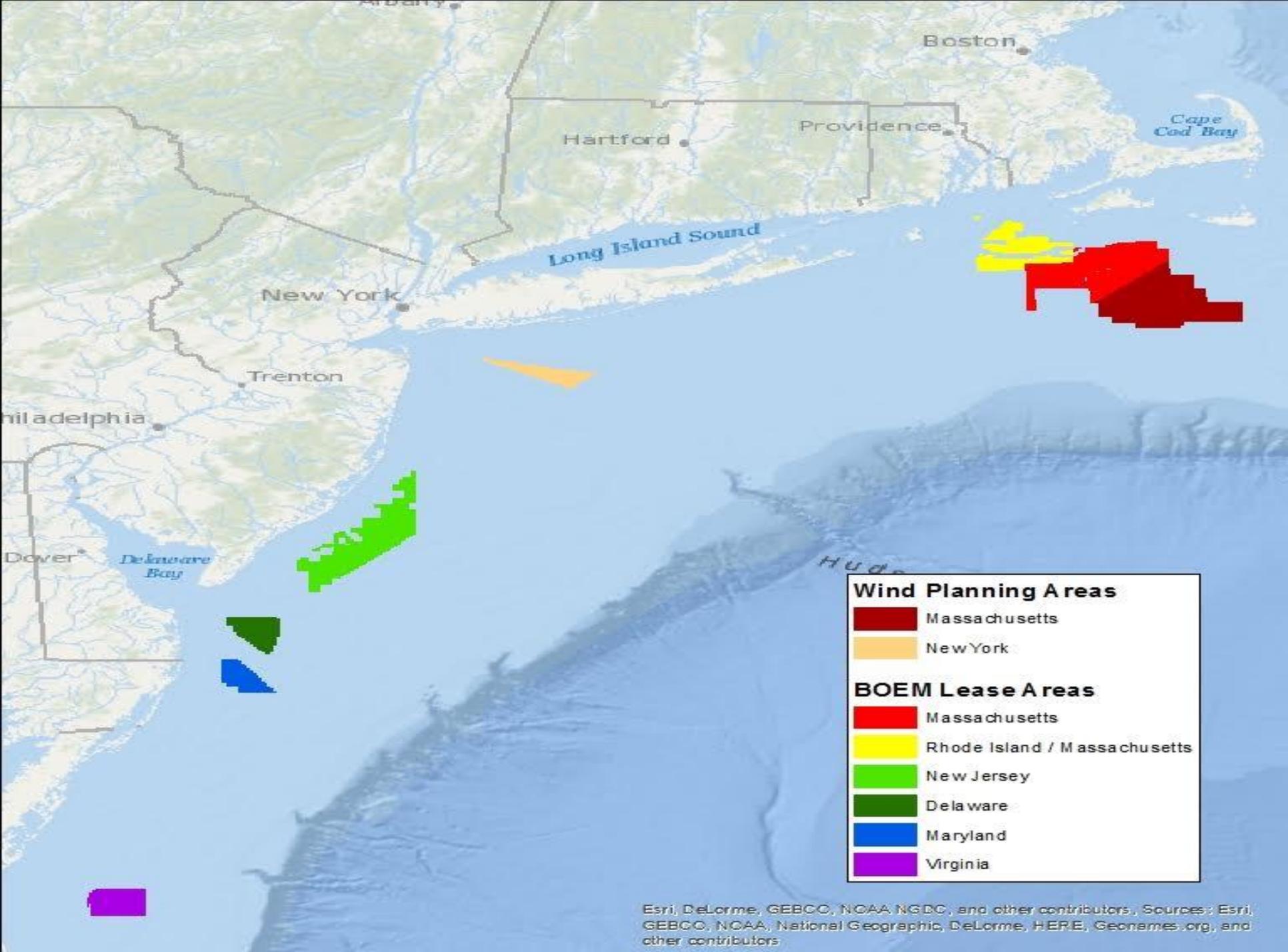
# Key Facts about US Offshore Wind

- **Federal BOEM auctions lease rights to OSW developers**
  - ✓ *MAWEA: 2015 auction Top bid ~ \$282K*
  - ✓ *NYWEA: 2016 auction Top bid ~ \$42.5M*
  - ✓ *MAWEA: 2018 auction Top bid ~ \$135M*
- **2016 Mass. Energy Legislation requires Public Utilities to buy 1,600 MW of electricity from OSW**
  - ✓ *Vineyard Wind selected to develop 800MW*
  - ✓ *\$6.5cent “strike price”*
- **43,000 jobs projected for the U.S. offshore wind industry by 2030**

# Atlantic Renewable Energy Leases



- Eight competitive federal lease sales generated over \$473 million in high bids for ~1.7m acres
- More than 15 GW capacity or 5 million homes powered
- 15 active OSW lease areas totaling 19 GW of energy
- OSW energy leases off every state from Cape Cod to Cape Hatteras



**Wind Planning Areas**

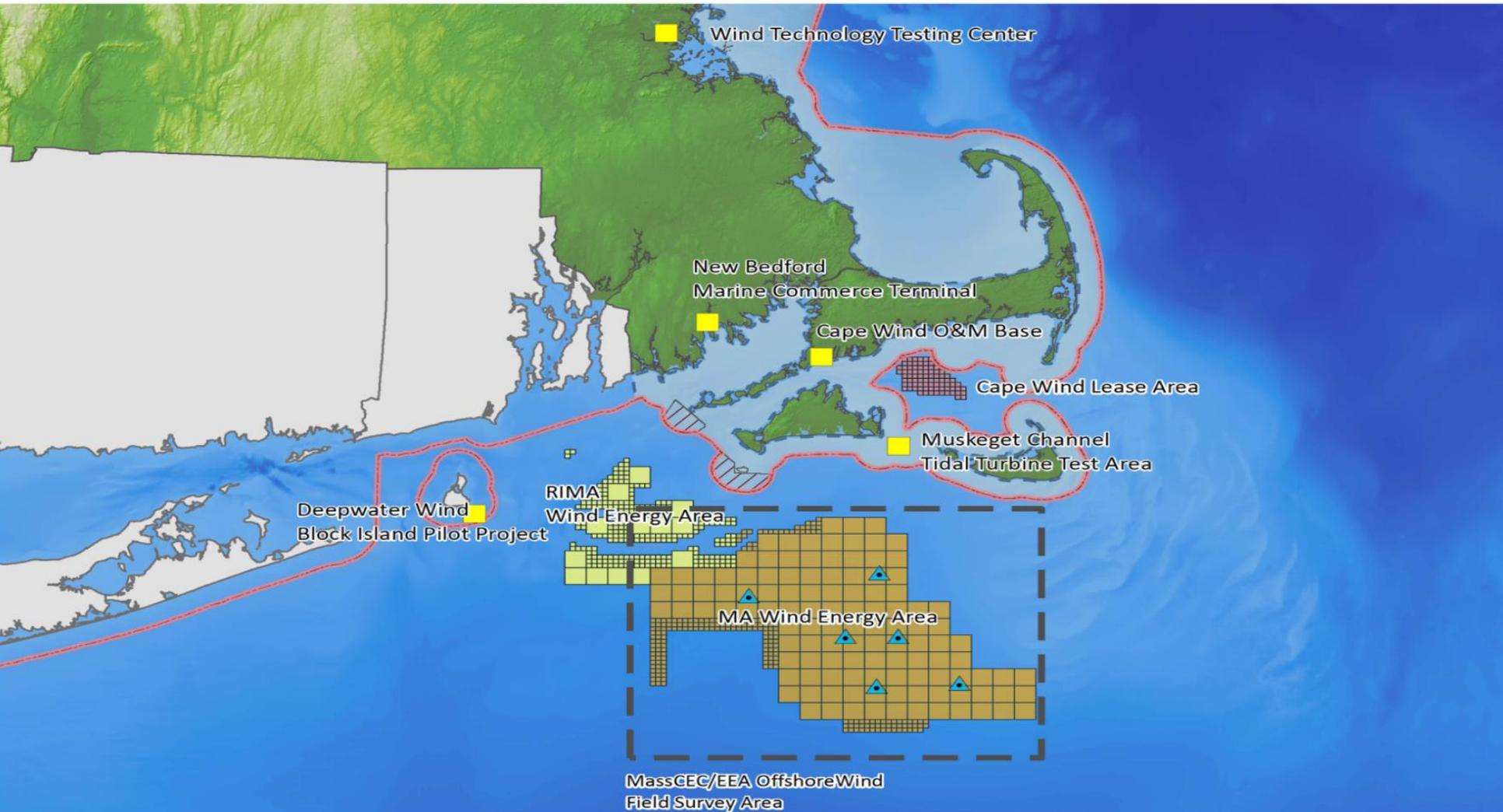
- Massachusetts
- New York

**BOEM Lease Areas**

- Massachusetts
- Rhode Island / Massachusetts
- New Jersey
- Delaware
- Maryland
- Virginia

Esri, DeLorme, GEBCO, NOAA, NGDC, and other contributors, Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

# Massachusetts Wind Energy Area



# Massachusetts Offshore Wind Hub

WIND TECHNOLOGY TESTING CENTER

NEW BEDFORD MARINE COMMERCE TERMINAL

Block Island Wind Farm

- Deepwater Wind North
- Deepwater Wind South
- Bay State Wind
- Vineyard Wind
- Equinor Wind US
- Mayflower Wind Energy
- Vineyard Wind

# MAWEA Offshore Wind Resource

The U.S. Department of Energy estimates the MAWEA could generate more than 10,000 MW (10GW) of clean energy.....

***That's enough to generate 18X the current electricity demand Massachusetts!***

# Massachusetts 83C Solicitation

## Round One -

- DOER issued RFP in 2017 for 400MW-800MW
- Selected Vineyard Wind in December 2017
  - ✓ 6.5 cents/KwH
- Begin construction December 2019
- Foundations in water 2020
- Towers & turbines in water 2021
- Turbines generating electricity 2022

# Massachusetts 83C Solicitation

## Round Two -

- DOER issued RFP on May 23, 2019 for additional 800MW
- Reply date August 9, 2019
- Winner announced November 8, 2019
- PPA in place by January 10, 2020

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# OCCUPATIONAL OUTLOOK HANDBOOK

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## Fastest Growing Occupations

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**Fastest growing occupations:** 20 occupations with the highest percent change of employment between 2014-24.

*Click on an occupation name to see the full occupational profile.*

OCCUPATION	GROWTH RATE, 2014-24	2016 MEDIAN PAY
<a href="#">Wind turbine service technicians</a>	108%	\$52,260 per year
<a href="#">Occupational therapy assistants</a>	43%	
<a href="#">Physical therapist assistants</a>	41%	
<a href="#">Physical therapist aides</a>	39%	
<a href="#">Home health aides</a>	38%	
<a href="#">Commercial divers</a>	37%	

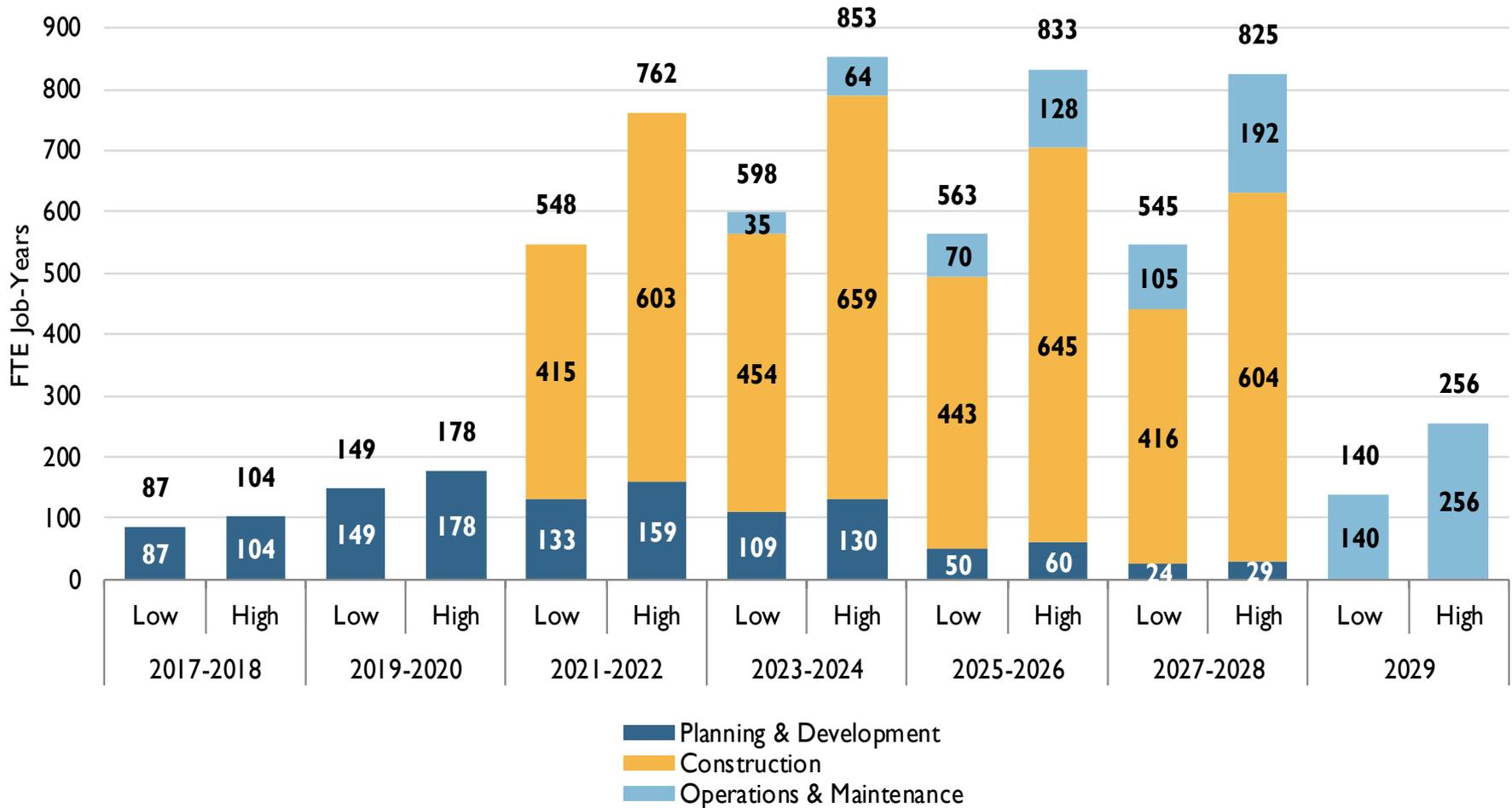


# New Job-Years by Occupation 2017-2030

Occupations	2017-18	2019-20	2021-22	2023-24	2025-26	2027-28	2029-30	Total Job-Years
<b>Planning &amp; Development</b>	94	160	142	116	54	26		592
Engineering	33	33	33	33				132
Surveying and Scientific Monitoring	11	22	22	22	11			88
Finance	11	10						21
Permitting		22	22					44
Legal	6	6						12
PR and Marketing	5	11	5					21
Machine Maintenance and Port Services	11	22						33
Site Managers			26	27	26	26		105
Water Transportation Workers	6	12	12	12	6			48
Other	11	22	22	22	11			88
<b>Construction</b>			520	569	556	522		2167
Project Engineers			18	20	20	18		76
Construction Managers			45	49	49	45		188
Machine Maintenance and Port Services			11	22	11	11		55
Water Transportation Workers			108	110	109	108		435
Trade Workers			323	352	351	325		1351
Longshoremen/Stevedores			45	49	49	45		188
Structural Iron & Steel Workers			90	98	98	91		377
Electricians			60	66	65	61		252
Material Moving Machine Operators			45	49	49	45		188
Other Installation Technicians			30	33	33	30		126
Laborers			53	57	57	53		220
Other			15	16	16	15		62
<b>Operations &amp; Maintenance</b>				47	47	47	47	188
Site/Plant Managers				8	8	8	8	32
Project Engineers				6	6	6	6	24
Water Transportation Workers				6	6	6	6	24
O&M Technicians				24	24	24	24	96
Other				3	3	3	3	12
<b>Total Annual Job-Years</b>	94	160	662	732	657	595	47	2947

# Job-Years 2017–2029

## Low and High Scenarios



# Economic Output in Massachusetts Construction

## Low and High Scenarios

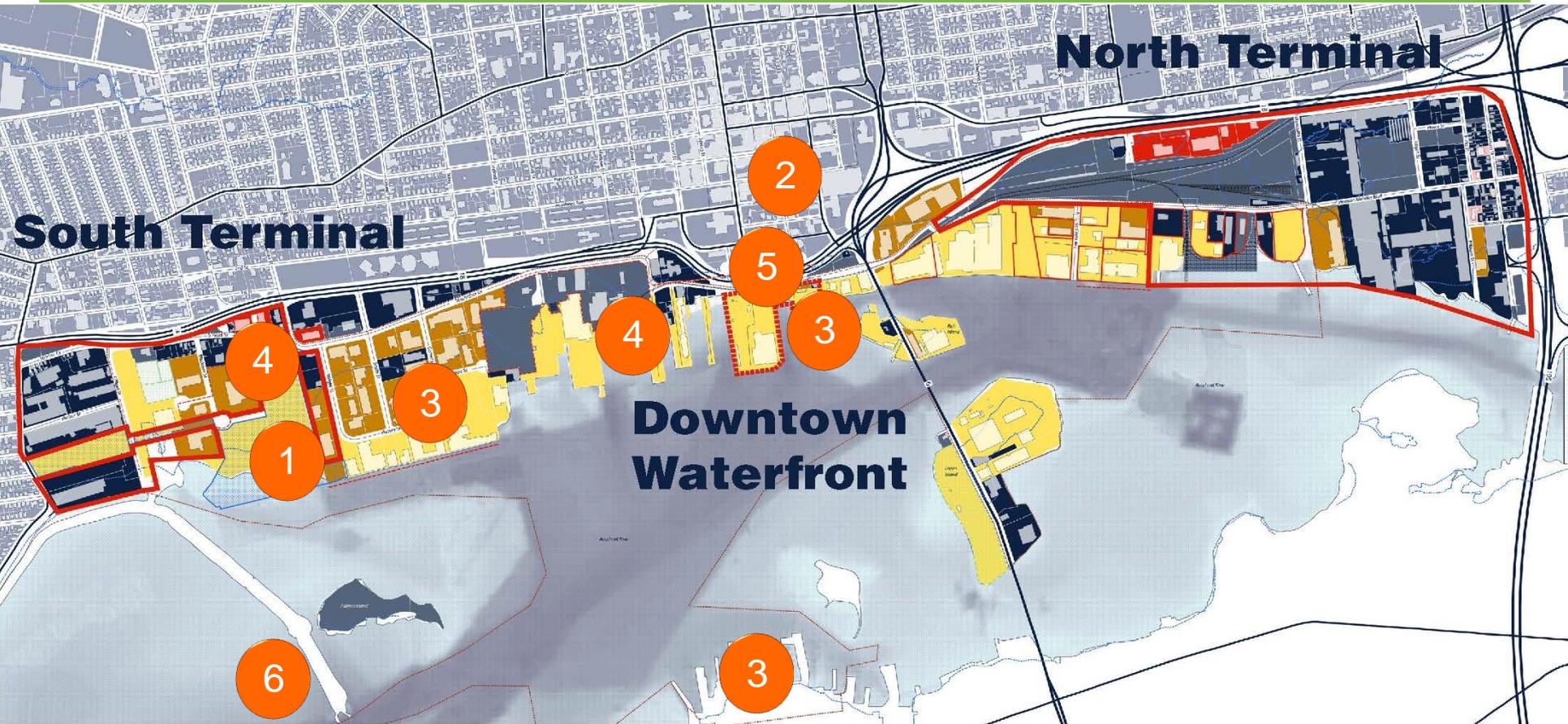
	Project Development & Onsite Labor (Direct) (\$M)	Turbine & Supply Chain (Indirect) (\$M)	Induced (\$M)	Total (\$M)
<b>Project 1</b>	\$161.9 - \$208.3	\$87.1 - \$173.3	\$95.7 - \$129.6	\$344.7 - \$511.2
<b>Project 2</b>	\$170.0 - \$205.5	\$90.2 - \$208.3	\$96.9 - \$133.5	\$357.1 - \$547.3
<b>Project 3</b>	\$172.6 - \$199.4	\$91.1 - \$199.8	\$95.9 - \$127.0	\$359.6 - \$526.2
<b>Project 4</b>	\$174.3 - \$191.9	\$91.6 - \$196.7	\$94.7 - \$121.3	\$360.6 - \$509.9
<b>Total</b>	\$678.8 - \$805.1	\$360.0 - \$778.1	\$383.2 - \$511.4	<b>\$1,422.0 - \$2,094.6</b>

# Annual Economic Output in Massachusetts for O&M

## Low & High Scenarios

	Project Development & Onsite Labor (Direct) (\$M)	Turbine & Supply Chain (Indirect) (\$M)	Induced (\$M)	Total (\$M)
Project 1	\$3.7 - \$6.7	\$41.0 - \$74.6	\$12.1 - \$22.0	\$56.8 - \$103.3
Project 2	\$3.7 - \$6.7	\$36.7 - \$66.2	\$11.0 - \$19.9	\$51.4 - \$92.8
Project 3	\$3.7 - \$6.7	\$33.7 - \$60.8	\$10.2 - \$18.5	\$47.6 - \$86.0
Project 4	\$3.7 - \$6.7	\$31.9 - \$57.8	\$9.8 - \$17.7	\$45.3 - \$82.2
Total	\$14.8 - \$26.8	\$143.3 - \$259.4	\$43.1 - \$78.1	\$201.1 - \$364.3

# Port of New Bedford



1 Marine Commerce Terminal

3 Full Marine Support

5 Access to Supply Chain

2 Research & Workforce Training

4 Sites & Incentives

6 Close to BOEM Wind Areas

# The Marine Commerce Terminal



The state of the art 26-acre facility has a 1,200 foot quayside and a 300-foot wide navigational channel dredged to -30 feet. The site has the ability to sustain uniform loads of 4,100 pounds per square foot and concentrated loads of 20,485 per square foot.

# OSW Career Pathway

- \* **Access** to Certificates or Higher Education degree
- \* **Opportunity** to achieve
  - ✓ *Pre-apprentice Certificate & College Credits*
  - ✓ *HiSET/GED & Wind Power Certificate*
- \* **Technology** to reinforce skills and meet academic standards
- \* **STEM core** focused on Electrical, Mechanical and Hydraulic skills
- \* **Bristol has only OSW associates degree program in US**



# Augmented by Health, Safety and Environmental Training (HSE)

- Aligned with industry standards and best practices for (HSE) Global Wind Organization “Basic Safety Training” certificate
  - ✓ Fire Awareness
  - ✓ First Aid
  - ✓ Manual Handling
  - ✓ Working at Heights
  - ✓ Sea Survival
- In US, other than OSHA requirements (land-side only)... there are currently no HSE regulations, standards, protocols or recommended practices in place for offshore wind



# Offshore Wind Memorandum of Agreement

- \* *BCC, UMD, MMA*
- \* *Other CONNECT partners and Cape Cod Community College*
- \* *Joint student admission and concurrent enrollment*
- \* *Accelerated baccalaureate degrees*
- \* *Coordinate and delineate research, workforce training roles; shared facilities*

# OSW Community Stakeholders Issues

- \* *Ocean stewardship, environmental protection and risk mitigation*
- \* *Impacts and risks of structures on biomass and marine commerce*
- \* *Interface with commercial fishing interests*
- \* *“State’s Rights” and resolving competition*
- \* *Developing port HUBS for OSW*
- \* *Host community impacts and compensation*
- \* *Social justice regarding economic impacts*
- \* *Access to training and jobs*
- \* *Workplace safety*

# Offshore Wind

## *A New Base Industry for U.S.*

*Thank you for your interest.  
Happy to answer any questions  
you may have.*