# Floating Offshore Wind

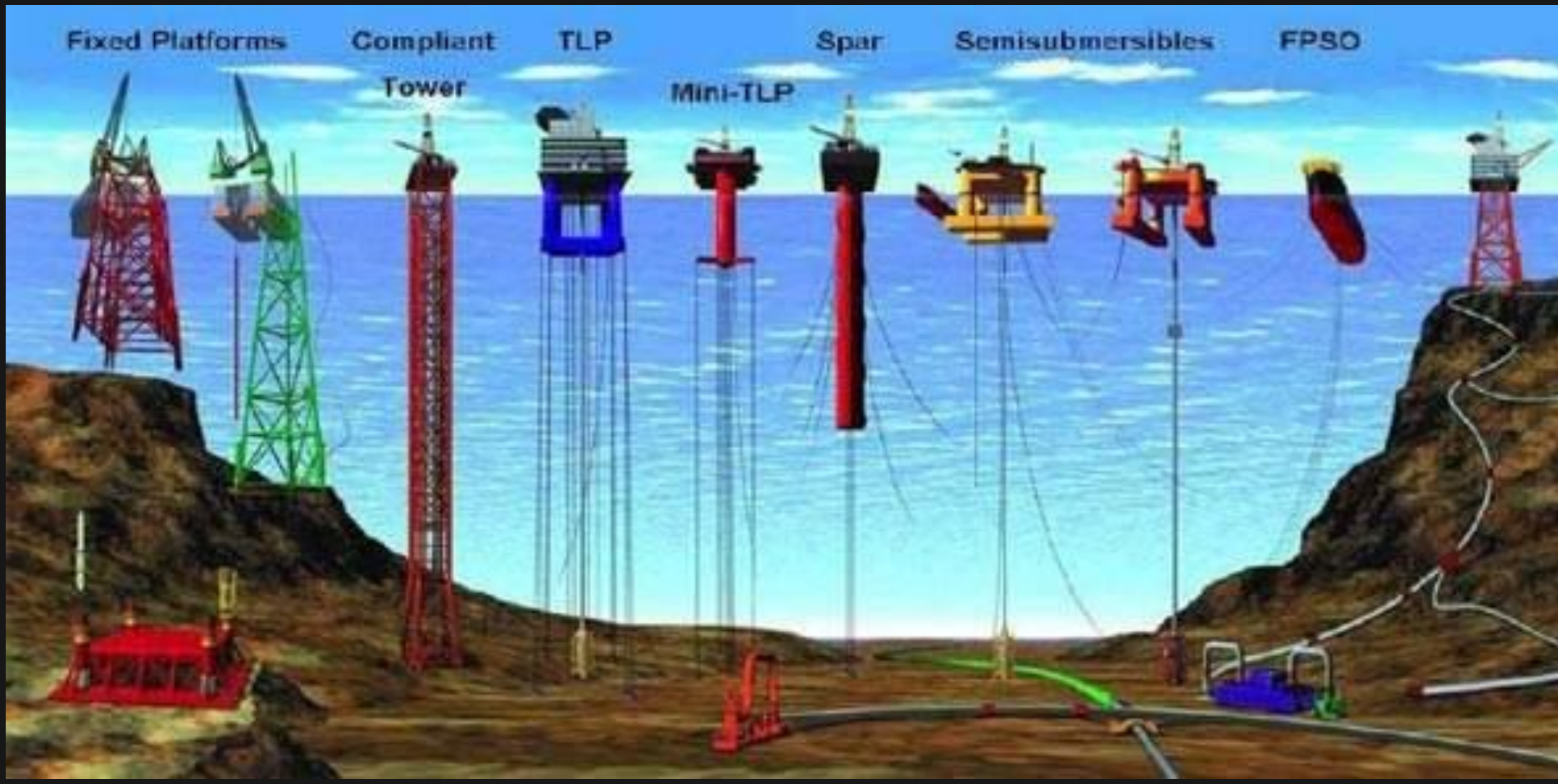
## 2023 NW OSW Supply Chain Summit

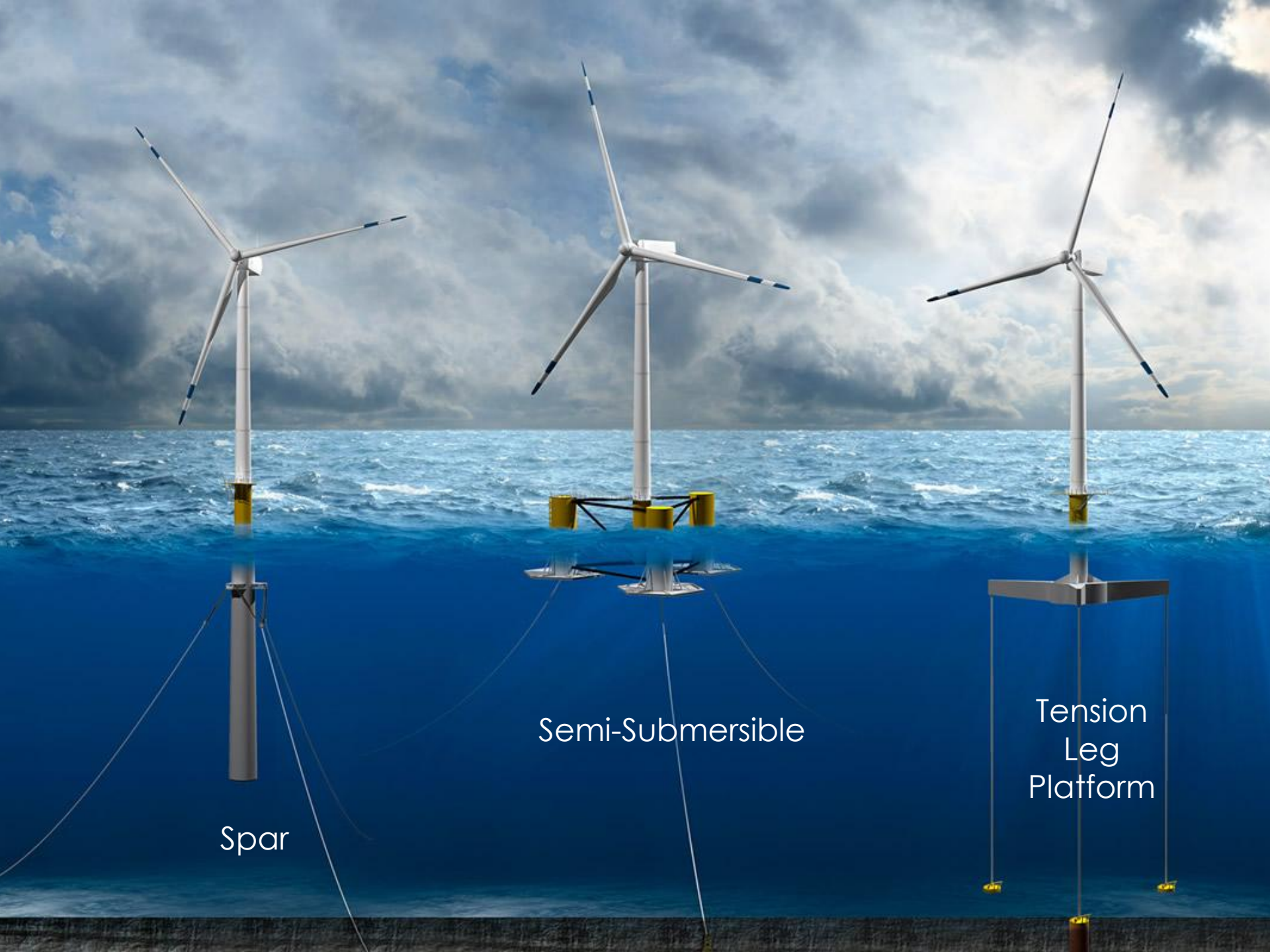
November 16, 2023

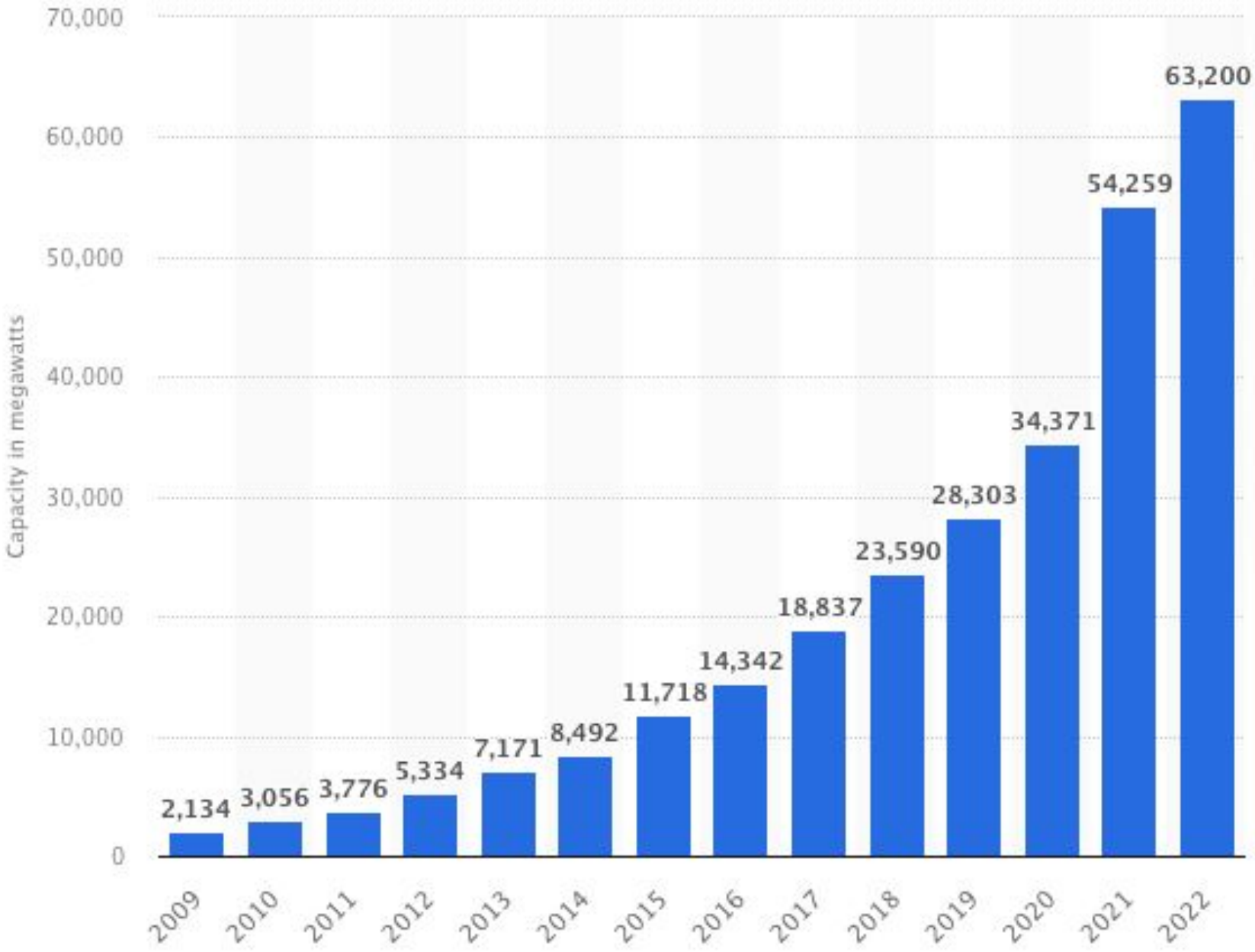
poet

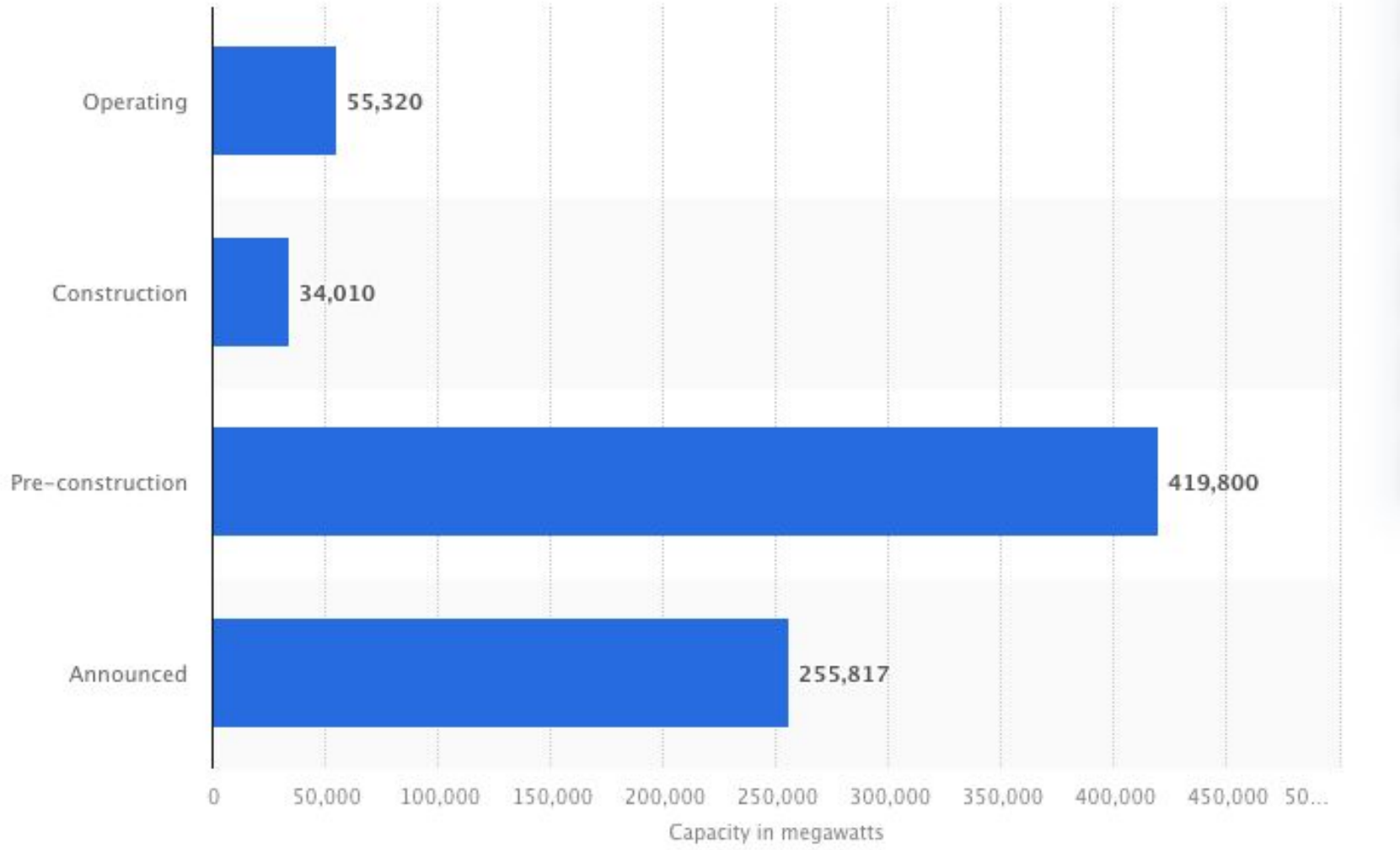
PACIFIC OCEAN ENERGY TRUST

# FLOATING OFFSHORE WIND


Fixed Platforms
Compliant Tower
TLP
Mini-TLP
Spar
Semisubmersibles
FPSO


Spar
Semi-Submersible
Tension
Leg
Platform


70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Capacity in megawatts
2,134
3,056
3,776
5,334
7,171
8,492
11,718
14,342
18,837
23,590
28,303
34,371
54,259
63,200
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


Operating
55,320
Construction
34,010
Pre-construction
419,800
Announced
255,817
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
50...
Capacity in megawatts

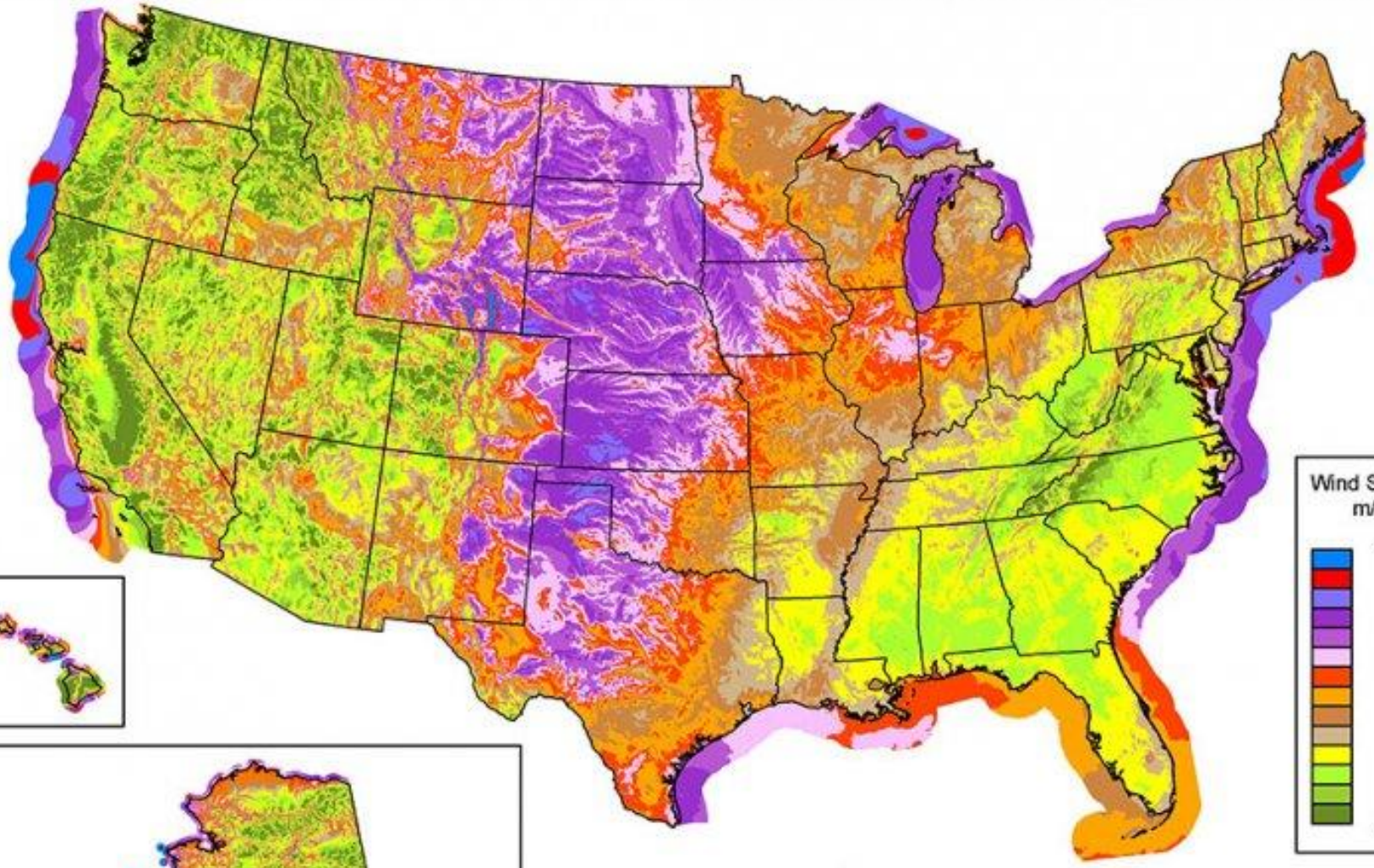
# STATE OF THE GLOBAL SECTOR

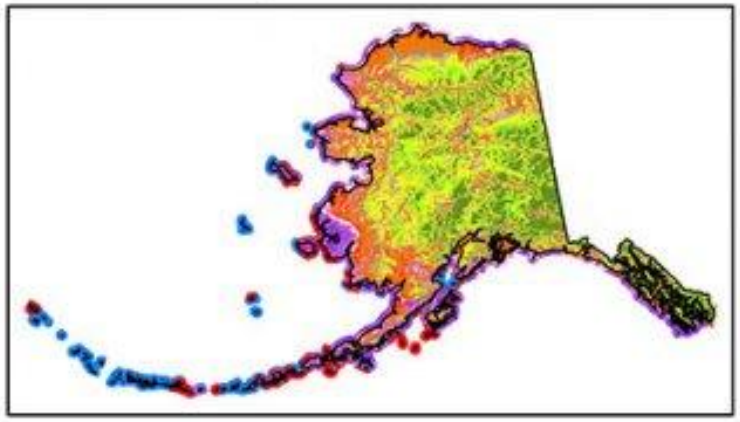
- Worldwide – approximately 70 GW
  - Europe has dominated, but China now leads
- Growth rate is accelerating - ~750 GW - pipeline of offshore wind energy projects which are under construction, consented, or being planned
- Cost for OSW continues to decline
  - 75 Percent reduction in costs since 2014
    - Below CFD price in Europe
    - Cost of capital – lower risk
    - Scale of production/Standardization
- Global Supply Chain

# HEADWINDS

- Inflation
- Interest rates
- Supply chain issues
- Dead whales
- NIMBY
- Lawsuits
- Permitting backlogs
- National Politics
- Oil and Gas opposition

# United States - Land-Based and Offshore Annual Average Wind Speed at 100 m

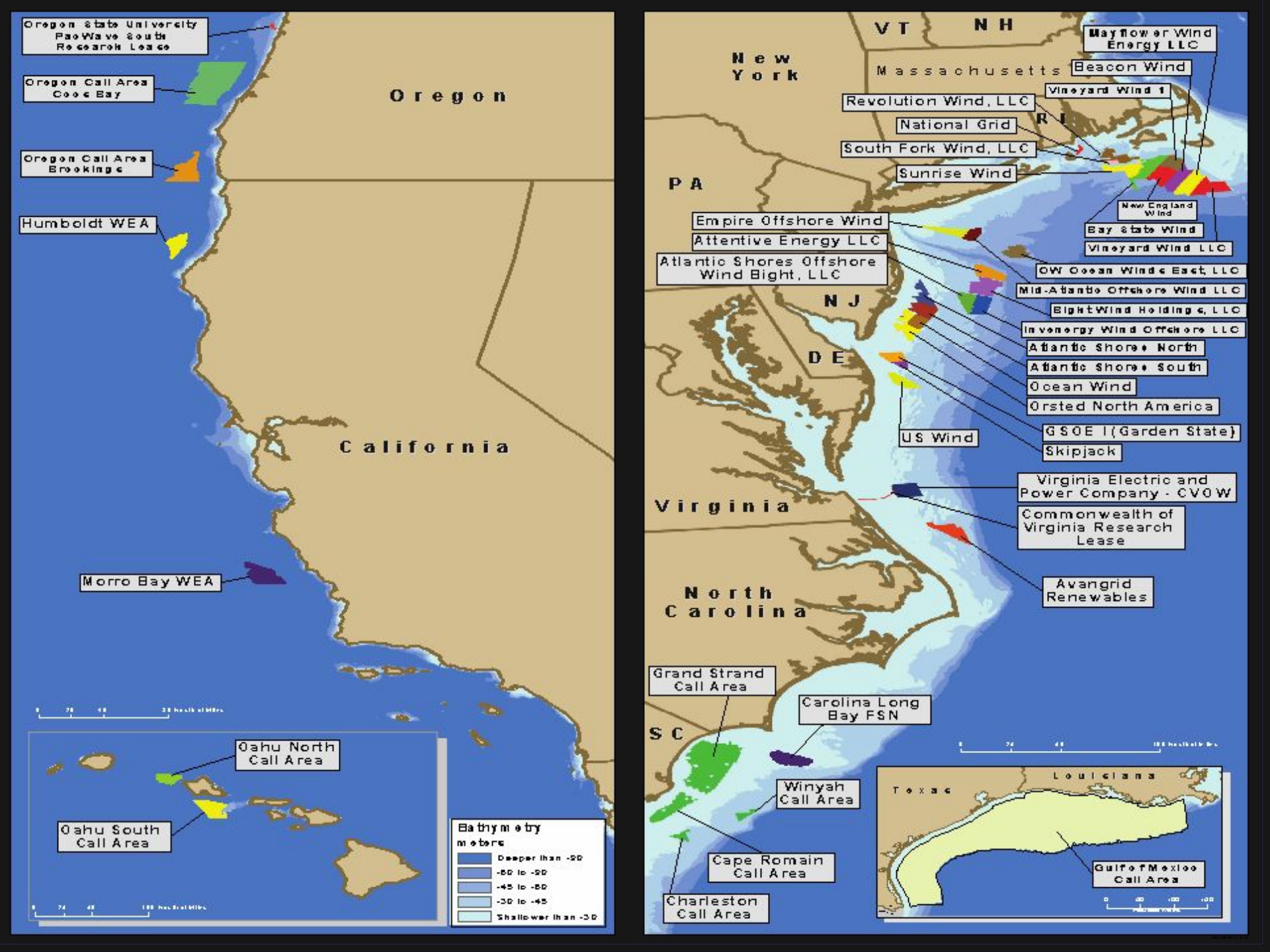




Source: Wind resource estimates developed by AWS Truepower, LLC. Web: http://www.awstruepower.com. Map developed by NREL. Spatial resolution of wind resource data: 2.0 km. Projection: Albers Equal Area WGS84.

AWS Truepower™
Where science delivers performance.

NREL
NATIONAL RENEWABLE ENERGY LABORATORY


Oregon State University PacWave South Research Lease
Oregon Call Area Coos Bay
Oregon Call Area Brookings
Humboldt WEA
Morro Bay WEA
Oregon
California
Oahu North Call Area
Oahu South Call Area
Bathymetry
meters
Deeper than -90
-60 to -90
-45 to -60
-30 to -45
Shallower than -30
VT
NH
New York
Massachusetts
RI
PA
NJ
DE
Virginia
North Carolina
SC
Mayflower Wind Energy LLC
Beacon Wind
Vineyard Wind 1
Revolution Wind, LLC
National Grid
South Fork Wind, LLC
Sunrise Wind
New England Wind
Bay State Wind
Vineyard Wind LLC
Empire Offshore Wind
Attentive Energy LLC
Atlantic Shores Offshore Wind Bight, LLC
OW Ocean Winds East, LLC
Mid-Atlantic Offshore Wind LLC
Bight Wind Holdings, LLC
Invenergy Wind Offshore LLC
Atlantic Shores North
Atlantic Shores South
Ocean Wind
Orsted North America
GSOE I (Garden State)
Skipjack
US Wind
Virginia Electric and Power Company - CVOW
Commonwealth of Virginia Research Lease
Avangrid Renewables
Grand Strand Call Area
Carolina Long Bay FSN
Winyah Call Area
Cape Romain Call Area
Charleston Call Area
Texas
Louisiana
Gulf of Mexico Call Area

# FLOATING OSW– WHAT'S THE OPPORTUNITY?

- Enormous Wind Resource – World Class
- High Capacity Factors > 60%
  - Function of Height and Distance from Shore
  - Ever larger turbines – currently at 18 MW!
- Leverages Steeply Descending Cost Curve of OSW
- Grid benefits beyond electrons
- Improved Resilience
- West Side Generation – Non-wires solutions to transmission
- Complimentarity with existing generation and load
- Close to Populations/Load Centers
- Enormous Economic development

# BUREAU OF OCEAN ENERGY MANAGEMENT

- BOEM
- manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way
- Has jurisdiction over the leasing and permitting of OSW
- After installation – Bureau of Safety and Environmental Enforcement
- ~10 year process – starts with "Task Force" and ends with issuance of final permits for the Construction and Operation Plan
- Includes a full array of federal, state, and local permits and consultations

| Planning & Analysis | Leasing | Site Assessment | Construction & Operations |
|---|---|---|---|
| ~ 2 YEARS | ~ 1-2 YEARS | UP TO 5 YEARS | ~ 2 YEARS (+25) |
| • Intergovernmental Task Force<br>• Request for Information or Call for Information and Nominations<br>• Area Identification<br>• Environmental Reviews | • Publish Leasing Notices<br>• Conduct Auction or Negotiate Lease Terms<br>• Issue Lease(s) | • Site Characterization<br>• Site Assessment Plan | • Construction and Operations Plan<br>• Facility Design Report and Fabrication and Installation Report<br>• Decommissioning<br>• Environmental and Technical Reviews |

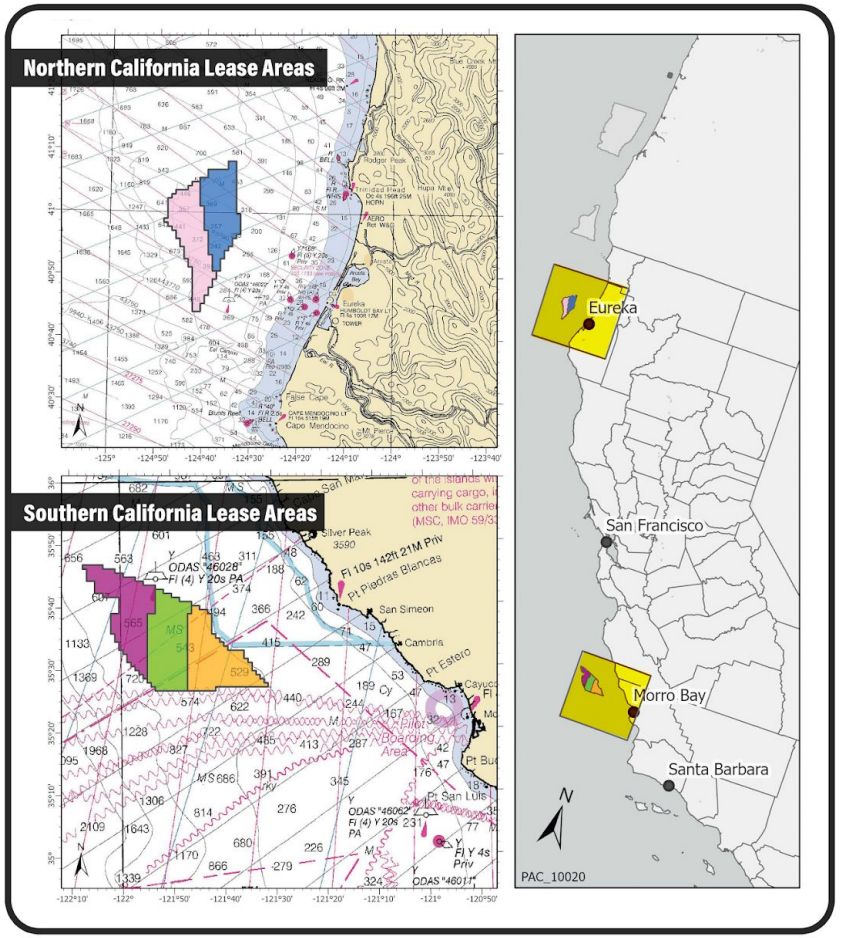
# BOEM AUCTIONS/LEASES

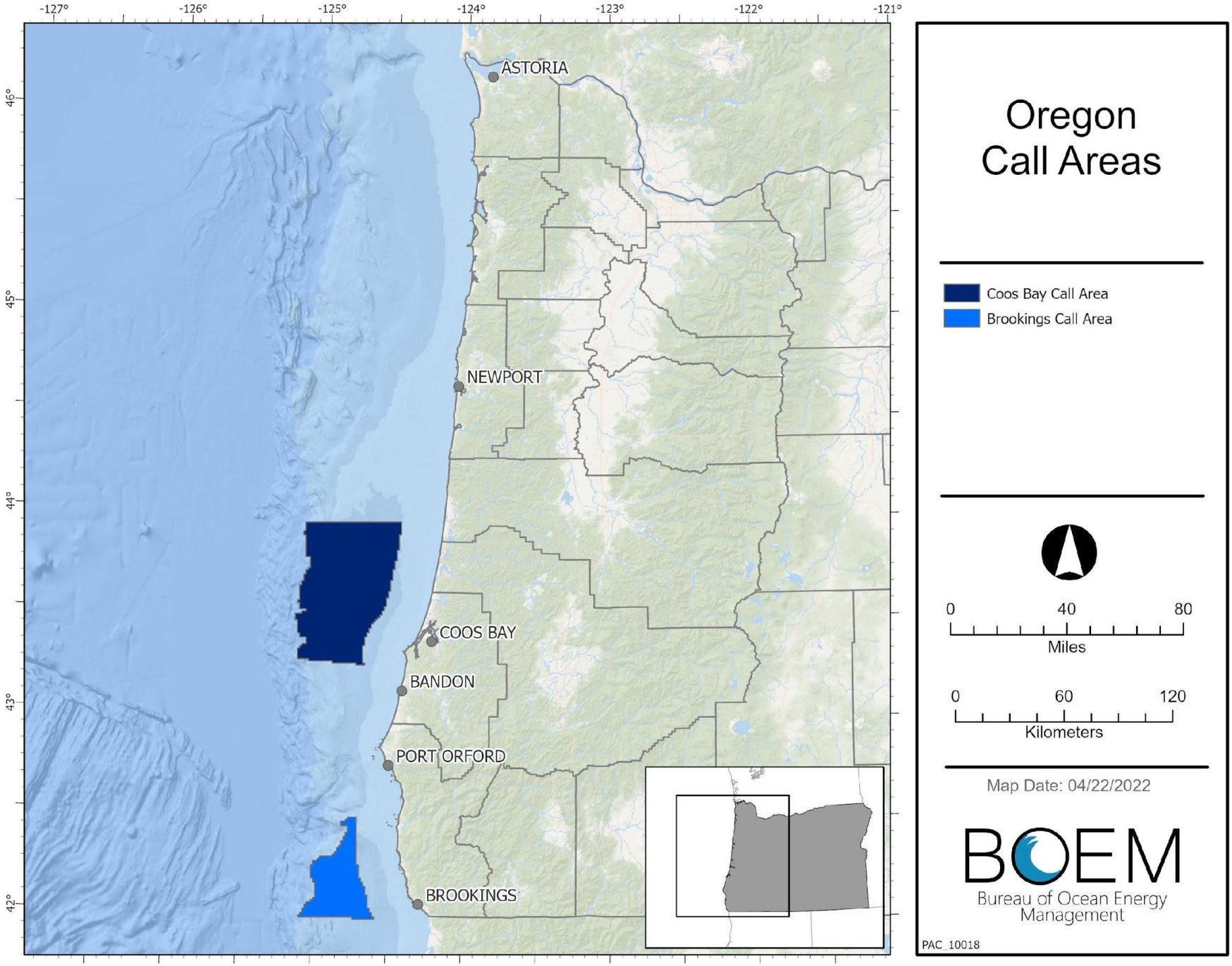
- Historically – traditional Auction – highest bidder wins
- Now – Multi Factor Auction
  - Highest Bidder Wins
  - But Includes lease "Bidding Credits" that return some percentage (30%)of the lease price back to local communities
- Bidding Credits
  - Supply Chain – up to 10%
  - Workforce Development – up to 10%
  - Community Benefit Agreements/Fishery Compensation
- California - $757,100,100 X 30% = $227,130,000
- Gulf of Mexico – 1/3 leases sold - $5,600,000 x .3 = $1.6M

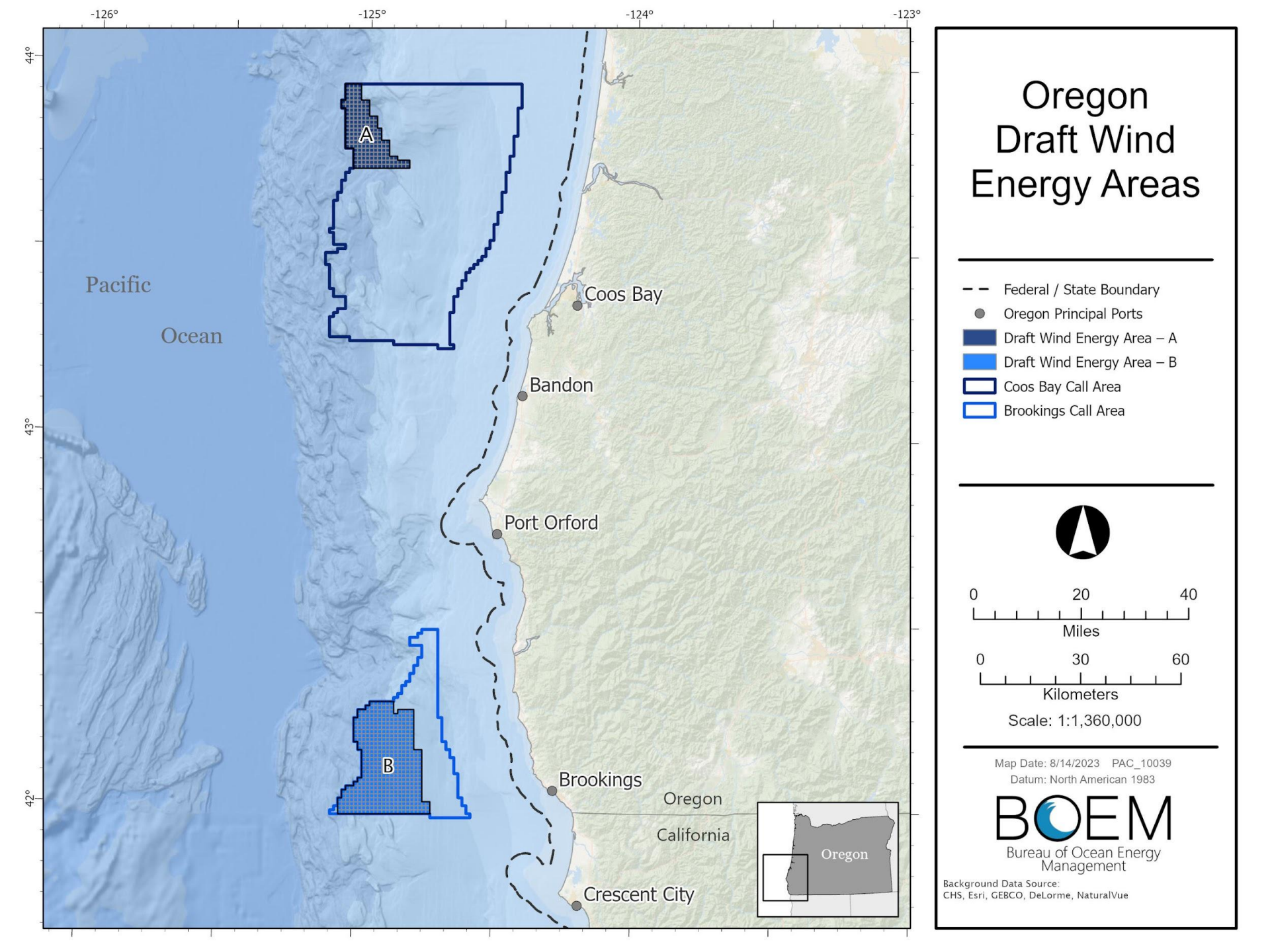
# Provisional Winners of the California Lease Areas, $757,100,000 in High Bids

| 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




-127°
-126°
-125°
-124°
-123°
-122°
-121°
46°
45°
44°
43°
42°
ASTORIA
NEWPORT
COOS BAY
BANDON
PORT ORFORD
BROOKINGS
Oregon
Call Areas
Coos Bay Call Area
Brookings Call Area
0
40
80
Miles
0
60
120
Kilometers
Map Date: 04/22/2022
BOEM
Bureau of Ocean Energy
Management
PAC_10018


-126°
-125°
-124°
-123°
44°
43°
42°
Pacific
Ocean
A
B
Coos Bay
Bandon
Port Orford
Brookings
Crescent City
Oregon
California
Oregon
Oregon
Draft Wind
Energy Areas
Federal / State Boundary
Oregon Principal Ports
Draft Wind Energy Area – A
Draft Wind Energy Area – B
Coos Bay Call Area
Brookings Call Area
0
20
40
Miles
0
30
60
Kilometers
Scale: 1:1,360,000
Map Date: 8/14/2023 PAC_10039
Datum: North American 1983
BOEM
Bureau of Ocean Energy Management
Background Data Source:
CHS, Esri, GEBCO, DeLorme, NaturalVue

WF1

## FINAL OBSERVATIONS

- World Class Resource
- We need the power
- Essential to meet goals
- Maximize the benefits
- Minimize the impacts

Jason Busch

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Pacific Ocean Energy Trust

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