DOCKETED	
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Project Title:	California Offshore Renewable Energy
TN #:	250399
Document Title:	May 23, 2023 Offshore Wind Ports and Workforce Workshop
Description:	Full Slide Deck of Presentations for the May 23, 2023 Offshore Wind Ports and Workforce Workshop
Filer:	susan fleming
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	5/30/2023 4:06:06 PM
Docketed Date:	5/30/2023

AB 525 Workshop
Ports and Workforce Development for Offshore Wind: Support Floating Offshore Wind Development

May 23, 2023

AM Workshop Schedule

1. Welcome
2. Opening Remarks
3. Purpose of Workshop
4. Moffat and Nichol: AB 525 Seaport Readiness Plan
5. Break
6. Port of Humboldt: Port Upgrades and Planning
7. Port of Long Beach: Pier Wind Project and Planning Activities
8. Questions and answers
9. Public Comment
10. Lunch Break

PM Workshop Schedule

1. Welcome Back
2. Commissioner Remarks
3. Catalyst: AB 525 Workforce Development and Economic Benefits Analysis
4. Xodus & BW: AB 525 Workforce Readiness Plan
5. Questions and Answers
6. Break
7. Stakeholder Panel: Workforce Development Needs
8. Public Comment
9. Closing Remarks

Opening Remarks
Commissioners

Overview of AB525
Rachel MacDonald

AB 525 Legislative Findings

If developed at scale, offshore wind can:

- ✓ Provide economic and environmental benefits.
- ✓ Advance progress toward California's renewable and climate goals.
- ✓ Diversify the state's energy portfolio.
- ✓ Realize economic and workforce development benefits.
- ✓ Contribute to renewable resource portfolio that can serve electricity needs and improve air quality in disadvantaged communities.
- ✓ Offer career pathways and workforce training opportunities.

Offshore wind should be developed in a manner that protects coastal and marine ecosystems.

AB 525 Interim Work Products

August 10, 2022

- Evaluate and quantify maximum feasible capacity of offshore wind
- Establish megawatt planning goals for 2030 and 2045

February 28, 2023

- Complete a preliminary assessment of economic benefits related to seaports and workforce development needs and standards

May 10, 2023

- Develop a permitting roadmap

Purpose of Workshop
Paul Deaver

Ports and Workforce Requirements

AB 525, Section 25991.3 requirements:

- CEC and other agencies develop a plan to improve waterfront facilities to support offshore wind activities
- An assessment of the needed port investments to support offshore wind
- An analysis of the workforce development needs of the CA OSW industry
- Recommendations for workforce standards

Workshop Activities

Port investments and upgrades and workforce development to support offshore wind:

- Present studies and ongoing work around ports and workforce development.
- Discuss opportunities, challenges, and near-term actions or strategies for port upgrades and investments and workforce development.
- Receive input/feedback from the panel discussion, and the public, to help inform the OSW strategic plan.

Matt Trowbridge
Moffat and Nichol

CEC Workshop
Offshore Wind Ports & Workforce

AB 525 Port Readiness Plan

May 23, 2023

moffatt & nichol

Presentation Agenda

1. Introductions
2. Background & Purpose
3. AB 525 Port Readiness Plan
4. Question and Answer

- **Ground Rules:**
  - Mute lines to keep audio clear
  - Please save questions for the end
  - Presentation ~35 mins
  - Question & Answer ~15 mins

Who We Are

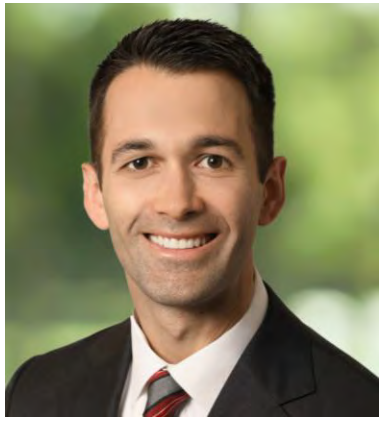
moffatt & nichol

Creative People, Practical Solutions.®

- Port Infrastructure Consultant
- Since 1945, Naval Shipyards in Long Beach
- Experts where land meets water
- California coastline
- California Ports & Harbors
- All Maritime Business Lines
  - Offshore wind, containers, bulk cargo, marinas, etc.

Matt Trowbridge, PE, SE, PEng

- Marine Structural Engineer
- Port Infrastructure Expert
- Offshore Wind Ports



AB 525 Strategic Plan for CA Offshore Wind

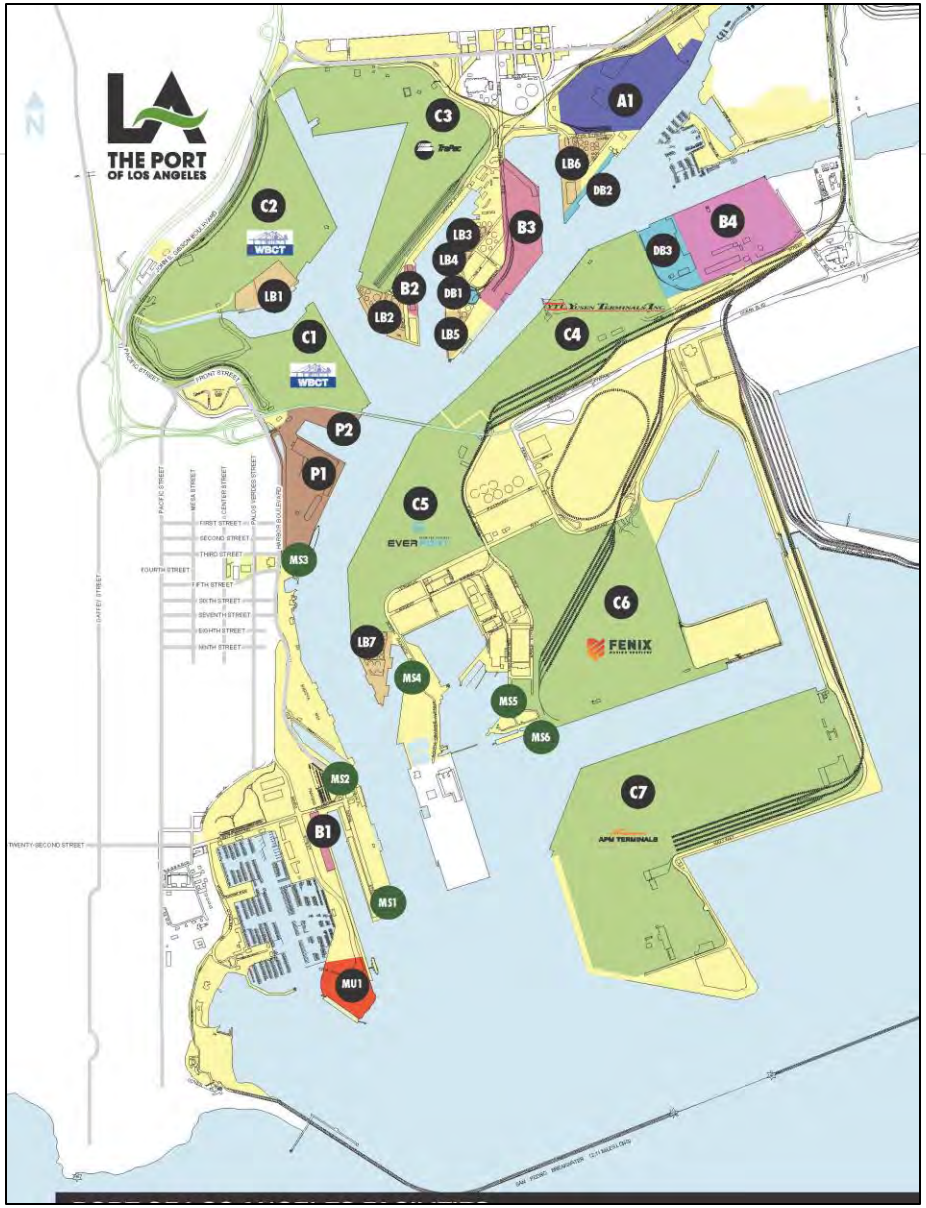
The strategic plan shall include, at a minimum, the following five chapters:

1. Identification of Sea Space
2. **Port Infrastructure** and Workforce Development
3. Transmission Planning
4. Permitting
5. Potential Impacts on Coastal Resources, Fisheries, Native American & Indigenous Peoples, and National Defense

Strategic Plan due on or before June 30, 2023

Definitions

- **Port:** a maritime facility comprising of one or more terminal sites. Some ports have many terminals (e.g., Los Angeles, Long Beach, Oakland, San Francisco).



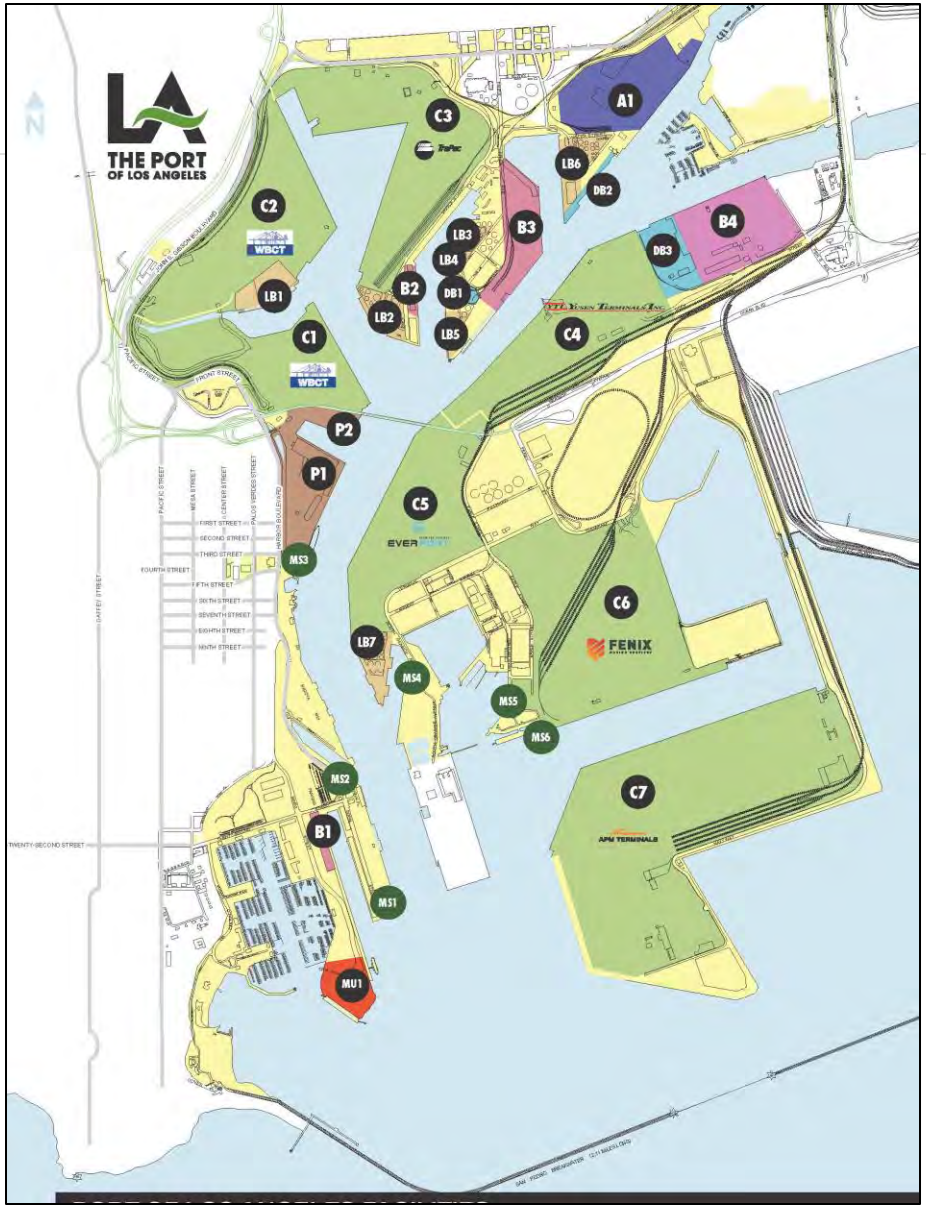
Example of a Port, Map Courtesy of Port of Los Angeles

Definitions

- **Port:** a maritime facility comprising of one or more terminal sites. Some ports have many terminals (e.g., Los Angeles, Long Beach, Oakland, San Francisco).

- **Port Terminal or Port Site:** a single location within a Port to transfer cargo to and from a vessel.

Example of a Port Terminal Site, Rendering Courtesy State of Connecticut | Press Office



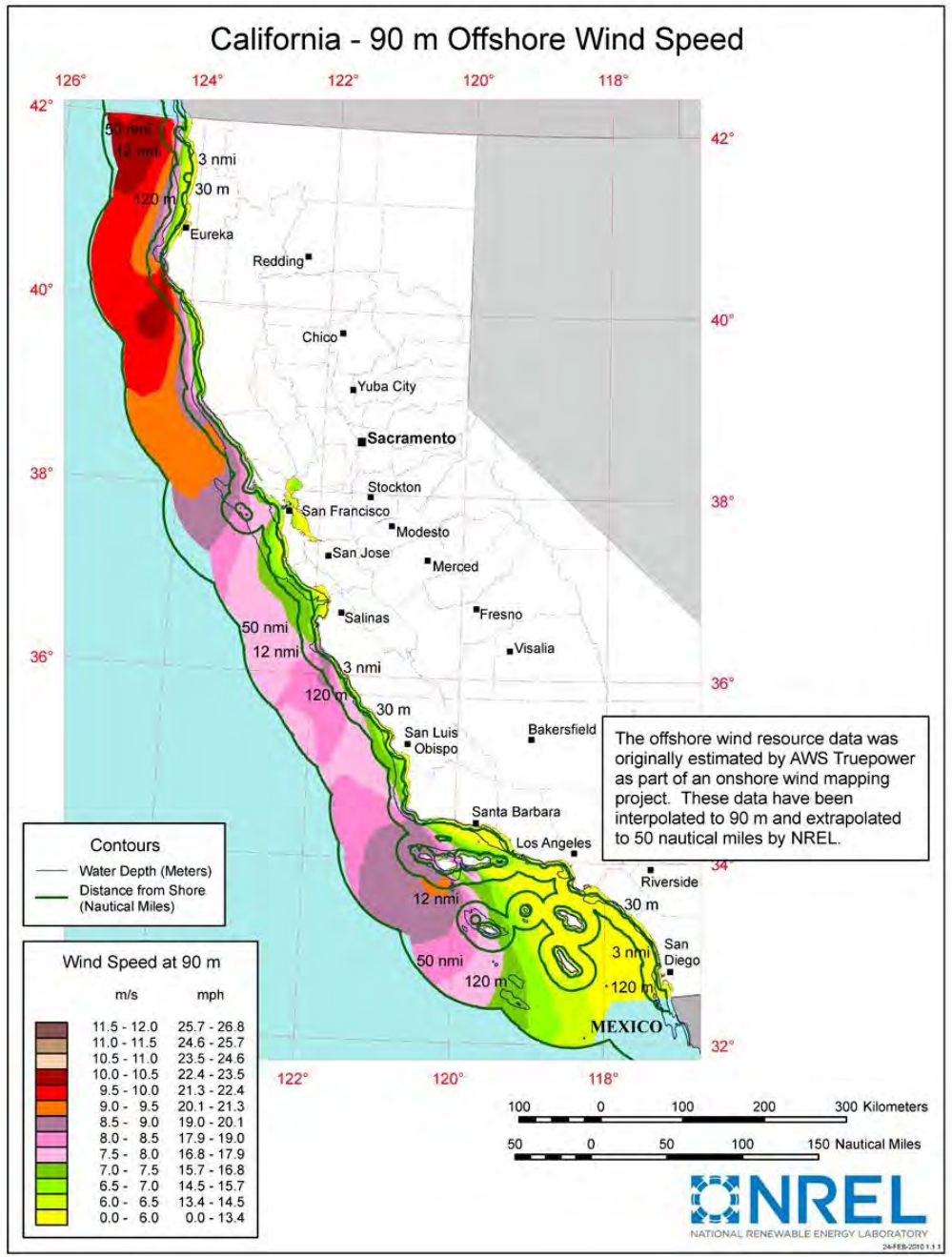
Example of a Port, Map Courtesy of Port of Los Angeles

California OSW Deployment Targets

- **Governor Newsom's Letter to CARB (July 2022):**
  - 20 GW by 2045
- **CEC Updated AB 525 Report (August 2022):**
  - 2–5 GW by 2030
  - 25 GW by 2045

25 GW = ~1,250 x 20 MW WTGs

Principle Power



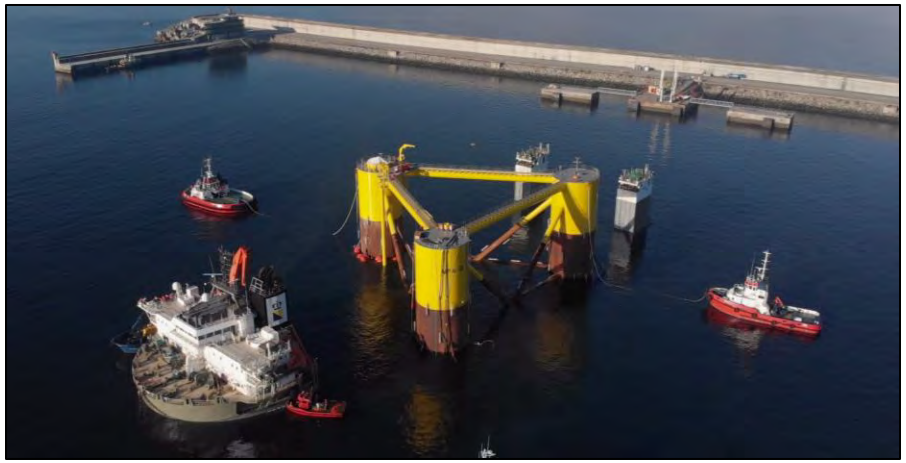
NREL

Floating OSW Wharf-side Assembly & Loadout

1) Fabrication

2) Loadout onto semi sub

3) Float off



4) WTG Integration

5) Tow to Installation Site

Photo reference: 1, 2, 4, and 5 by Principle Power; 3 by EDP Renewables

Offshore Wind Requires Ports

- **What is needed for Offshore Wind?**
  - Wind Resource
  - Electrical Grid
  - Ports and Port Terminals
- **Construction, Operations, and Maintenance of OSW farms requires Ports:**
  - Sheltered harbor areas
  - Large laydown areas
  - Deep, navigable water
  - Heavy load capacity
- **There are no existing port terminals on the US West Coast that can currently support OSW**
  - Requires significant investment and development
  - Requires a multi-port strategy
  - Adding a new maritime industry without displacing or replacing existing maritime uses

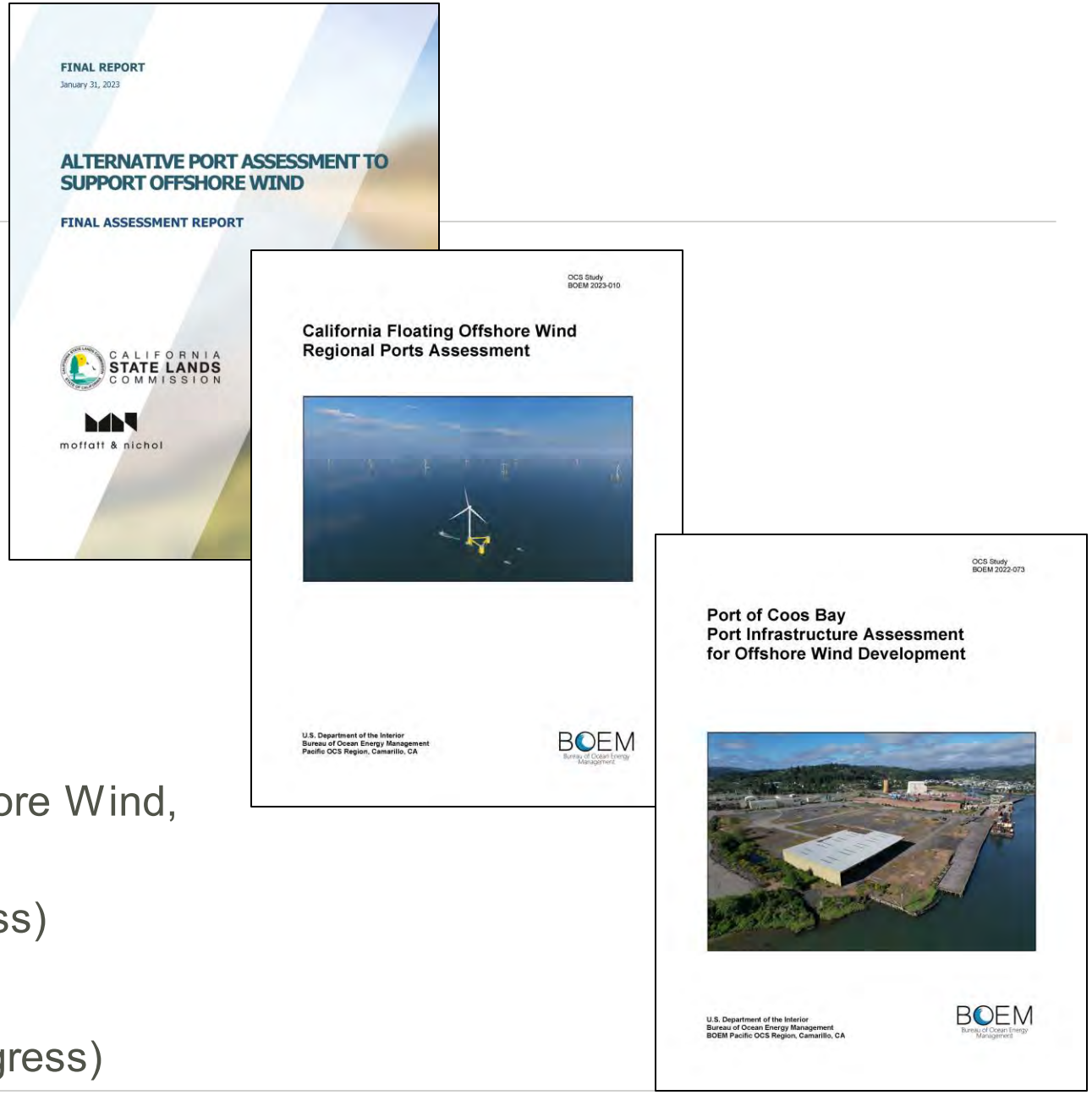
Photo Reference: Principle Power

Roadmap for the AB 525 Port Readiness Plan

1. Determine Port Needs for OSW Use
2. Determine How Many Port Sites are Required
3. Identify Potential Port Sites
4. Determine Port Improvements Required
5. Evaluate and Compare Port Sites
6. Publish AB 525 Seaport Strategy Report

OSW Port Studies US West Coast

- **Bureau of Ocean Energy Management**
  - Port of Coos Bay, Port Infrastructure Assessment for OSW Development, BOEM 2022-073
  - California Floating OSW Regional Ports Assessment, BOEM 2023-010
  - California Floating OSW Regional Ports Feasibility Analysis, 2023 (in progress)
- **California State Lands Commission**
  - Alternative Port Assessment to Support Offshore Wind, January 2023
  - AB 525 Port Readiness Plan, 2023 (in progress)
- **National Renewable Energy Laboratory**
  - West Coast Port Strategy Study, 2023 (in progress)



Roadmap for the AB 525 Port Readiness Plan

1. **Determine Port Needs for OSW Use**
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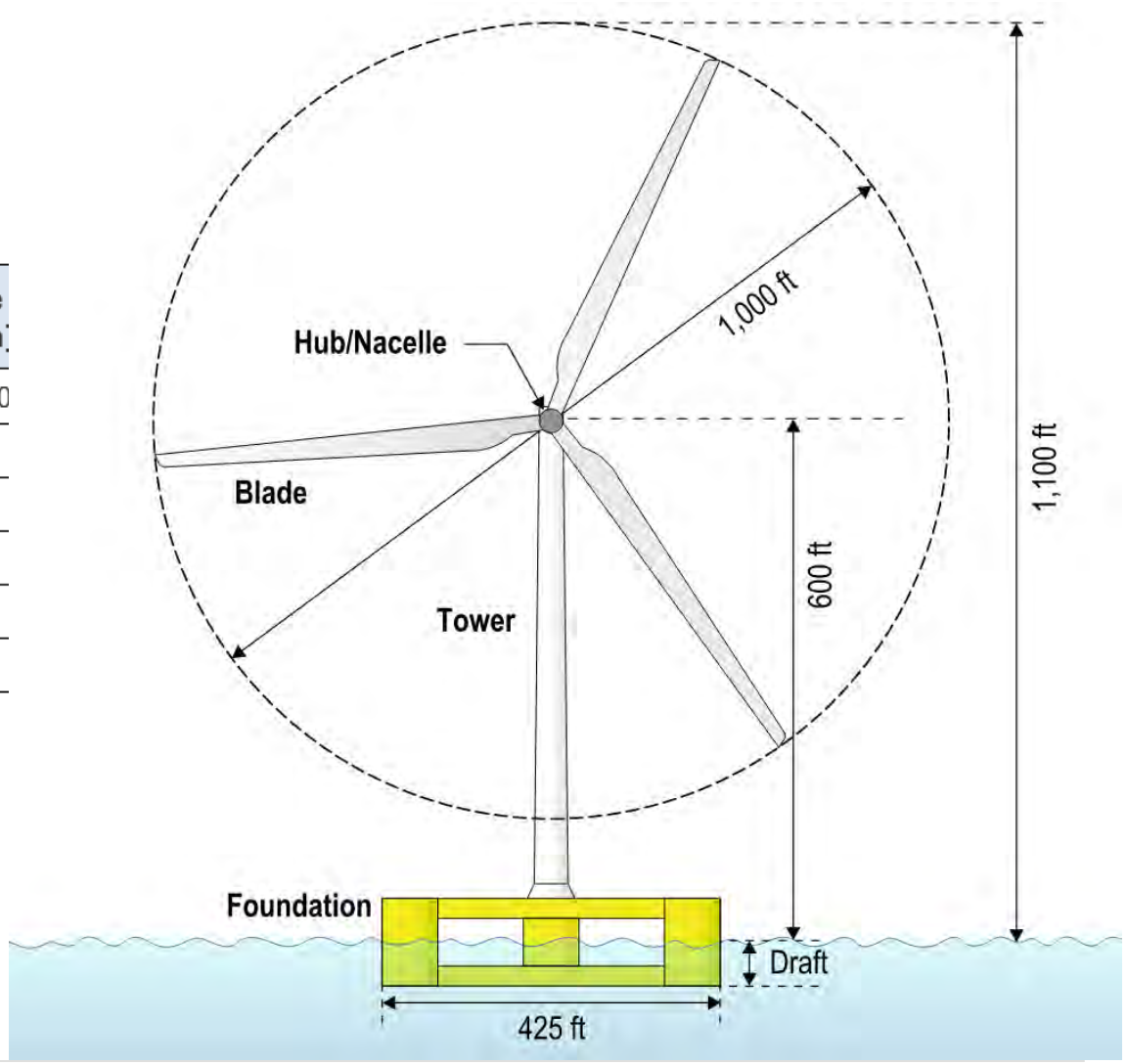
Floating OSW Turbine Dimensions

Floating Offshore Wind Turbine	Approximate Dimension [ft]	Approximate Dimension [m]
Foundation Beam / Width	Up to 425 ft x 425 ft	Up to 130 m x 130
Draft (Before integration)	15 to 25 ft	4.5 to 7.5 m
Draft (After integration)	20 to 50 ft	6 to 15 m
Hub/Nacelle Height (from Water Level)	Up to 600 ft	Up to 183 m
Tip Height (from Water Level)	Up to 1,100 ft	Up to 335 m
Rotor Diameter	Up to 1,000 ft	Up to 305 m



Types of OSW Port Terminals

- **Staging and Integration (S&I) Site:** a port site to receive, stage, and store offshore wind components and to assemble the floating turbine system for towing to the offshore wind area.
  - **Turbine Maintenance Site:** a facility to perform major maintenance on a fully assembled turbine.
  - **End of Life Decommissioning Site:** a site to decommission, disassemble, recycle, and dispose of turbine systems that are at end of life.
- **Manufacturing/Fabrication (MF) Site:** a port site that receives raw materials via road, rail, or waterborne transport and creates larger components in the offshore wind supply chain.
- **Operation and Maintenance (O&M) Site:** a base of wind farm operations with warehouses/offices, spare part storage, and a marine facility to support O&M vessels for crew transfer
- **Construction Support Facilities:**
  - **Installation Support Site:** a base of construction operations for the fleet of construction vessels necessary for construction and commissioning of the offshore wind farm.
  - **Mooring Line, Anchor, and Electrical Cable Laydown Site:** a site to receive and stage mooring lines, anchors, and electrical cables

Staging and Integration

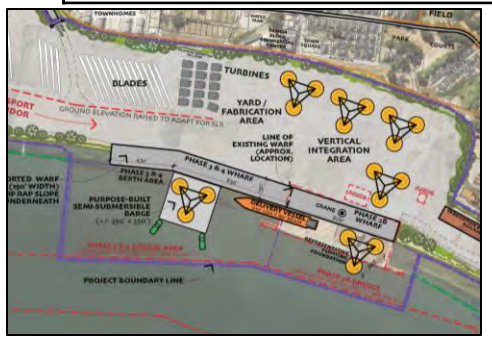
Manufacturing Port (Foundations Shown)

Operations & Maintenance

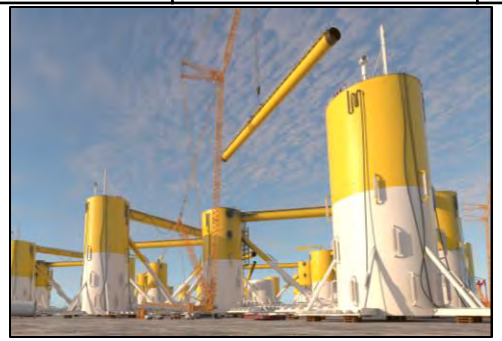
Photo reference (top to bottom): Humboldt Harbor District; Port of Long Beach, REACH & Mott MacDonald

Floating OSW Port Requirements

Design Requirement	Staging and Integration (S&I)	Manufacturing (MF)	Operations & Maintenance (O&M)	Anchor & Mooring Line Storage, Construction Support	Electrical Cable Laydown
Acreage, minimum	30 – 100 acres	30 – 100 acres	2 – 10 acres	10 – 30 acres	20 – 30 acres
Wharf Length	1,500 ft	800 ft	300 ft	300 ft	500 ft
Minimum Draft at Berth	38 ft	38 ft	20 – 30 ft	20 – 30 ft	30 – 35 ft
Draft at Sinking Basin	40 – 100 ft	40 – 100 ft	Not Required	Not Required	Not Required
Wharf Loading	> 6,000 psf	> 6,000 psf	100 – 500 psf	500 psf	1,000 psf
Uplands / Yard Loading (for WTG components)	2,000 – 3,000 psf	2,000 – 3,000 psf	100 – 500 psf	500 psf	1,000 – 2,000 psf



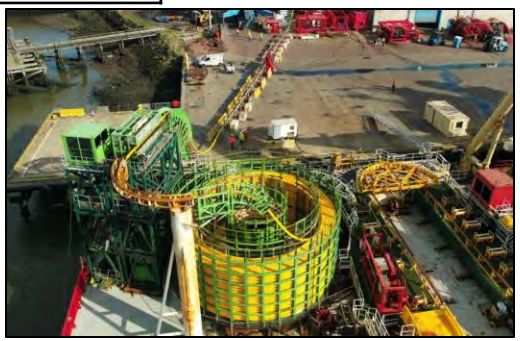
S&I



MF

O&M

Anchor Storage

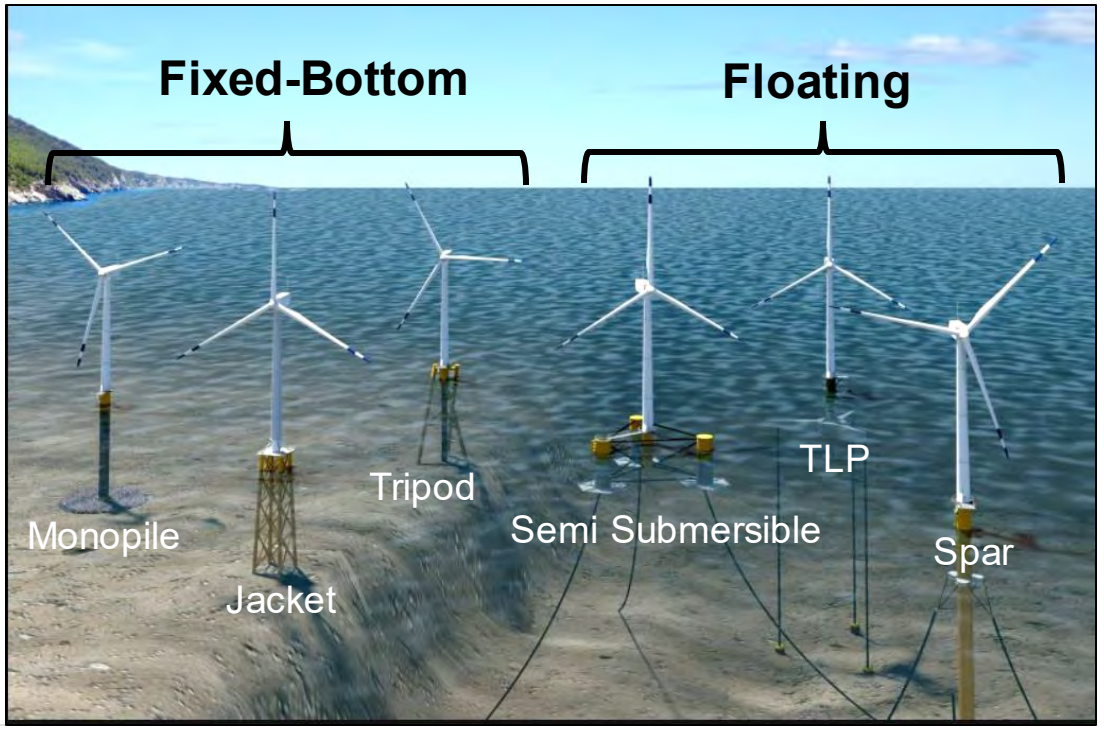


Cable Laydown

Photo reference (left to right): Humboldt Harbor District; Port of Long Beach, REACH & Mott MacDonald; MAERSK Service Supply, Global Marine Group

Summary of OSW Industry Port Needs

- **General**
  - Port sites need to be close to Lease Areas to reduce transportation risk and cost
  - Co-locate as many supply chain items in the same location as possible
  - US West Coast ports must plan for >15 MW turbines (up to 25 MW turbines)
- **Floating Foundations**
  - Likely to be semi-submersible floating foundation (concrete, steel, or hybrid) or tension leg platform (TLP)
  - Semi-sub barge with sinking basin, ramp, or direct transfer methods required to move floating foundation from land to water
- **Wet Storage**
  - Required to safely moor floating foundations or integrated turbines to mitigate risk of weather downtime, vessel traffic, entrance channel downtime, etc.



Roadmap for the AB 525 Port Readiness Plan

1. Determine Port Needs for OSW Use
2. **Determine How Many Port Sites are Required**
3. Identify Potential Port Sites
4. Determine Port Improvements Required
5. Evaluate and Compare Port Sites
6. Publish AB 525 Seaport Strategy Report

Determining Required Number of Ports

- **Governor Newsom's Letter to CARB (July 2022):**
  - 20 GW by 2045
- **CEC Updated AB 525 Report (August 2022):**
  - 2–5 GW by 2030
  - 25 GW by 2045

BOEM California Study (2023-010):

Year	Target Deployment				
	Low		Medium	High	
Rate	0.5 GW/yr	1 GW/yr	1.5 GW/yr	2 GW/yr	2.5 GW/yr
2030	1 GW	2 GW	3 GW	4 GW	5 GW
2035	3.5 GW	7 GW	10.5 GW	14 GW	17.5 GW
2038	5 GW	10 GW	15 GW	20 GW	25 GW
2045	8.5 GW	17 GW	25 GW	34 GW	42.5 GW
2048	10 GW	20 GW	30 GW	40 GW	50 GW
2050	11 GW	23 GW	33 GW	44 GW	55 GW

Required Number of Port Sites in California 25 GW of OSW by 2045

Type of Site	Low (8 GW)	Low-Med (17 GW)	Medium (25 GW)	Med-High (34 GW)	High (42 GW)
S&I Sites	1	2	**3**	4	5
MF Site (Blade)	1	2	**2**	3	3
MF Site (Tower)	1	1	**1**	1	2
MF Site (Nacelle Assembly)	1	1	**1**	1	1
MF Site (Foundation Assembly)	1	2	**2**	3	4
SOV berths for O&M Activities	3 to 7	6 to 12	**9 to 16**	12 to 20	15 to 23
Mooring Line & Anchor Storage Sites	5 to 15 ac	10 to 25 ac	**20 to 40 ac**	25 to 50 ac	30 to 65 ac
Electrical Cable Laydown Sites	4 to 8 ac	8 to 14 ac	**12 to 22 ac**	16 to 28 ac	21 to 36 ac

- **Need approximately 10 large port sites and 10 small port or harbor sites to meet CA targets by 2045**
- **S&I Site = ~80 acres, Blade & Tower MF Site = ~100 acres, Foundation MF Site = ~80 acres, Nacelle MF = 25-100 acres**
- **Strategizing the development of manufacturing port sites in California will maximize job creation and economic impact to the State**

Roadmap for the AB 525 Port Readiness Plan

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Identify Potential Port Sites

Options for OSW Port Sites in California

1. Use Existing Ports & Harbors – Upgrade port infrastructure within an existing port or harbor

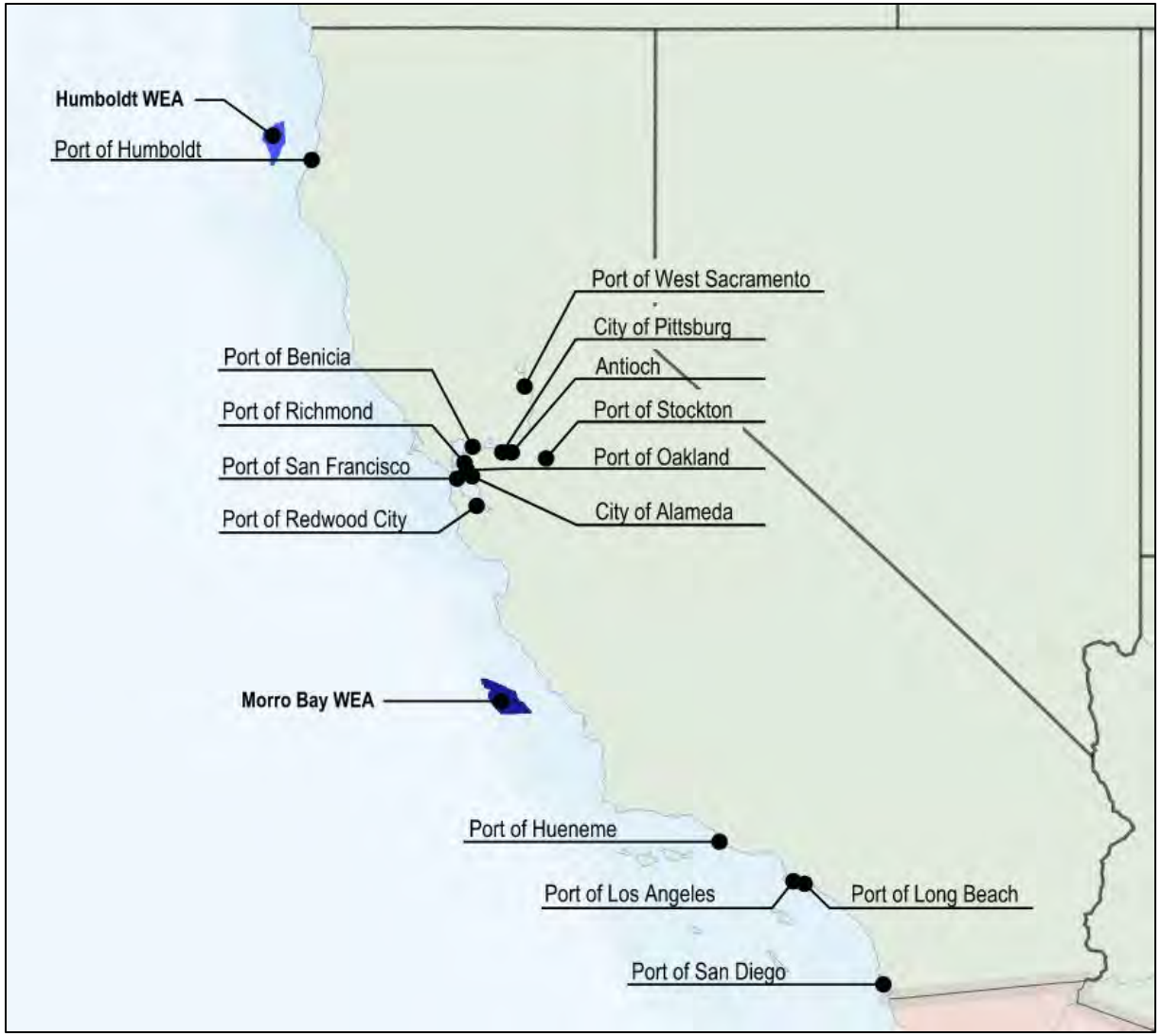
2. Create a New Port or Harbor – Construct a new port at undeveloped site or at a former industrial site outside of existing ports (alternative option)

It is important to study both to ensure the best locations are identified

Existing Ports

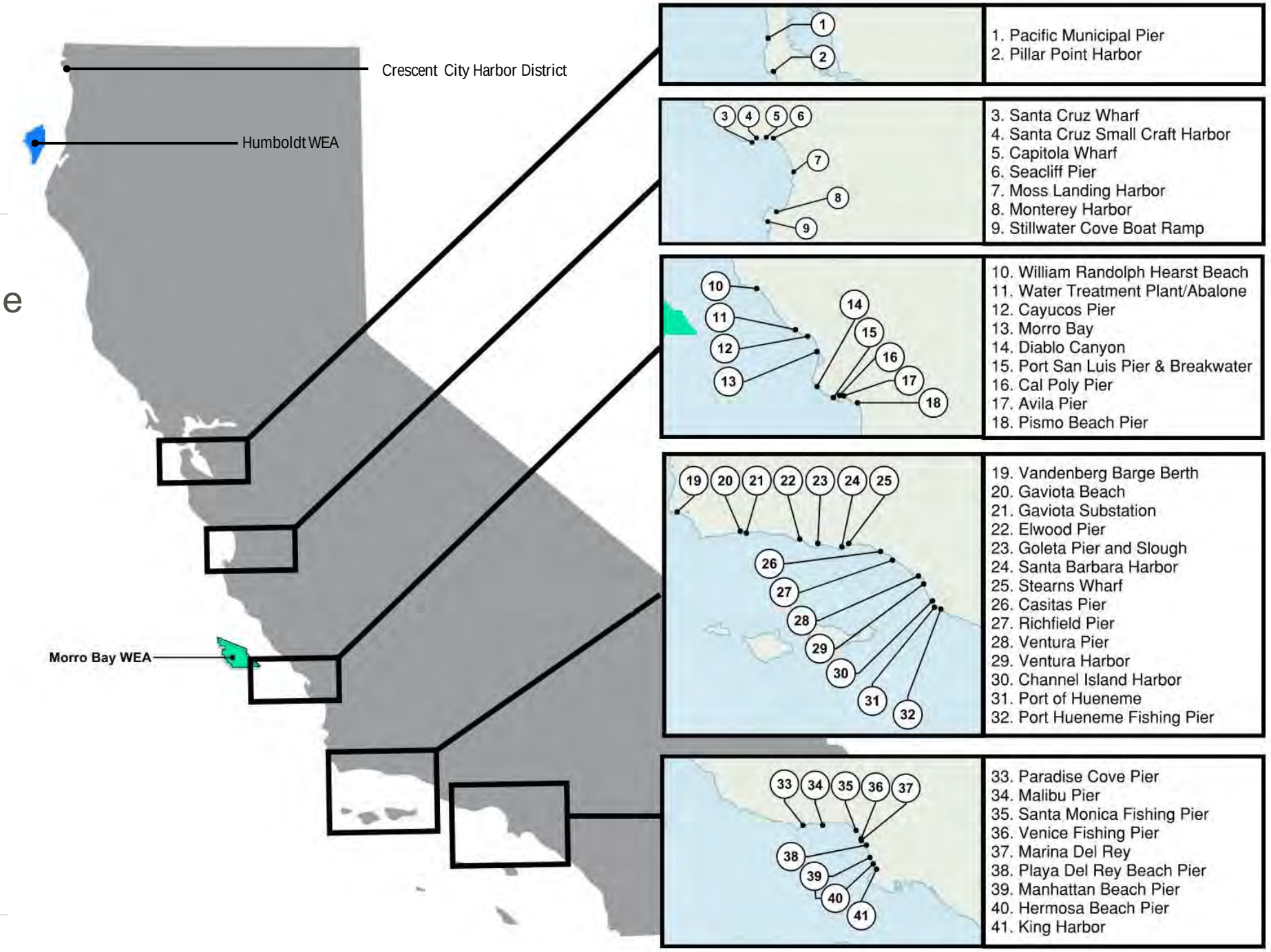
Existing Ports

- 11 deep water ports
- 4 industrial port areas



Existing Harbors

- Existing harbors along the North and Central Coast



Study on Option to Develop New Port Site

Identify Alternative Port Sites

- Outside existing Ports
- Proximity to Morro Bay Lease Area
- Staging and Integration Sites

Alternative Port Site Screening Criteria

Site Screening Criteria

- Exclude the following sites:
  - Residential / Urban Areas
  - California Marine Protected Areas
  - State Parks
  - National Forest
  - Military Base
  - Vandenberg Danger Zone
  - Airspace Restrictions
  - Islands (e.g. Catalina, San Nicolas, San Clemente)
  - Existing offshore oil & gas platforms
- Consider Existing and Proposed National Marine Sanctuaries
- Consider Engineering Feasibility
- Consider Permitting and Environmental Impacts

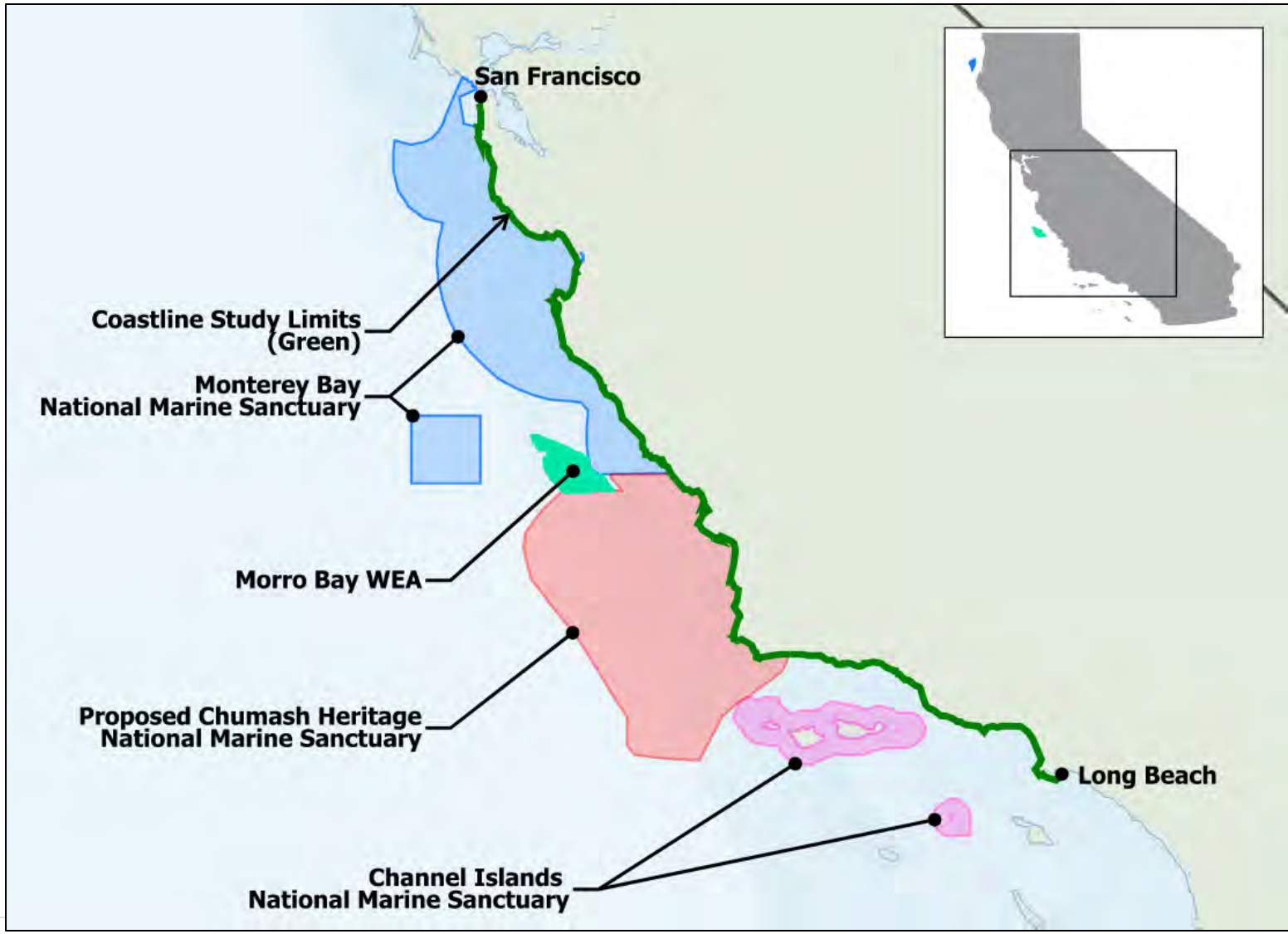
Screening Results

- Red = portion of coastline eliminated from consideration = ~77%

Primary Screening Criteria	Approx. % Shoreline*
Residential Zones	26%
State Marine Protected Areas	24%
Military Base	8%
Vandenberg Evacuation Area	9%
State Parks	34%
National Forests	5%
Airspace Restrictions	13%
Total	**~77%**

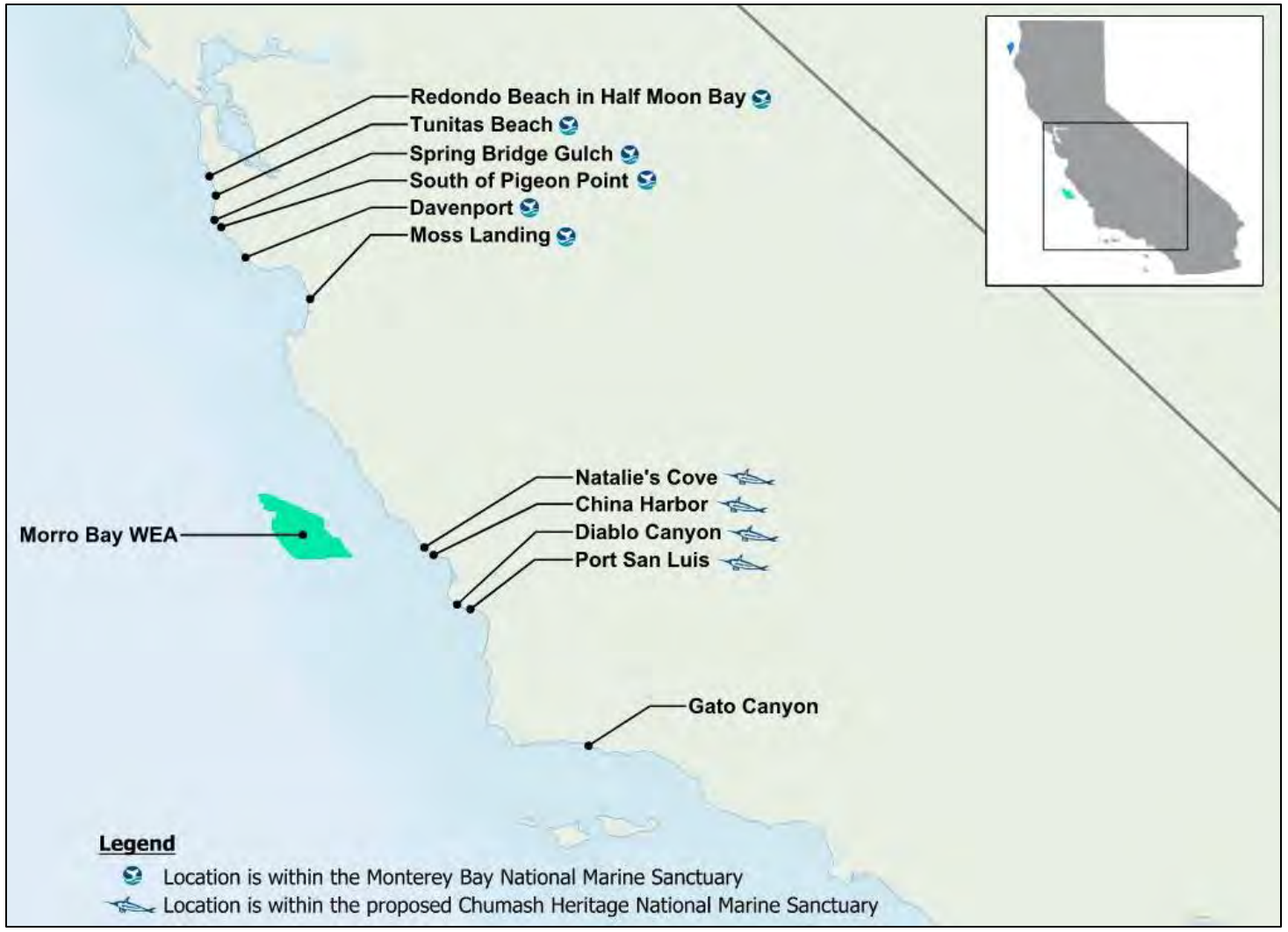
National Marine Sanctuaries (NMS)

- ~ 49% Existing NMS
- ~ 75% Existing & Proposed NMS
  - **Existing NMS**
    - Monterey Bay NMS
    - Channel Islands NMS
  - **Proposed NMS**
    - Proposed Chumash Heritage NMS



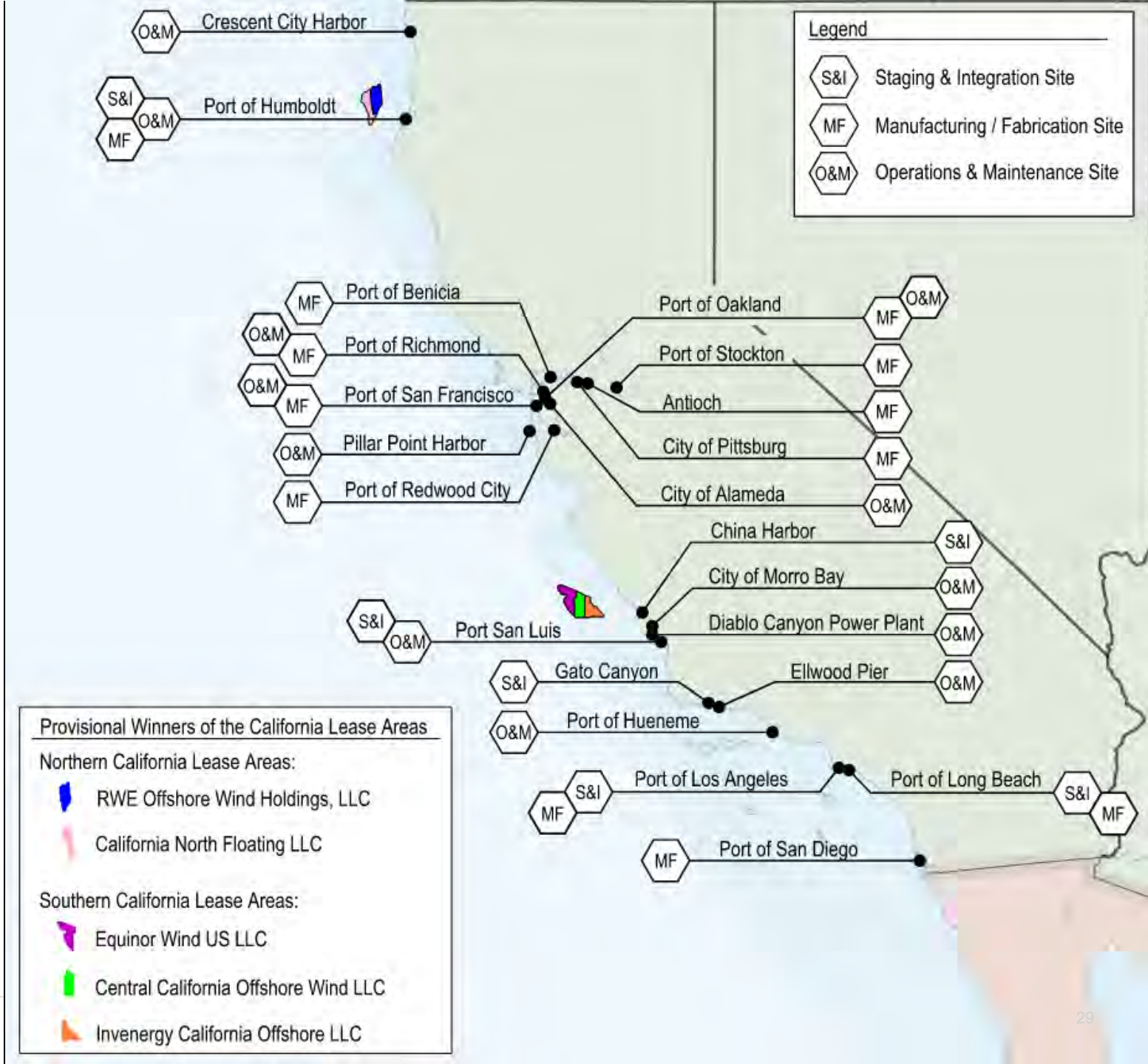
Create a New Port Site for S&I

- Short List of 11 Sites for S&I
- 3 sites move forward to be further assessed with existing port sites:
  - Port San Luis
  - China Harbor
  - Gato Canyon



Identified Sites to be Further Evaluated

- These are the sites that move forward with more detailed evaluation



Roadmap for the AB 525 Port Readiness Plan

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Port Improvements Required

- **Determine the cost and schedule for infrastructure improvements such as:**
  - Demolition of existing facilities (buildings, marine structures, etc)
  - Remediation of existing site contaminants
  - Construction of new wharves or berths
  - Completion of geotechnical ground improvements
  - Dredging / deepening of berth pocket
  - Deepening / widening of federal navigation channels and entrance channels
  - Install fill to raise site for sea level rise (SLR) and to provide required working surface
  - Miscellaneous civil site improvements (utilities, drainage, etc.)
  - Significant electrical improvements (electrified terminals, no emissions)
  - Construct buildings, warehouses, factories, security features, training facilities, etc.
  - Projects to mitigate environmental impacts

Roadmap for the AB 525 Port Readiness Plan

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2. Determine How Many Port Sites are Required
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5. **Evaluate and Compare Port Sites**
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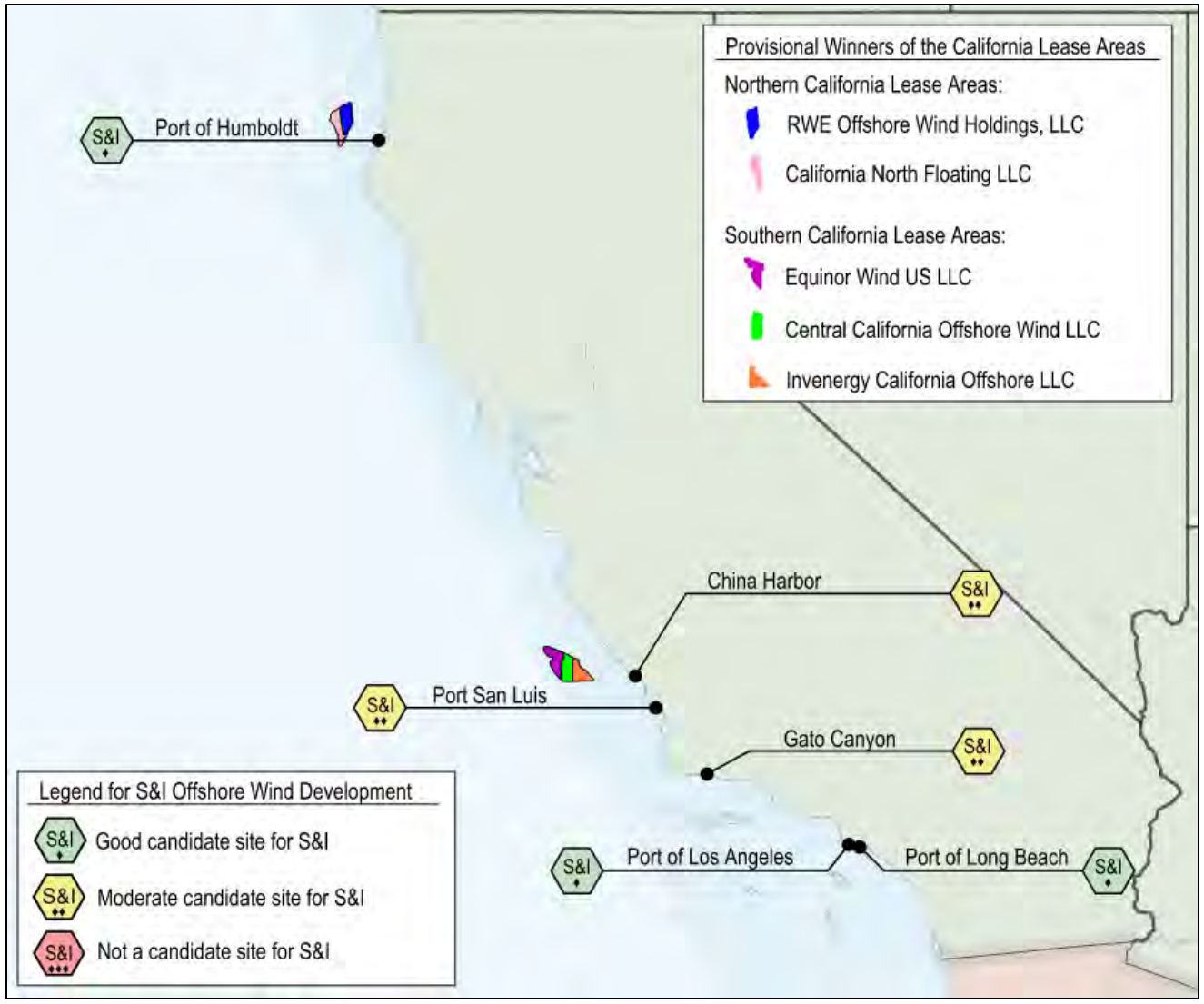
Compare and Evaluate Port Sites

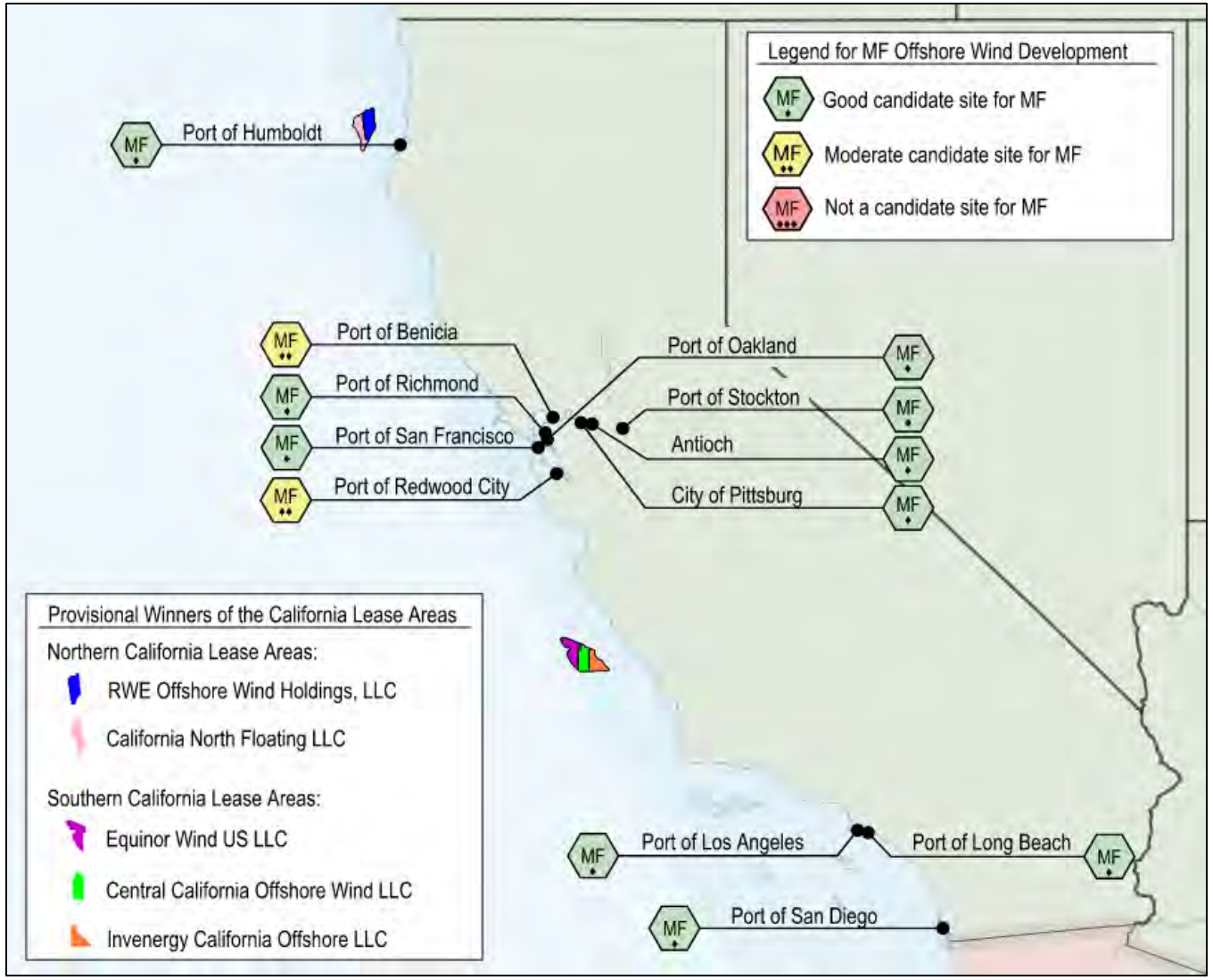
- **Report provides detailed assessment on:**
  - Towing and navigation study
  - Environmental considerations
  - Cost and schedule

Best CA Port Sites – Staging & Integration



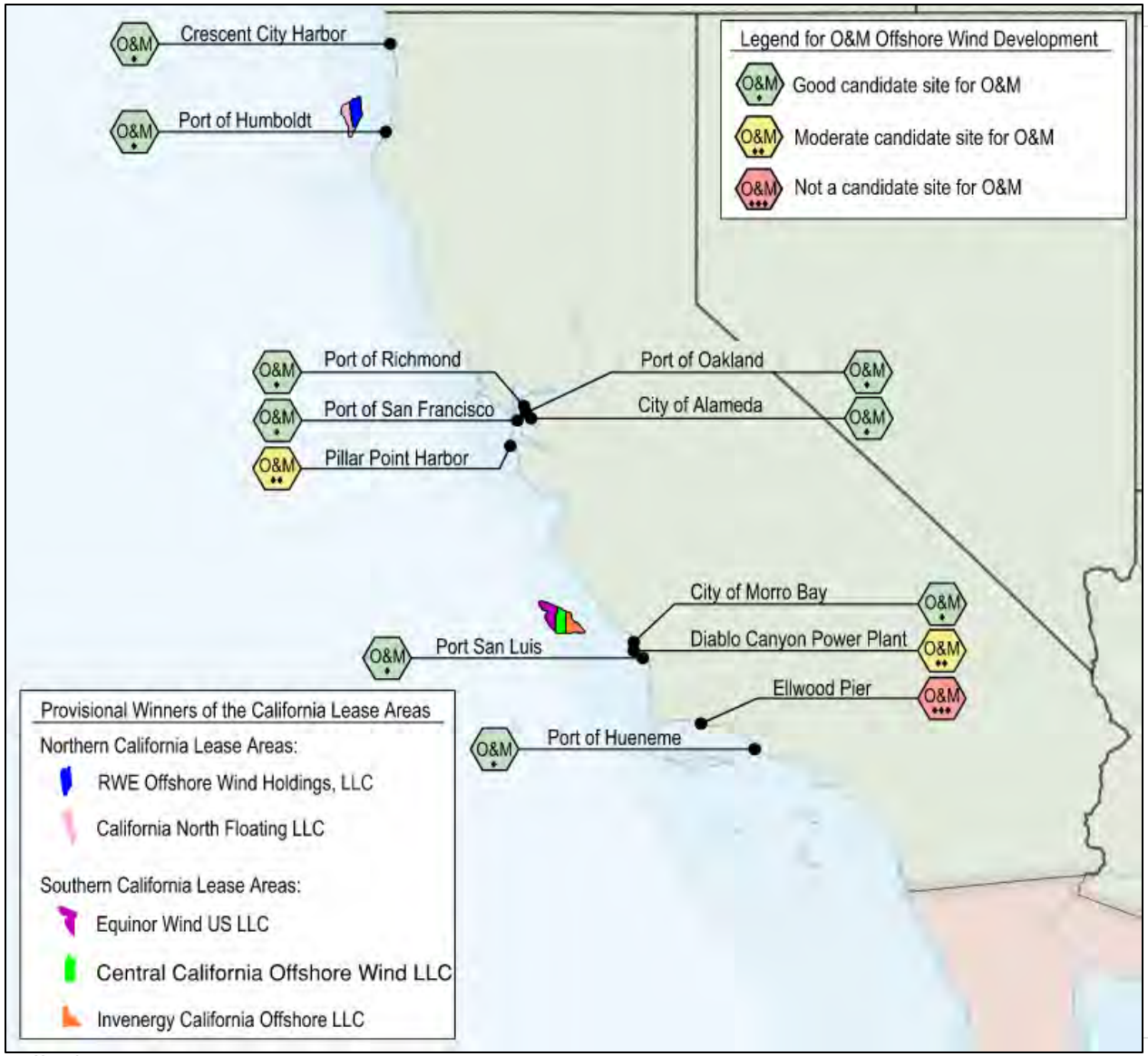
- Without these type of sites, OSW development is not possible
- Port of Humboldt and Port of Long Beach have announced projects

Best CA Port Sites – Manufacturing



- These type of sites provide significant job creation and economic impact

Best CA Port Sites – Operations & Maintenance



Multi-Port Strategy to Achieve State Offshore Wind Planning Goals

Type of Site	Medium (25 GW)
S&I Sites	3
MF Site (Blade)	2
MF Site (Tower)	1
MF Site (Nacelle Assembly)	1
MF Site (Foundation Assembly)	2
SOV berths for O&M Activities	9 to 16
Mooring Line & Anchor Storage Sites	20 to 40 ac
Electrical Cable Laydown Sites	12 to 22 ac

- Need approximately 10 large port sites (>80 acres) and 10 small port or harbor sites (2-10 acres) to meet CA targets by 2045
- Strategizing the development of manufacturing port sites in California will maximize job creation and economic impact to the State
- California ports and harbors can be ready to support the OSW industry with adequate and timely investments

Roadmap for the AB 525 Port Readiness Plan

1. Determine Port Needs for OSW Use
2. Determine How Many Port Sites are Required
3. Identify Potential Port Sites
4. Determine Port Improvements Required
5. Evaluate and Compare Port Sites
6. **Publish AB 525 Port Readiness Plan**

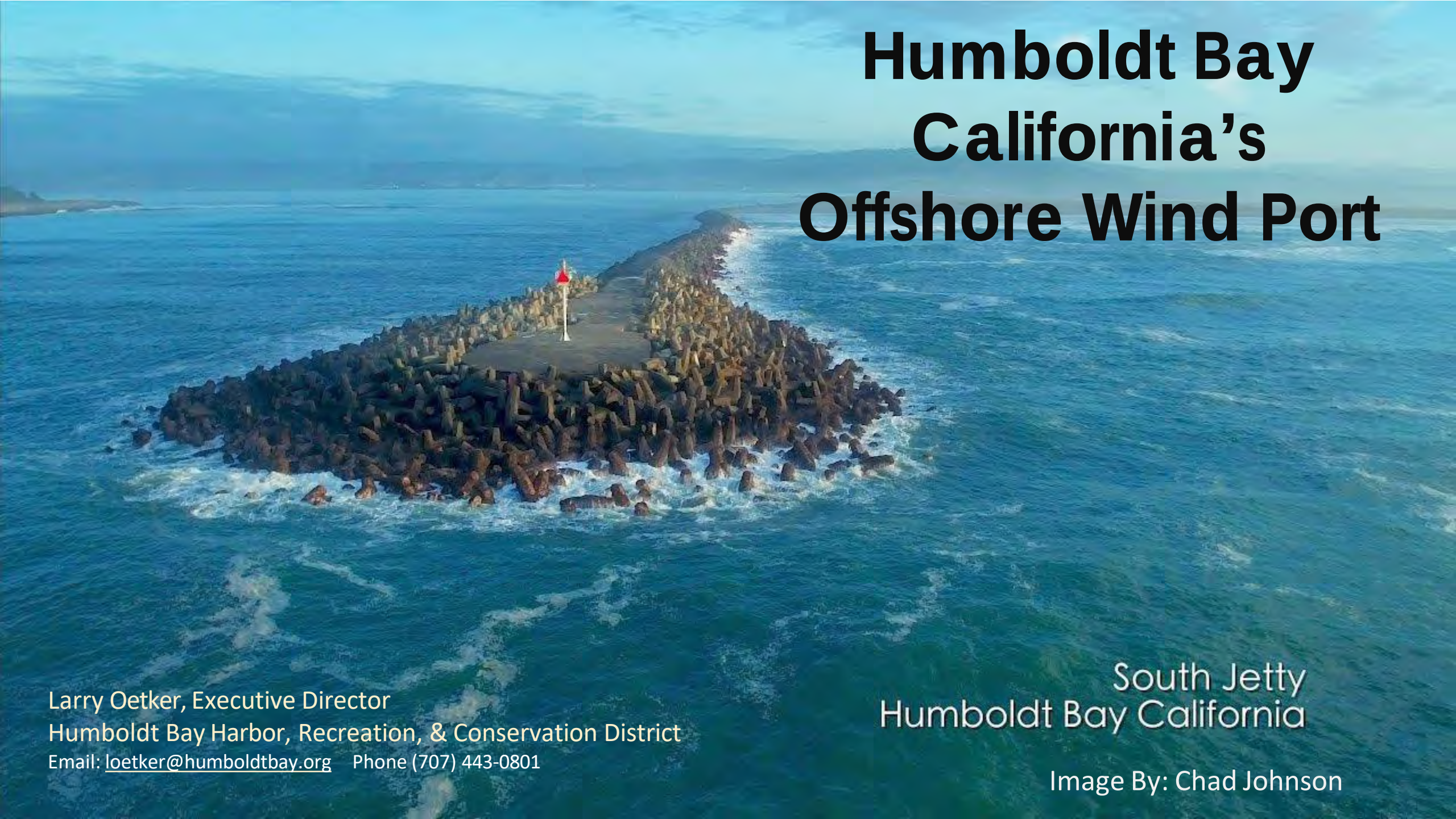
Thank you

Questions and Answers

10 Minute Break

Larry Oetker
Port of Humboldt

Humboldt Bay California's Offshore Wind Port



South Jetty
Humboldt Bay California

Image By: Chad Johnson

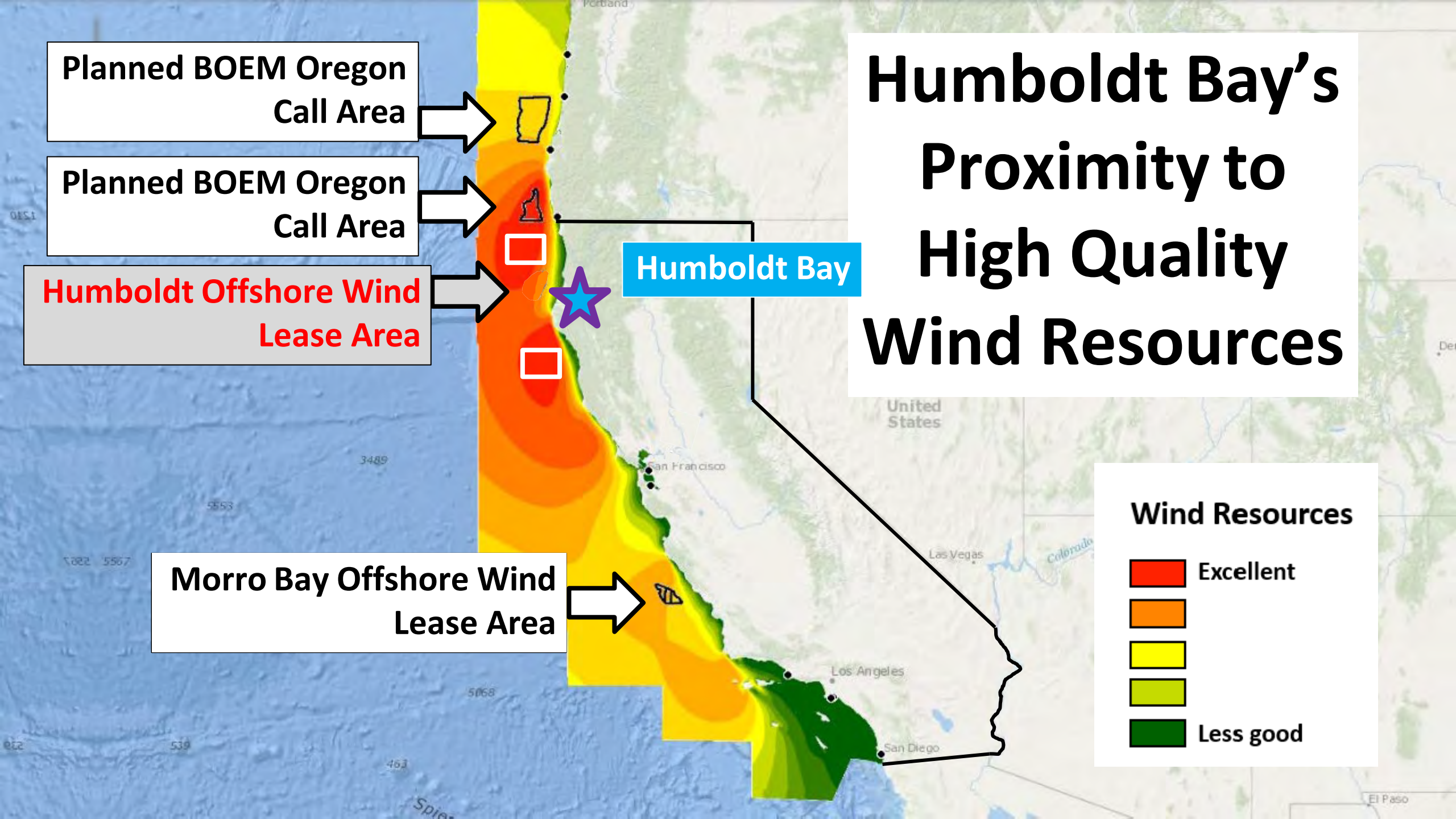
Larry Oetker, Executive Director
Humboldt Bay Harbor, Recreation, & Conservation District
Email: loetker@humboldtbay.org Phone (707) 443-0801

California

New Transmission & Carbon Free Energy Upgrades

By 2030 5 GW

By 2045 25 GW

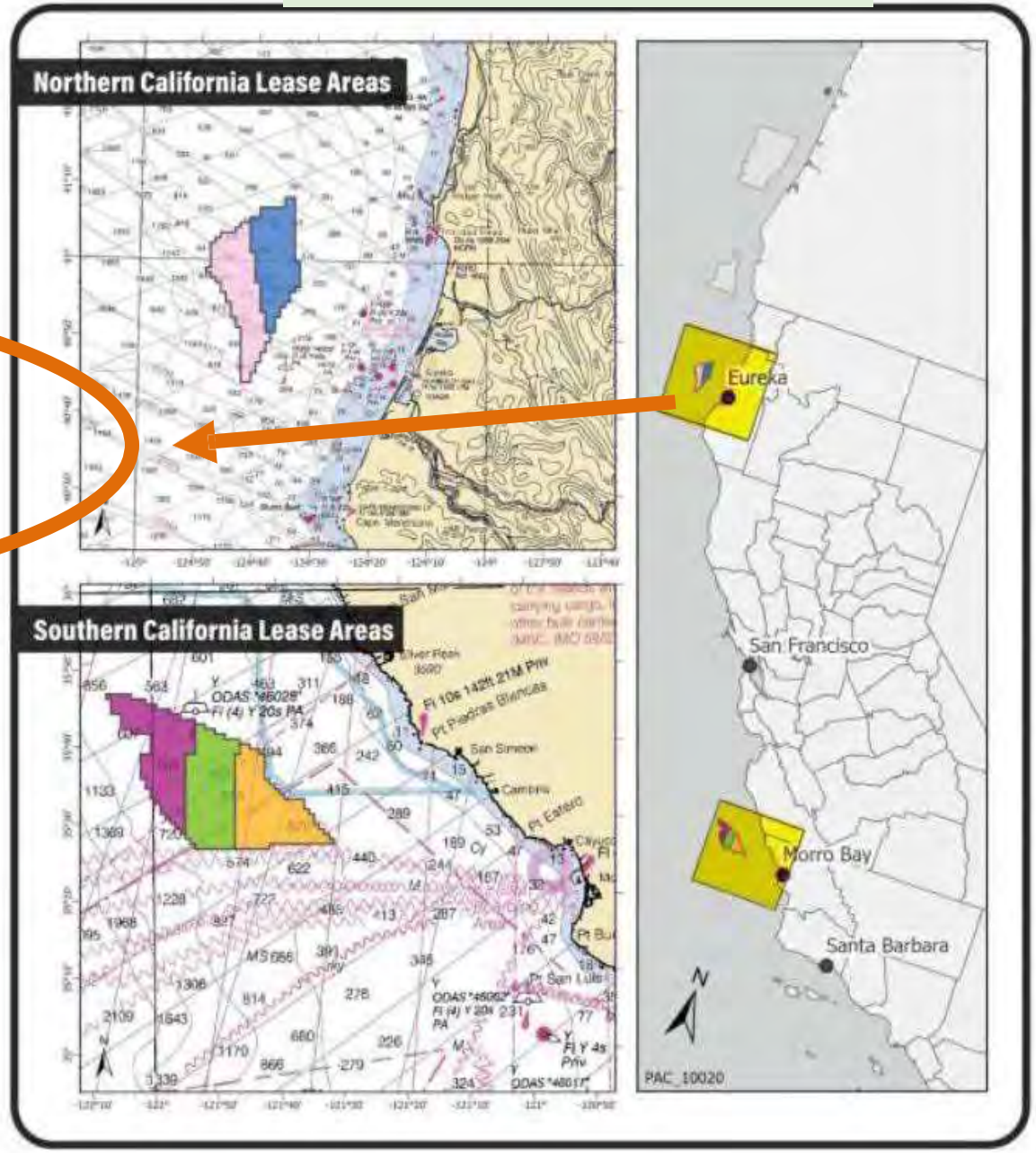

Planned BOEM Oregon Call Area
Planned BOEM Oregon Call Area
Humboldt Offshore Wind Lease Area
Humboldt Bay
Morro Bay Offshore Wind Lease Area
Humboldt Bay's Proximity to High Quality Wind Resources
Wind Resources
Excellent
Less good
Portland
United States
San Francisco
Las Vegas
Los Angeles
San Diego
El Paso

December 2022

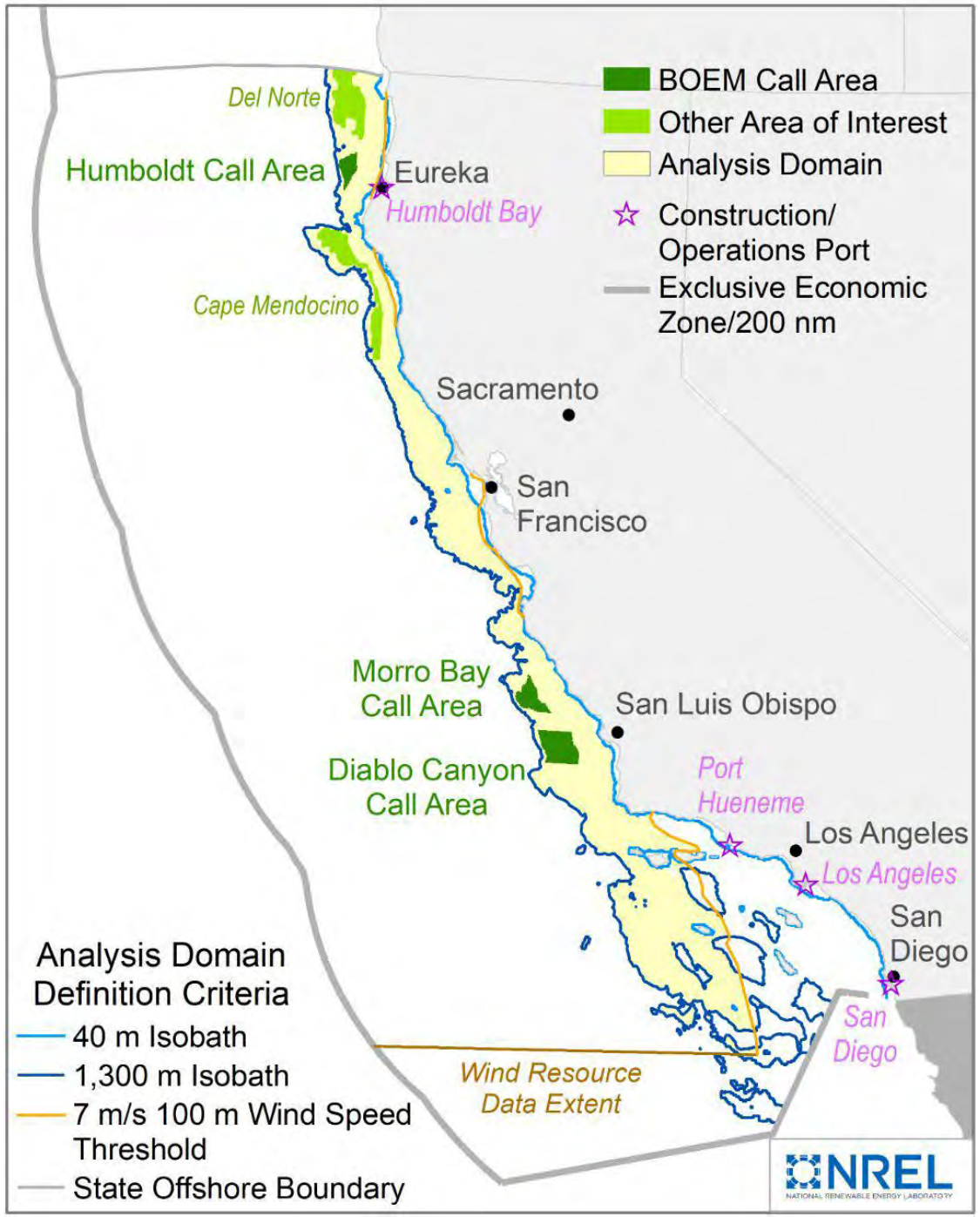
Provisional Winners of the California Lease Areas, $757,100,000 in High Bids

LEASE AREA		
OCS-P0561	RWE Offshore Wind Holding, 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



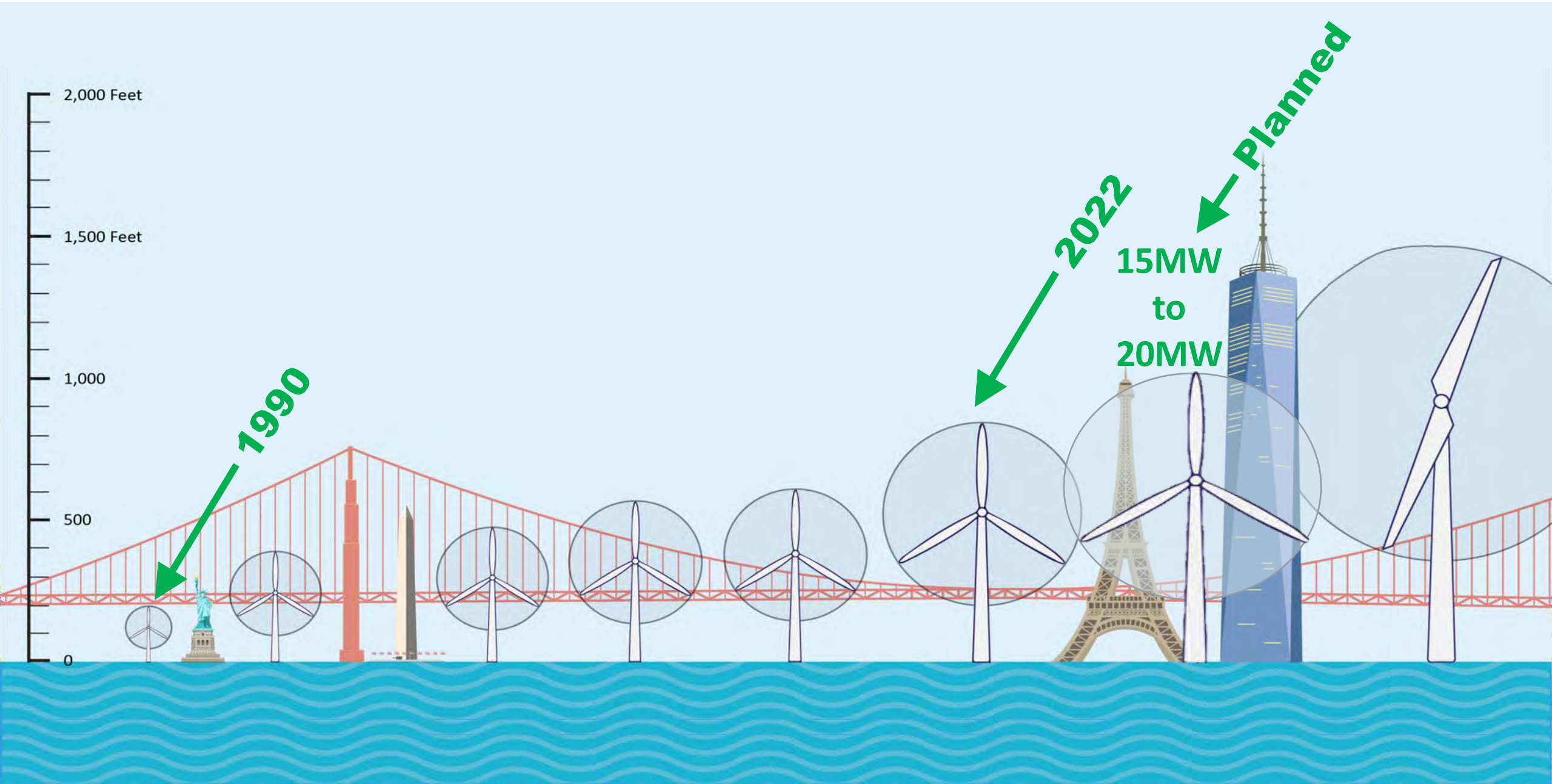
CA Carbon Neutral Energy by 2040

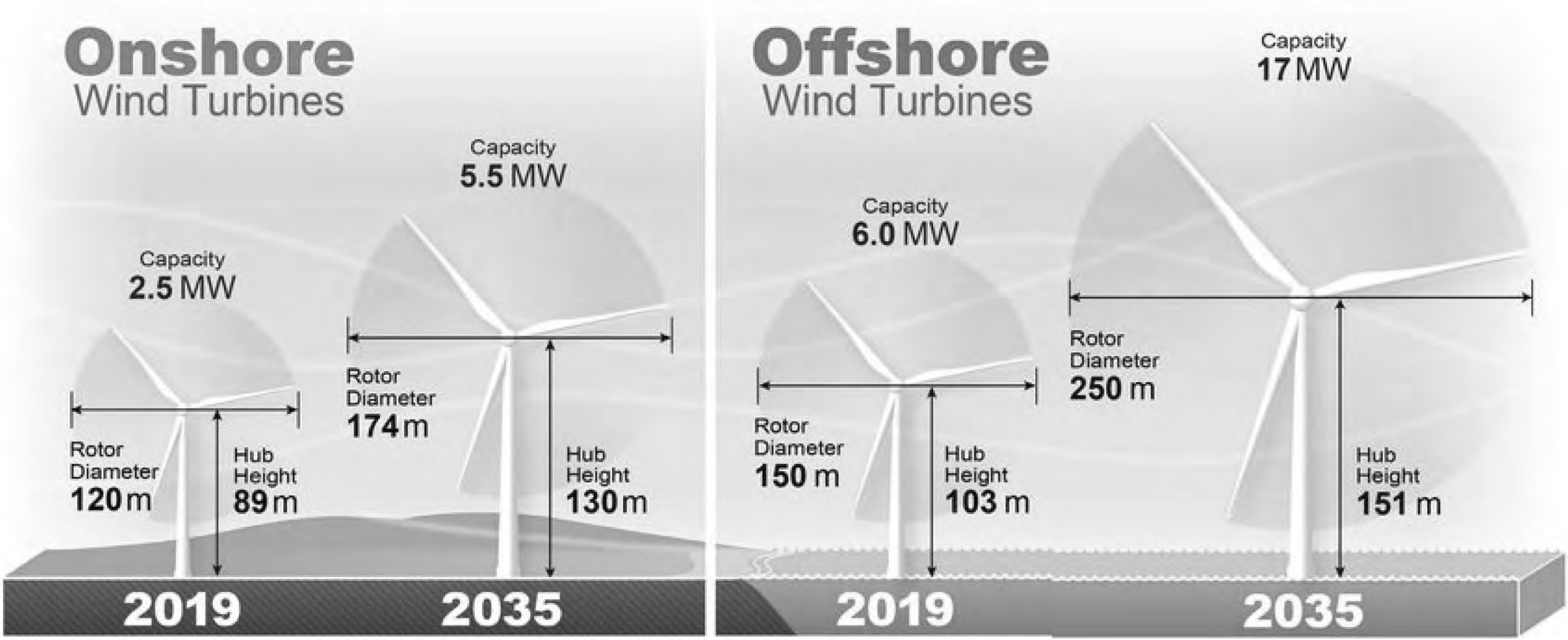


Ca. Offshore Wind Areas

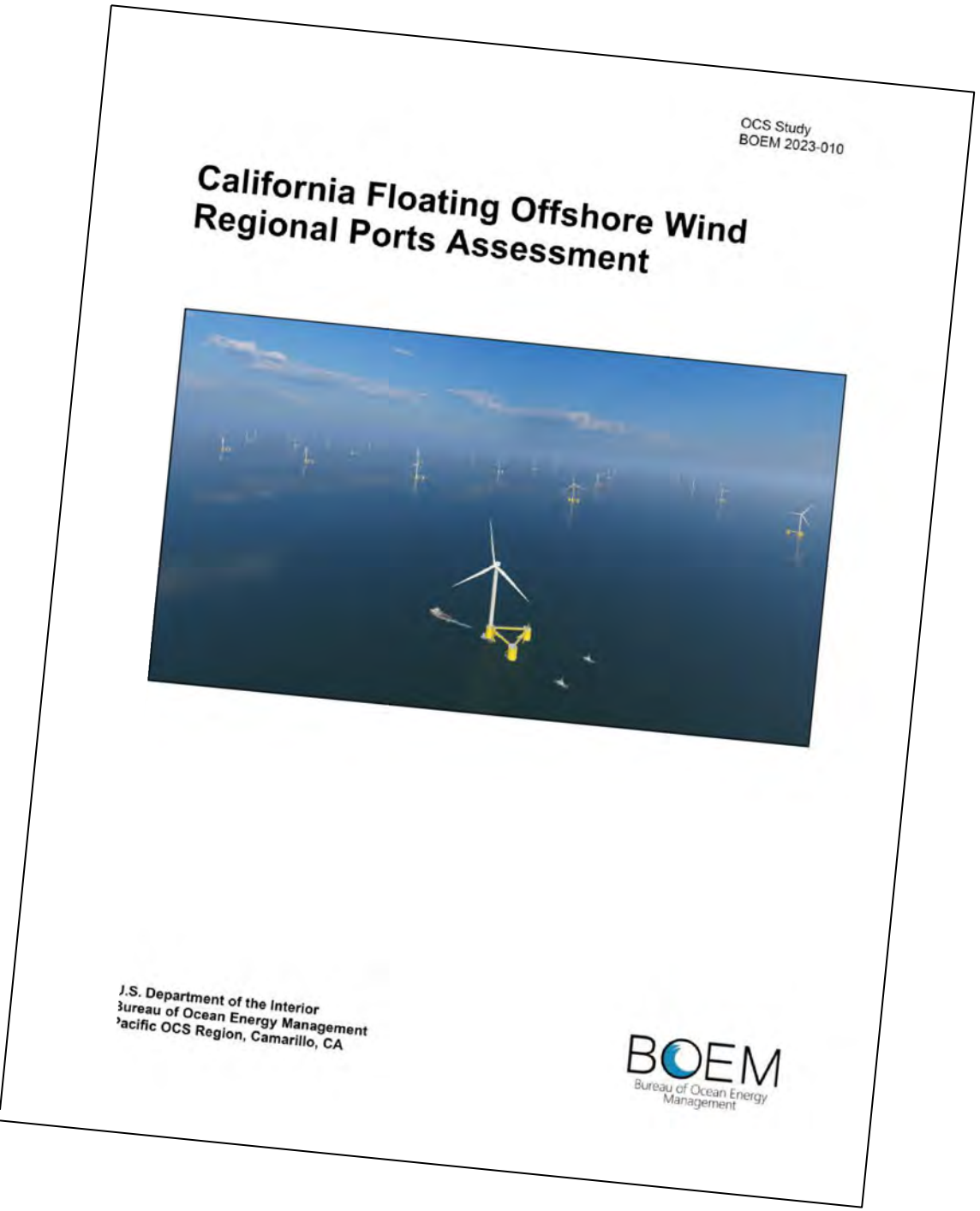
- Phase I
  - Humboldt 1.6 GW
  - Morro Bay 3.0 GW
- Future Phases
  - Cape Mendocino 6.2 GW
  - Del Norte 6.6 GW
  - Diablo Canyon 4.3 GW
  - Brookings, Oregon
  - Coos Bay Oregon 3.0 GW

Evolution of Offshore Wind Turbine Sizes




Onshore
Wind Turbines
Capacity
2.5 MW
Rotor
Diameter
120 m
Hub
Height
89 m
Capacity
5.5 MW
Rotor
Diameter
174 m
Hub
Height
130 m
2019
2035
Offshore
Wind Turbines
Capacity
6.0 MW
Rotor
Diameter
150 m
Hub
Height
103 m
Capacity
17 MW
Rotor
Diameter
250 m
Hub
Height
151 m
2019
2035

The Deepwater Port Authorities of CAPA



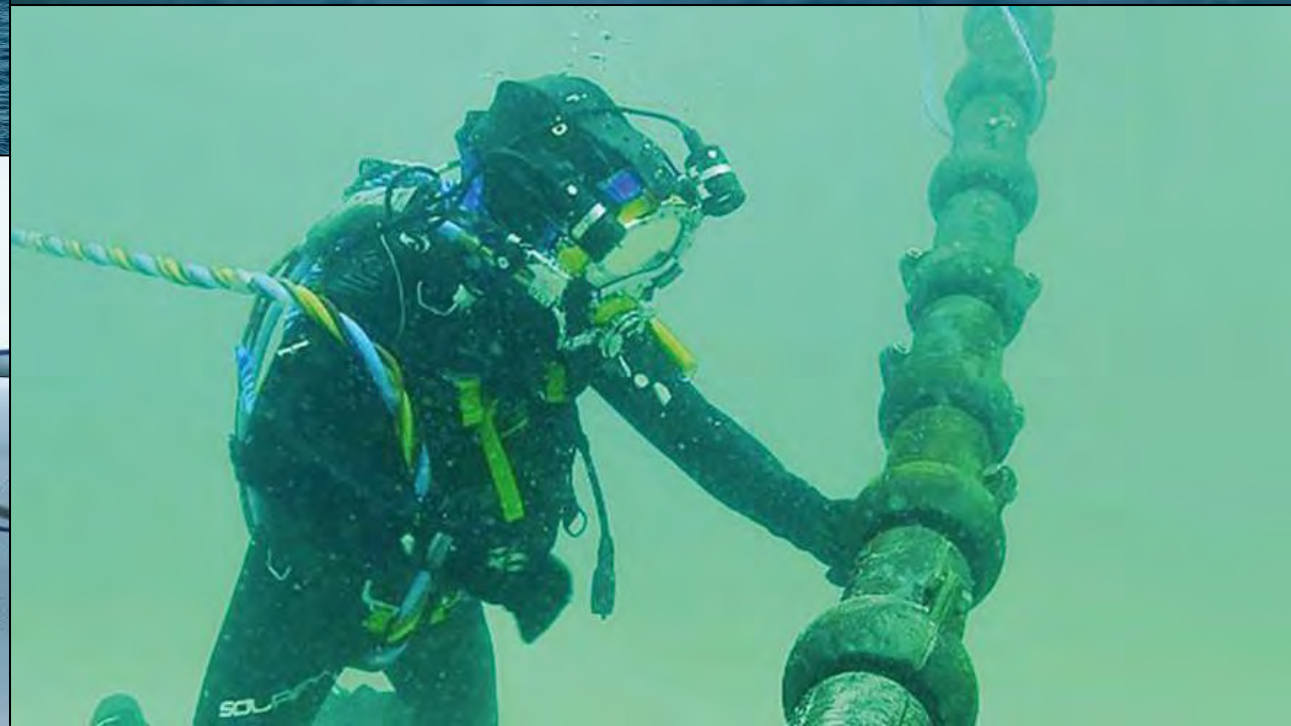
BOEM Regional Ports Assessment

- Published in January of 2023
- Identifies three types of ports needed to support floating offshore wind:
  - Staging and Integration (S&I)
  - Component Manufacturing (CM)
  - Operations and Maintenance (O&M)
- Classifies all the ports/harbors in California by their ability to service the three needed types of ports

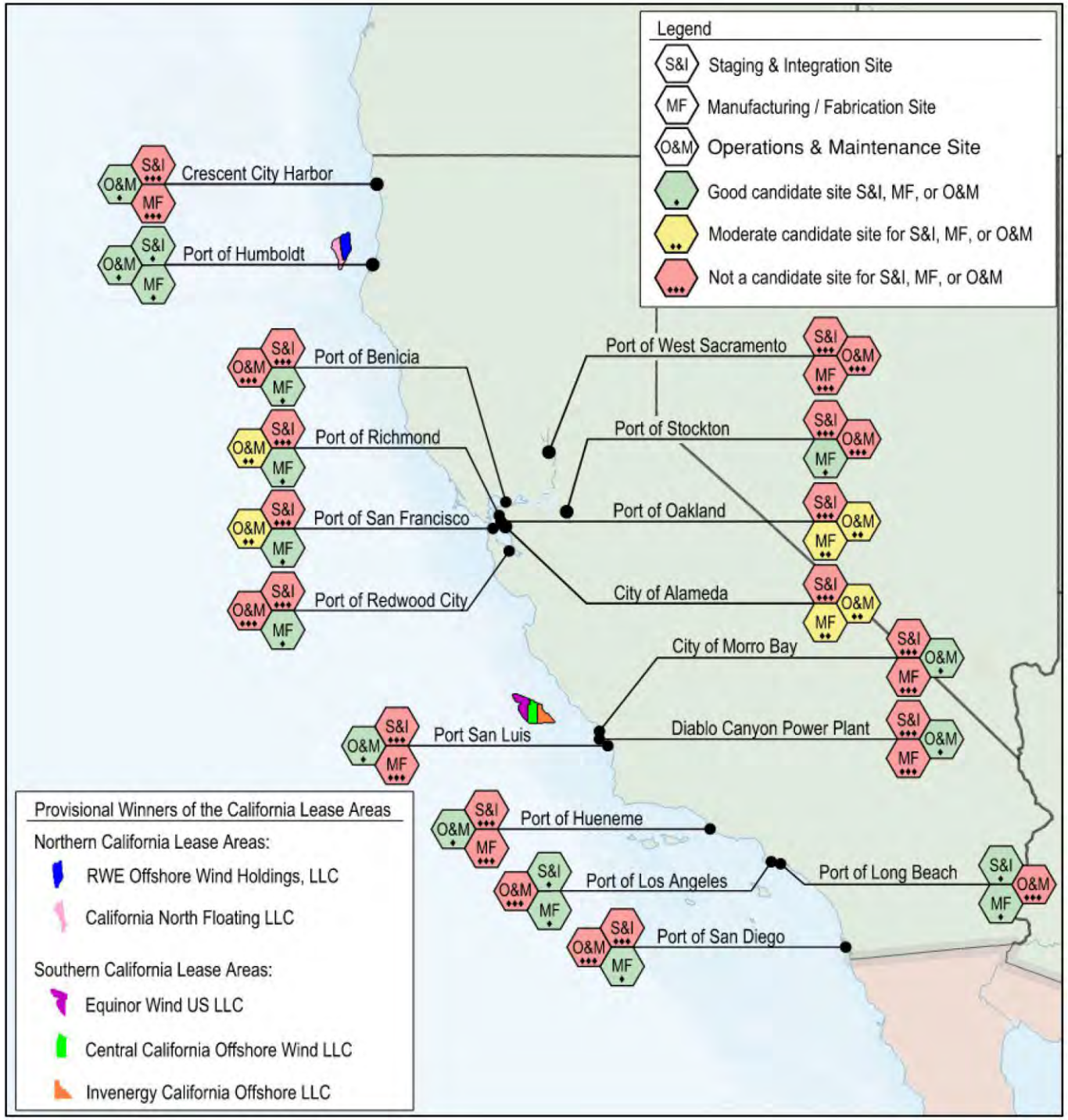
Port Type 1: Component Manufacturing (CM)

Port Type 2: Staging and Integration (S&I)

Port Type 3: Operations and Maintenance (O&M)



BOEM's Evaluation of Port's Ability to Service OSW by Type



Growing a Wind Energy Supply Chain

Supply Chain Activities

- **Project development and management**
- **Manufacturing**
  - Nacelle, hub, and assembly
  - Blades
  - Tower
  - Foundation supply
  - Array cable supply
  - Export cable supply
  - Onshore and offshore substation supply
  - Operational infrastructure
- **Installation**
  - Turbine installation
  - Foundation installation
  - Array cable installation
  - Export cable installation
  - Other installation
- **Operation, maintenance, and service**
  - Wind farm operation
  - Turbine maintenance and service
  - Foundation maintenance and service
  - Subsea cable maintenance and service
  - Substation maintenance and service
- **Decommissioning**

Metal Bending Manufacturing

Offshore Wind Blade

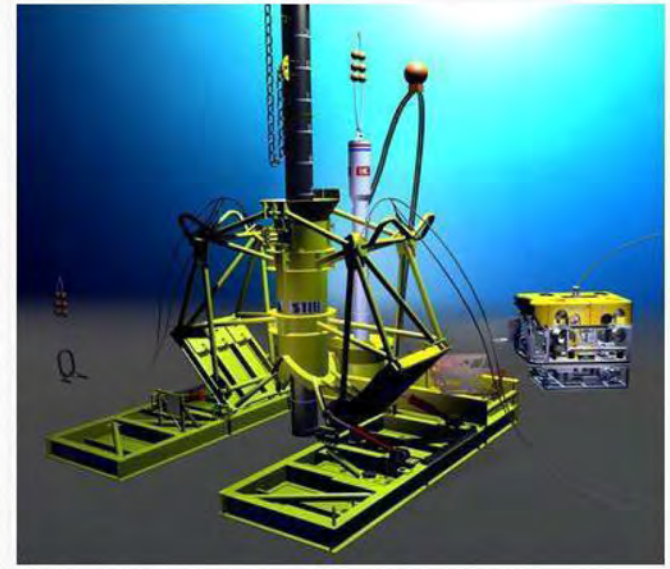
The V236-15.0 MW™ prototype nacelle has been completed at our factory in Lindø and is ready for testing.

DRAG-EMBEDDED ANCHOR

GRAVITY-BASE ANCHOR

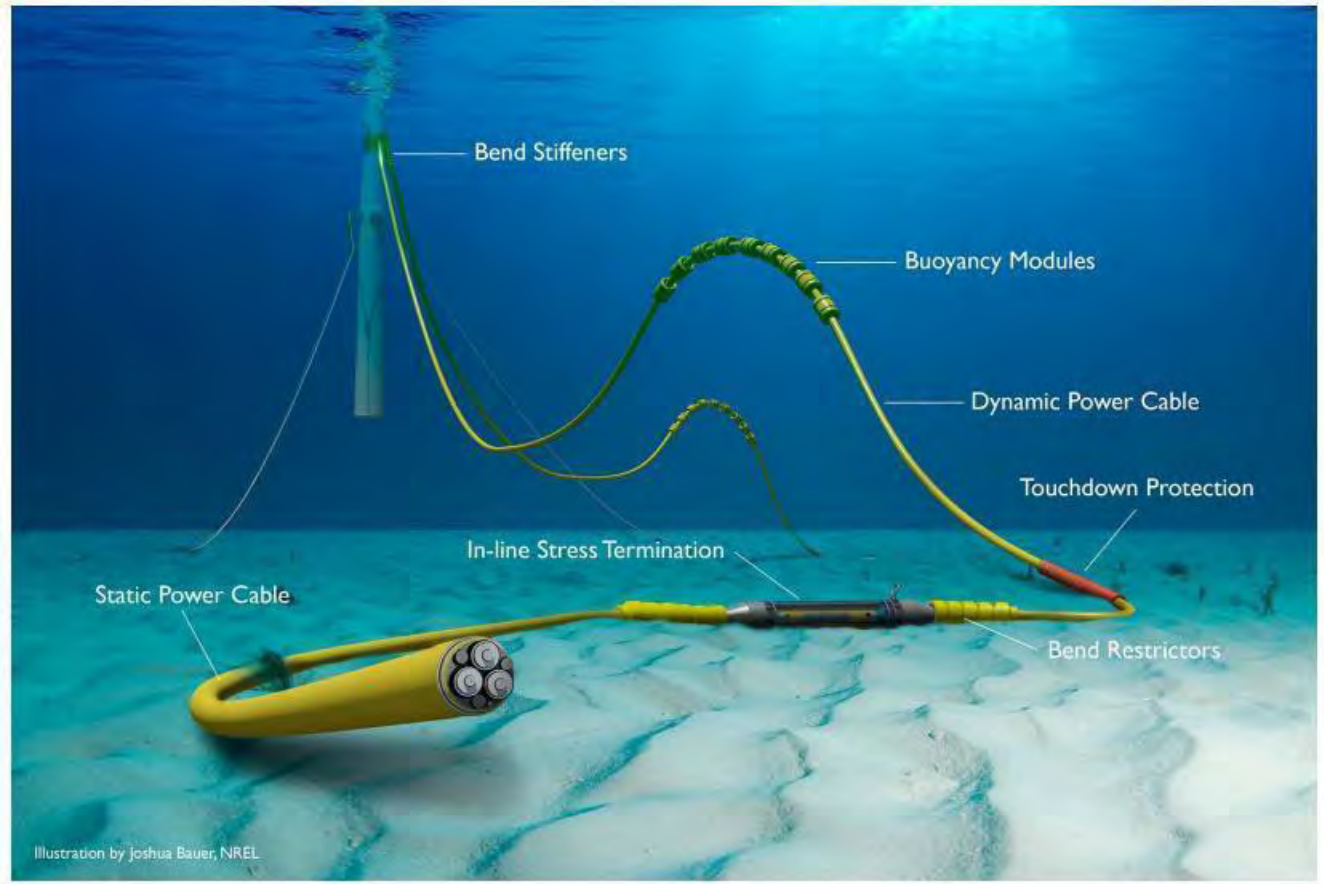
SUCTION ANCHOR

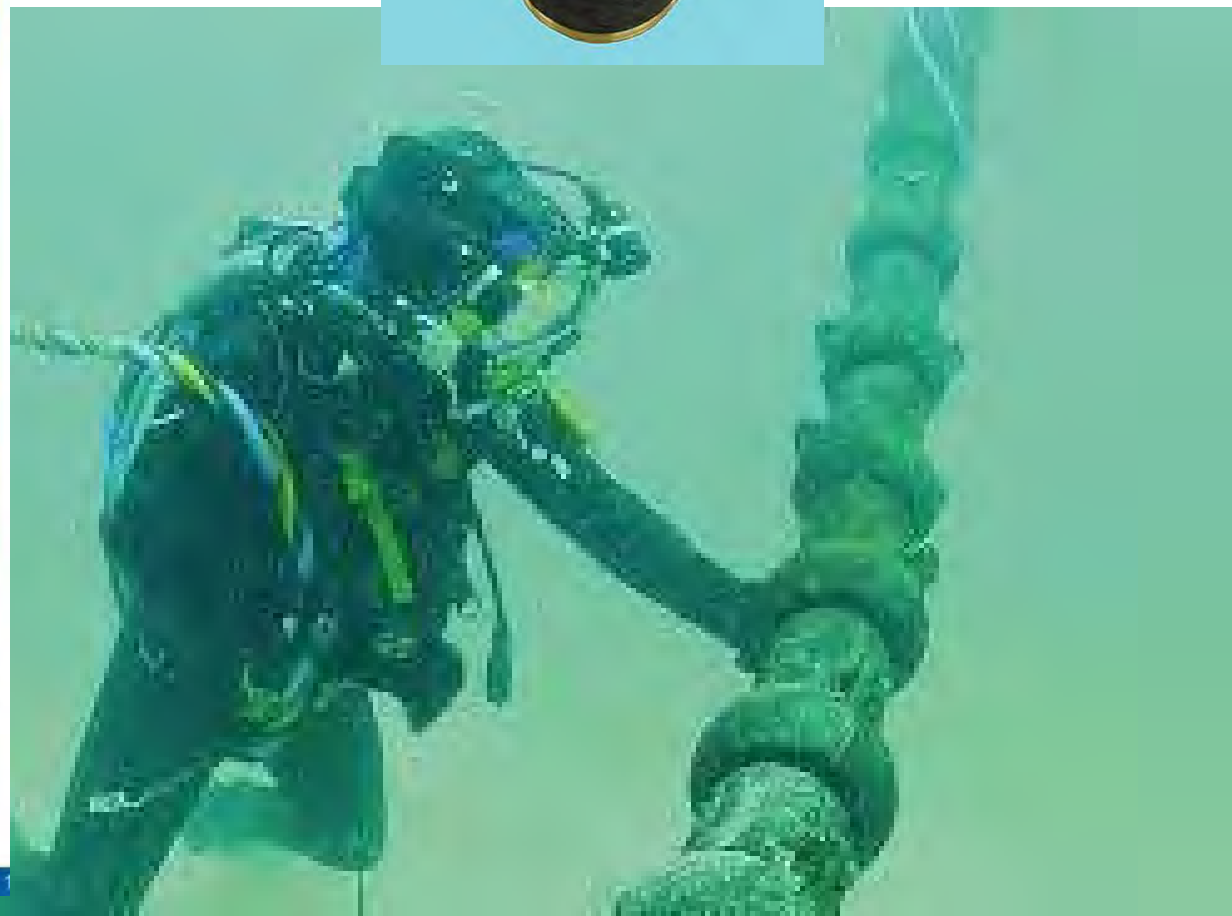
DRIVEN PILE ANCHOR



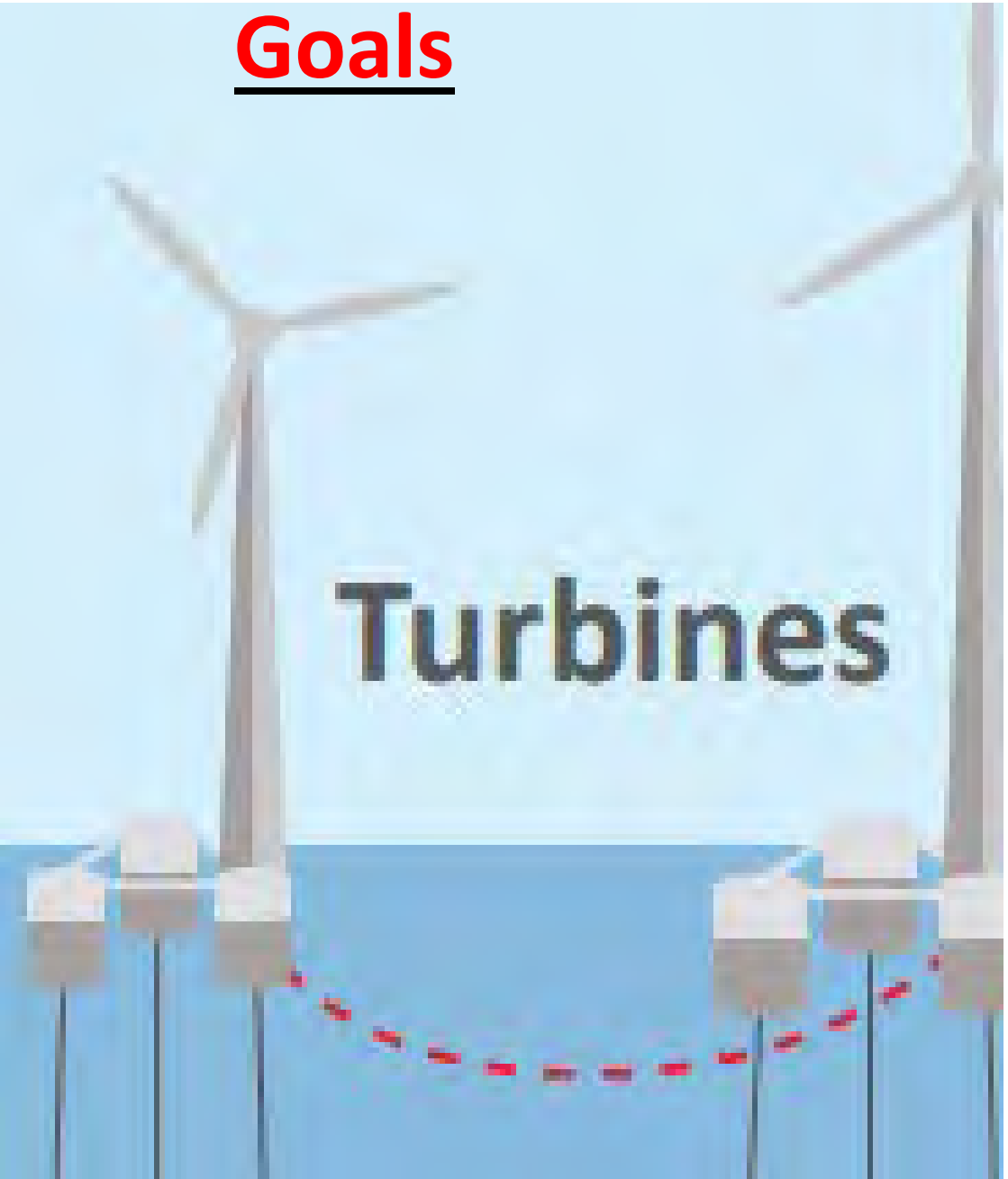
DRIVEN ANCHOR PLATE

Undersea Electrical Power Cables





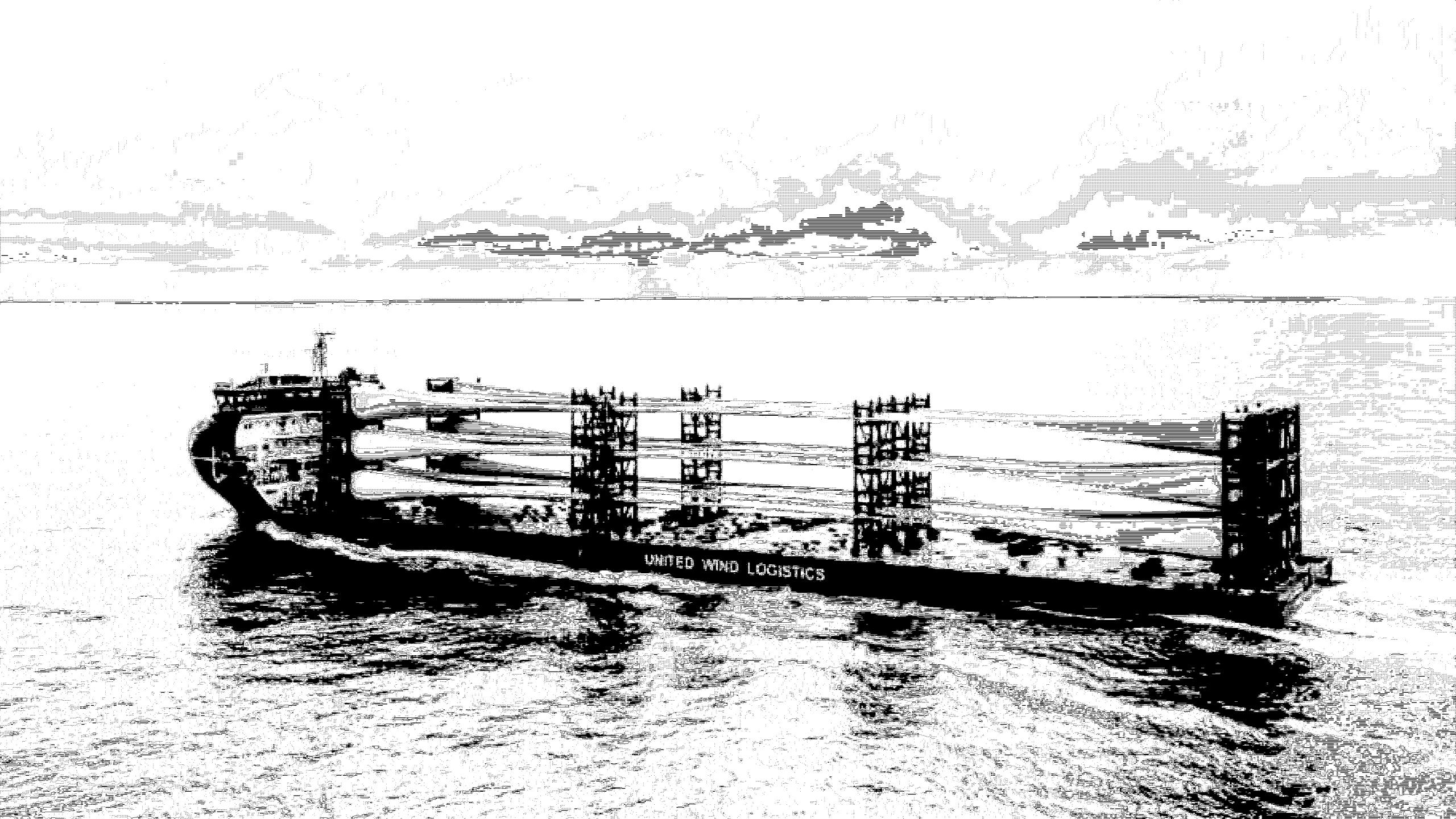
Number of Turbines Needed to meet State Goals



- CA Goal = 25 GW
- Each turbine = ~15 MW
- Requires ≥ ~1,667 turbines
- 1,667 floaters
- 1,667 turbine/nacelles
- 5,000 blades
- 1,000,000 feet of towers
- 15 million feet of mooring lines
- 6,000+ anchors
- ??? miles of transmission cables


Kassel
Paderborn
33
Hannover
Bielefeld-Süd
Dortmund
2
500 m
GLS
GLS
MAN

© AP


UNITED WIND LOGISTICS

Manufactured on-site or shipped.


200T
wison
惠 生 海 工
425'
425'
425'
100'

Floater Footprint & Dodger Stadium

NOTE: THIS OVERVIEW PLAN AND THE IDEAS HEREIN ARE CONCEPTUAL IN NATURE AND ARE NOT INTENDED FOR PROJECT APPROVAL OR CONSTRUCTION. MORE DEVELOPED PLANS ARE TO BE BASED ON ACCURATE SURVEY AND BASE DATA INFORMATION.

0' 2,000' 4,000'

N

KEY MAP

AREA OF DETAIL

CITY OF EUREKA

HUMBOLDT BAY

CITY OF ARCATA

CITY OF BLUE LAKE

PACIFIC OCEAN

BAY ENTRANCE

SOUTH JETTY

NORTH JETTY

EXISTING ENTRANCE CHANNEL (48')

SOUTH SPIT

U.S. COAST GUARD STATION

SAMOA FIELD AIRPORT

NEW NAVY BASE ROAD

NEW NAVY BASE ROAD

TOWN OF SAMOA

HUMBOLDT OFFSHORE WIND TERMINAL PROJECT SITE

SAMOA PENNISULA

255

EXISTING SAMOA FEDERAL CHANNEL (38')

EXISTING TURNING BASIN (38')

EXISTING SAMOA FEDERAL CHANNEL (38')

TULOWAT ISLAND

SAMOA BRIDGES

HUMBOLDT BAY

FIELDS LANDING BOAT YARD

KING SALMON

EXISTING SOUTH CHANNEL (25')

PG&E POWER PLANT

CITY OF EUREKA

101

101

101

CR COLLEGE OF THE REDWOODS

(1 MILE)

WOODLEY ISLAND MARINA & HARBOR DIST. HQ

CITY OF ARCATA &

CAL POLY HUMBOLDT

(5 MILES)

LEGEND

- FEDERAL NAVIGATION CHANNELS *
- INDUSTRIALLY ZONED LANDS ***
- HUMBOLDT OFFSHORE WIND TERMINAL PROJECT SITE

* Per the 2021 Humboldt County Airport Land Use Compatibility Plan, the Samoa Field Airport is a minor landing strip with no currently published instrument approaches and an estimated average of eight landings per week of small private aircraft through the year 2039.

** The "Potential Wet Storage Sites" indicate areas of the Bay that are at least 45 feet deep and outside of the Federally-maintained navigation channels. These potential areas are currently under review and will be adjusted as more detailed analysis of the sites are conducted.

*** The industrially zoned lands shown in this figure are owned by multiple public and private parties. These lands fall within the jurisdictions of Humboldt County and the City of Eureka. Many of these industrially zoned lands contain existing docks and terminals and/or the capacity for new docks/terminals. These lands include substantial areas of additional development capacity.

HUMBOLDT BAY HARBOR RECREATION & CONSERVATION DISTRICT

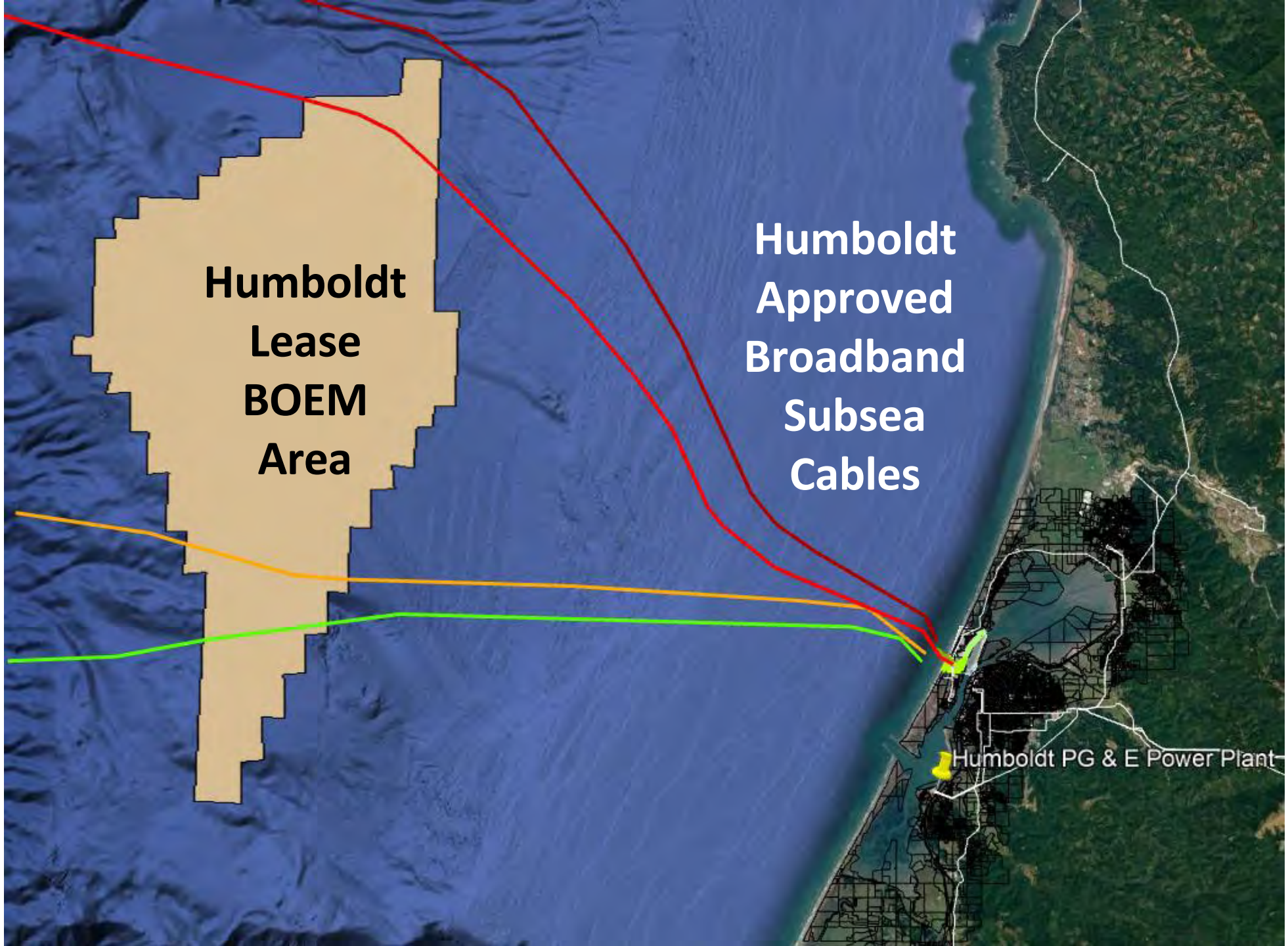
moffatt & nichol

HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL

OVERALL BAY VIEW

JULIAN BERG DESIGNS
ARCHITECTURE & PLANNING
julianbergdesigns.com
707 • 407 • 8870

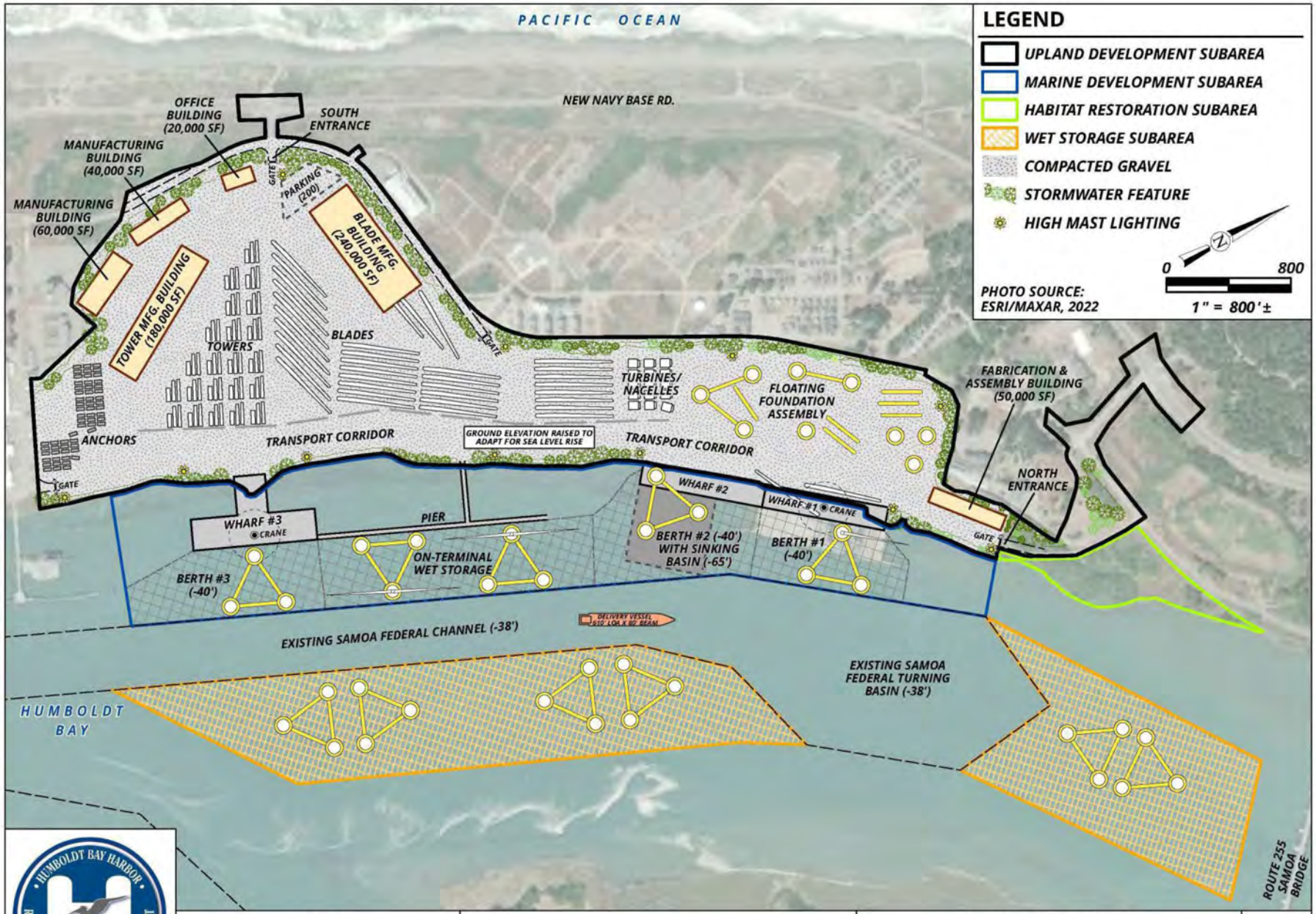
5.9.22


Humboldt
Lease
BOEM
Area
Humboldt
Approved
Broadband
Subsea
Cables
Humboldt PG & E Power Plant

HUMBOLDT BAY'S ASSETS FOR OSW

- Channel width
- Channel depth
- No vertical draft restrictions
- Immediately-available industrial sites w/ direct access to federal navigation channel
- Geographically-central to short and long- term wind areas

CROWLEY®



HUMBOLDT BAY HARBOR RECREATION & CONSERVATION DISTRICT

moffatt & nichol

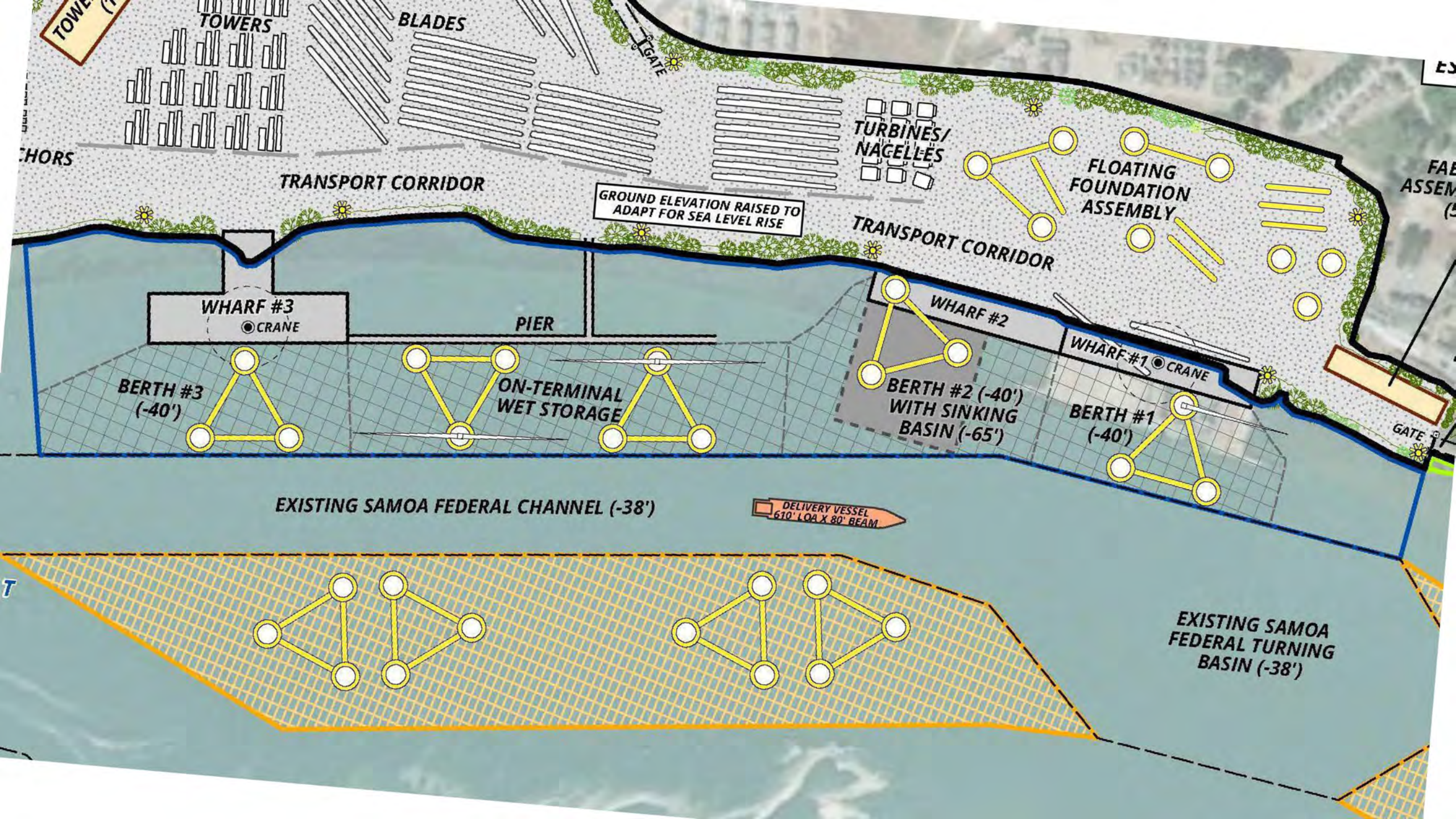
SHN

Humboldt Bay Offshore Wind Heavy Lift Marine Terminal

Project Example #1

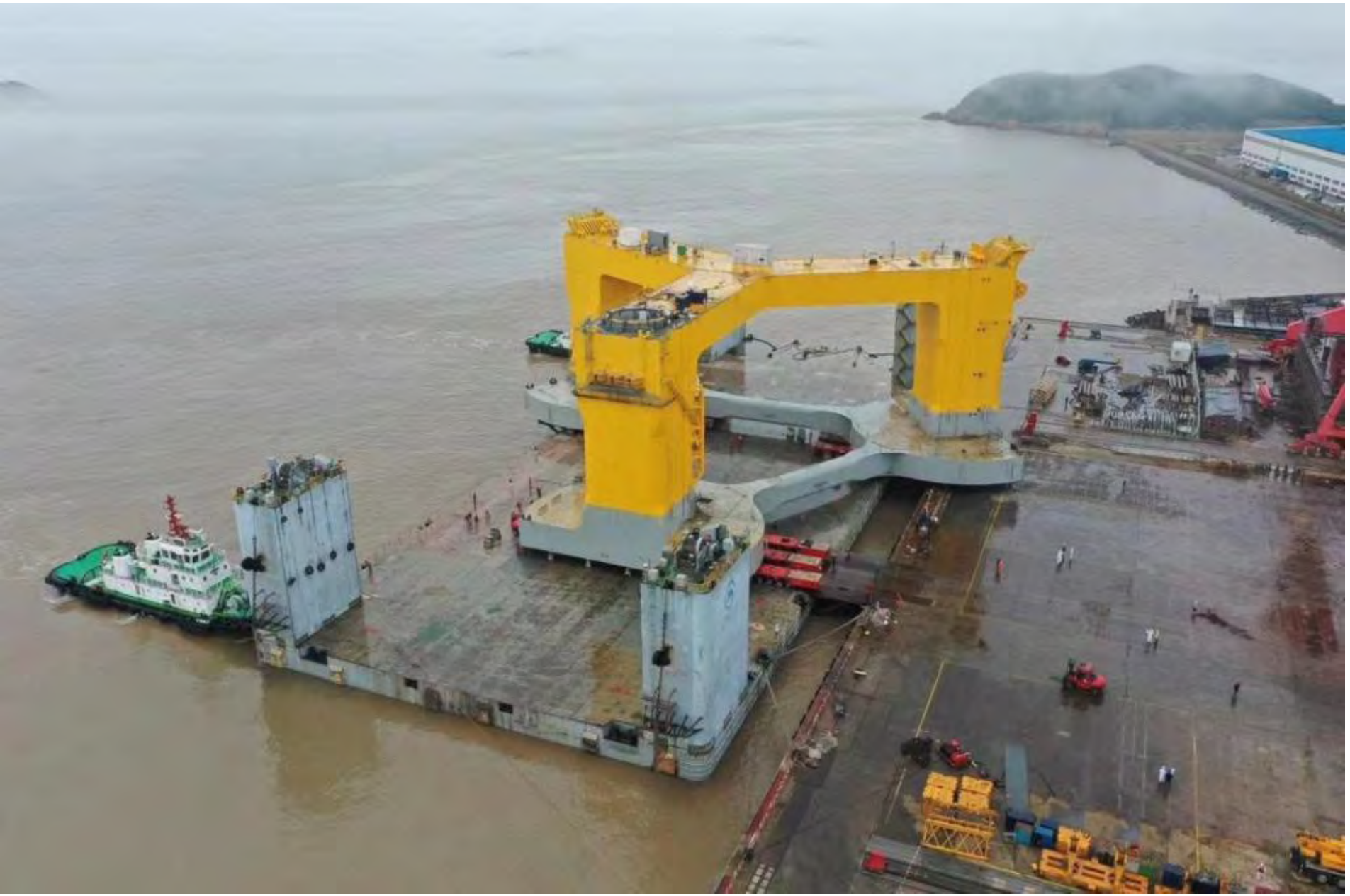
April 2023

Figure 3.1


TOWERS
BLADES
GATE
TURBINES/
NACELLES
FLOATING
FOUNDATION
ASSEMBLY
TRANSPORT CORRIDOR
GROUND ELEVATION RAISED TO
ADAPT FOR SEA LEVEL RISE
TRANSPORT CORRIDOR
WHARF #3
CRANE
PIER
WHARF #2
WHARF #1
CRANE
BERTH #3
(-40')
ON-TERMINAL
WET STORAGE
BERTH #2 (-40')
WITH SINKING
BASIN (-65')
BERTH #1
(-40')
GATE
EXISTING SAMOA FEDERAL CHANNEL (-38')
DELIVERY VESSEL
610' LOA X 80' BEAM
EXISTING SAMOA
FEDERAL TURNING
BASIN (-38')

Shanghai-headquartered Wison Offshore & Marine has shipped out China's first floating wind foundation **platform from its yard in Zhoushan.**

June 9, 2021 Source: Wison Offshore & Marine



The semi-submersible platform will support MingYang Smart Energy's MySE5.5MW typhoon-resistant wind turbine which recently rolled off the production line.

Source: Wison Offshore & Marine


WF1

Summary of Progress to Date

- CEQA / Engineering Technical Reports
  - Topographic and Hydrographic Surveys
  - Geotechnical Investigation
  - Cultural Surveys
  - Wetland Delineations and Biological Surveys
  - Phase I Environmental Site Assessment (hazardous materials)
  - Dredge Sediment Characterization
  - Traffic Analyses
  - Power/electrical/stormwater/utility options evaluations
  - Shoreline Planning and Sea Level Rise Analyses

moffatt & nichol

Plans for 2023

- Stakeholder and public engagement
- PIDP Grant Submittal [Engineering Design Phase] (May 2023)
- CEQA/NEPA (June 2023) (USACOE Requested Lead Agency)
- Permits submittal (August 2023)
- >30% design
- Channel tow-out modeling
- Project Financing

CONCLUSION

1. Per State and Federal published studies, there will need to be 3 port types (S&I, CM, and O&M) and there will need to be 10 port terminals in California.
2. Not all 10 terminals need to come on-line at the same time. Development will be phased between now and 2035 in order to meet State goals.
3. Staging & Integration (S&I) is the most critical and most difficult to construct. The other port functions (CM and O&M) will come after S&I is operational.
4. Port development is an essential early component in the overall development pipeline. The State will need to fund planning, permitting, design, and construction phases of port/terminal development.
5. Significant State investments will be needed to develop needed port infrastructure.
6. California needs to invest in the existing 11 deep water CAPA ports.

Suzanne Plezia
Port of Long Beach

Port of LONG BEACH
THE GREEN PORT

PIER WIND CONCEPT

SUZANNE PLEZIA, P.E.

SENIOR DIRECTOR, CHIEF HARBOR ENGINEER

CALIFORNIA ENERGY COMMISSION

WORKSHOP ON ASSEMBLY BILL 525: PORTS AND WORKFORCE DEVELOPMENT

MAY 23, 2023


ZEERO
Zero Emissions, Energy Resilient Operations
Port of
LONG BEACH
THE GREEN PORT

WHOLE OF GOVERNMENT APPROACH

Port of LONG BEACH THE GREEN PORT

AB 525

Offshore Wind Goals
Economic Benefit
Permitting Roadmap

California Regional *Ports Assessment*

BOEM Bureau of Ocean Energy Management

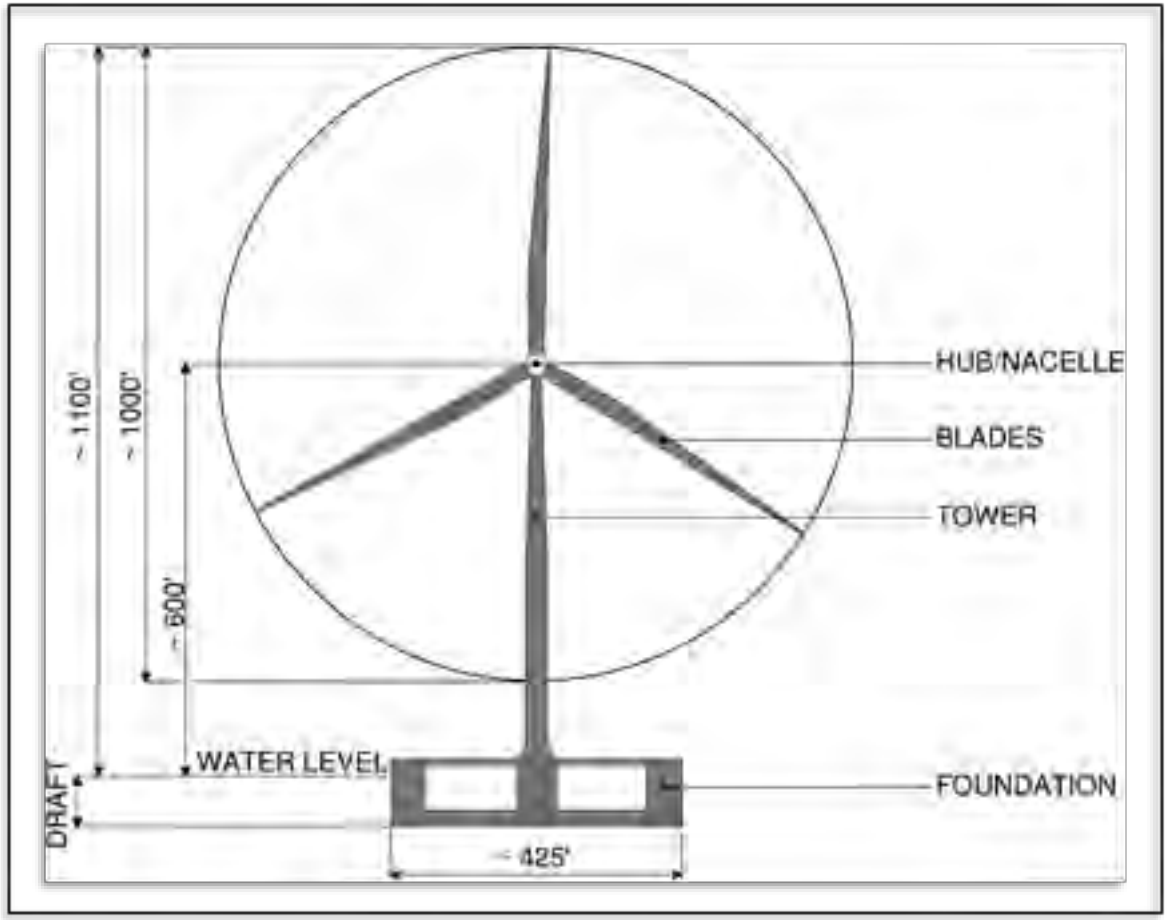
Alternative *Ports Assessment*

California State Lands Commission

West Coast *Ports Strategy Study*

NREL Transforming ENERGY

PLANNING FOR FUTURE INNOVATION



20-25 MW FLOATING OFFSHORE WIND TURBINE SYSTEM DIMENSIONS

FLOATING OFFSHORE WIND TURBINE	APPROXIMATE DIMENSION
Foundation Beam / Width	Up to 425 ft x 425 ft
Foundation Draft (Before Integration)	15 – 25 ft
Foundation Draft (After integration)	20 – 50 ft
Hub/Nacelle Height (from Water Level)	Up to 600 ft
Tip Height (from Water Level)	Up to 1,100 ft
Rotor Diameter	Up to 1,000 ft

Source: Pier Wind Conceptual Report April 2023

NACELLES

Source: Vestas

TOWER

Source: Steelwind Nordenham

BLADE

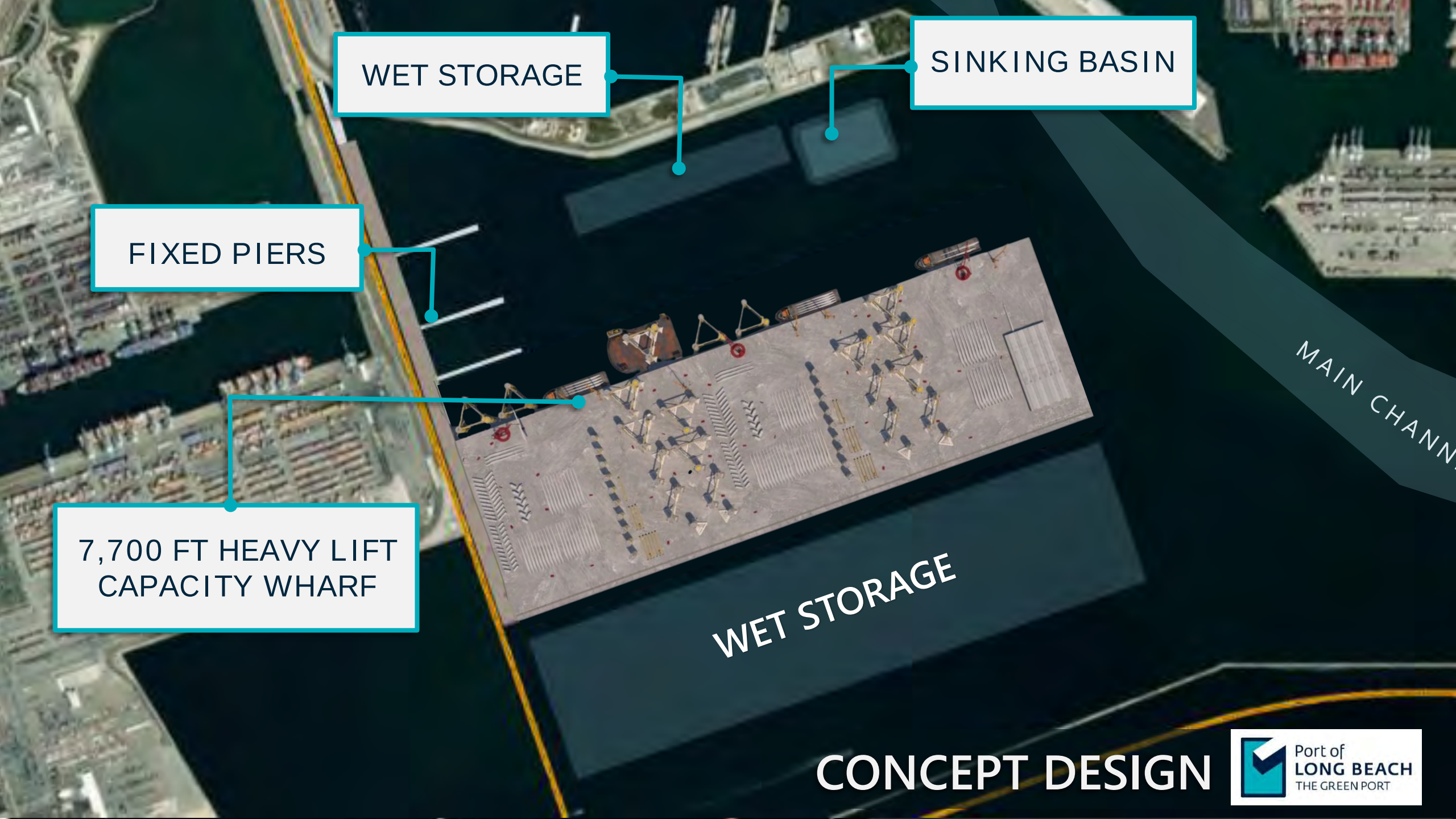
Source: LM Wind Power

FOUNDATION

Source: Wison Offshore & Marine

Source: Pier Wind Vision


Port of
LONG BEACH
THE GREEN PORT
HARBOR DISTRICT
HOW CAN THE PORT OF LONG BEACH HELP SUPPORT?
NO AIR HEIGHT RESTRICTIONS
150 ACRES
-40' to -70'
DEEP
MAIN CHANNEL
COMPLETED
CONCEPT REPORT IN
5 MONTHS



CONCEPT DESIGN

Port of LONG BEACH
THE GREEN PORT

FLEXIBLE, ADAPTABLE

Port of LONG BEACH
THE GREEN PORT

SCHEDULE AND COST

Port of LONG BEACH
THE GREEN PORT

TODAY

2027
START OF CONSTRUCTION

EARLY 2031

LATE 2031

2035

ENV/ PERMITTING

PH 1A

PH 1B

PH 2

CAUSEWAY

FIXED PIERS

WET STORAGE

SINKING BASIN

100 ACRES

100 ACRES

200 ACRES

WET STORAGE

$4.7B
(2023)

400 ACRES

80
80
80
80
80

WORKFORCE

Port of LONG BEACH
THE GREEN PORT

Oil and Gas

REQUIRE SIGNIFICANT WORKFORCE

CREATE NEW JOBS AND OPPORTUNITIES

GREEN ECONOMY

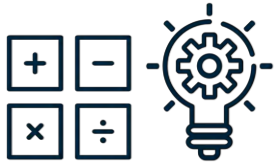
POLB WORKFORCE DEVELOPMENT SUPPORT

Port of LONG BEACH
THE GREEN PORT

Grade School

Academy of Global Logistics

High School

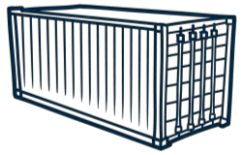


Advanced Manufacturing, Construction, and Engineering Academy

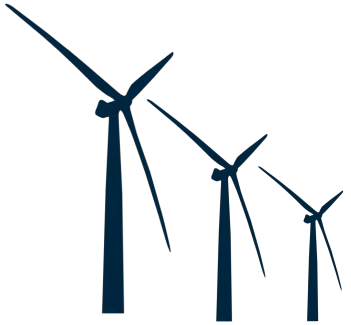
Universities

Community College
Maritime Center of Excellence

Goods Movement Training Campus



Project Labor Agreement



Careers

CONTRACT AND PLA TRANSITIONAL WORKER GOALS

Port of LONG BEACH THE GREEN PORT

Targeted effort to identify local employment candidates from the communities closely surrounding the Port

JOBS COORDINATOR/ PLA ADMINISTRATOR

POLB

CONTRACTOR

WORKERS THAT BUILD PROJECTS

UNIONS

APPRENTICESHIP PROGRAM

COMMUNITY & PRE-APPRENTICESHIP PARTNERS

- Electrical Training Institute
- Pacific Gateway
- Jordan High School STAR Program (Laborers Local 1309)
- Long Beach City College
- Women In Non-Traditional Employment Roles (WINTER) and Youth Build
- My Brothers Keeper (Carpenters Southwest Training Trust)
- Los Angeles Veterans Collaborative (USC Center for Innovation and Research)
- Helmets to Hardhats

Assistance with overcoming barriers to employment

Examples of Barriers:

- Homelessness
- Criminal record
- Inability to pass a drug test
- Lack of transportation
- Unable to afford required tools and union dues

Long Beach City College (MC3)

OR

ECONOMIC BENEFIT

Port of LONG BEACH
THE GREEN PORT

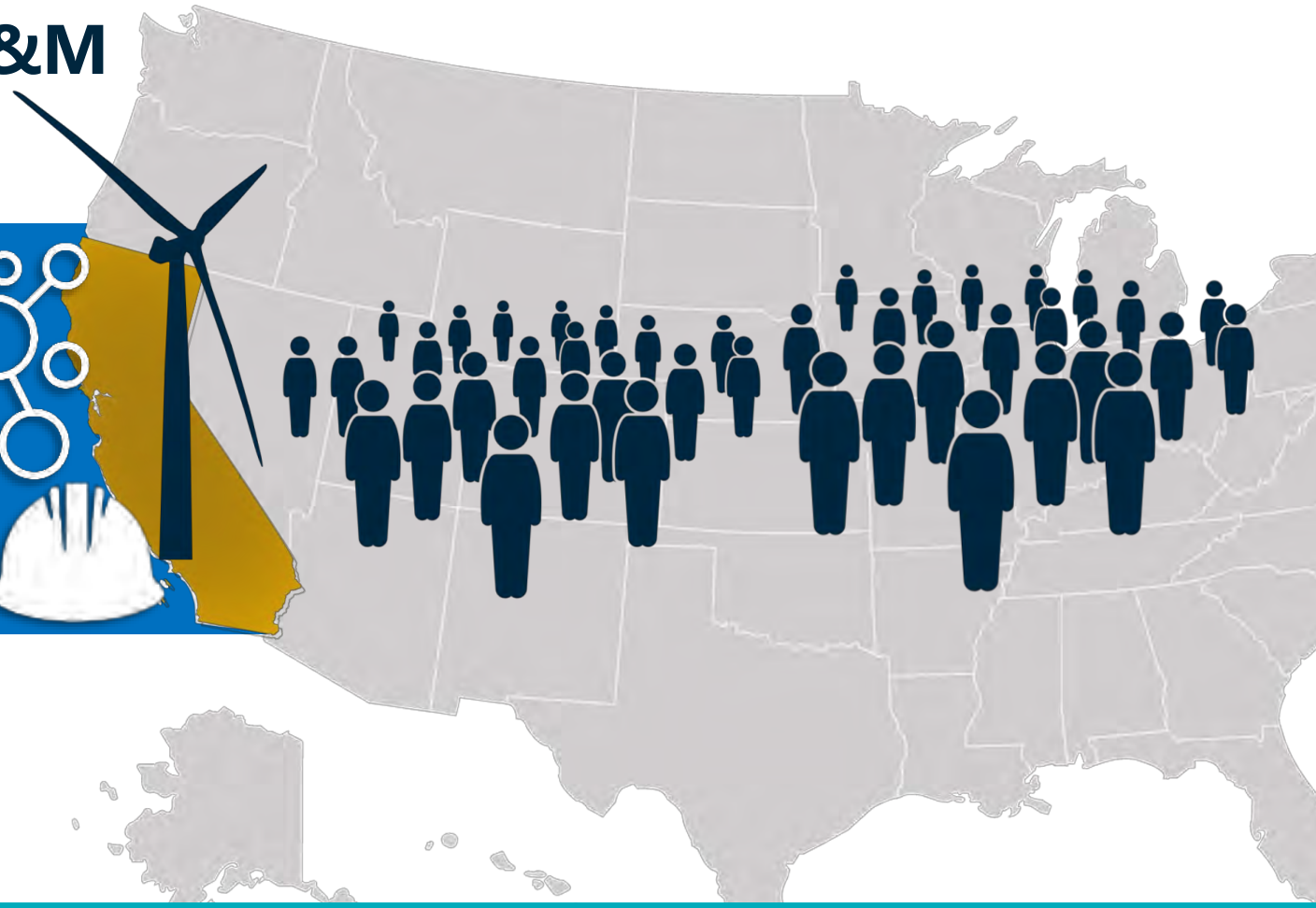
AB525: Preliminary Assessment of Economic Benefits of Offshore Wind

$39.7 billion total state GDP construction + $7.9 billion O&M

(NREL/BOEM 16 GW scenario)

17,500 full-time CA jobs in 2045 using cluster-based strategies

(The American Jobs Project, 18 GW scenario)



BENEFITS SUMMARY

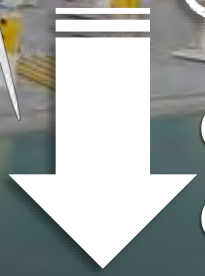
Port of LONG BEACH
THE GREEN PORT

Positions California and the United States to be at the forefront of floating offshore wind innovation and development

US Goal of **15 GW BY 2035**

CA Goal of **25 GW BY 2045**

SCALE



Greenhouse Gases

Cost of Energy

LARGEST PURPOSE-BUILT OFFSHORE WIND FACILITY

NEXT STEPS

Port of LONG BEACH THE GREEN PORT

CONCEPT REPORT

www.polb.com/pierwind

5 MAIN WORK STREAMS

CEQA/ NEPA

PRELIMINARY DESIGN

BUSINESS/ FINANCE / DELIVERY

ENGAGEMENT / COMMUNITY OUTREACH

WORKFORCE DEVELOPMENT

Port of
LONG BEACH
THE GREEN PORT

Public Comment Instructions

Rules
- 3 minutes per person

Zoom
- Click “raise hand”

Telephone
- Press *9 to raise hand
- Press *6 to (un)mute

When called upon
- Unmute, spell name, state affiliation, if any

Written Comments:
- Due: June 9th, 2023 by 5:00 p.m.
- Docket: 17-MISC-01
- Submit at: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-MISC-01

3-MINUTE TIMER

Closing Remarks

Lunch Break
Return at 1:30 pm

Welcome Back

PM Workshop Schedule

1. Welcome Back
2. Commissioner Remarks
3. Catalyst: AB 525 Workforce Development and Economic Benefits Analysis
4. Xodus & BW: AB 525 Workforce Readiness Plan
5. Questions and Answers
6. Break
7. Stakeholder Panel: Workforce Development Needs
8. Public Comment
9. Closing Remarks

Workforce Requirements

AB 525, Section 25991.3 requirements:

- An analysis of the workforce development for offshore wind
- Consult with representatives of key labor organizations
- Recommend workforce standards for equitable economic benefits
  - Prevailing wage
  - Local and targeted hiring
  - Workforce skills and training needs

Ben Pogue
Catalyst

Catalyst Environmental Solutions

Analytical Guidance and Benefits Assessment for AB 525 Strategic Plan

Seaport and Workforce Development for Floating Offshore Wind in California

Presented by: Ben Pogue
Director of Natural Resource Management
Catalyst Environmental Solutions

Catalyst
ENVIRONMENTAL SOLUTIONS

Analytical Framework

Section 25991.3 of AB 525 – The Framework for Assessment

a. Based on the sea spaces identified pursuant to Section 25991.2, the commission, in coordination with relevant state and local agencies, shall **develop a plan** to improve waterfront facilities that could support a range of floating offshore wind energy development activities, including construction and staging of foundations, manufacturing of components, final assembly, and long-term operations and maintenance facilities.

b. The plan developed pursuant to subdivision (a) shall include all of the following:

(1) **A detailed assessment of the necessary investments in California seaports** to support offshore wind energy activities, including construction, assembly, and operations and maintenance. The assessment shall consider the potential availability of land and water acreage at each seaport, including competing and current uses, infrastructure feasibility, access to deep water, bridge height restrictions, and potentially impacted natural and cultural resources, including coastal resources, fisheries, and Native American and Indigenous peoples.

(2) **An analysis of the workforce development needs** of the California offshore wind energy industry, including **occupational safety requirements**, **the need to require the use of a skilled and trained workforce to perform all work**, and **the need for the Division of Apprenticeship Standards to develop curriculum for in-person classroom and laboratory advanced safety training for workers**.

(3) **Recommendations for workforce standards** [illegible] offshore wind energy facilities and associated infrastructure, including, but not limited to, prevailing wage, skilled and trained workforce, apprenticeship, local hiring, and targeted hiring standards, that ensure sustained and **equitable economic development** benefits.

c. In developing the plan pursuant to subdivision (a), the commission shall **consult with representatives of key labor organizations and apprenticeship programs** that would be involved in dispatching and training the construction workforce.

d. On or before December 31, 2022, the commission shall complete and submit to the Natural Resources Agency and the relevant fiscal and policy committees of the Legislature a **preliminary assessment of the economic benefits of offshore wind as they relate to seaport investments and workforce development needs and standards**.

e. The plan developed pursuant to this section shall be included in the chapter of the strategic plan relating to economic and workforce development and identification of port space and infrastructure as specified in paragraph (2) of subdivision (c) of Section 25991.

Principal Mandate: CEC is charged with preparing a chapter of the overall Strategic Plan that considers seaport and workforce development.

Seaport Assessment: Siting/screening analysis (SLC-M&N Team). Assess level of investment – serves as input value for economic benefits assessment (below).

Workforce Development Needs: what type and how many workers will be needed for the OSW workforce. How ready is California to meet this demand?

Workforce Occupational Safety Requirements: Empirical review of OSRs in other industries/states.

Training Needs Assessment: Existing training assets versus what is needed (gaps analysis). Need for unified training curriculum, in-person training/facilities.

Workforce Standards: Prevailing wage analysis. Empirical review (East Coast). Hiring/training standards and equitable hiring practices and recommendations.

Stakeholder Engagement: Interviews with unions, labor organizations, training experts, NREL, industry, and academics.

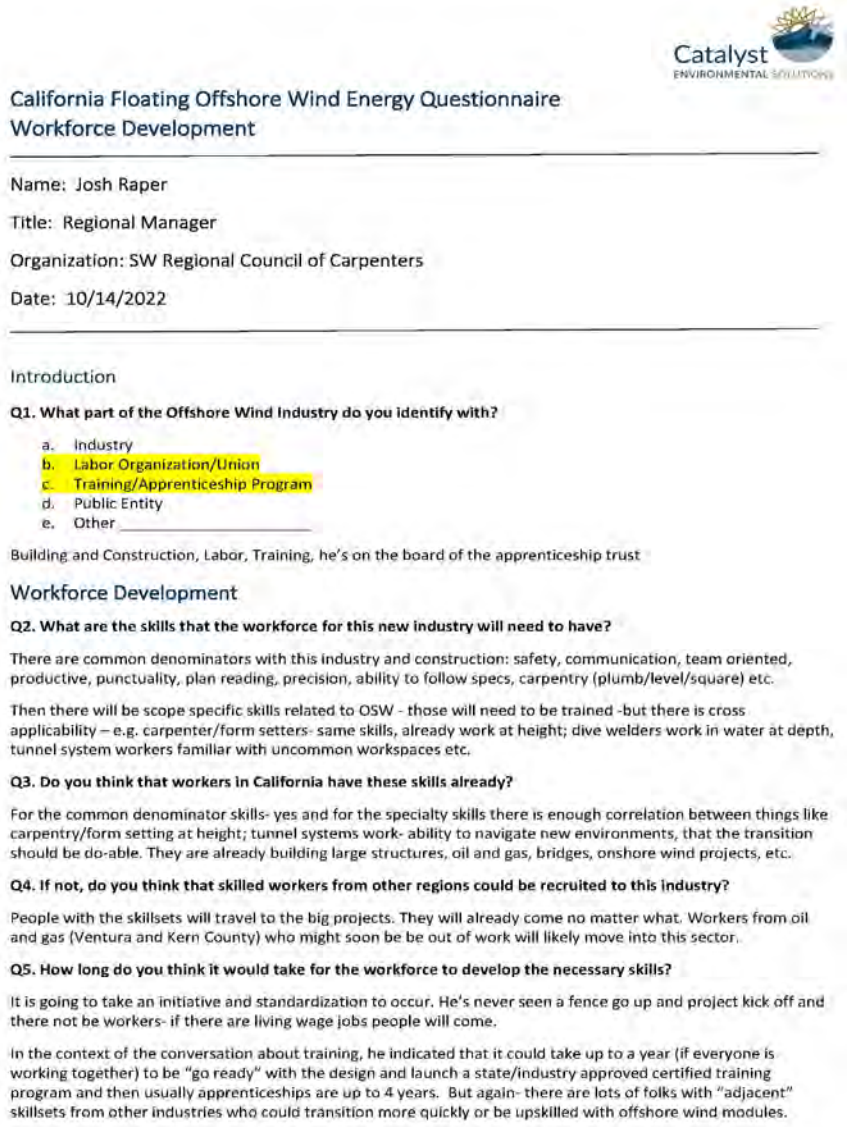
Economic Benefits Analysis & Supply Chain Opportunities: IMPLAN model of economic benefits (jobs, income, fiscal revenues, etc.) and policy options for capturing supply chain benefits.

OSW Area of Analysis	AB 525 Issue	Key Issue/Question	Section of Assessment	Summary of Finding
Workforce Development Needs	An analysis of the workforce development needs of the California offshore wind energy industry, including occupational safety requirements, the need to require the use of a skilled and trained workforce to perform all work.	How many workers/jobs will be required to develop the workforce that can meet the demands of the 2030 (2-5 GW) and 2045 (25 GW) goals?	Section 3.3 Number of Jobs Needed for Floating OSW Workforce	Approximately 2,375-8,280 jobs are expected to be required for California's floating offshore workforce by 2030, and 5,063-17,950 jobs by 2045. These estimates/ranges were derived from three keynote studies on forecasting California's workforce needs: • NREL/BOEM. April 2016. "Floating Offshore Wind in California: Gross Potential for Jobs and Economic Impacts from Two Future Scenarios." • American Jobs Project. February 2019. "The California Offshore Wind Project: A Vision for Industry Growth"; BVG/American Jobs Project. January 2019. "CA Jobs Modeling Methodology." • Guidehouse. May 2022. "California Supply Chain Needs Summary." California Energy Commission.
		What is the proportion of jobs for the supply chain, construction, and operations/maintenance phases?	Section 3.4 Distribution of Workforce Occupations Per Phase	Approximately 2/3rds of the OSW workforce will be in the supply chain and manufacturing sectors. This is a key finding of this Assessment and also represents California's primary opportunity to capture the economic benefits of developing an ambitious offshore wind industry. As observed in the infographic below, the construction and operations/maintenance phases offer similar levels of jobs, around 700-800 jobs, whereas the supply chain is expected to generate 4,020 jobs.
		What types of skills and occupations are needed for the OSW workforce?	Section 3.5 Occupational Skills Mapping	As provided in the radar/skills graphics in Figure 3-4, Technicians and Trades dominate the needed skills for supply chain, representing over 50% of the skill set needed for those occupations. Construction veered towards Construction and Assembly skills, but also had a significant need in the Technicians and Trades as well. The majority of skills for the Operations/Maintenance phase are in the Technicians and Trades skills, however Administrative and Clerical skills are also required. As observed in Figure 3-5, when compiling all three phases, the Technicians and Trades represent the primary skills area of need, followed by Construction/Assembly, and Administrative/Clerical.
		What is the existing occupational workforce supply?	Section 3.6.1 Existing Workforce	California maintains a large and diverse workforce, with approximately 16.5 million workers (2021). While the new offshore wind workforce will represent a cross-section of occupational types, requiring a wide variety of jobs to operate the industry, some of the key sectors that will be impacted by the offshore wind industry are Installation, Maintenance, and Repair (approximately 500,000 current workers); Construction and Extraction (approximately 650,000 current workers); and Production (approximately 750,000 current workers).
		What are the potential skills and occupational gaps for the California OSW workforce?	Section 3.6.2 Gaps Analysis	As observed in Figure 3-6, the majority of California's occupational types/sectors are in a position to internalize the new demand created by the offshore wind industry; however, a few occupational types are currently unprepared to meet the demand of the new industry. Those occupational types that are forecasted to experience an increase of more than 20% by 2030 and more than 60% by 2045 are: • Miscellaneous Plant and System Operators • Tank Care, Truck, and Ship Loaders • Forging Machine Setters, Operators, and Tenders (Metal and Plastic) • Wind Turbine Service Technicians • Engine and Other Machine Assemblers These findings track with the conclusion that nearly two-thirds of the new jobs created by California's offshore wind industry will be located in the supply chain (i.e., manufacturing, assembly, extraction, production, fabrication, etc.). While some speciality occupations, such as wind turbine technician, will essentially be wholly new job types in California, it is the State's supply chain sectors that will experience significant new demand for trained workers.

Engagement with Training, Industry, Labor, and Apprenticeship Organizations

Interviewees

- International Brotherhood of Electrical Workers (Labor/Union)
- CA State Building & Construction Trades (Labor/Union)
- SW Regional Council of Carpenters (Labor/Union)
- International Longshore and Warehouse Union (Labor/Union)
- Kiewit (EPCI)
- Orsted (Developer)
- Siemens Gamesa (Manufacturer)
- Maersk Training (Training)
- Center for International Trade and Transportation (CSU Long Beach) (Academia; Apprenticeship Program)
- Bristol Community College (Academia; NREL Advisory Group)
- NREL (Federal Government)
- Global Wind Organization (Trade Group; NREL Advisory Group)
- Cape and Islands Self Reliance (Training; NREL Advisory Group)
- Business Network on Offshore Wind (Academia; NREL Advisory Group)



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California Floating Offshore Wind Energy Questionnaire
Workforce Development

Name: Josh Raper

Title: Regional Manager

Organization: SW Regional Council of Carpenters

Date: 10/14/2022

Introduction

Q1. What part of the Offshore Wind Industry do you identify with?

a. Industry
b. Labor Organization/Union
c. Training/Apprenticeship Program
d. Public Entity
e. Other _____

Building and Construction, Labor, Training, he's on the board of the apprenticeship trust

Workforce Development

Q2. What are the skills that the workforce for this new industry will need to have?

There are common denominators with this industry and construction: safety, communication, team oriented, productive, punctuality, plan reading, precision, ability to follow specs, carpentry (plumb/level/square) etc.

Then there will be scope specific skills related to OSW - those will need to be trained -but there is cross applicability – e.g. carpenter/form setters- same skills, already work at height; dive welders work in water at depth, tunnel system workers familiar with uncommon workspaces etc.

Q3. Do you think that workers in California have these skills already?

For the common denominator skills- yes and for the specialty skills there is enough correlation between things like carpentry/form setting at height; tunnel systems work- ability to navigate new environments, that the transition should be do-able. They are already building large structures, oil and gas, bridges, onshore wind projects, etc.

Q4. If not, do you think that skilled workers from other regions could be recruited to this industry?

People with the skillsets will travel to the big projects. They will already come no matter what. Workers from oil and gas (Ventura and Kern County) who might soon be be out of work will likely move into this sector.

Q5. How long do you think it would take for the workforce to develop the necessary skills?

It is going to take an initiative and standardization to occur. He's never seen a fence go up and project kick off and there not be workers- if there are living wage jobs people will come.

In the context of the conversation about training, he indicated that it could take up to a year (if everyone is working together) to be "go ready" with the design and launch a state/industry approved certified training program and then usually apprenticeships are up to 4 years. But again- there are lots of folks with "adjacent" skillsets from other industries who could transition more quickly or be upskilled with offshore wind modules.

01 What are the critical skills that this new workforce will need?

02 What are some of the obstacles and limitations to fielding an offshore wind construction workforce?

03 What could expedite workforce training and development? What can CA do to facilitate workforce training and development?

04 What types of incentives would help recruit new workers to build a workforce pipeline?

05 How much of the future OSW workforce will be coming from existing sectors/industries?

06 What existing training and apprenticeship programs could be repurposes or expanded to train CA's OSW workforce?

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Benchmarking Installed Capacity to Forecast Workforce Development Needs

- NREL/BOEM. April 2016. "Floating Offshore Wind in California: Gross Potential for Jobs and Economic Impacts from Two Future Scenarios."
- American Jobs Project. February 2019. "The California Offshore Wind Project: A Vision for Industry Growth"; BVG/American Jobs Project. January 2019. "CA Jobs Modeling Methodology."
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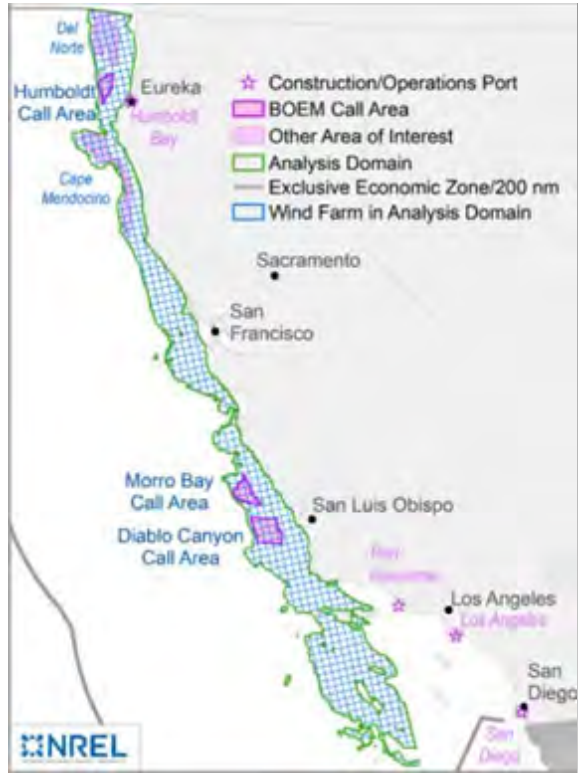
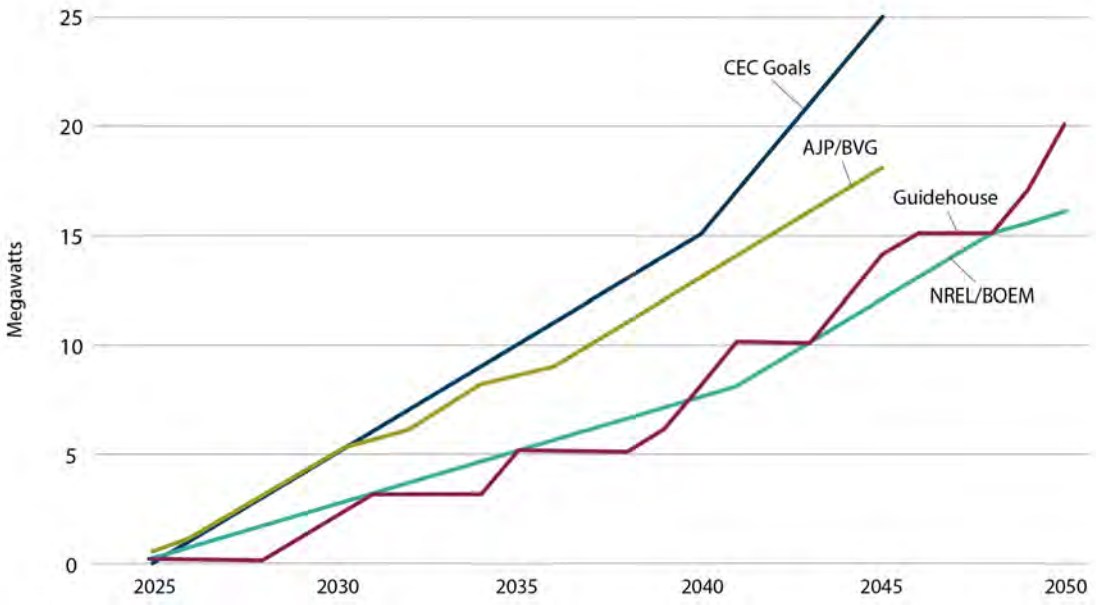


Conceptual Growth Patterns for Installed Capacity CEC Goals and Forecasting Models



Bounding Ranges/Estimates for Jobs Needed for OSW Workforce (2030 and 2045)

Source/Model	2030				2045			
	Supply Chain	Const.	O&M	Total Jobs	Supply Chain	Const.	O&M	Total Jobs
American Jobs Project	2,100	350	1,200	3,650	9,000	1,400	2,600	13,000
NREL/BOEM	5,490	1,130	1,660	8,280	11,280	2,340	4,330	17,950
Guidehouse	1,936	125	314	2,375	3,382	173	1,508	5,063
TOTAL RANGE	**1,936 – 5,490**	**125 – 1,130**	**314 – 1,660**	**2,375 – 8,280**	**3,382 – 11,280**	**173 – 2,340**	**1,508 – 4,330**	**5,063 – 17,950**

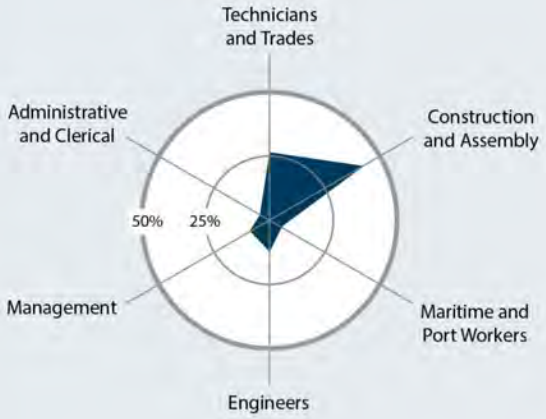
Supply Chain

4020 jobs

Supply Chain

- Laborers and Freight, Stock, and Material Movers (Hand)
- Metal Furnace Operators, Tenders, Pourers, and Casters
- Operating Engineers and Other Construction Equipment Operators
- Engine and Other Machine Assemblers
- Forging Machine Setters, Operators, and Tenders, Metal and Plastic
- Miscellaneous Assemblers and Fabricators
- Computer Control Programmers and Operators
- First-Line Supervisors of Production and Operating Workers
- Structural Metal Fabricators and Fitters
- Welding, Soldering, and Brazing Workers

Construction

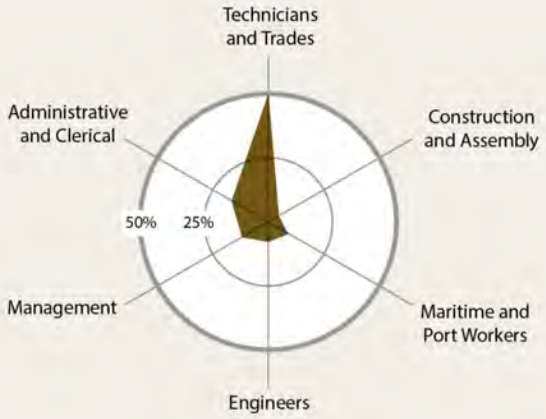


803 jobs

Construction

- Miscellaneous Installation, Maintenance, and Repair Workers
- Miscellaneous Electrical and Electronic Equipment Mechanics, Installers, and Repairers
- Industrial Engineers, Including Health and Safety
- Miscellaneous Plant and System Operators
- Wind Turbine Service Technicians
- General and Operations Managers
- Engineering Technicians, Except Drafters
- Construction Laborers
- Construction Equipment Operators
- Captains, Mates, and Pilots of Water Vessels

Operations and Maintenance

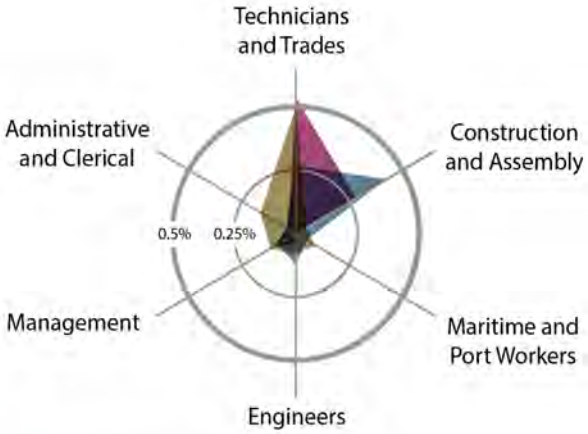


730 jobs

Operations and Maintenance

- General and Operations Managers
- Wind Turbine Service Technicians
- Captains, Mates, and Pilots of Water Vessels
- Engineering Technicians, Except Drafters
- Industrial Engineers, Including Health and Safety
- Miscellaneous Electrical and Electronic Equipment Mechanics, Installers, and Repairers
- Secretaries and Administrative Assistants
- Electrical and Electronics Engineers
- Compliance Officers
- Miscellaneous Installation, Maintenance, and Repair Workers

Combined



- Construction jobs
- Operations and maintenance jobs
- Supply chain jobs

Workforce Needs by Occupational Type/Sector (2030)

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Supply Chain Assessment – Policy Options

Policy, Incentive, Tax Break	Geography (who instituted the policy)	Component Supported	Input Supported	How California Could Adopt/Adapt Policy?
Feed in Tariffs and Other Subsidies	The Netherlands, Denmark, Germany	All		Develop a feed-in tariff and/or subsidy scheme to make floating OSW energy competitive and encourage the development of a local supply chain
Industry based Training Programs			Steel Fabrication Laborers & Manufacturers	Adapt California's initiative for a High-Road Training Partnership Program for floating OSW, Expand Employment Training Panel funding to support floating OSW industry
Competitive Grant Funding	New Jersey, Maryland, US federal government	All	All	
Local Source Requirements		All	All	Community workforce agreements or community benefits agreements
Direct Investment in Training Programs	Maryland, New Jersey, New York, Rhode Island, Massachusetts	All	All Component Part Production Labor Forces	Create partnership with academia (Cal Poly Humboldt and other local JCs) and fund floating OSW training opportunities through these facilities
Tax Credits	US federal government, New Jersey, Rhode Island			Adapt Capital Investment Incentive Program, promote CAEATFA sales and use tax credit
Public Private Partnerships				
ive Hub evelopment	Virginia, Maryland, North Carolina, Maine, Denmark, UK	All	All	Could create an floating OSW hub or center (near Humboldt Bay or San Francisco)

Materials (Steel) Production and Fabrication

Policies Successfully Used Elsewhere	Opportunity for California
Direct Public and Private Sector Investment (Maryland)	Create partnerships with floating OSW developers and combine funds to invest in a new steel manufacturing/fabrication facility or provide the needed upgrades to current steel fabrication facilities to support floating OSW manufacturing
Subsidies (Europe)	Offer tax breaks for steel manufacturing/fabrication facilities that support floating OSW production – this incentive could encourage facilities to invest in the equipment and training needed to support floating OSW component production
Local Source Requirements (East Coast & Europe)	Requiring local sources to support floating OSW production will guarantee local work and a consistent pipeline of projects that include steel manufacturing and fabrication

Component Manufacturing

Policies Successfully Used Elsewhere	Opportunity for California
Direct Public and Private Sector Development (New Jersey, New York)	Create partnerships with floating OSW developers and combine funds to invest in component part manufacturing facilities
Grants and Cooperative Agreements (New Jersey, Maryland, Federal Govt.)	Institute a grant program that covers necessary upgrades for Tier 2 facilities that support component manufacturing facilities. Design Cooperative Agreements that supply a percentage of the initial investment needed to build a floating OSW component manufacturing facility to lessen the risk for potential investors
Tax Credits and Rebates & Tax Deductions and Exemptions (East Coast & Europe)	Adapt the Capital Investment Incentive Program, increase sales use and tax exclusion program for all facilities that support floating OSW development

Supply Chain Workforce Development

Policies Successfully Used Elsewhere	Opportunity for California
Project Labor Agreements (East Coast)	Institute workforce agreements that require local supply chain and labor force.
Instituting New or Adapting Current Labor Training Programs (East Coast & Europe)	Adapt High-Road Training Partnership program to support floating OSW labor training and expand Employee Training Panel so it can support floating OSW labor employers by providing funds for proper training. Invest in a new training facility or program dedicated to floating OSW development.

Economic Benefits Analysis About the IMPLAN Model

Input

- Workforce Development
- Seaport Development
- Training Center

IMPLAN

- Statewide Economy
- Greater Humboldt County Region

- Without Policy Support
- With Policy Support

Economic Activity

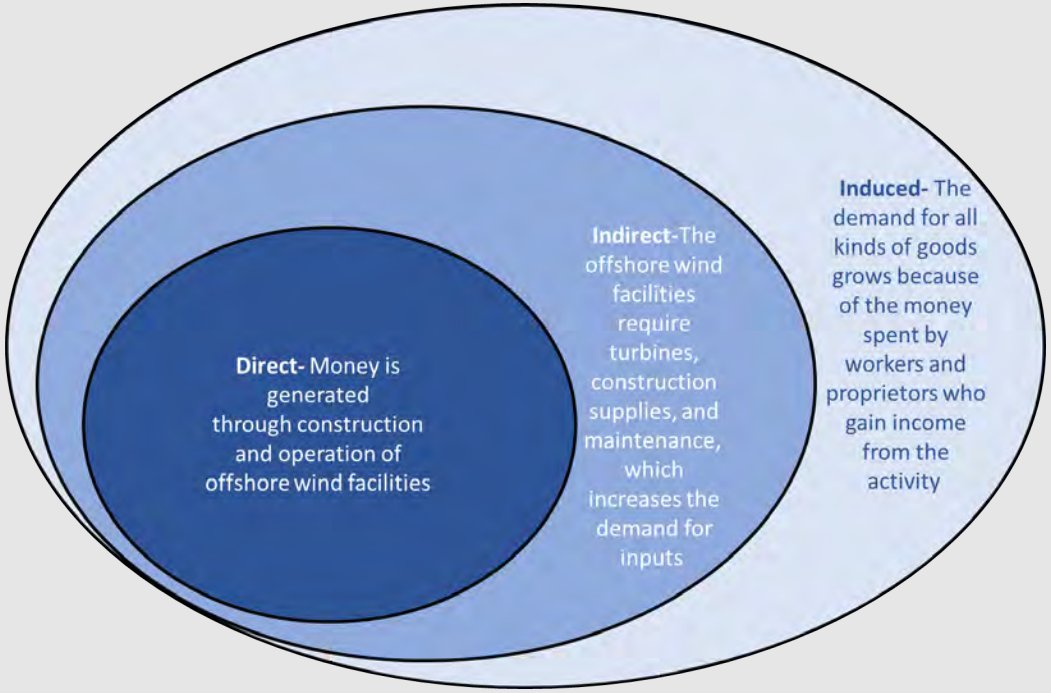
Jobs

Labor Income

Fiscal Revenues

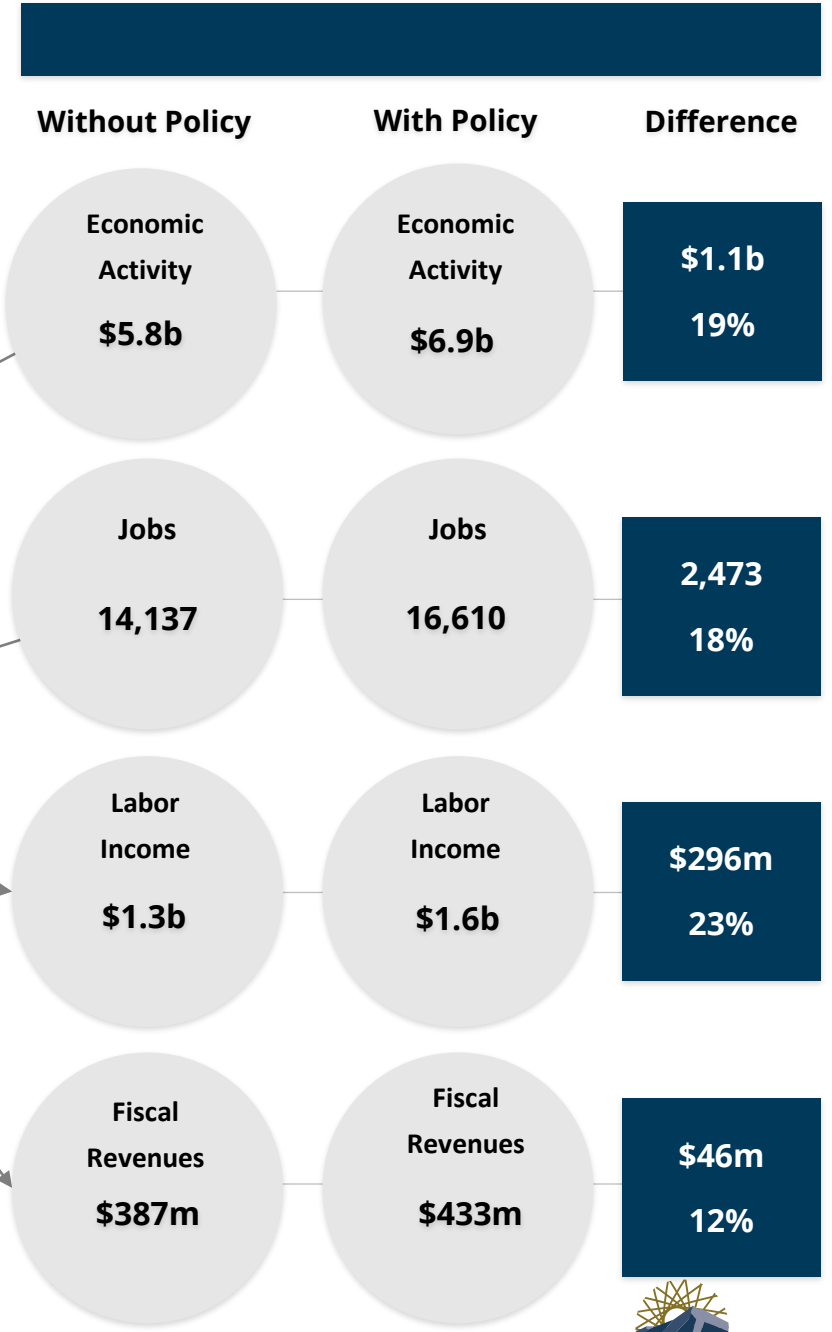
Types of Beneficial Economic Impacts

Direct, Indirect, and Induced Impacts



Economic Benefits Assessment
Statewide Analysis With & With Out Policy

Scenario	Investment Input	Output GDP		Number of Jobs		Labor Income		Fiscal Impacts	
	Year	2025	2045	2025	2045	2025	2045	2025	2045
Without Policy	Workforce Development		$5,803		14,137		$1,266		$386.8
	Seaport Development	$85.2		406		$33.5		$2.9	
	Training Center Construction	$18.7		98		$8.1		$0.66	
	Total	**$103.9**	**$5,803**	**504**	**14,137**	**$41.6**	**$1,266**	**$3.6**	**$386.8**
With Policy	Workforce Development		$6,883		16,610		$1,562		$432.8
	Seaport Development	$96.6		444		$36.8		$3.3	
	Training Center Construction	$18.7		98		$8.1		$0.66	
	Total	**$115.3**	**$6,883**	**542**	**16,610**	**$44.9**	**$1,562**	**$4.0**	**$432.8**



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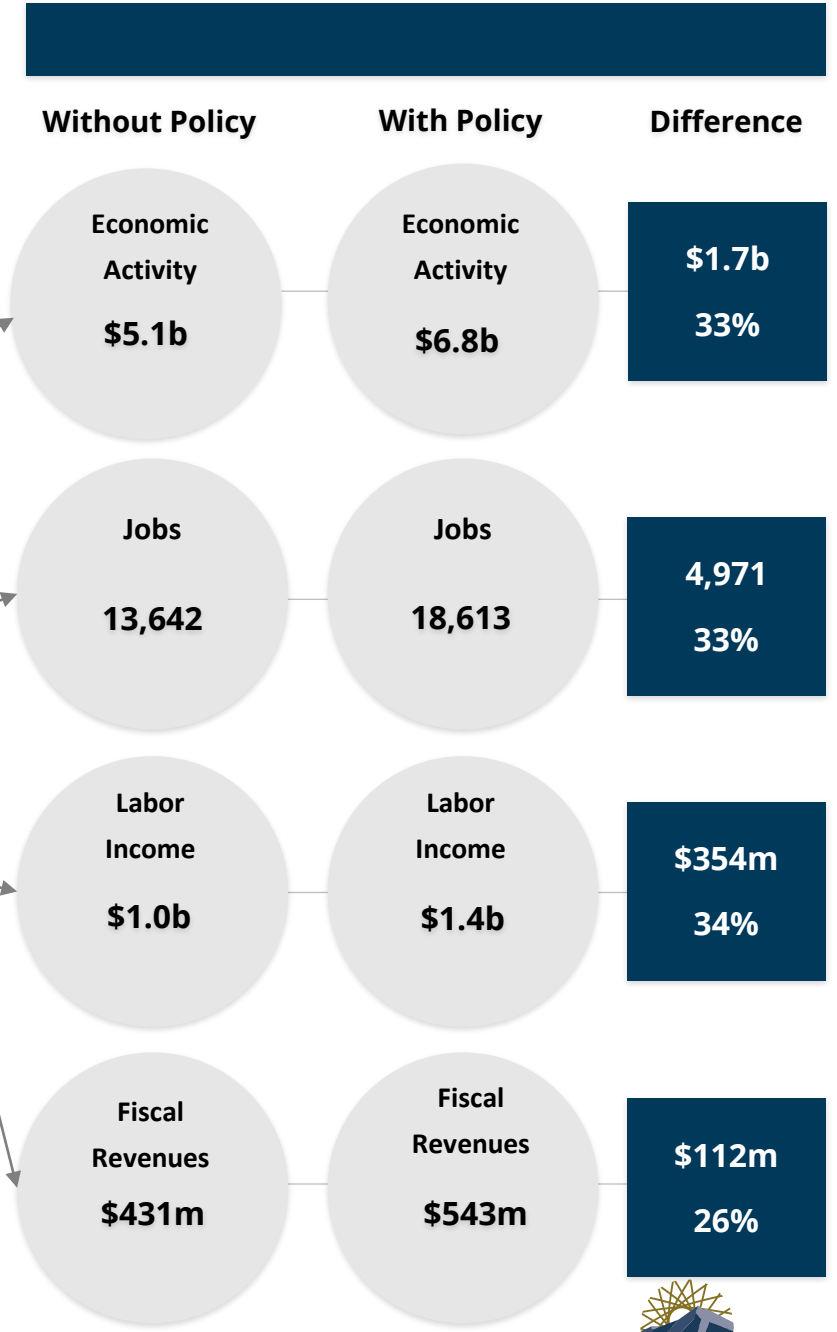
Economic Benefits Assessment
Greater Humboldt Analysis With & With Out Policy

Scenario	Investment Input	Output GDP		Number of Jobs		Labor Income		Fiscal Impacts	
	Year	2025	2045	2025	2045	2025	2045	2025	2045
Without Policy	Workforce Development		$5,126		13,642		$1,028		$431.4
	Seaport Development	$62.0		362		$23.4		$2.2	
	Training Center Construction	$14.4		93		$6.4		$0.5	
	Total	**$76.4**	**$5,126**	**455**	**13,642**	**$29.8**	**$1,028**	**$2.7**	**$431.4**
With Policy	Workforce Development		$6,820		18,613		$1,382		$543.3
	Seaport Development	$83.2		448		$28.6		$3.0	
	Training Center Construction	$14.4		93		$6.4		$0.5	
	Total	**$97.6**	**$6,820**	**541**	**18,613**	**$35.0**	**$1,382**	**$3.5**	**$543.3**



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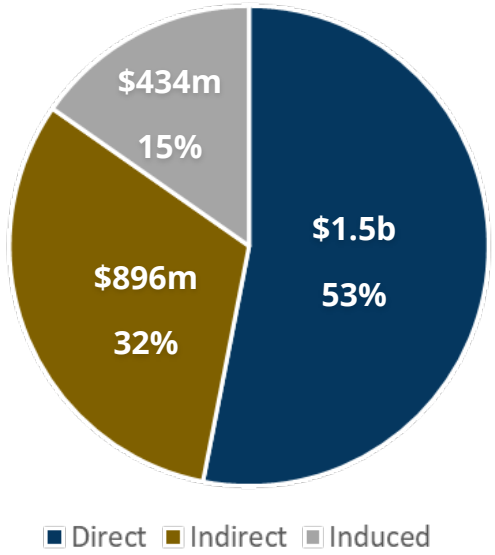
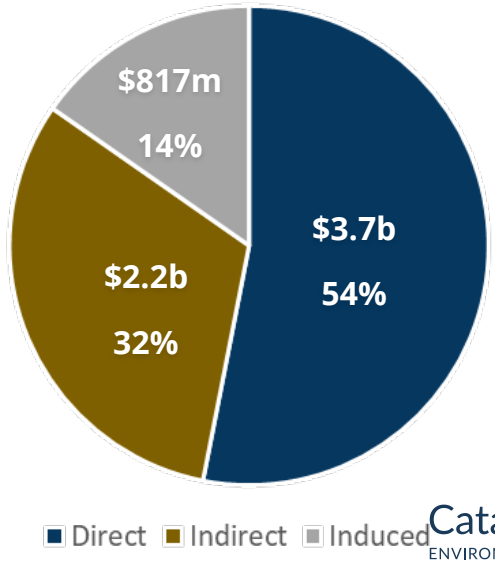
Economic Benefits Assessment
Direct, Indirect, and Induced Impacts – Economic Activity (GDP)

Investment	2023		2024/2025 annual		2030		2045	
DIRECT IMPACT								
Workforce Development					$1,504	$1,504	$3,694	$3,694
Seaport Development	$41.8	$41.8	$41.8	$41.8				
Training Center Construction			$10.0	$10.0				
Total	**$41.8**	**$41.8**	**$51.8**	**$51.8**	**$1,504**	**$1,504**	**$3,694**	**$3,694**
INDIRECT IMPACT								
Workforce Development					$535.2	$895.5	$1,292	$2,180
Seaport Development	$21.8	$30.9	$21.8	$30.9				
Training Center Construction			$3.4	$3.4				
Total	**$21.8**	**$30.9**	**$25.2**	**$34.3**	**$535.2**	**$895.5**	**$1,292**	**$2,180**
INDUCED IMPACT								
Workforce Development					$355.5	$433.6	$817.3	$1,009
Seaport Development	$21.6	$23.8	$21.6	$23.8				
Training Center Construction			$5.3	$5.3				
Total	**$21.6**	**$23.8**	**$26.9**	**$29.1**	**$355.5**	**$433.6**	**$817.3**	**$1,009**
TOTAL IMPACT								
Workforce Development					$2,395	$2,833	$5,803	$6,883
Seaport Development	$85.2	$96.6	$85.2	$96.6				
Training Center Construction			$18.7	$18.7				
Total	**$85.2**	**$96.6**	**$103.9**	**$115.3**	**$2,395**	**$2,833**	**$5,803**	**$6,883**

2030



2045



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SECTION 8

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Literature Review & Living Library

Comprehensive Review of OSW Workforce and Seaport Development

A researcher's best friend. An exhaustive list of key sources and references for California's offshore wind workforce and seaport development. Live links to most key OSW sources, all in one place.

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Thank you!
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Brooklyn Fox (Xodus)
Josh Williams (BW)

XODUS

[bw] RESEARCH PARTNERSHIP

CEC Workshop on Assembly Bill 525

AB 525 Workforce Readiness Plan

May 23, 2023

WWW.XODUSGROUP.COM
www.bwresearch.com

Agenda

1. Methodology
2. Phase 1: Workforce Needs Assessment
3. Phase 2: Workforce Capability Assessment
4. Phase 3: Gap Analysis
5. Recommendations for Workforce Development Strategy

Methodology

Phase 1: Workforce Needs Assessment (Port upgrades)

- The analysis was done using the IMPLAN Input-Output modeling tool for activities related to construction and upgrading of port infrastructure.

- Port upgrade activities were linked to ports grouped into four regions:
  - North Coast, Bay Area, Central Coast, Southern California

- Inputs came from AB 525 Port Readiness Study, and included:
  - Port locations
  - Value of anticipated investment
  - Timing and duration of construction
  - Port use in offshore wind industry:
    - North Coast ports used for hosting component manufacturing, staging and integration (S+I), and operations and maintenance (O&M)
    - Bay Area ports used for hosting component manufacturing
    - Central Coast ports used for O&M
    - Southern California ports hosting component manufacturing, and S+I

Phase 1: Workforce Needs Assessment (Port upgrades)

Table 1. Port Upgrades: Timeline, Regions, Investments (from AB 525 Port Readiness Plan)

Port Use	Port	Region	Construction Years	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
S&I and Manufacturing	Port of Humboldt	North Coast	5	x	x	x	x	x								
S&I and Manufacturing	Port of Los Angeles	Southern California	8		x	x	x	x	x	x	x	x				
S&I and Manufacturing	Port of Long Beach	Southern California	9		x	x	x	x	x	x	x	x	x			
Manufacturing	Port of San Francisco	Bay Area	5	x	x	x	x	x								
Manufacturing	Port of Stockton	Bay Area	5	x	x	x	x	x								
Manufacturing	Bay Area Private Terminal - Amports Antioch	Bay Area	5	x	x	x	x	x								
Manufacturing	Bay Area Private Terminal - Pittsburg	Bay Area	5	x	x	x	x	x								
O&M	Crescent City	North Coast	5		x	x	x	x	x							
O&M	Port of Humboldt	North Coast	4		x	x	x	x								
O&M	Morro Bay Harbor	Central Coast	4		x	x	x	x								
O&M	Port San Luis	Central Coast	4		x	x	x	x								
O&M	Heuneme	Central Coast	4		x	x	x	x								

Phase 1: Workforce Needs Assessment (Offshore Wind)

- Offshore wind workforce needs assessment approach is a “bottom-up” model that considered the workforce directly required in the development, manufacturing, installation, and operations & maintenance of commercial-scale floating offshore wind projects.
- Workforce in each supply element considers those required at the endpoint in the supply chain – i.e. at the point of delivery of products and services up to and including the project developer.
- The total California offshore wind project capacity considered as 17 individual commercial-scale projects installed to meet state level offshore wind generation capacity goals.
- 3 scenarios were modelled to reflect varying levels of local content- a baseline, medium, and high scenario.
- Model considered multiple characteristics of the required workforce, including: Number of workers, location of employment, educational attainment requirement, necessary qualifications and certifications, and opportunity for apprenticeship training.

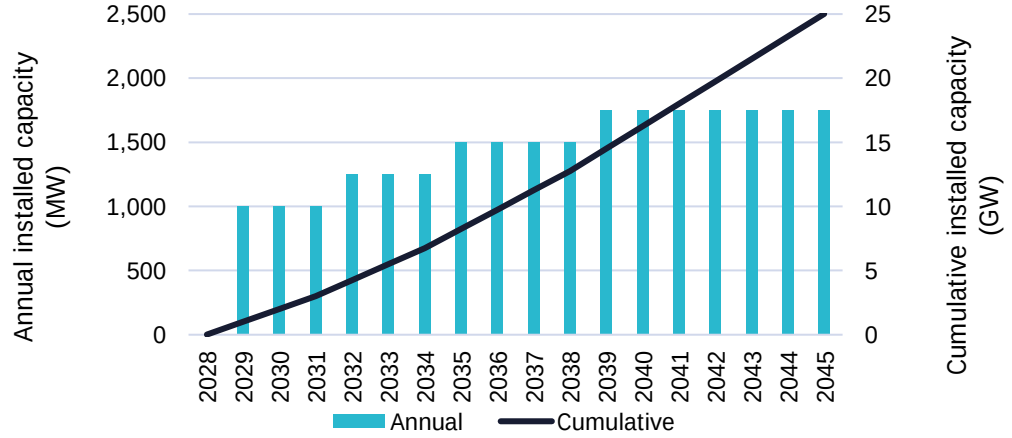


Figure 1. Modeled annual installed offshore wind capacity

Table 2. Description of supply area relative to operational date of windfarm

Supply Chain Area	Year of workforce requirement relative to commercial operations date (COD)
Project development	Workforce formed long before COD, services procured around 5 years prior.
Wind turbine supply	Up to two years prior to COD.
Balance of plant supply (BoP)	Up to two years prior to COD.
Installation and commissioning	Services begin up to one year before COD, followed by turbine integration and tow to site the year of COD.
Operations and Maintenance	Services needed from the point of COD through lifetime of the project (25+ yrs).

Phase 1: Workforce Needs Assessment (Offshore Wind)

- Workforce location mapped regionally based on capabilities of the ports deemed “good” in AB 525 Port Readiness Plan.
- Some workforce considered at state-level but not mapped to any specific regional port capability:
  - Project development phase
  - Manufacturing of mooring lines, anchors, array and export cables
  - Onshore construction workforce

Table 3. Regional capabilities: Regions, supply area, and number of ports

Supply Area	North Coast	Bay Area	Central Coast	Southern California
Foundation manufacturing	1			1
Tower manufacturing		1		1
Blade manufacturing	1	1		1
Nacelle assembly		1		
Staging and integration	1			2
Operations & maintenance	7	1	3	

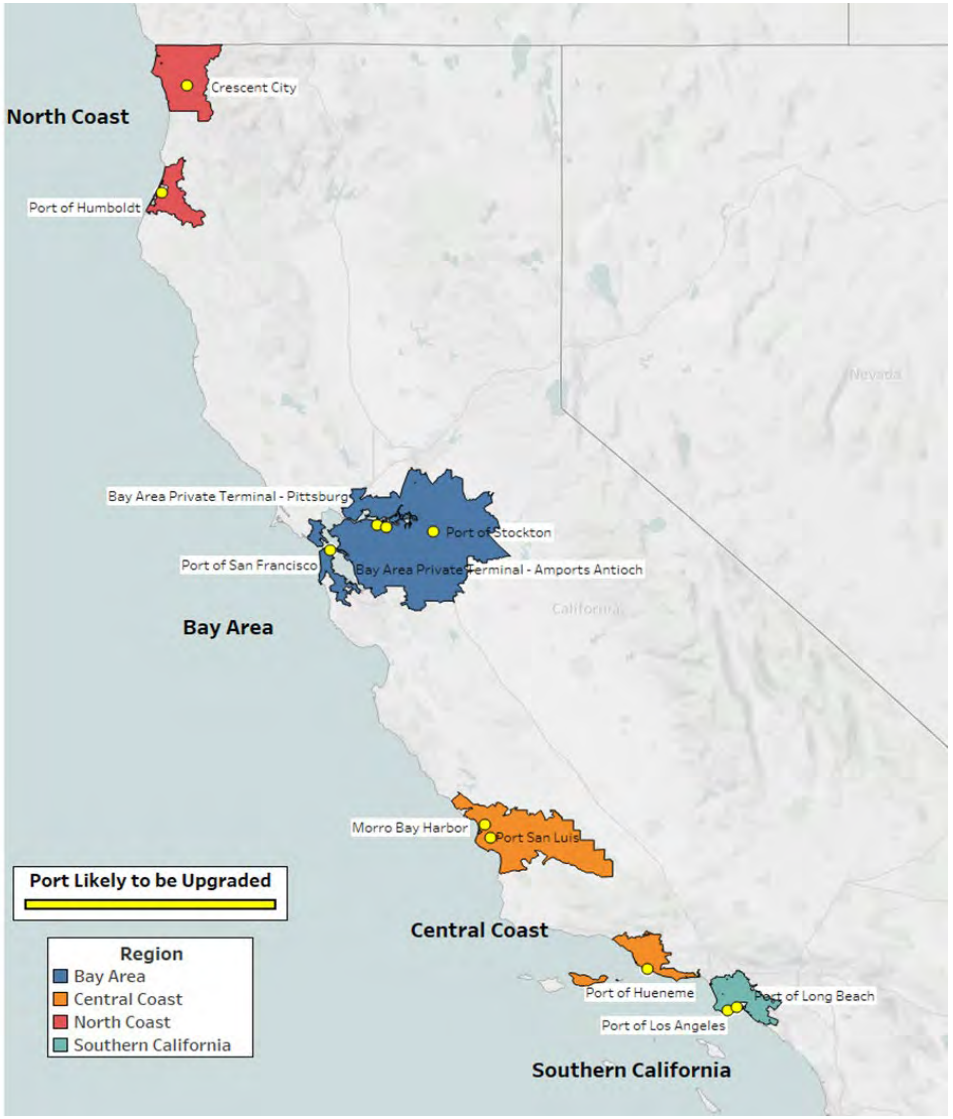


Figure 2. Map of regional ports in CA

Phase 2: Workforce Capability Assessment

Occupational supply analysis providing current snapshot of quantity and distribution of types of workers needed for port infrastructure and offshore wind development.

1. Identify all relevant industry (NAICS) & occupations (SOC codes) for ports + offshore wind work
2. Quantify average commute distance by sub-region.
3. Quantify current total employment in each of the four regions (2022)
4. Identify baseline economic demand for these occupations assuming no offshore wind growth (to be used in gap analysis)
5. Identify current training programs and apprenticeships by region, provider type, and occupational focus
6. Conducted executive interviews with relevant stakeholders, including:
    - Offshore wind project developers
    - Training centers
    - Unions
    - Community colleges
    - Maritime academies

Phase 3: Gap Analysis and Recommendations

1. Port jobs were mapped against baseline economic demand for year 2030 by region and SOC codes
2. Offshore wind jobs for year 2030 and 2040 in the “high” scenario were mapped against baseline economic demand for year 2030 by region and SOC codes
3. Recommendations formulated through executive interviews with developers, labor unions and existing training programs, combined with results from the regional gap analysis

Phase 1: Workforce Needs Assessment

Workforce Demand – Offshore wind

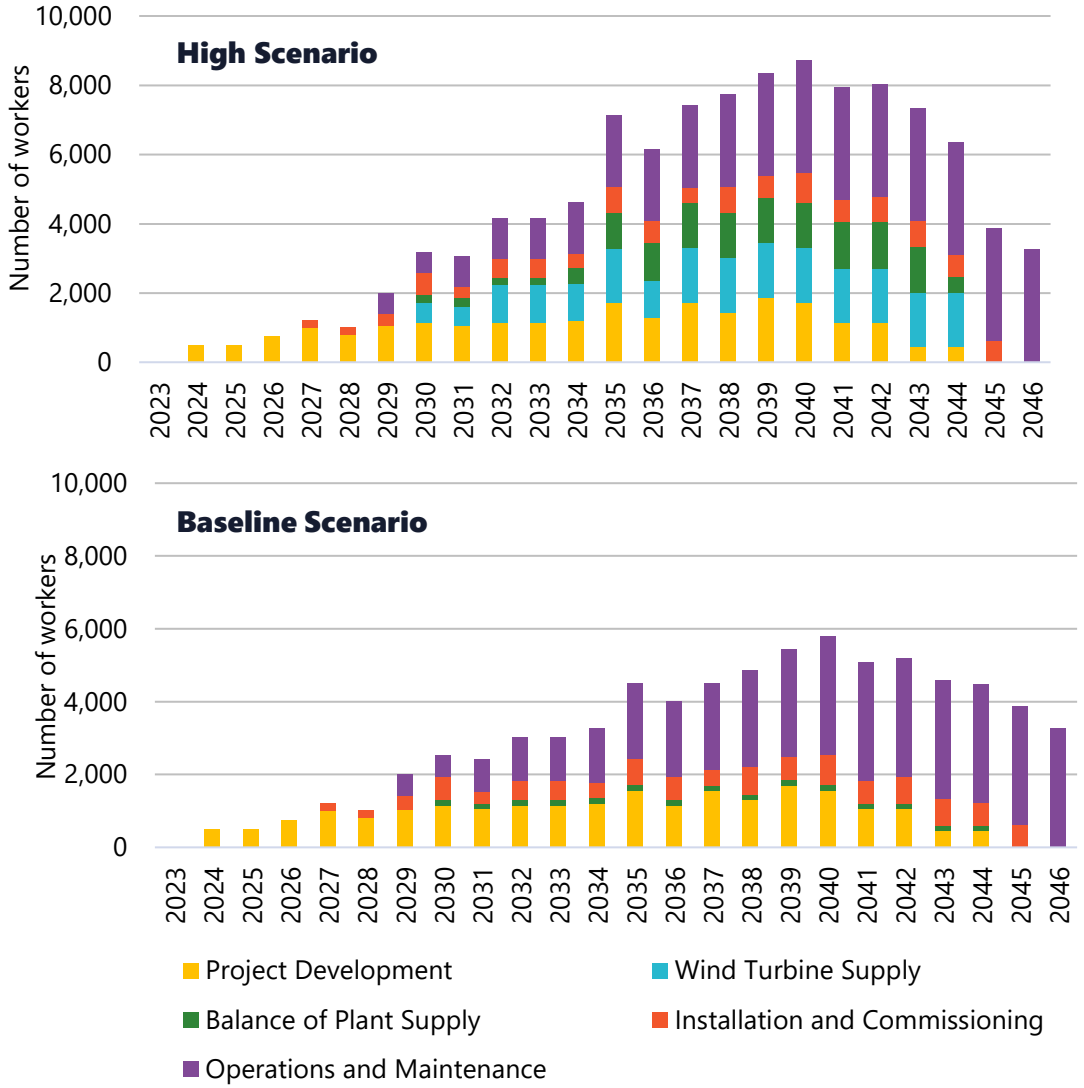
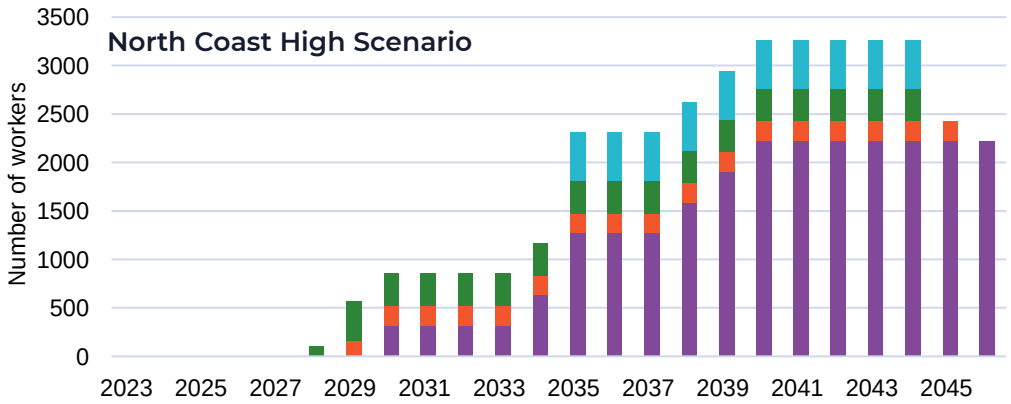


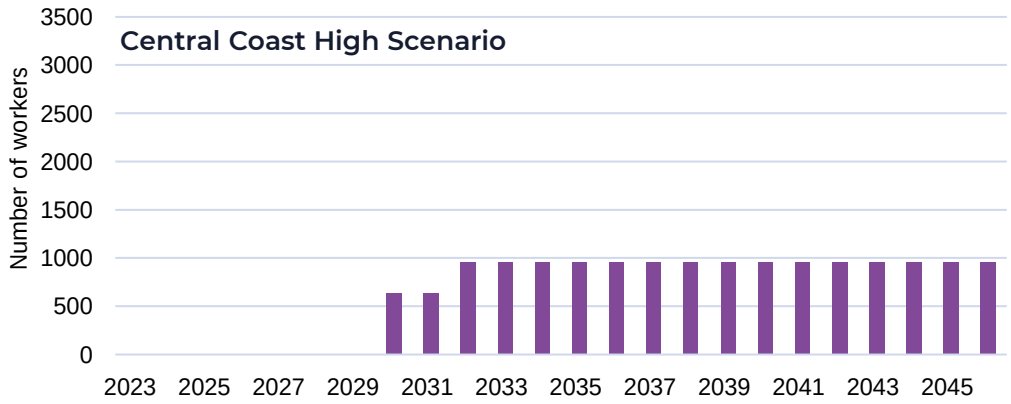
Figure 3. California offshore wind workforce demand for High and Baseline Scenarios

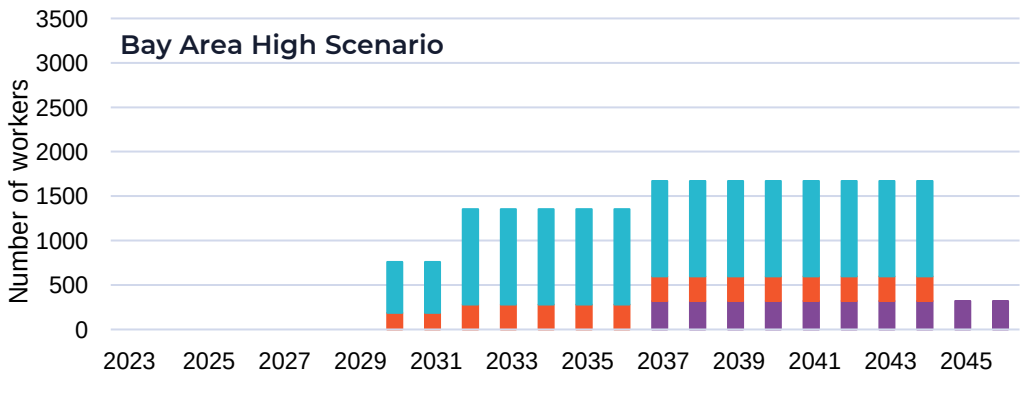
Key points:

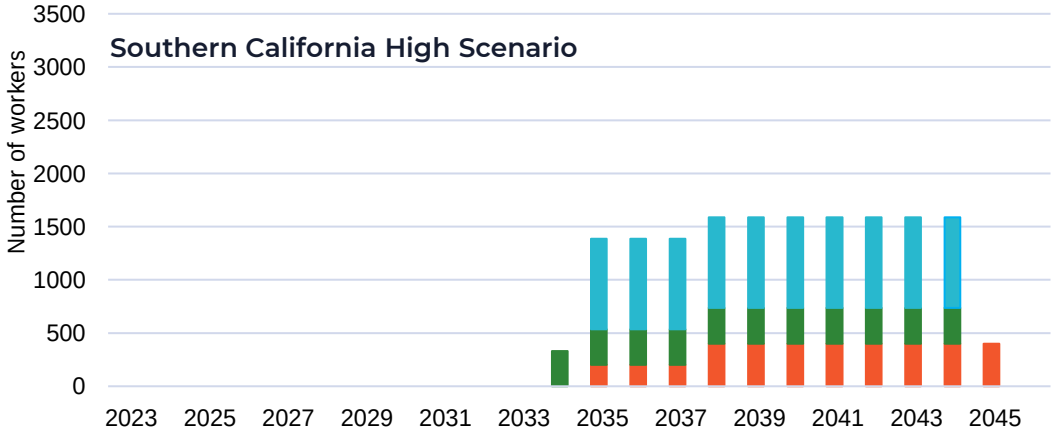
- Most robust opportunity for CA workforce in O&M phase
- Need for significant CA manufacturing workforce driven by presence of manufacturing facilities
- Approx. 1700 jobs annually from demand for project development services
- CA workforce requirement in installation phase limited predominantly to onshore work- staging and integration.
- Top jobs among all scenario include engineers, laborers, welders, production operatives, heavy equipment operators, protective coating technicians

Workforce Demand – Offshore Wind (regional analysis)









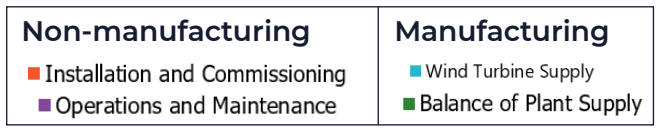


Figure 4. Regional offshore wind workforce demand in California under High Scenario

Key points:

- Long term O&M workforce opportunity in North and Central Coast
- Bay Area and SoCal workforce sensitive to attraction of manufacturing facilities

Workforce Demand – Port upgrades, state-wide

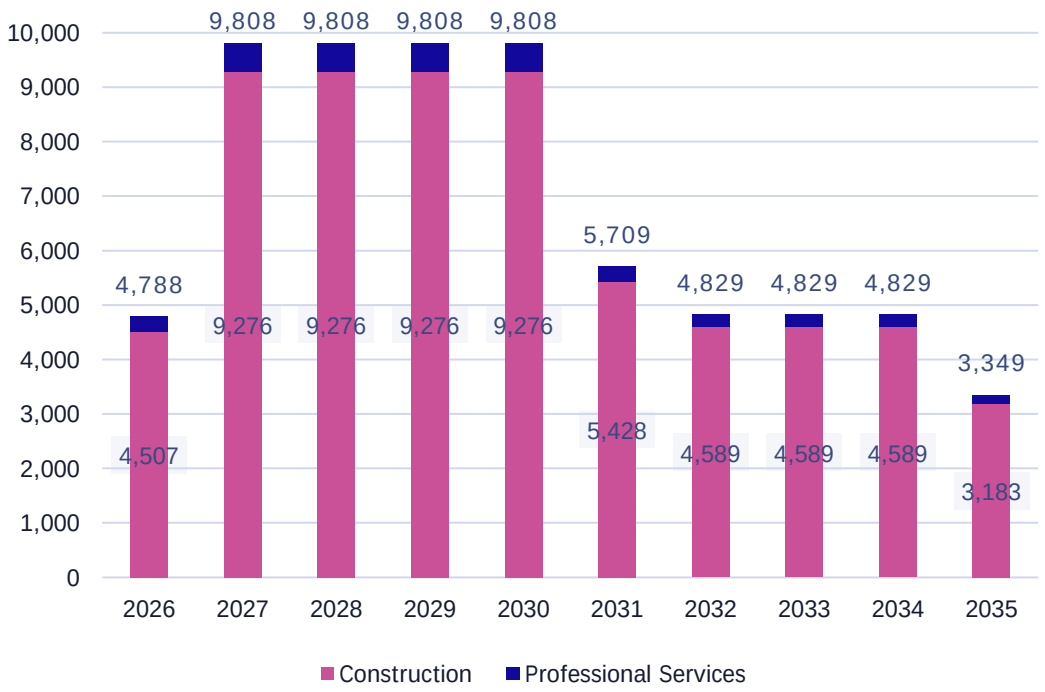


Figure 5. Total annual port workforce demand all regions

Table 4. Workforce demand by occupation for top in-demand jobs required for port upgrades

SOC	Occupation	Total Port Infrastructure Jobs, 2030
47-2061	Construction Laborers	1,142
47-2111	Electricians	1,136
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	730
47-2031	Carpenters	619
47-2152	Plumbers, Pipefitters, and Steamfitters	510
11-9021	Construction Managers	452
13-1082	Project Management Specialists	391
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	385
53-3032	Heavy and Tractor-Trailer Truck Drivers	362
43-9061	Office Clerks, General	351

- Peak of ~9,900 total jobs annually if all ports are realized.
- Almost three-quarters (72%) are in construction industries.
- Top 5 occupations include: construction laborers, electricians, supervisors, carpenters, & plumbers.

Workforce Demand – Port Upgrades, regional analysis

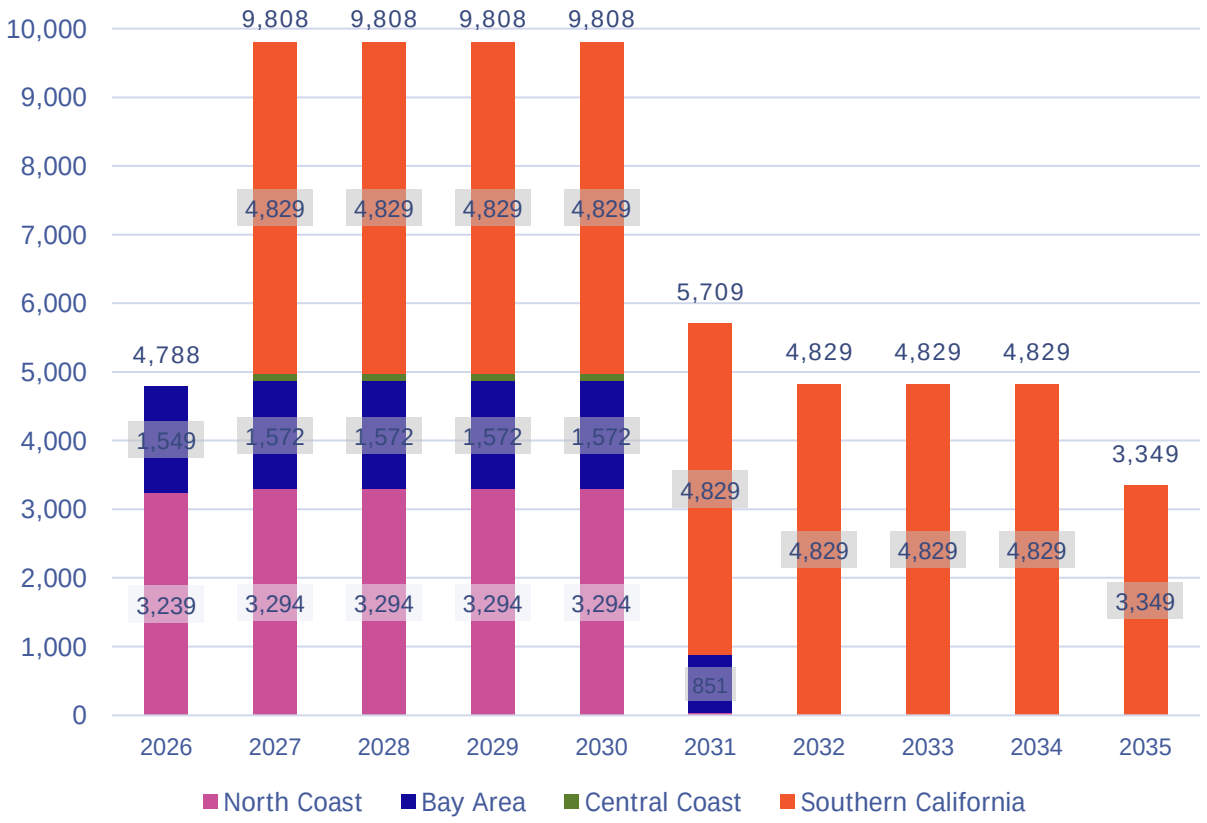


Figure 6. Total annual port workforce demand by region

- Highest job growth will be in Southern California: ~4,800 jobs each year between 2027 and 2035.
- North Coast expected to support ~3,000 – 3,300 jobs each year between 2026 through 2030.
- Bay Area supports ~1,500 workers each year from 2026 to 2031.
- Lowest projected job growth in Central Coast: ~130 jobs annually from 2027-2030.

Phase 2: Workforce Capability Assessment

Current Occupational Supply Overview I

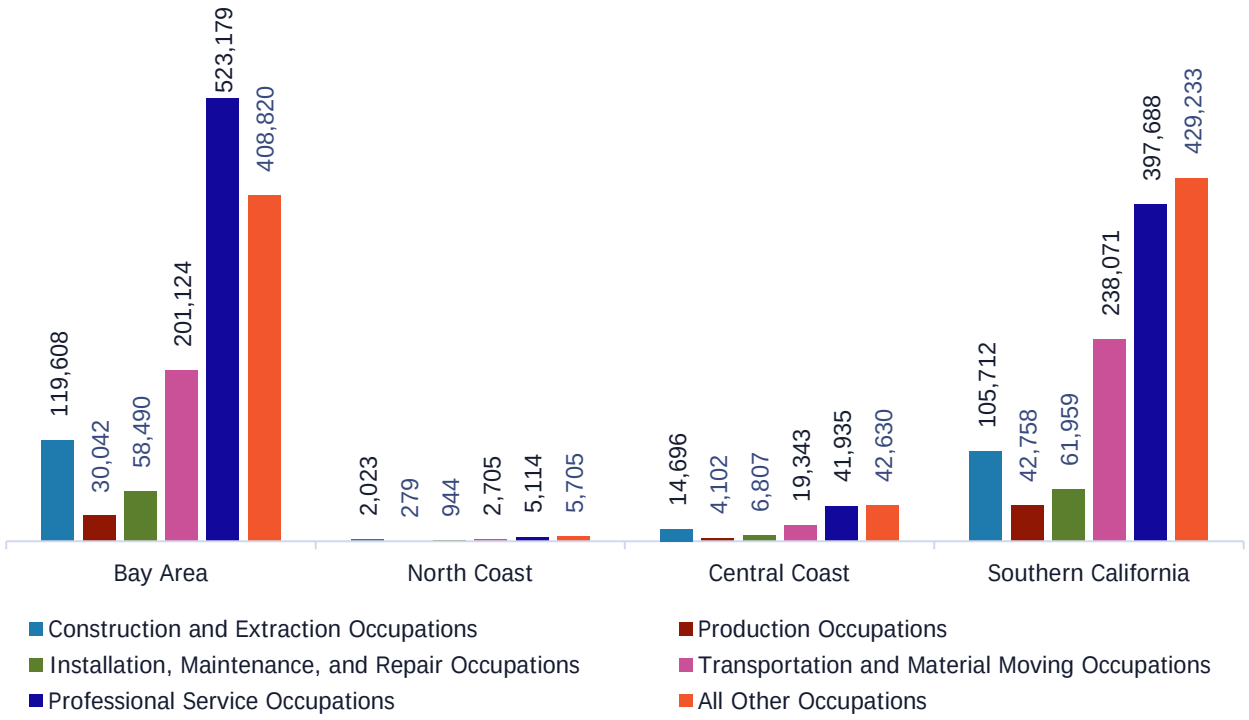


Figure 7. Total jobs in major occupational groups by region, 2022 Q3

- In 2022, 94.8 percent of the 2.3 million offshore wind adjacent jobs are in the Bay Area and Southern California. Significant contrast between these two regions with the North and Central Coast.

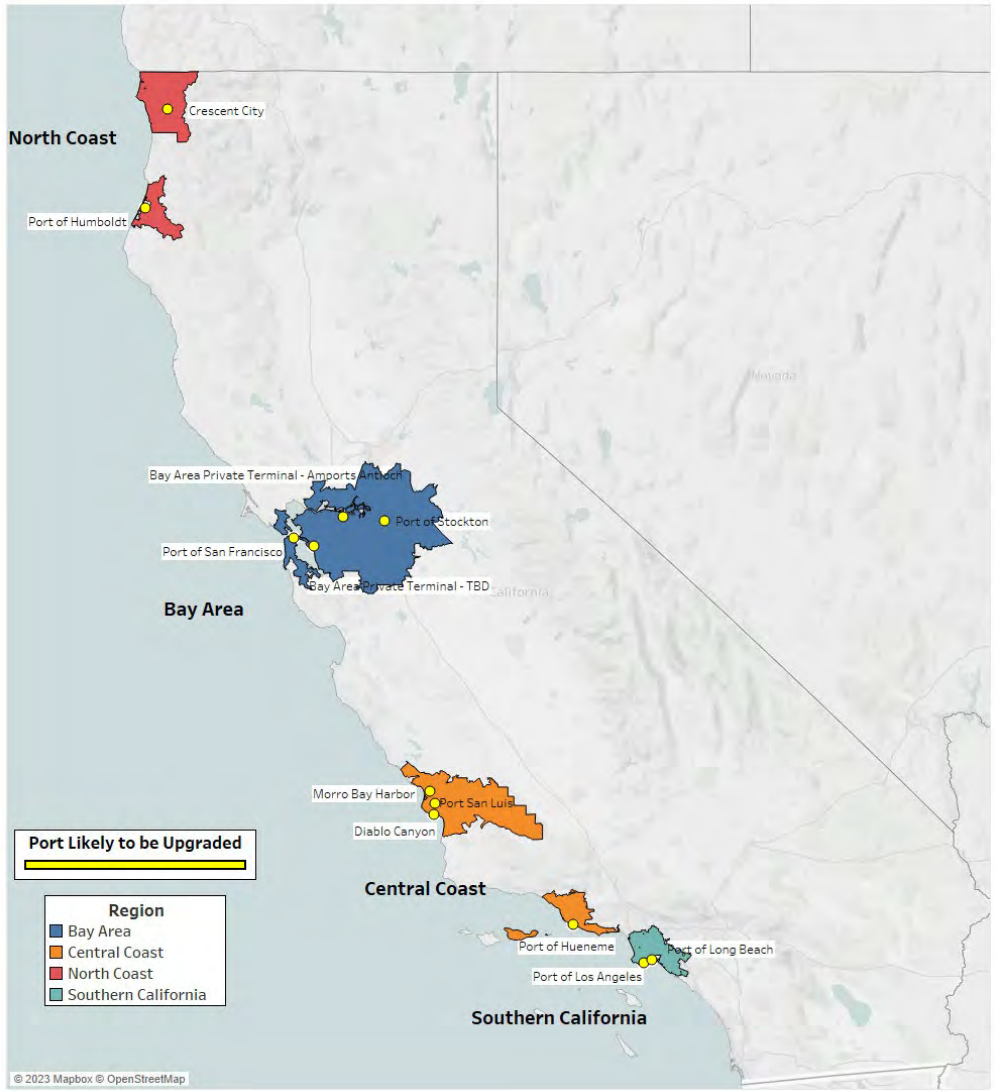


Figure 8. Map of regional ports in California

Current Occupational Supply Overview II

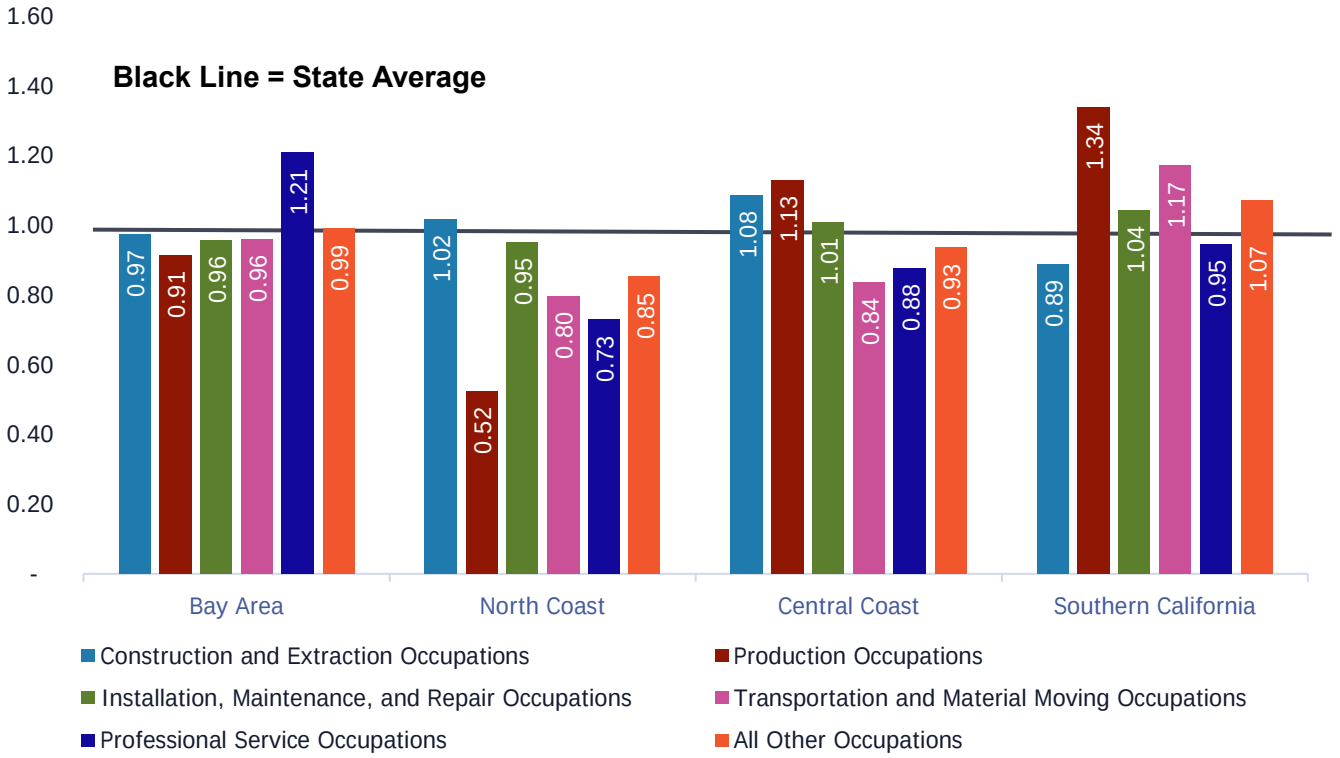


Figure 9. Location quotients for major occupational groups by region, 2022 Q3

- Bay Area leads the state in share of professional service jobs.
- Southern California & Central Coast are statewide leaders in production occupations.
- North Coast & Central Coast have below average concentration of most occupations required for offshore wind + port site development.

Phase 3: Gap Analysis

Regional Gap Analysis

North Coast

- The North Coast will require both an upskilling of the current workforce AND a sizeable increase in the total size of the working age population that are willing to work in infrastructure upgrades and the OSW industry.
- Represents the region with the largest demand of construction laborers among all regions.
- Significant gaps in all occupations for offshore wind and port upgrades.

Bay Area

- The Bay Area has a sizeable working population to draw from but will need to communicate and prepare those in the trades the employment opportunities in and around OSW.
- Workforce demand in the Bay Area for offshore wind are all related to manufacturing jobs.

Table 5. Gap analysis for occupations with the greatest demand required for port activity in the North Coast

Occupation	Potential Workforce Demand (no. of workers)	% Growth Above 2030 Projections
Construction Laborers	345	>100%
Electricians	345	>100%
First-Line Supervisors of Construction Trades and Extraction Workers	220	>100%
Carpenters	188	>100%
Plumbers, Pipefitters, and Steamfitters	155	>100%
Construction Managers	135	>100%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	116	>100%
Project Management Specialists	101	>100%
Office Clerks, General	95	>100%
Cement Masons and Concrete Finishers	89	>100%

Regional Gap Analysis

Central Coast

- Growth from offshore wind demand exceeds expected baseline growth overall, where workforce gaps in this region are related to quayside, maritime roles, and wind turbine technicians.
- The Central Coast represents a relatively tight labor market, the high cost of housing, and the low concentration of a skilled workforce near the Central Coast ports will make recruiting O&M workers more challenging.

Southern California

- Highest demand of welders needed in any region
- Similar to the Bay Area, this sub-region has a sizeable working population to draw from but there will be a need to communicate and prepare those in related occupations and with relevant skills to the employment opportunities in and around OSW.

Table 6. Gap analysis for occupations with the greatest demand required for offshore wind activity in the Central Coast

Occupation	Potential Workforce Demand (no. of workers)	% Growth Above 2030 Projections
Construction Laborers	60	19%
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	45	>100%
Hoist and winch operator	40	>100%
Rigger	40	>100%
Welders, Cutters, Solderers, and Brazers	40	42%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	35	47%
Electro-Mechanical and Mechatronics Technologists and Technicians	30	>100%
Sailors and Marine Oilers	30	>100%
Captains, Mates, and Pilots of Water Vessels	30	>100%
Engineering Technologists and Technicians, Except Drafters, All Other	30	>100%

Regional Summary

Key themes

- Workforce development seen in 3 stages:
  - Prepare workforce to design and build the required infrastructure – constructing of transmission upgrades and ports.
  - Attract local manufacturing and *then* develop a manufacturing workforce
  - Build up long-term O&M capabilities – specifically in North and Central, while also building project development capabilities

- Workforce development needed most severely in the North Coast- it will pose a significant challenge combined with larger challenges the are faces in terms of infrastructure and resilience in the existing energy supply.

- Upskilling and recruitment for electricians and construction managers

Consultant Recommendations

Consultant Recommendations

Recommendations developed around five themes:

1. Identify a primary state agency for California's offshore wind industry
2. Align workforce investments with regional needs & port strategies
3. Develop shared training programs & curriculum, according to workforce demands & project timelines
4. Early engagement and coordination with unions, education and workforce institutions, and planning entities
5. Invest in research and innovation for offshore wind industry – technology, manufacturing, S+I

Consultant Recommendations

Identify a primary state agency for California's offshore wind industry

- A centralized state-level quasi-public agency dedicated to renewable energy with developer participation - initialized through state-mandates to accelerate net-zero goals.
- State-led supply chain and workforce development programs– conducted on a regional level. Leverage to fund DEI offshore wind workforce programs.
- Primary agency used to commission offshore wind planning, and agency used to reduce unpredictability of permitting structure

Align workforce investments with regional needs & port strategies

- Invest in programs and resources that expand current and potential offshore wind workforce in/around the North Coast i.e. workforce housing projects.
- Develop shared programs and resources that expand the pipeline for carpenters, plumbers, pipefitters, and HVAC installers for port upgrades.
- Prioritize and coordinate with transmission upgrades projects to ensure alignment of readily available workers and job opportunities for port upgrades and offshore wind.

Develop shared training programs & curriculum, according to workforce demands & project timelines

- Develop and provide training programs and/or seminars that prepare current electricians for port upgrades.
- Develop training programs and/or resources so current construction and project managers and supervisors can transition into the offshore wind industry.
- Build capacity at educational institutions near-term, focusing on STEM-related curriculum. Engage with stakeholders to create career pathways beginning in early education.

Consultant Recommendations

Early engagement and coordination with unions, education and workforce institutions, and planning entities

- Coordinate with unions on anticipated workforce mobilization efforts from the Bay and Southern California to the North and Central Coast.
- Coordinate early with labor unions to develop apprenticeship training programs, which target skills needed based on anticipated activities in each region.
- Coordinate workforce development efforts to align with net-zero goal of California, building workforce in renewable energy space.

Invest in research and innovation for offshore wind industry – technology, manufacturing, S+I

- Provide funding avenues for continued R&D, developing and supporting innovation hubs/incubators to become world leaders in floating offshore wind.
- Encourage public-private partnerships between developers, manufacturers, universities, research institutions, and government agencies for R&D.
- Collaborate with economic development agencies to understand current supply chain and best ways to commercialize innovation.

Thank you.

Brooklyn Fox

Renewables Consultant

T +1 (617) 699-2973

E Brooklyn.fox@xodusgroup.com

Josh Williams, Principal

jwilliams@bwresearch.com

Sarah Lehmann, Project Manager

slehmann@bwresearch.com

Questions and Answers

10 Minute Break

Panel Discussion

Moderator: Ben Pogue

Jeffrey Andreini, Vice President, Crowley

Scott Lewis, Executive Director, NorCal Carpenters Training

Jeremy Stefek, Workforce and Economic Development Researcher, NREL

Robert Collier, External relations director for Cierco, CADEMO project

Scott Adair, Economic Development Director, Humboldt County

Next Steps

Date	Upcoming Workshops
June 9th, 2023	Public Comments due from today's workshop.
May 25th, 2023	Assessing Transmission Upgrades and Investments for Offshore Wind Development off the Coast of California
June 1st, 2023	Identifying Additional Suitable Sea Space and Assessing Impacts and Mitigations for Offshore Wind Energy Development
June 2nd, 2023	Permitting Roadmap

Public Comments

Public Comment Instructions

Rules

- 3 minutes per person

Zoom

- Click “raise hand”

Telephone

- Press *9 to raise hand
- Press *6 to (un)mute

When called upon

- Unmute, spell name, state affiliation, if any

Written Comments:

- Due: June 9th, 2023 by 5:00 p.m.
- Docket: 17-MISC-01
- Submit at: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-MISC-01

3-MINUTE TIMER

Closing Remarks

Thank You!

Paul Deaver: Paul.Deaver@energy.ca.gov

CEC offshore wind docket:
https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01

CEC offshore wind page:
https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/offshore-renewable-energy

Public comments June 9th, 2023