

## North Coast OSW Port & Coastal Infrastructure

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#### Introduction

#### Study Purpose

Inform government, industry, and stakeholders

#### Topic

Exploring the existing capability and feasibility of infrastructure improvements needed to support offshore wind on California's North Coast

- Port
- Coastal



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# Outline

#### Introduction/Background

Port Infrastructure Navigation Marine Terminal Costs & Schedule Summary

Cable Landfall

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#### Port and Coastal Infrastructure Floating Offshore Wind





## Port Infrastructure

Navigation Marine Terminals



#### Scope

Port and Coastal Infrastructure Assessment

- 1. Develop conceptual-level port infrastructure requirements for supporting small (~150 megawatts (MW),12+ units) and large (~1800MW, ~150 units) floating OSW installations.
- 2. Identify capabilities and gaps of the existing port infrastructure.
- 3. Recommendations for port infrastructure upgrades.
- 4. Opinions of planning-level construction cost estimates



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#### **Component Scale**

Source: Josh Bauer, NREL



Mott MacDonald North Coast OSW Port & Coastal Infrastructure MARINE TRANSPORTATION SYSTEM DEPENDENT



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## West Coast Floating Offshore Wind Port Infrastructure

2016 Study

#### Assembly At Port

- Air Draft
- Water Depth
- Wave Climate
- Proximity

#### **Offsite Fabrication**

- Blades, turbines, etc.
- Substructure TBD

#### Marine Transport

- Overland connection type
- Common in Industry





![](_page_12_Picture_0.jpeg)

![](_page_13_Figure_0.jpeg)

![](_page_14_Figure_0.jpeg)

#### Study Methodology

#### Level of Assessment

- Prefeasibility level
- Not a detailed evaluation

#### Methodology

- Site Inspection
- Data Compilation and Review
- Literature and Prototype Industry Review
- Stakeholder Engagement (Vessel Pilots, Harbor District, Developers)
- Conceptual Level Engineering Analysis
- Pre-Feasibility Level Facility Upgrade Schematics

![](_page_16_Picture_0.jpeg)

## Navigation

## Humboldt Bay Port Infrastructure

**Offshore Floating Wind Farm** 

![](_page_17_Figure_2.jpeg)

ALL IMAGES SHOWN ARE FOR ILLUSTRATION PURPOSE ONLY

#### **Navigation Facilities**

![](_page_18_Picture_1.jpeg)

![](_page_18_Picture_2.jpeg)

Device Motion Clearance Seabed Variance

![](_page_18_Figure_4.jpeg)

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![](_page_19_Figure_0.jpeg)

![](_page_20_Figure_0.jpeg)

#### Concept Example – Outer Channel Controlling Depth

![](_page_21_Figure_1.jpeg)

8, 2020

![](_page_22_Figure_0.jpeg)

![](_page_23_Figure_0.jpeg)

![](_page_24_Picture_0.jpeg)

## **Marine Terminal**

## Humboldt Bay Port Infrastructure

**Offshore Floating Wind Farm** 

**NOT TO SCALE Bar/Entrance Channel** Installation / Component Delivery / O&M Yard Storage / Staging **Fabrication Facility** Substructure Fabrication / Float Off **m** • -----Wharf Inner Channel Assembly / Component Delivery / O&M **Component Delivery Staging Area** Multiple Devices Wet Storage Multiple Devices **Ballast Area** 

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### **Existing Marine Terminals**

![](_page_26_Figure_1.jpeg)

**Screening:** 

**Upland Area**  $\checkmark$ 

- ✓ Navigation Impacts
- •

![](_page_26_Picture_6.jpeg)

Meets primary criteria; upgrades may be needed.

Does not meet primary criteria, or major mitigation would be required.

#### Marine Terminal – Assembly

![](_page_27_Figure_1.jpeg)

#### **Example Assembly Terminal Layouts**

#### **Considerations**

#### • Yard

- Sufficient space for either size project
- Area dependent on navigation constraints
- Ground improvements likely

#### Wharf

 Over-water coverage – minimize impacts on eelgrass beds

#### • Berth

- Dredging likely required for either size project
- Fabrication
  - Likely requires additional exclusive-use berths and yard area

![](_page_28_Figure_12.jpeg)

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#### Structure Concepts

#### **Existing Conditions at RMTI**

![](_page_29_Picture_2.jpeg)

![](_page_29_Picture_3.jpeg)

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![](_page_29_Figure_5.jpeg)

# Fil Concept

## Summary

Port Infrastructure Assessment

#### **Existing Infrastructure**

#### **Navigation**

Existing navigation channel can likely support floating offshore wind projects

Device size may be limited w/out channel modifications

#### **Marine Terminal**

Existing wharf and yard need upgrades

Creosote piles likely need to be removed

#### Upgrades

#### **Navigation**

Outer FNC: Installation throughput may depend on channel modifications

Inner FNC: Widening may be required depending on device geometry

#### **Marine Terminal**

Berth dredging likely required New high-capacity wharf required Yard ground improvement and grading required

Large repairs may occur at assembly berth, CTVs + SOVs require new facility

#### Operations

**Seasonality:** Seasonal installation is likely, components may be delivered year-round

Maintenance dredging: Timing adjustments to earlier in season likely beneficial and may be needed

**O&M:** Pacific winter wave climate – considerations for O&M crew access

**Other Uses**: The new marine terminal exceeds capacity and length needs for other industries.

#### Cost and Schedule

#### **Capital Costs**

#### **Assembly**

Small: \$50-110m

Large: \$150-300m

**Fabrication** 

\$50-100m

#### <u>0&M</u>

Small: \$1-2 m

Large: \$6-10 m

#### **Schedule**

Marine Terminal Build-out Regulatory considerations In-water work window Small: ~4-6 years Large: ~5-7+ years

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#### **Example Areas for Further Investigation**

Port & Coastal Infrastructure

Maneuvering Analysis	Coastal Engineering Analysis	Stakeholder Outreach
Full Bridge Simulations	Port Planning and Logistics	Regulatory
Throughput	Wharf Elevation	Surveying
	Aids to Navigation	Geotechnical Investigation
	<b>Resiliency Study</b>	Ceoteennearmeestigation
	Siting of O&M Facility	
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![](_page_33_Picture_0.jpeg)

## Cable Landfall

![](_page_33_Figure_2.jpeg)

#### Cable Landfall

![](_page_34_Figure_1.jpeg)

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#### Trenchless

![](_page_34_Figure_4.jpeg)

#### Landfall likely feasible

- Can be one of the most complex elements
- Data collection and engineering to reduce risk
- Focus on HDD most common trenchless
- Utilities and truck access
- Marine support barge and vessels Additional study/engineering needed

![](_page_35_Picture_0.jpeg)

## Thank you

![](_page_35_Picture_2.jpeg)