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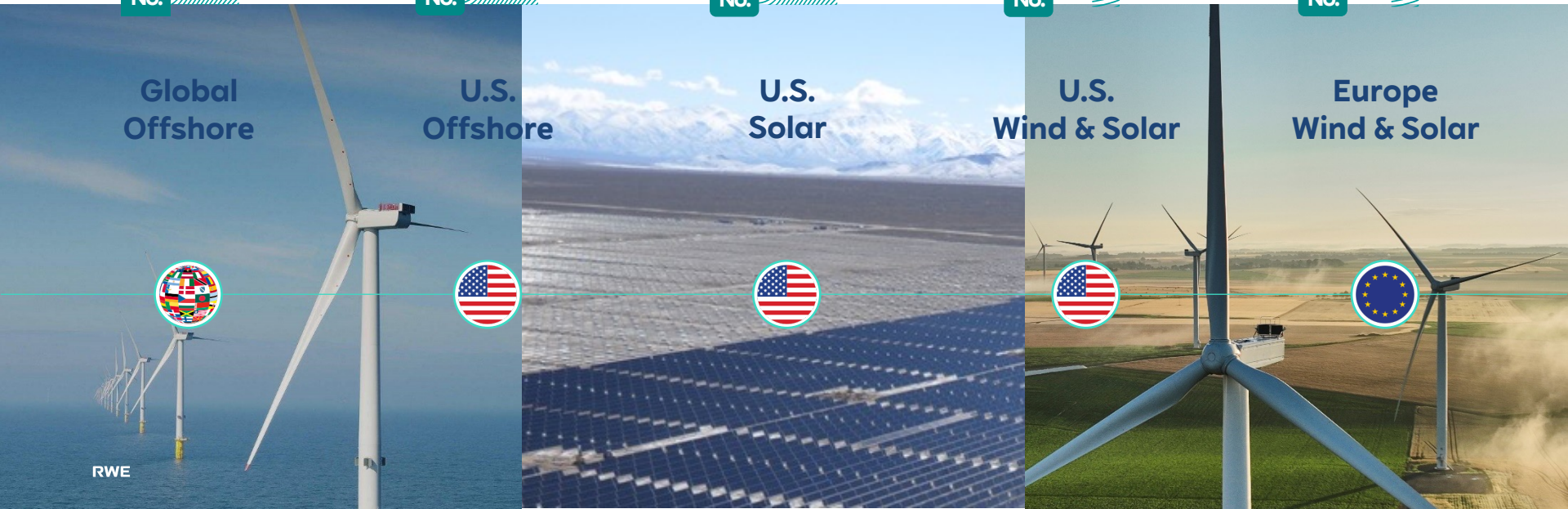
2024 SDP Annual Conference

Application of Scenario Thinking for US Offshore Wind Development

Brendon Keinath, PhD

RWE is one of the largest global players in renewables.



Overview | Application of Scenario Thinking for US Offshore Wind Development

Grounding

Upskill in OSW to provide perspective on the opportunity

Scenario Thinking

Share case study on OSW in the US

Signposting

Reflection on Case Study & Current Status

Grounding

- US Landscape
- Technology
- Project Development

Grounding: US Landscape

Grounding: US Landscape

Whitehouse.gov

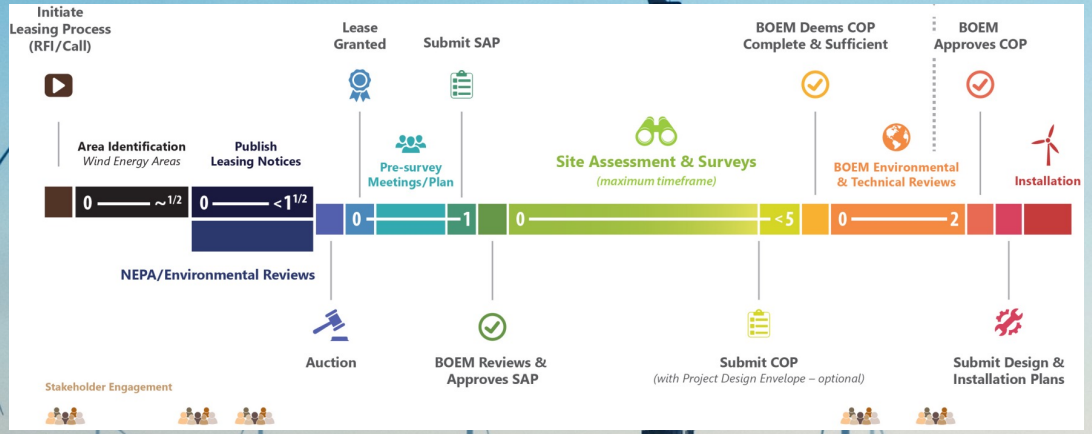
MARCH 29, 2021

FACT SHEET: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs

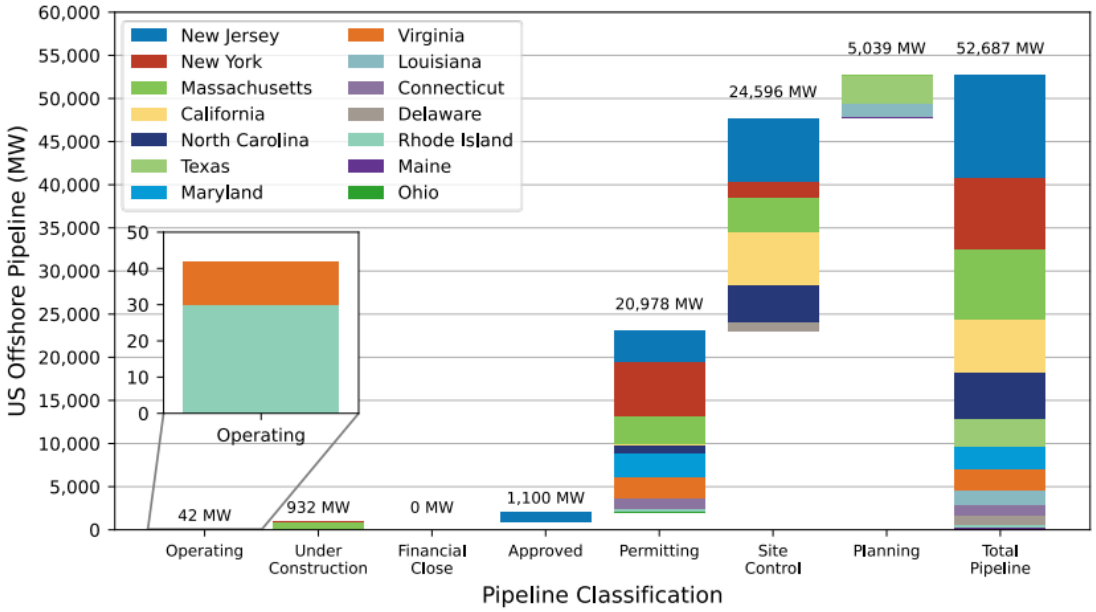
BRIEFING ROOM › STATEMENTS AND RELEASES

Interior, Energy, Commerce, and Transportation Departments Announce New Leasing, Funding, and Development Goals to Accelerate and Deploy Offshore Wind Energy and Jobs

- **Establishing a Target of Employing Tens of Thousands of Workers to Deploy 30 Gigawatts (30,000 megawatts) of Offshore Wind by 2030.**
  - 2050 implications of meeting the 2030 goal: Achieving this target also will unlock a pathway to 110 GW by 2050.



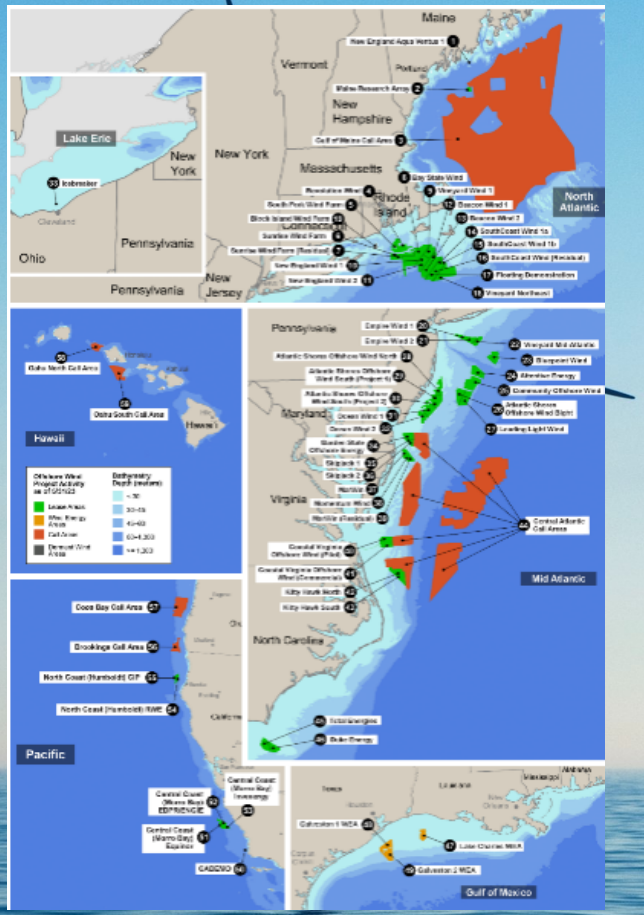
Grounding: US Landscape



U.S. project pipeline classification by status.

Note: The approval of Ocean Wind occurred on July 5, 2023, after the stated cutoff date of May 31, 2023.

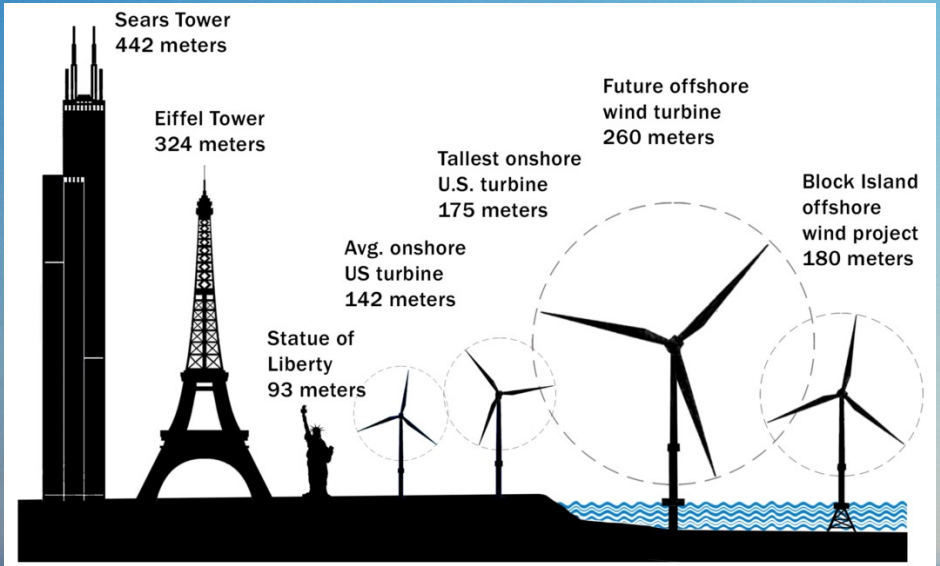
Offshore Wind Market Report: 2023, NREL & DOE



Locations of U.S. offshore wind energy pipeline activity and Call Areas as of May 31, 2023. ***Map created by John Frenzl, National Renewable Energy Laboratory (NREL)***

Grounding: Technology & Project Development

Grounding: Technology & Project Development



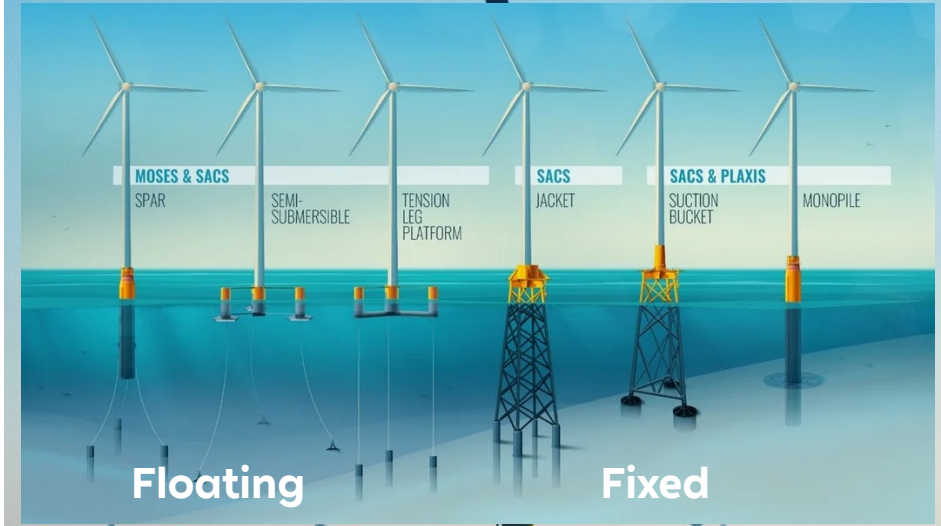


Figure on left taken from andlinger center at princetown.edu; figure on right taken from Pham, M., *All About Offshore Wind Turbine Foundations*

Grounding: Technology & Project Development

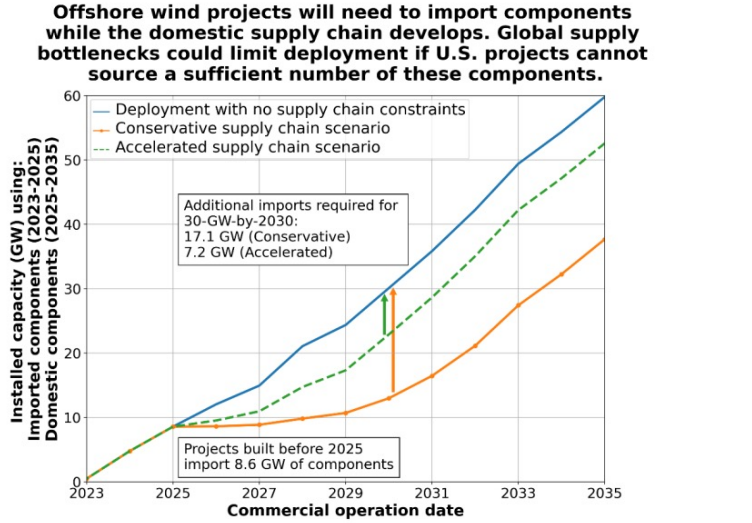
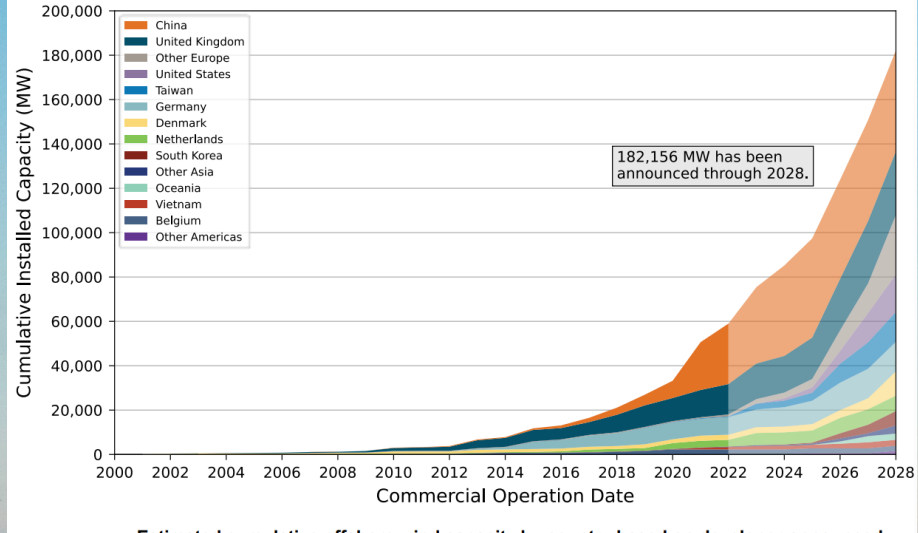


Figure ES3. Manufacturing constraints on offshore wind energy deployment for accelerated and conservative domestic supply chain scenarios.

NREL, A Supply Chain Road Map for Offshore Wind Energy in the United States, Jan 2023



Estimated cumulative offshore wind capacity by country based on developer-announced commercial operation dates (CODs).

DoE, Offshore Wind Market Report: 2023 Edition

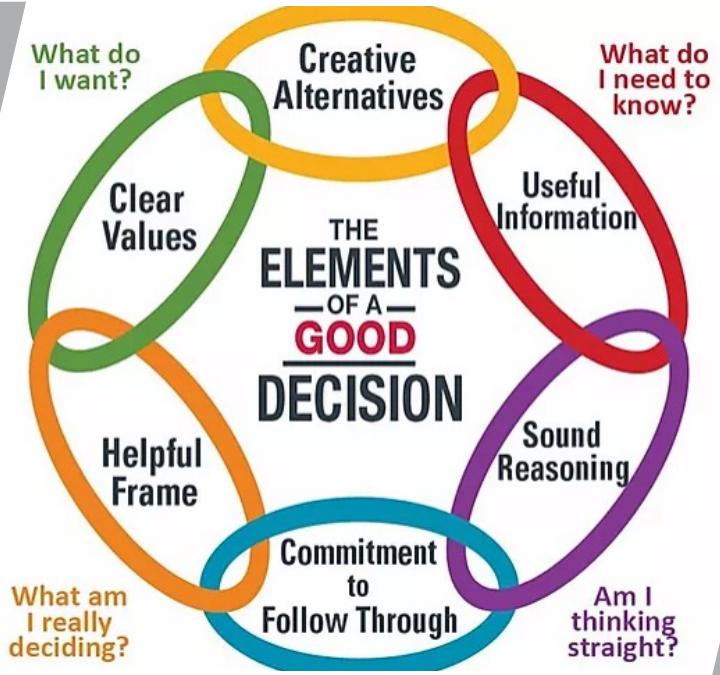
Scenario Thinking

- DQ Elements
- Framing/Issues Sorting
- Uncertainty Ranking
- Scenario Descriptions

DQ Elements: Summary for this Case Study

1

Opportunity Definition
Issue List & Categorization



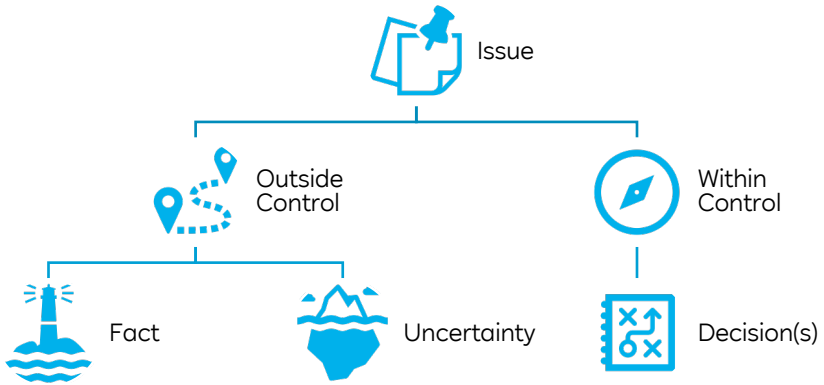
2

Uncertainty Ranking
Scenario Development

Framing/Issues Sorting: *Under what conditions are 50 GW of OSW installed in the US by 2035?*

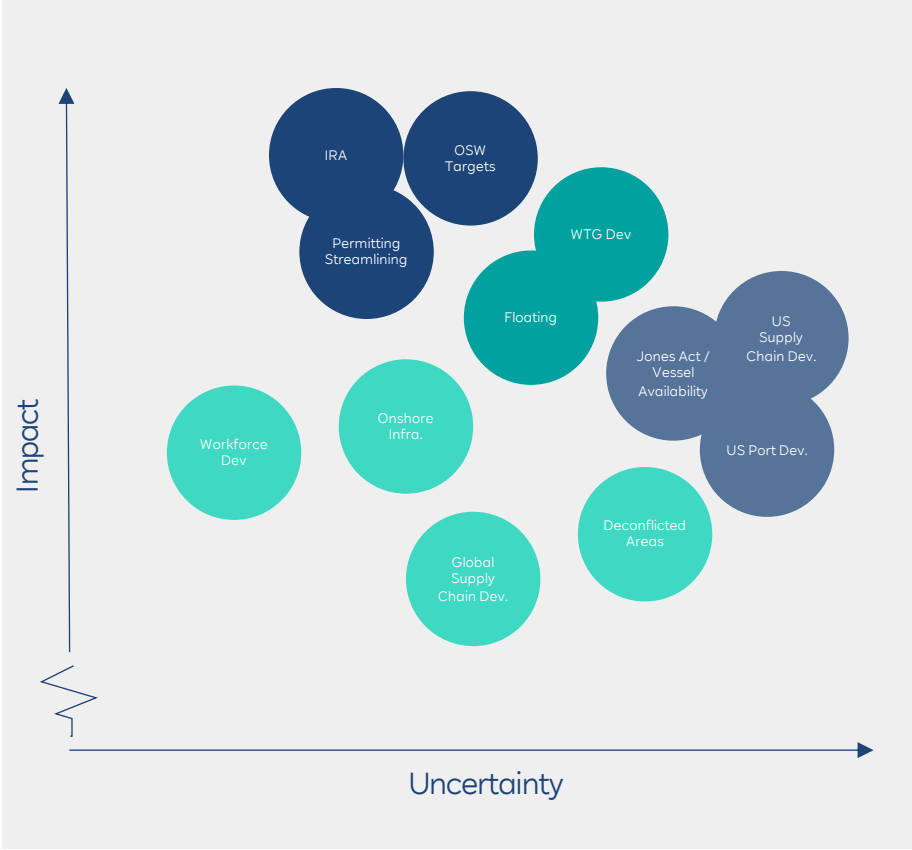
Brainstorming

Sorting



Key Uncertainties: Risk and Opportunities

Risks & Opportunities



US Landscape

+ Increase in OSW targets & permitting streamlining implemented

- Stagnant targets & implementation of streamlining challenged

Technology

+ Continued WTG development; floating OSW learning curve

- WTG tech challenges; global floating learning does not translate to US

Project Development

+ Key supply chain & ports developed and future proofed; Compliant vessels available for construction

- Local investments lag; globally constrained vessel market

Project Development

Run A Tight Ship

Implications:

- *Less efficient development of sea bed areas*
- *Floating technology adoption in the US lags impacting delivery timeline*
- *Infrastructure and vessels developed to support fixed bottom*

Copper Bottom

Implications:

- *Upward vector in capacity per area developed*
- *Ability to rely on local manufacturing improves timing and availability for installation*
- *Compliant vessel availability supports project delivery*

Down in the Doldrums

Implications:

- *Less efficient and longer development timelines*
- *Floating technology impact minimal in achieving goals in timeframe*
- *Challenging delivery models without key infrastructure and manufacturing sites*

Trim Ones Sails

Implications:

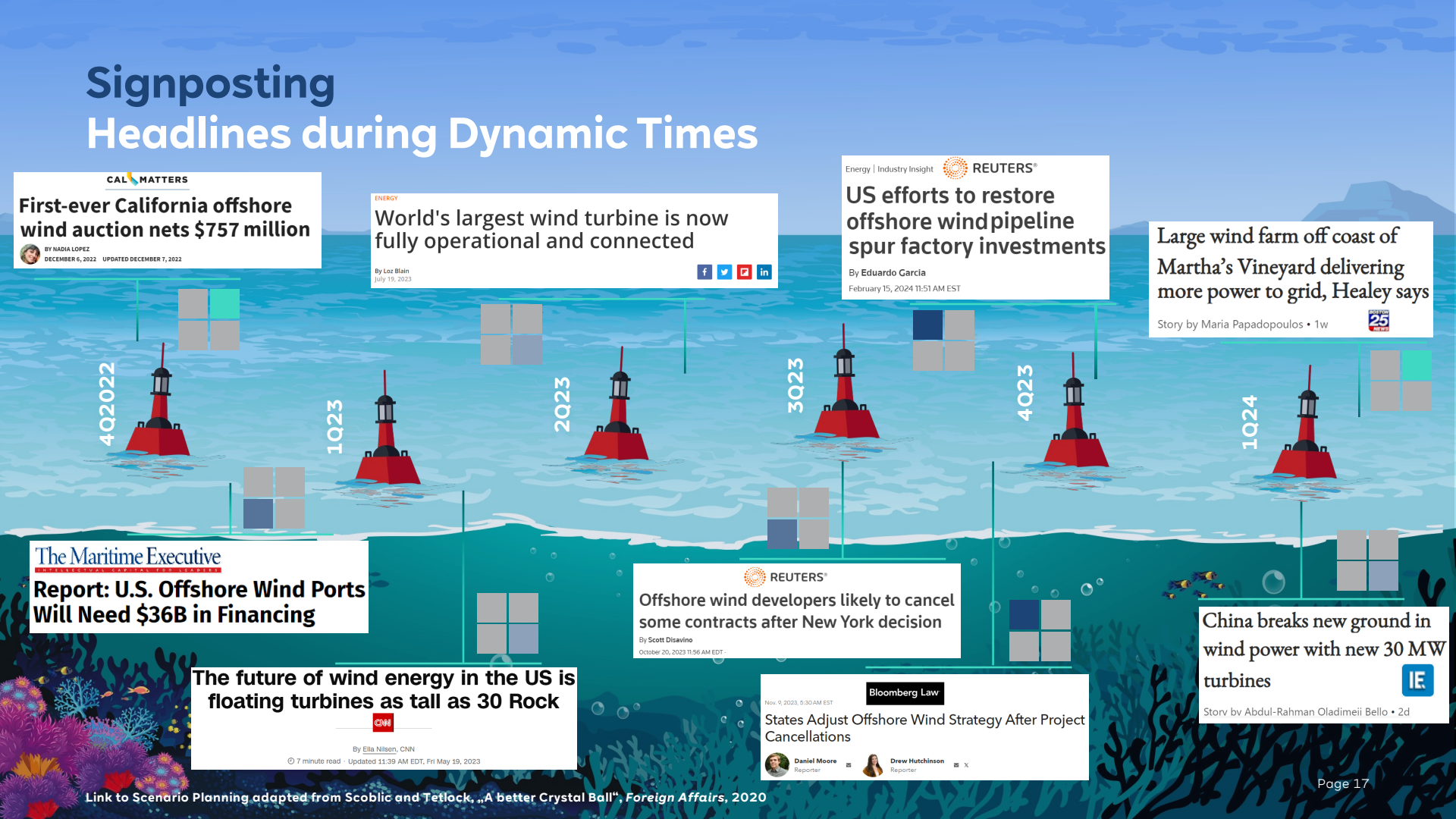
- *Upward vector in capacity per area developed possible with global supply chain*
- *Additional strains on global bottlenecks likely including vessels*

Technology

Signposting

- Dynamics of Nascent Market
- Highlighting Recommendations

Signposting
Headlines during Dynamic Times

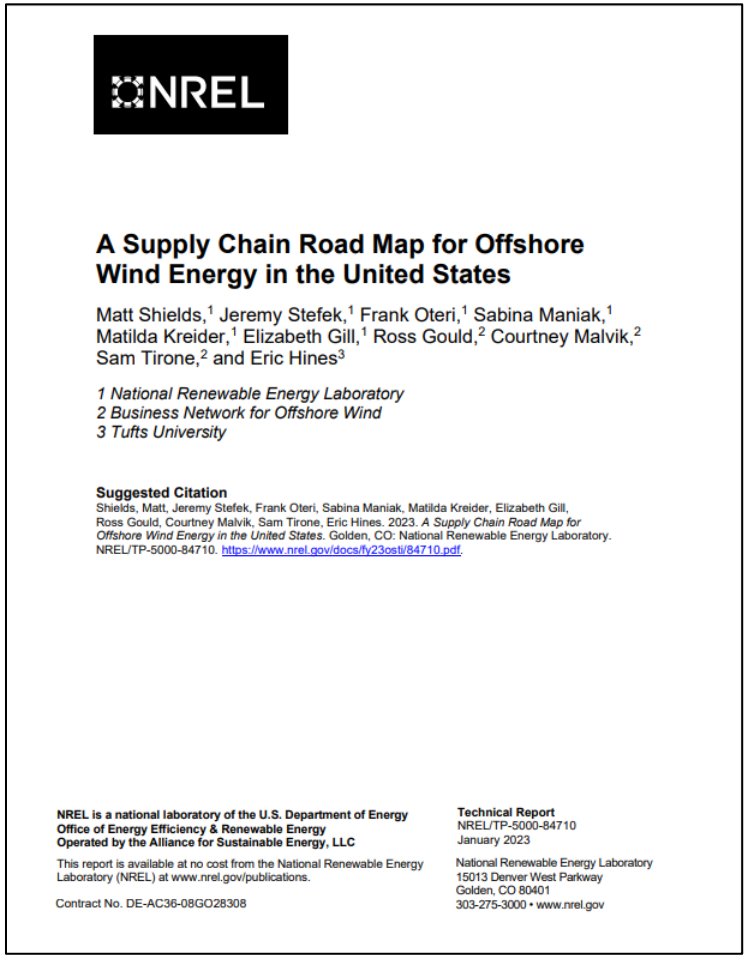


Link to Scenario Planning adapted from Scoblic and Tetlock, „A better Crystal Ball", *Foreign Affairs*, 2020

Potential Actions:
Highlightling NREL Recommendations

Actions Gaining Critical Momentum (2025-2030)

- Construct the major supply chain facilities to meet the demand pipeline [with *future proofing* in mind – including floating]
- Leverage…industrial working groups [creating collective and collaborative approach]
- Incorporate learning from early-stage commercial-scale projects… [and global floating developments]



NREL

A Supply Chain Road Map for Offshore Wind Energy in the United States

Matt Shields,[1] Jeremy Stefek,[1] Frank Oteri,[1] Sabina Maniak,[1] Matilda Kreider,[1] Elizabeth Gill,[1] Ross Gould,[2] Courtney Malvik,[2] Sam Tirone,[2] and Eric Hines[3]

1 National Renewable Energy Laboratory
2 Business Network for Offshore Wind
3 Tufts University

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Closing| Application of Scenario Thinking for US Offshore Wind Development

Grounding

OSW is a dynamic and complex opportunity in the US

Scenario Thinking

Given uncertainty, scenario thinking is a powerful tool for all stakeholders

Signposting

Exciting times ahead for the nascent industry in the US

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Questions