Supply Chain Activities in the United States

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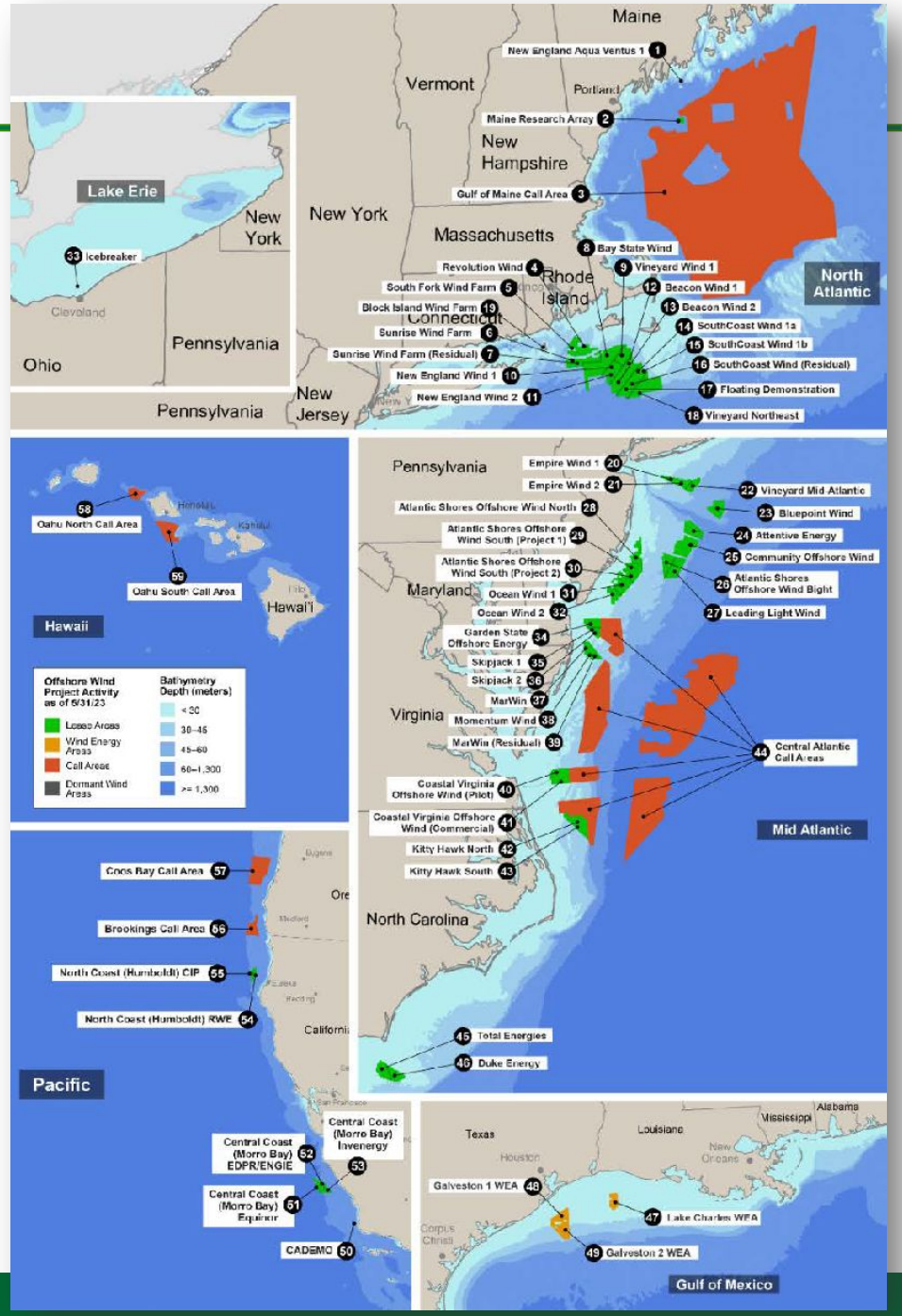
U.S. Offshore Wind Summary

- U.S. offshore wind target set in March 2021 for 30 gigawatts (GW) by 2030 with pathway to 110 GW by 2050
- Floating offshore wind target set in September 2022 for 15 GW by 2035
- State policies procurement targets of 42,730 megawatts (MW) by 2040
- 52,687 MW estimated in total project pipeline
- 42 MW operational
- Vineyard Wind (800 MW) and South Fork (132 MW) under construction
- In 2022, $2.7 billion supply chain investment was announced



Manufacturing Revitalization Opportunity

Required Resources to Deploy 30GW of Offshore Wind Energy by

- **2,100** Wind turbines
- **2,100** Foundations
- **6,800** Miles of cable
- **58** Crew transfer vessels
- **4–6** Wind turbine installation vessels
- **11** Service operation vessels
- **4** Cable lay vessels
- **2** Scour protection installation vessels
- **4–8** Transport vessels
- **4–6** Heavy lift vessels
- **12,300–49,000** Full-time equivalents average annual workforce

Source: *The Demand for a Domestic Offshore Wind Energy Supply Chain* (2022)

Investments in Manufacturing Facilities Needed to Establish a Supply Chain by 2030

- **$3.5 billion** Wind turbines
- **$1.3 billion** Substructures
- **$1.8 billion** Electrical components
- **$3.5 billion** Installation vessels
- **$8 billion** Ports
- **$3 billion** Steel plates
- **$1.3 billion** Other components

Source: *A Supply Chain Road Map for Offshore Wind Energy in the United States* (2023)

Federal Offshore Wind Resources

Resource Type	Projects and Programs
National and Regional Roadmaps and Needs Assessments	• National Offshore Wind Supply Chain Road Map • U.S. Offshore Wind Workforce Assessment • West Coast Ports Analysis • Wind Energy Supply Chain Deep Dive Assessment (EO 14017 report) • East Coast Supply Chain MOU and associated working group
Initiatives to Support R&D	• FLoating Offshore Wind readINess (FLOWIN) Prize • Manufacturing of Large Wind Energy Equipment Funding Awards • Supply & logistics technology studies (funded through the National Offshore Wind Research Development Consortium)
Funding and Loan Guarantee Resources	• DOE Manufacturing and Energy Supply Chains Office Funding Programs • DOE Loan Programs Office Title 17 Innovative Clean Energy Loan Guarantee Program • Maritime Administration Port Infrastructure Development Program • Maritime Administration Title XI Federal Ship Financing Program

Floating Offshore Wind

Floating Offshore Wind

- 2/3 of US offshore wind resource
- Regional & economy-wide decarbonization
- Coastal and national economies
- Potential for U.S. innovation & leadership

Timing

- Cusp of commercialization
- Rapid period of growth around the worl

Global Opportunity

- United States 15 GW by 2035
- Oregon 3 GW by 2030
- California 25 GW by 2045

- Scotland: 24.9 GW leased
- South Korea: 18.9 GW in development
- Global projection: 10.9 GW installed by 2030

Targets:

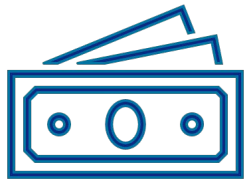
Spain – 3 GW by 2030
UK (Floating) – 5 GW by 2030
Portugal – 10 GW by 2030
Japan – 10 GW by 2030
South Korea – 14 GW by 2030
Norway – 30 GW by 2040

ENERGY earthshots
U.S. DEPARTMENT OF ENERGY

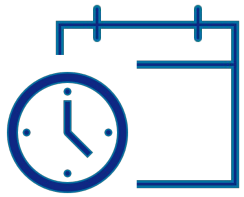
Floating Offshore Wind™

The ***Floating Offshore Wind Shot*** will drive U.S. leadership in floating offshore wind design, manufacturing, and deployment to decarbonize our economy and revitalize our coastal

Reduce the cost of floating offshore wind electricity by >70% in deep waters by 2035*



>70% Reduction



2035

BOEM also announced an associated deployment goal of 15GW floating offshore wind by 2035

*70% cost reduction to $45 per megawatt hour (MWh)

Key Needs for Floating Offshore Wind Development

- Cost Reductions
- Domestic Supply Chains, Including Ports
- Expanded, Just, and Sustainable Deployment
- Transmission Development
- Co-Generation Applications

Technical R&D Contributions to Achieve the Target

Serial Manufacturing and Integrated Designs

- Serial manufacturing of hundreds of turbine systems and platforms per year

Develop Larger Turbines with Higher Generation Capacity

- Component scaling with optimized systems and advanced controls

Systems Engineering & Co-Design

- Optimization including controls, mooring, anchoring & supply chain

Increase Operational Reliability

- Predictive and remote maintenance capabilities
- Circular economy and lifetime extension practices

Photo: Harland and Wolff Heavy Ind.

Photo: Siemens

Complementary Projects

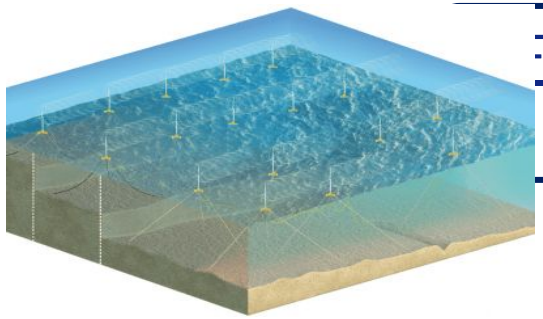
ATLANTIS Phase II

West Coast Port Strategy Study

NOWRDC Ocean Co-Use and Transmission Research Awards

FLoating Offshore Wind ReadINess (FLOWIN) Prize

Environmental Research Award: West Coast Bat Monitoring Project

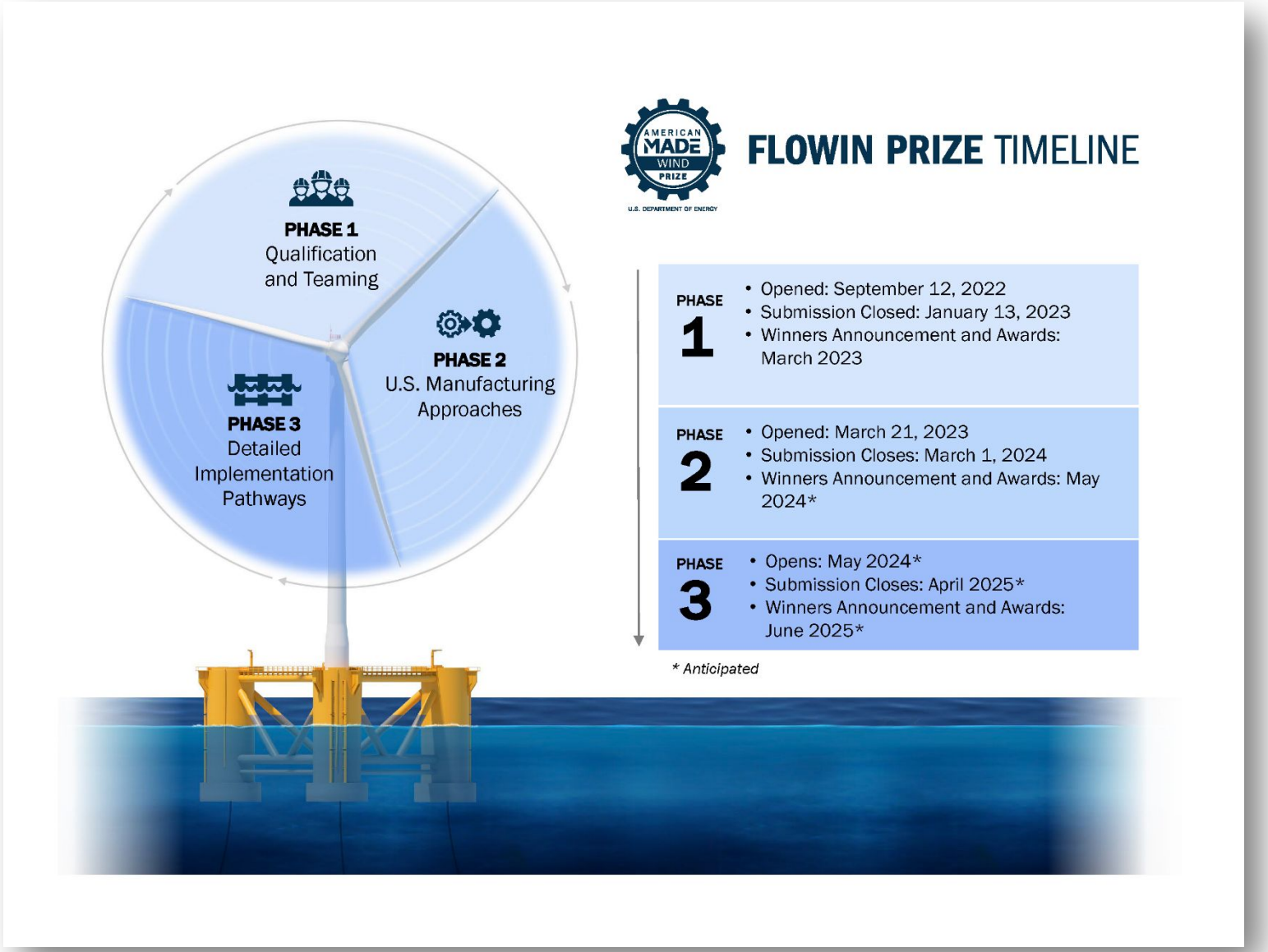


Floating Offshore Wind Array Design Project

West Coast Offshore Wind Transmission Literature Review and Gaps Analysis

FLOWIN

- Goal: to establish a pathway to cost-effective domestic manufacture and deployment of commercial gigawatt-scale floating wind farms in U.S. waters



Loan Programs Office: Potential OSW Supply Chain Projects

Under Title 17 Clean Energy Loan Guarantee Program

- Manufacturing of turbines, monopiles, towers, nacelles, blades, foundations, and subsea cables;
- Deployment of fixed-bottom and floating offshore wind farms; and
- Transmission upgrades, including HVDC deployment, required upgrades to the point of interconnection (POI) at land-based substations and transformer and conductor manufacturing.

Under Advanced Technology Vehicles Manufacturing Loan Program

- Manufacturing of maritime vessels and associated components as long as the project meets all other eligibility criteria under the ATVM program.

Office of Manufacturing and Energy Supply Chain

- Bipartisan Infrastructure Law (BIL)
- $750 million
- Support manufacturing projects in communities that have experienced coal mine or coal-fired power plant closures.
- Provide grants to small- and medium-sized manufacturers to build, expand, or re-equip facilities to produce or recycle property needed to support secure, resilient domestic clean energy supply chains.

Maritime Administration Grants

- MARAD Title XI Federal Ship Financing Progra
  - Vessels of National Interest
  - Loan for up to 87.5% of cost of vessel.
- Port Infrastructure Development Program
  - 2022
    - Bridgeport Operations and Maintenance Wind Port, CT
    - Salem Wind Port, MA
    - Arthur Kill Offshore Wind Terminal Project, NY
  - 2023
    - Redwood Marine Terminal and Baywide Master Plan Project, CA
    - Baltimore County Offshore Wind Manufacturing Hub, MD
    - Wind Port at Paulsboro, Phase 2, NJ
    - Norfolk Offshore Wind Logistics Port, VA

Inflation Reduction Act (IRA) Implementation

- ~$370 billion for climate including 11 new or extended tax incentives for wind energy

- **Extends clean energy deployment incentives at least 10 years**: 30% investment tax credit (ITC) or $27.5/MWh production tax credit (PTC)
  - Conditioned on wage and apprenticeship requirements
  - 10% bonuses for a) building in energy communities, b) domestic content
- **Clean energy manufacturing tax credits**
  - $10 billion in competitive manufacturing ITCs, focused on energy communities
  - Manufacturing PTCs for blades ($0.02/W), towers ($0.03/W), nacelles ($0.05/W), offshore wind foundations ($0.02/W fixed-bottom, $0.04/W floating), specialized vessels for offshore wind (10%)
- **Expanded clean energy financing**—up to $350 billion in new federal loans for clean energy infrastructure and manufacturing through DOE Loan Programs Office

Thank you

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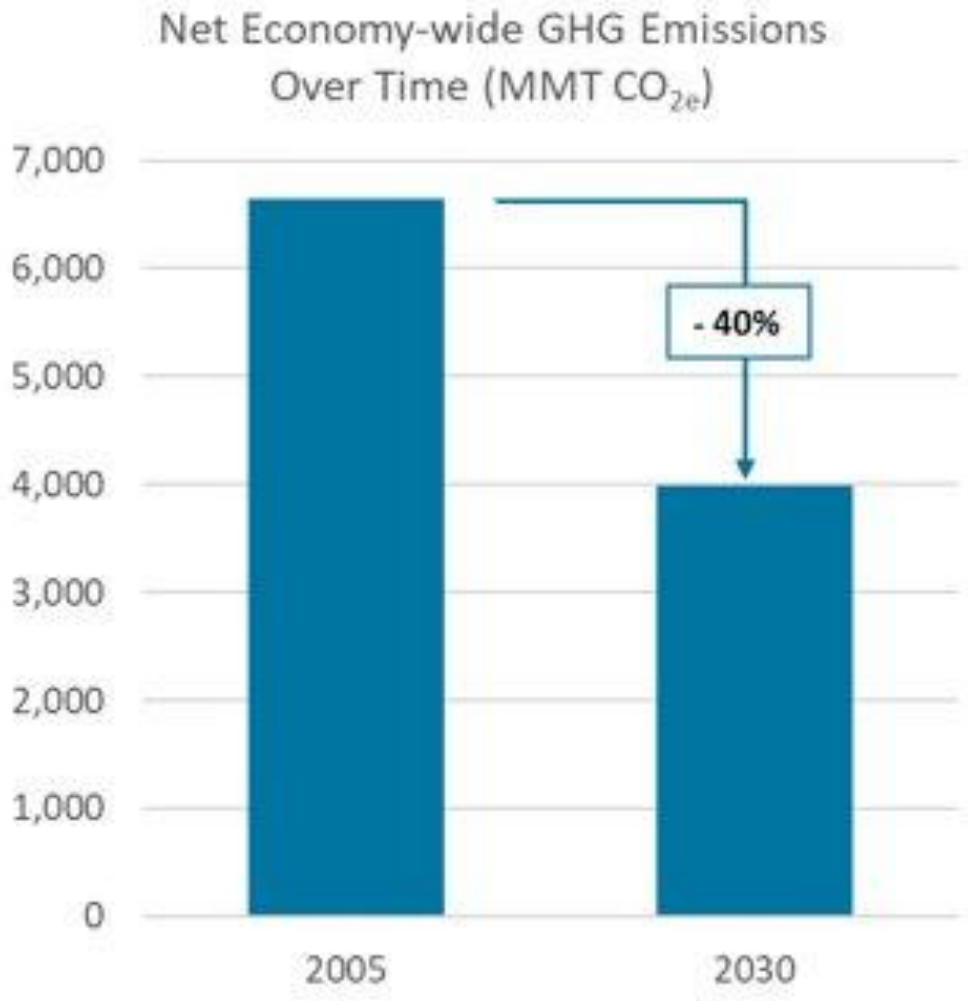
Inflation Reduction Act energy highlights

- $369B investment, most comprehensive climate and clean energy package in American history
- Provides long-term clean energy policy stability
- Supply and demand-side programs for domestic clean energy production and manufacturing: tax credits, grants, loans
- Significant focus on and incentives for good jobs
- Major consumer transport, home energy incentives
- Benefits for disadvantaged and energy communities



Supports ~40% GHG emissions reductions

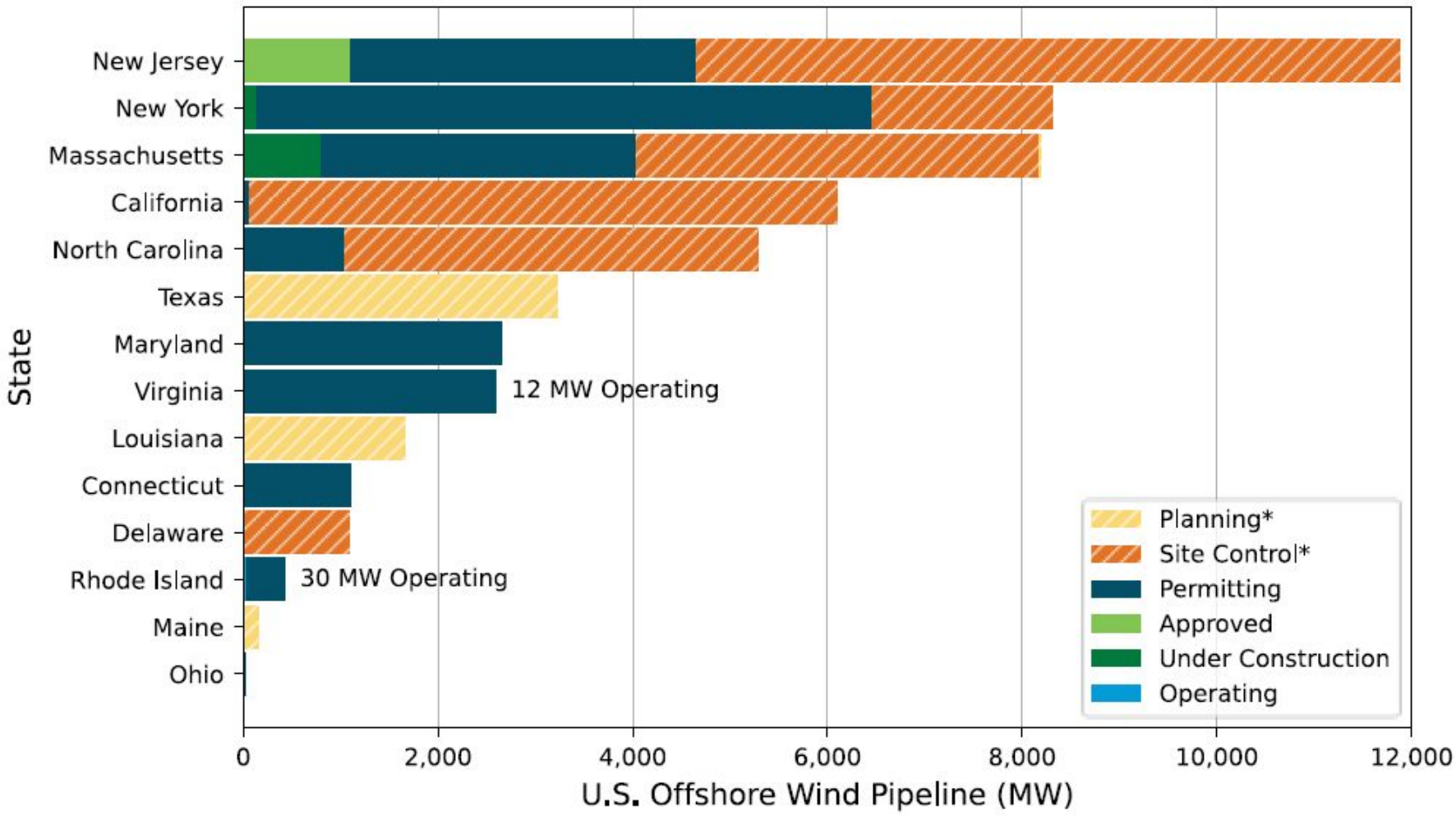
ITC (§48) and PTC (§45) Summary

- **Credit**: Investment or production credit available to businesses taxpayers installing certain energy or electricity equipment.
- **Technologies**: Each credit is technology specific, mostly covers all renewables. Some technologies able to choose one or the other.
- **Value**: **Credit value if meeting prevailing wage and apprenticeship requirements is 30% for ITC**, $26/MWh for first 10 years for PTC (inflation adjusted). **If not, 5x lower.**
- **Bonuses and Stacking**: 10% (PTC) or 10 percentage point (ITC) bonus for meeting energy community or domestic content requirements. Bonuses are stackable. Facilities can also stack ITC or PTC with §45V hydrogen production credit.
- **Timeline**: Extended for projects beginning construction before 2025. Then transitions to technology-neutral clean electricity §48E ITC and §45Y PTC.

Domestic Manufacturing Capacity

Product	Announced availability in the U.S.	# of announced facilities	% of demand met in 2030	# of additional facilities needed	Notes
Blades	2025 - 2028	0	18	5	
Nacelles	2025 - 2028	2	100	1	GE (NJ), Vestas (NJ). Final assembly only. Full assembly would likely require 4 facilities.
Towers	2025 - 2028	1	33	2	Marmen Welcon (NY).
Monopiles	2023	2	60	1	EEW (NJ), Haizea (MD).
Jackets	N/A	0	0	1	Can build one-off designs but no mass manufacturing facility has been announced
HVAC Export cable	2021	2	96	2	Nexans (SC), Prysmian (MA)
HVDC Export cable	N/A	0	0		No HVDC manufacturing facility has been announced.
Array cable	2026 - 2029	1	75	1	Hellenic (MD)
Offshore substations	2023	N/A	100	0	Can use existing shipyards. Assembly of structural assembly only, power electronics likely imported.
Transition pieces	2025 – 2027	1	30	3	Smulders (NY).

U.S. Pipeline Potential of 53 GW in Various Development Phases



- 42 MW operational
- 932 MW under construction

Source: U.S. Department of Energy Office of Energy Efficiency & Renewable Energy (2023)
*Includes Ocean Winds 1

Summary of Major IRA Wind Energy Tax Credits (2)

IRC §	IRA §	Short Name	Major Changes by IRA Enactment
45X	13302	**Advanced Manufacturing Production Credit**	Direct-pay tax credit for domestic production of certain solar and wind components (varies), offshore wind vessels (10%), and critical minerals (10%)
48C	13501	**Advanced Energy [Manufacturing] Project Credit**	$10B competitively awarded for investments in eligible property designed to produce equipment used for producing energy from specified renewable sources or other specified purposes. $4B earmarked for qualifying projects located in energy communities.

Advanced Manufacturing PTC: 45X

- New direct-pay production tax credit for domestic production of qualifying solar, wind, and battery components, and offshore wind vessels and critical mineral processing.
- Credits provided for **eligible components produced and sold before Jan. 1, 2030**. For components sold after that date, the credit is reduced by 25% each year, and is unavailable for components sold in 2033 and beyond.
    - Phaseout does not apply to the credits for critical minerals.

Wind 45X Credit Values (all values per watt unless specified)	
Blade	$0.02
Nacelle	$0.05
Tower	$0.03
Offshore Wind Foundation	Fixed: $0.02; Floating: $0.04
“Purpose-Built” Offshore Wind Vessel	10% of sales price

Advanced Energy Manufacturing ITC: 48C

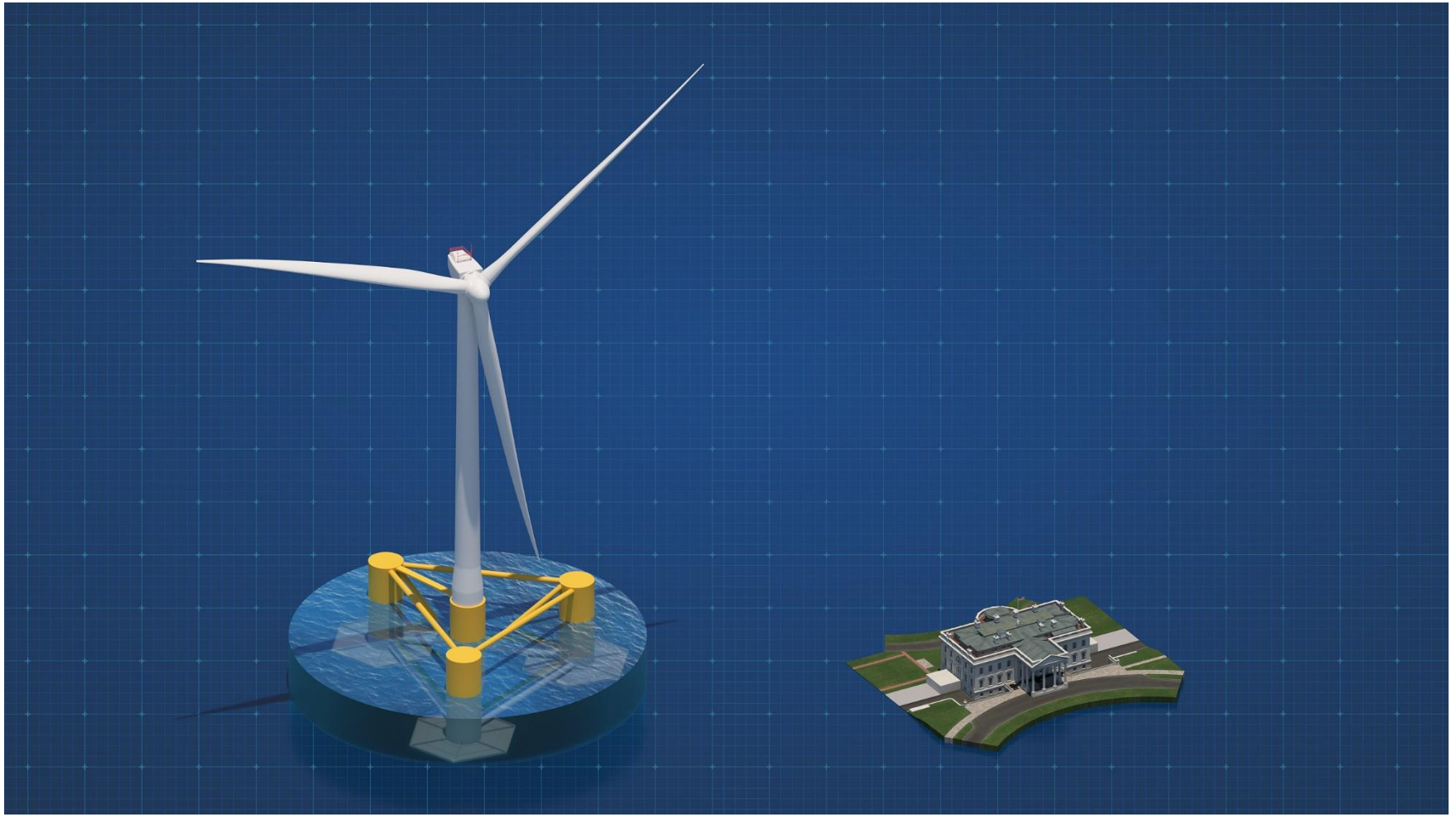
- Competitively allocated 30% ITC for investments in eligible property (facilities and major tooling) designed to produce equipment used for specified clean energy purposes, including:
  - Renewable energy component manufacturing or recycling
  - Grid modernization equipment manufacturing (e.g. transformers)
  - Low-carbon fuel production equipment manufacturing (e.g. H2 electrolyzers)
  - Energy efficiency equipment
  - Electric and fuel cell vehicle manufacturing
  - Other energy property designed to reduce GHG emissions by >20%

- $10 billion total credit available; $4 billion earmarked for energy communities.
- Does not stack with 45X manufacturing production credit
- $4B initial allocation issued in May 31 guidance. Wind priorities: Component production facilities and specialized steel production, particularly for offshore wind, such as monopile-grade steel and towers; recycling of wind components, particularly blades

Atlantic Offshore Wind Transmission Study – Recommended Actions

- Immediate: collaborative actions to identify points of interconnection and planning standards
- Near-term: plan offshore network, standards for HVDC technology, identify offshore transmission paths
- Mid-term: construction, testing centers
- Long-term: state-led transmission planning, cost allocation, national transmission corridors

Scale of Floating Offshore Wind Systems



Source: NREL