



# Impact of IRA, IIJA, CHIPS, and Energy Act of 2020 on Clean Technologies

Deep Dive | Offshore Wind

APRIL 2023



## Background | Objectives and context of this work

### Objective

- Explore impacts of recent legislation<sup>1</sup> on U.S. opportunity and remaining challenges for emerging clean technology deployment

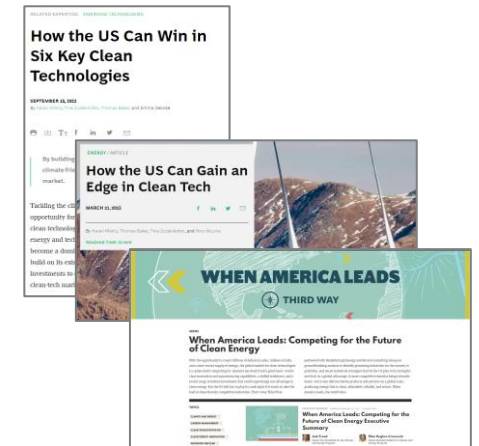
### Stakeholders involved

- Analysis was commissioned by Breakthrough Energy and Third Way, with input from stakeholders across the public and private sectors



### Related publications

- BCG report | How the US Can Win in Six Key Clean Technologies
- BCG report | How the US Can Gain an Edge in Clean Tech
- Third Way publication | When America Leads: Competing for the Future of Clean Energy



1. Legislation assessed here includes Inflation Reduction Act (IRA), Infrastructure Investment and Jobs Act, CHIPS and Science Act, and the Energy Act of 2020  
Source: BCG analysis

1,100-  
2,000 Mtpa

Annual global  
abatement potential  
in 2050

\$520-580B

Cumulative US  
domestic market  
'20-'50

\$80-120B

Cumulative US  
exports '20-'50

~90k<sup>4</sup>

Cumulative job  
creation through  
2050

## Offshore wind (OSW) | Executive summary

➤ The US currently trails behind Europe and China who have deployed ~50 GW of combined capacity, which is nearly 2x the US 2030 target of 30 GW. Recently passed IRA and IIJA<sup>1</sup> provisions help the US reclaim its domestic market, accelerate OSW deployment, and position the US for regional exports into the Americas

➤ Expanded ITC<sup>2</sup> provisions increase domestic demand for OSW projects by reducing the LCOE by ~30% from \$75/MWh to \$50/MWh, increasing the US domestic market by ~\$30B by 2030 post-IRA and creating ~50K new jobs before 2030

➤ The IRA and IIJA incentivize building a robust US supply chain which positions the US to capture both the domestic market and regional export markets where the US holds proximity advantages by subsidizing component manufacturing through AMPCs<sup>3</sup> and funding infrastructure development, including ports and Jones Act-compliant vessels

➤ Permitting reform, transmission expansion, and industry-wide standardization are needed to accelerate domestic deployment and infrastructure, which helps the US capture learnings from early projects and innovate on design and installation processes

➤ Providing funding for floating technology demonstrations and deployment can further position the US to lead in a nascent part of the offshore wind market and unlock additional export potential

1. IIJA = Infrastructure Investment and Jobs Act 2. ITC = investment tax credit 3. AMPC = advanced manufacturing production credit 4. Total number of positions created through 2050; incremental new jobs calculated as sum of all non-negative one-year differences in # job-years (e.g., 2021 job-years minus 2020 job-years gives 2021 new jobs); incremental new jobs added to sum from prior period for cumulative calculation  
Note: All numbers on lefthand side are based on projections from IEA's Announced Pledges (APS) 2022 scenario and are sums across all segments for the 2020-2050 timeline

Source: BCG analysis, IEA, DOE

# Recent US policies have resulted in significant increases in projected size of addressable market, exports, and jobs within offshore wind

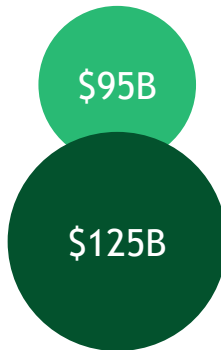
Impact of recent US policies (incl. IRA, IIJA) on cumulative market and job creation from 2020-2030



## US market

US cumulative total addressable market ('20-'30) increases from \$95B to \$125B due to increased domestic deployments

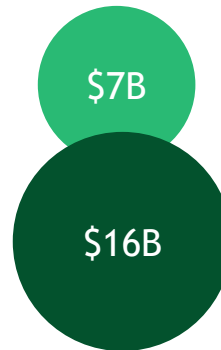
\$B in market size



## US exports

US cumulative obtainable exports ('20-'30) climb to \$16B after IRA/IIJA due to first mover advantage in regional markets

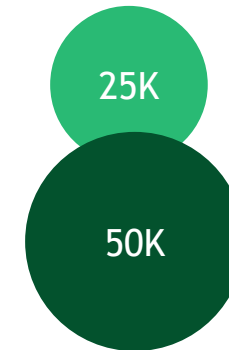
\$B in exports



## US job creation

New job creation in US OSW industry doubles to 50K given increased domestic deployments and a domestic supply chain

Number of jobs

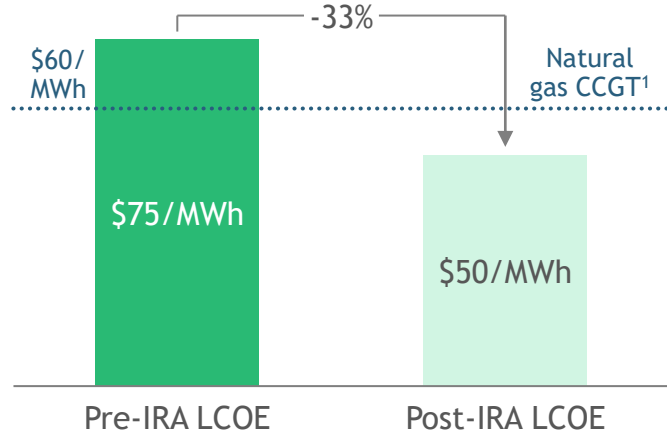


Note: All numbers based on IEA STEPS (2021 and 2022) scenario based on change over timeframe from 2020-2030  
Source: IEA; BCG analysis

# Legislation impacts | IRA and IIJA incentives reduce costs for offshore wind projects, accelerating domestic deployment



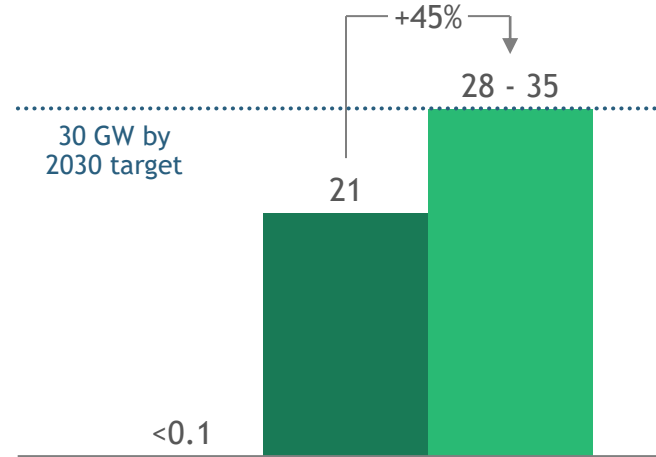
Expanded incentives reduce US offshore wind LCOE ~30% ...



- **ITC:** 6% base with 5X bonus multiplier to 30% + 10% for domestic content + 10% for energy community
- **PTC:** \$0.003/kWh base with 5X bonus multiplier to \$0.015/kWh + 10% for domestic content + 10% for energy community



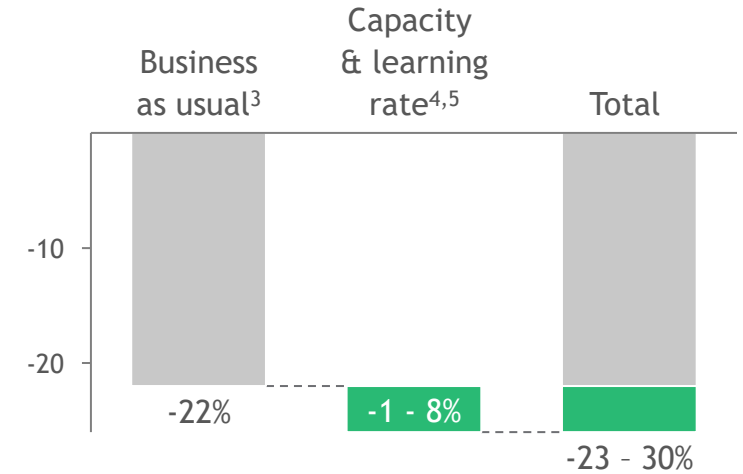
... increasing projected 2030 OSW deployment by over 40% ...



- 2020 Capacity
- 2030 Capacity pre-IRA
- 2030 Capacity post-IRA, base scenario²



... and decreasing OSW capital costs an additional 8% by 2030




IRA drives up to an additional ~1-8% cost decline through 2030


1. LCOE for Gas Combined Cycle is between \$45-\$74/MWh according to Lazard 2. Calculated using STEPS scenario data from IEA World Energy Outlook 2022 3. Business as usual: 2030 capacity projection pre-IRA based on IEA stated policy (STEPS) scenario 4. Capacity effect: incremental cost reduction due to added US capacity and additional global deployment (assumed 3x US increase) 5. Learning rate effect: incremental cost reduction due to de-risked commercialization (US moving early) and innovation (improved learning rates)  
Source: IEA World Energy Outlook 2022, IEA Offshore Wind Outlook 2019, Lazard LCOE projections; BCG analysis

# Legislation impacts | Policies support the buildout of a robust US domestic supply chain, enabling recapture of domestic markets and regional exports





## Permitting and development


 **10% ITC/PTC bonus** for meeting domestic content requirements


 **Expansion** of offshore wind leasing areas to the Southeast and US territories

## Design and manufacturing


 **\$20-\$50/kW** manufacturing credit for OSW components (45X)


 **Up to 30% ITC** for facilities that manufacture OSW components (48C)

 **\$244M in funding** for clean energy demonstration projects under IIJA (not OSW specific)

 **\$3B in funding to DOE** under CHIPS for development and demonstration (not OSW specific)


## Construction


 **10% of sales price** tax credit for manufacturing installation vessels

 **\$600M** for port infrastructure upgrades to support offshore wind construction activities

## Offtake


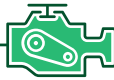


 **\$100M** in interregional transmission analysis and planning

 **Up to 50% ITC** for wind electricity producing facilities (48E)

 **Up to \$0.015/kWh + 20% bonus** PTC for production of wind electricity (45Y)

**Legend:**  Domestic mfg. base  Commercialization of novel technologies  Infrastructure development  Cost reduction

# Legislation impacts | Advanced manufacturing credits subsidize domestic component manufacturing and help offset US cost disadvantages

Component	Component cost <sup>1</sup>	IRA mfg. production credit <sup>2</sup>	% credit of component cost
 Blade	\$350/kW	\$60/kW <sup>3</sup>	15-20% of cost
 Nacelle	\$490/kW	\$50/kW	10-15% of cost
 Fixed foundation	\$290/kW	\$20/kW	5-10% of cost
 Floating foundation	\$700/kW	\$40/kW	5-10% of cost

Large, labor-intensive, components (i.e., blades) are most heavily supported to incentivize domestic manufacturing

Higher credit value for novel floating foundations supports commercialization of a nascent and more complex technology

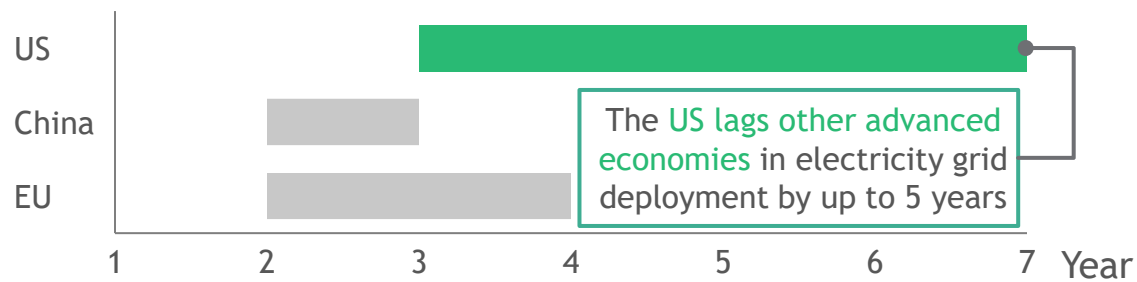
1. Costs only include component costs and exclude installation costs. Costs are calculated using NREL Cost of Wind Energy Review 2020 2. Manufacturers can choose between the 45X production credit or the 48C investment credit; this analysis concerns the 45X PTC 3. The manufacturing credit is \$20/kW per blade which is a total of \$60/kW for the blade trio  
 Source: IRA, NREL Cost of Wind 2020, IEA; BCG Analysis

# Legislation impacts | Realizing significant legislation benefits will require grid expansion and permitting reform to accelerate project development



## Transmission and interconnection challenges

Typical OSW interconnection timeline for electricity grids<sup>1</sup>



Power grid infrastructure projects are complex and lengthy in both permitting and construction

- Existing onshore coastal grid **unable to accommodate significant OSW interconnections** without upgrades
- **Long interconnection queues** and lack of interstate transmission planning delay OSW deployment
- Novel **offshore transmission solutions** (e.g., backbone transmission lines) are an alternative to onshore upgrades



## Permitting landscape challenges



US OSW permitting can take up to 10 years, given:

- Lack of clarity around permitting timelines
- Challenges of going through federal, state, and local-level permitting



Developers must **pay large amounts upfront for wind area leases**

- Increases project development risk
- Reduces profits on projects that already struggle with low margins




IRA has **tied offshore wind leasing to offshore oil and gas leasing requirements**

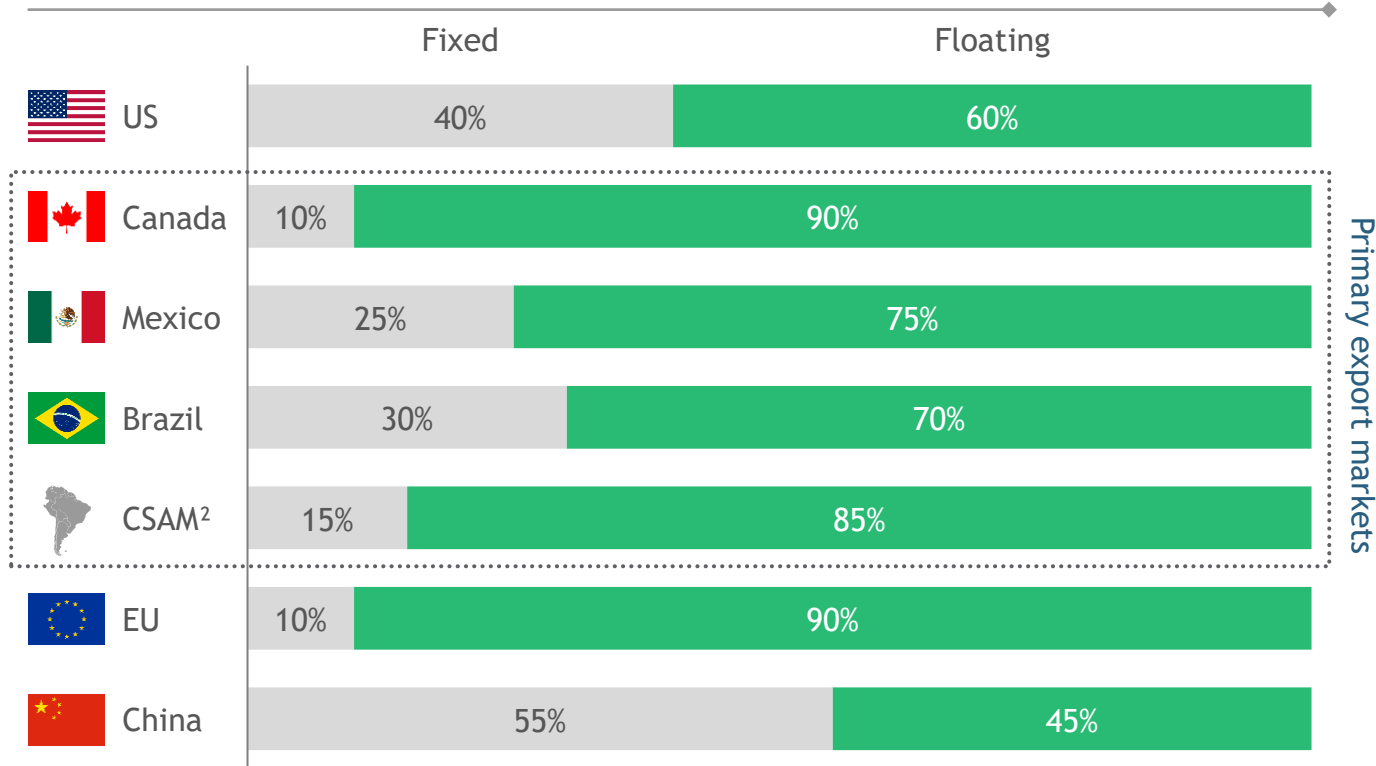
- Environmental groups grow reluctant to accelerate offshore wind deployment at the expense of oil and gas leasing

1. IEA World Energy Outlook 2022  
Source: IEA; BCG Analysis



# New innovations | Nascent floating technology positions US for regional exports

 Most countries, including the US, have high technical potential in deep waters that require floating technology<sup>1</sup>



1. From IEA Offshore Wind Outlook 2019, includes wind areas between 20 and 300km from shore which contributes to high floating proportion 2. CSAM = Central and South America  
Source: IEA; BCG Analysis

## Key takeaways

US can build lead in floating deployment, given:

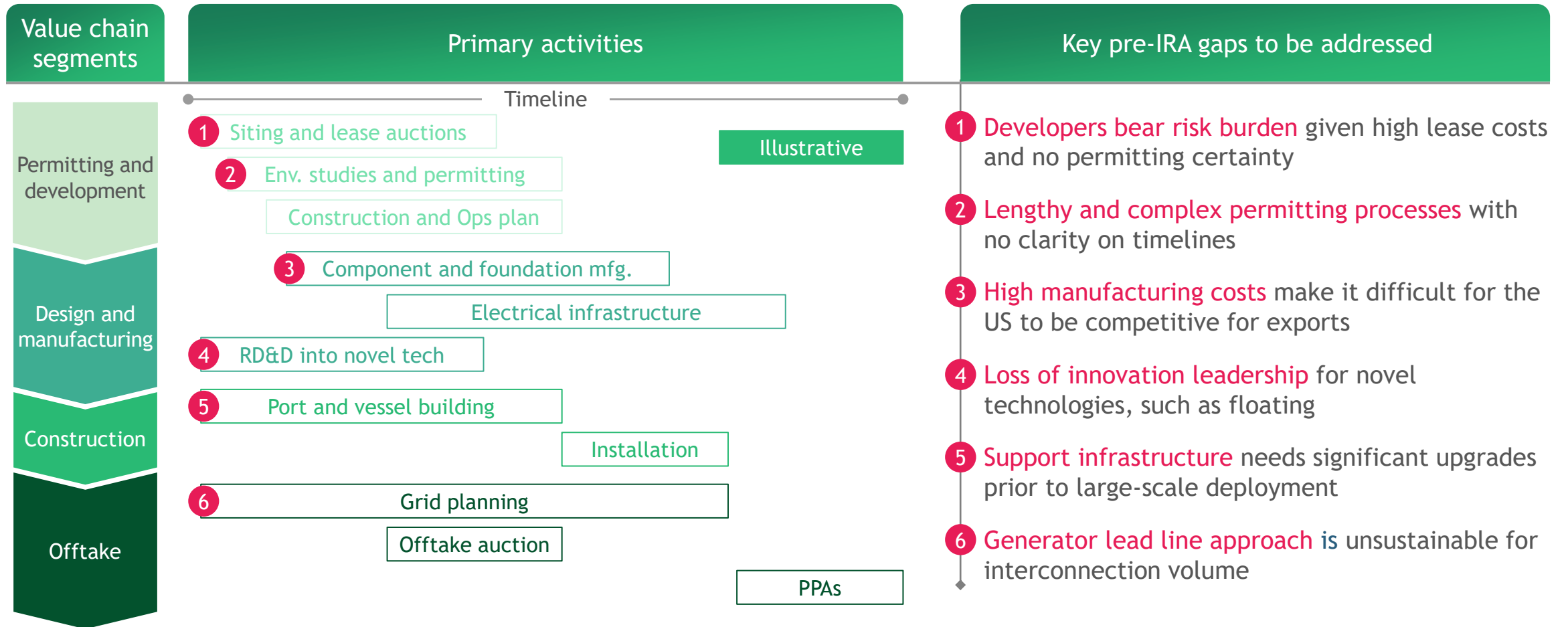
- **Overlap with offshore oil and gas** allows for a transition of knowledge, labor, and equipment
- **Floating research centers and demonstration projects** align with of deep-water areas

**US priority export markets** have a high portion of wind areas in deep waters, **creating potential for the US to export floating technology**

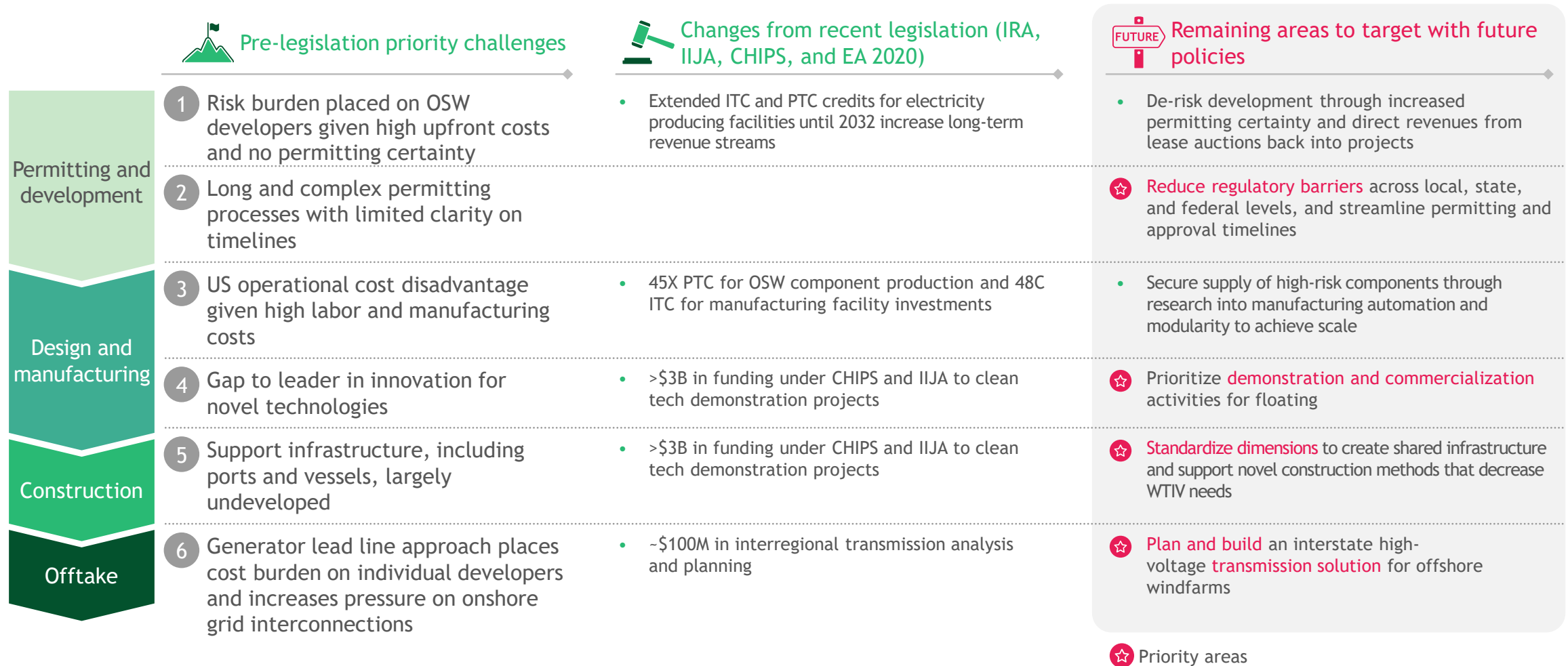
EU is significant competitor with a high proportion of deep-water technical potential

- US must accelerate floating RD&D and catch up to **leading EU players** and capture regional exports

# Pre-legislation challenges | Offshore wind deployment has been hindered by permitting delays and insufficient supporting infrastructure



# Remaining challenges | Recent legislation has addressed many priority issues for OSW, but additional policy needed to accelerate deployment



# Summary | Actions to further boost US competitiveness

## Key levers that will enable the US to win the offshore wind market



### Permitting reform

Permitting reform and increased clarity around timelines to simplify and de-risk project development and help developers secure access to financing more easily



### Commercialization of novel technologies

Funding for demonstration and deployment of nascent technologies, such as floating, to translate research leadership into commercial success



### Standardization





Support for industry-wide standards on dimensions (e.g., component size and weight) to ensure support infrastructure doesn't become obsolete before the end of useful life



### Transmission expansion





Planned high-voltage transmission solution for OSW to replace generator lead line approach and resolve exploding interconnection queues

# Backup | New legislation provides incentives for facilities and production of Offshore Wind (I/III)

 Provision	 Summary	 Type	 Total investment
<b>1</b> IRA Section 13101: Renewable Energy Production Tax Credit <sup>1</sup>	Extension and modification of PTC for electricity for wind. Base credit of 0.3 cents/kWh and 1.5 cents/kWh if Wage/Apprenticeship requirements are met. Ends for facilities after 2024 and is replaced by 13701	Production Tax Credit (PTC)	\$51B
<b>2</b> IRA Section 13102: Energy Investment Tax Credit <sup>1</sup>	Extension and modification of the Investment Tax Credit to expand clean energy manufacturing. 30% ITC and 10% bonus if domestic manufacturing requirements are met. Ends for facilities after 2024 and is replaced by 13702	Investment Tax Credit (ITC)	\$13.96B
<b>3</b> IRA Section 13103: Low-Income Solar and Wind Investment Tax Credit <sup>1</sup>	Increase in energy credit for facilities placed in service in connection with low-income communities, only for facilities under 5MW. 10% bonus for project located in low-income communities	Investment Tax Credit (ITC)	Uncapped
<b>4</b> IRA Section 13701: Clean Electricity Production Credit <sup>2</sup>	Intended to replace 13101 and phases out in 2032. Tax credit for domestically produced, zero emissions electricity. Facility must be placed into service after December 31 <sup>st</sup> , 2024. Technology agnostic	Production Tax Credit (PTC)	\$11.2B
<b>5</b> IRA Section 13702: Clean Electricity Investment Credit <sup>2</sup>	Intended to replace 13102 and phases out in 2032. Tax credit for domestically produced, zero emissions electricity. Facility must be placed into service after December 31 <sup>st</sup> , 2024. Technology agnostic	Investment Tax Credit (ITC)	\$50.9B





1. [CTVC IRA Tracker](#) 2. [BakerHostetler](#)  
Source: BCG analysis

# Backup | New legislation provides incentives for facilities and production of Offshore Wind (II/III)

 Provision	 Summary	 Type	 Total investment
<b>6</b> IRA Section 50153: Interregional Transmission Planning Investments <sup>3</sup>	Funding for interregional and offshore wind electricity transmission planning, modeling, and analysis	Grant	\$100M
<b>7</b> IRA Section 50251: Offshore Wind Leasing <sup>3</sup>	Authorizes the DOI to issue leases on the outer continental shelf for offshore wind and ties offshore wind leasing to offshore oil and gas by requiring BOEM to offer at least 60M acres for oil and gas leasing before offering new OSW leases	N/A	N/A
<b>8</b> IRA Section 13501: 48C Advanced Energy Manufacturing Project Credit <sup>3</sup>	Tax credit of up to 30% on investments into clean energy manufacturing facilities	Manufacturing Tax Credit	\$10B
<b>9</b> IRA Section 13502: 45X Advanced Manufacturing Production Credit <sup>3</sup>	Production credit for domestically produced clean technology components, including blades, nacelles, and foundations for offshore wind	Manufacturing Tax Credit	\$30.6B
<b>10</b> IIJA Section 41007: Renewable Energy Demonstration Projects <sup>3</sup>	Provides grants to fund renewable energy demonstration projects	Grants	\$244M

1. [CTVC IRA Tracker](#) 2. [BakerHostetler](#) 3. RMI  
Source: BCG analysis

# Backup | New legislation provides incentives for facilities and production of Offshore Wind (III/III)

 Provision	 Summary	 Type	 Total investment
<b>11</b> IIJA Section 40209: Advanced Energy Manufacturing and Recycling Grant Program <sup>3</sup>	Designed to provide grants to small- and medium-sized manufacturers to enable them to build new or retrofit existing manufacturing and industrial facilities to produce or recycle advanced energy products in communities where coal mines or coal power plants have closed	Grants	\$750M
<b>12</b> CHIPS Section 10771: Advanced Research Projects Agency–Energy <sup>3</sup>	Allocates funding to Department of Energy research, development, and demonstration activities (ARPA-E) for energy projects (not specific to offshore wind)	Grant	\$1.2B
<b>13</b> CHIPS Section 10771: Office of Electricity <sup>3</sup>	Allocates funding to Department of Energy research, development, and demonstration activities related to electricity (not specific to offshore wind)	Grant	\$1B
<b>14</b> CHIPS Section 10771: Office of Energy Efficiency and Renewable Energy–Renewable Power <sup>3</sup>	Allocates funding to Department of Energy research, development, and demonstration activities for renewable power research (not specific to offshore wind)	Grant	\$800M
<b>15</b> CHIPS Section 10622: Regional Clean Energy Innovation Program <sup>3</sup>	Authorizes a Regional Clean Energy Innovation Program at DOE to establish partnerships that promote the economic development of diverse geographic areas of the US by supporting clean energy innovation (not OSW specific)	Grant	\$250M

1. [CTVC IRA Tracker](#) 2. [BakerHostetler](#) 3. RMI  
Source: BCG analysis

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