# BUILDING NORTH CAROLINA'S OFFSHORE WIND SUPPLY CHAIN

***A webinar on the roadmap for leveraging manufacturing and infrastructure advantages***

March 30, 2021


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OFFICE OF SCIENCE, TECHNOLOGY & INNOVATION (OSTI)
N.C. DEPARTMENT OF COMMERCE


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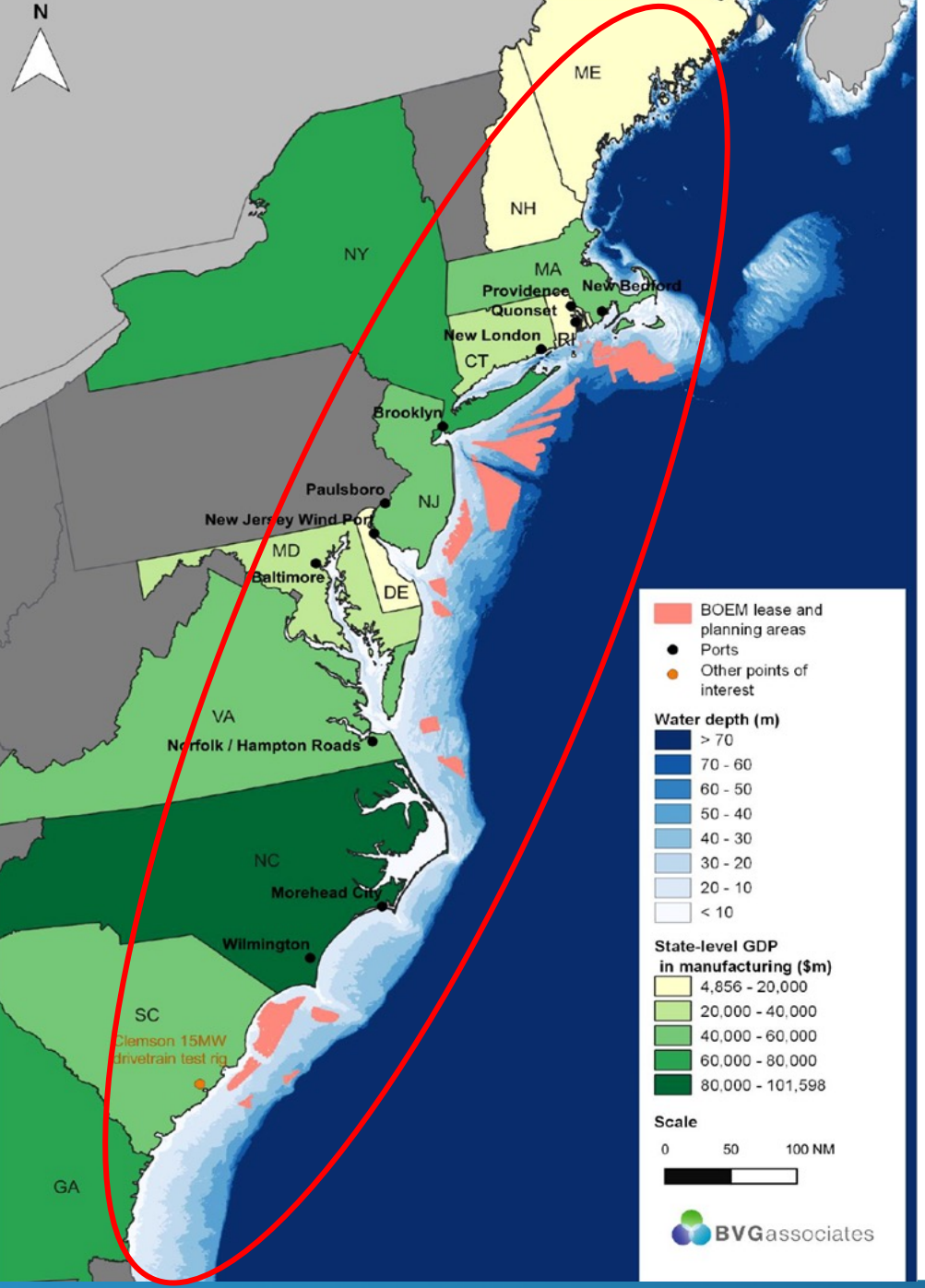
# Agenda


- **Welcome and Introduction (10 min)**
  - John Hardin, North Carolina Department of Commerce
- **The market and the NC opportunity (10 min)**
  - Mike Blanch and Andy Geissbuehler, BVG Associates
- **NC infrastructure (10 min)**
  - Rich Baldwin, Lloyds Register
- **The development of the supply chain related to manufacturing and NC's clean energy market (10 min)**
  - Steve Kalland, N.C. Clean Energy Technology Center
- **Key recommendations (10 min)**
  - Mike Blanch, BVG Associates and Steve Kalland, N.C. Clean Energy Technology Center




# OSW Provides An Opportunity for:

- Hundreds of billions of dollars in **economic development**
- Thousands of **new jobs**
- Significant increase in **renewable energy generation**

## in North Carolina

**U.S. OSW Development**

- Current state offshore wind targets total about 30 GW
- Projected 41 GW of installed capacity by end of 2035
- 1 GW of offshore wind powers about 380,000 homes/year

# Projected Growth, Scale & Potential

1. Global market for OSW has grown by 24% annually since 2013 and is projected to grow at more than 20% per year across the next 5 years.

   *~2021, BVG Associates*

2. Throughout 2019, the UK generated 22.7 % of its electricity from offshore and onshore wind, and during December 2020, wind generation reached 43% of total demand.

   *~2021, BVG Associates*

3. The total U.S. offshore wind *technical resource potential* (or the amount of energy it is physically possible to produce) is approximately double the total electricity use in the U.S.

   *~2016, Office of Renewable Energy & Energy Efficiency, U.S. Department of Energy*

# Mobilizing for Success

October 2018: Governor Cooper announced:
***Executive Order 80: NC's Commitment to Address Climate Change & Transition to a Clean Energy Economy***

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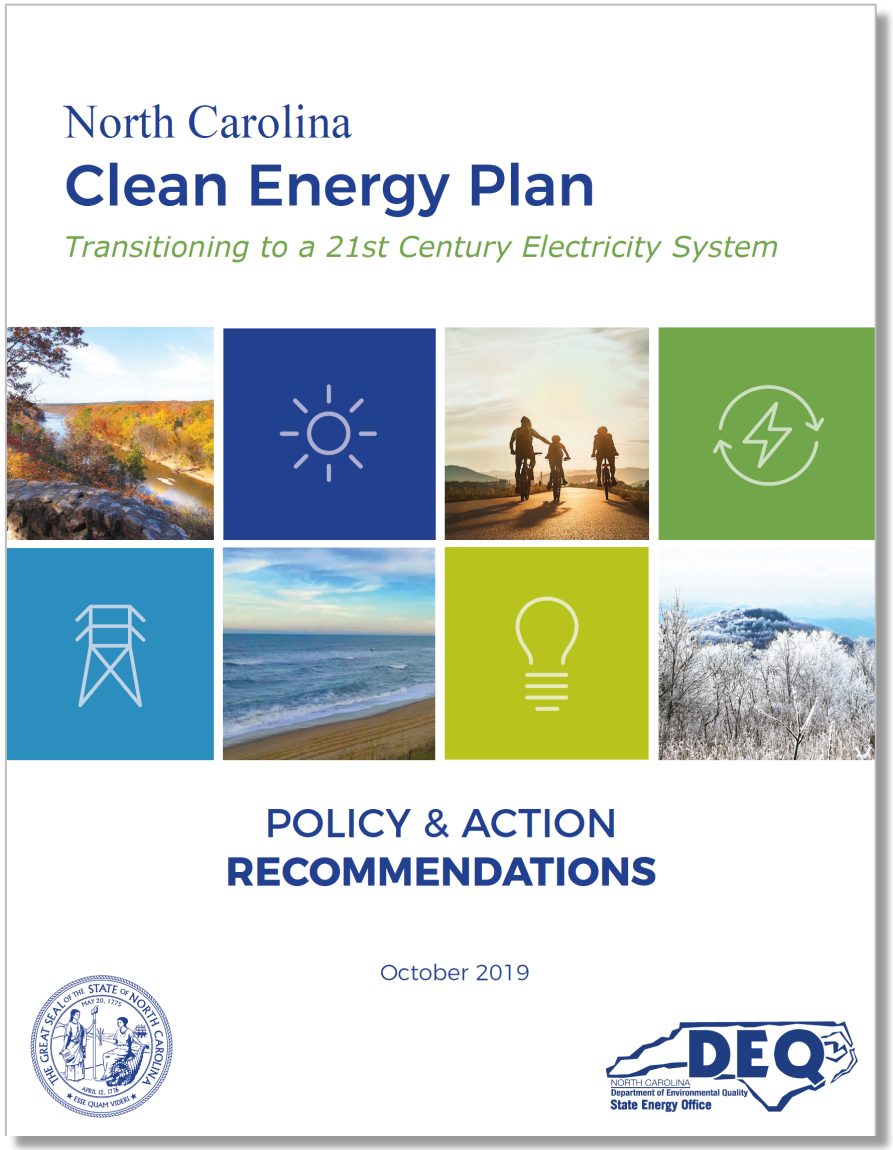
Under EO 80, NCDEQ developed & released (in 2019):
***NC Clean Energy Plan*** →

- Includes recommendations supporting effort with regional states to **develop robust offshore wind industry & energy market**
- October 29, 2020: NC, VA & MD signed memorandum of understanding (MOU) forming:

  *Southeast & Mid-Atlantic Regional Transformative Partnership for Offshore Wind Energy Resources* **(SMART-POWER)**



# NC State Leadership & Coordination

## Dept. of Environmental Quality

***Policy Analysis, Engagement with Energy Providers & Federal Agencies***

Jennifer Mundt, Senior Policy Advisor

## Governor's Office

***Overall Leadership & Coordination***

Jeremy Tarr, Senior Advisor for Climate Change Policy

## Dept. of Commerce

***Supply Chain, Infrastructure, & Economic Impacts Analysis, Engagement with Public & Communities***

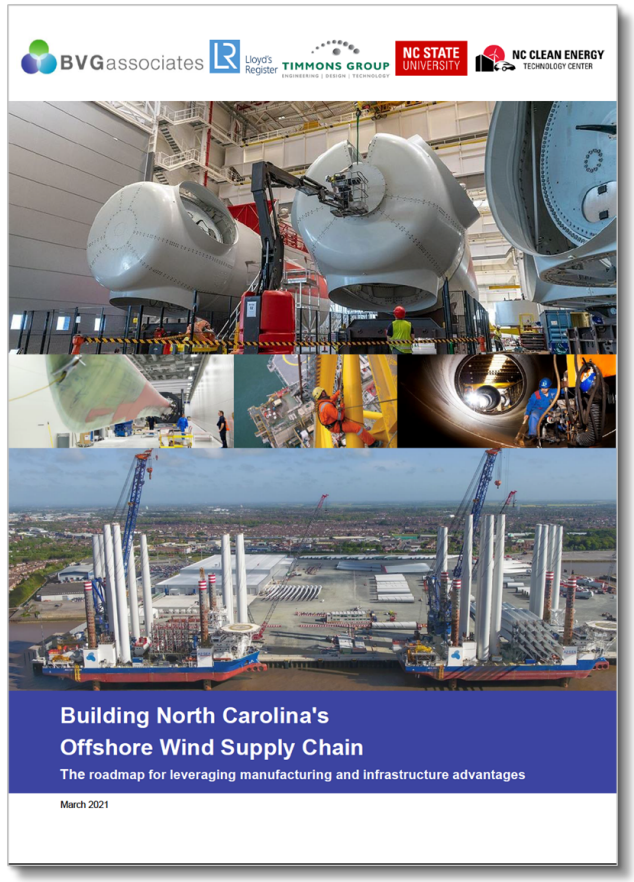
John Hardin, Executive Director, OSTI

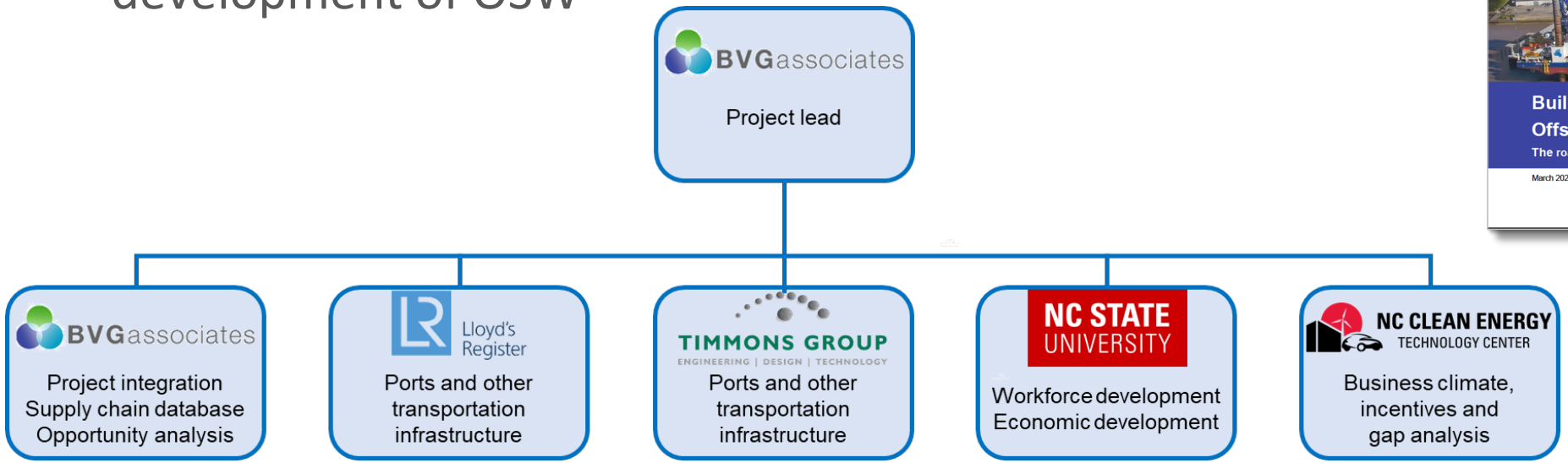
**OSW Interagency Leadership Team:** Agencies above + NC Department of Transportation, NC Ports, Economic Development Partnership of NC, and NC Department of Military & Veterans Affairs

# NC Offshore Wind Supply Chain Assessment

## Purpose

1. Characterize the economic OSW opportunity for NC
2. Assess NC's advantages in existing assets, business potential, and infrastructure (e.g., ports)
3. Recommend several options to support the growth and development of OSW

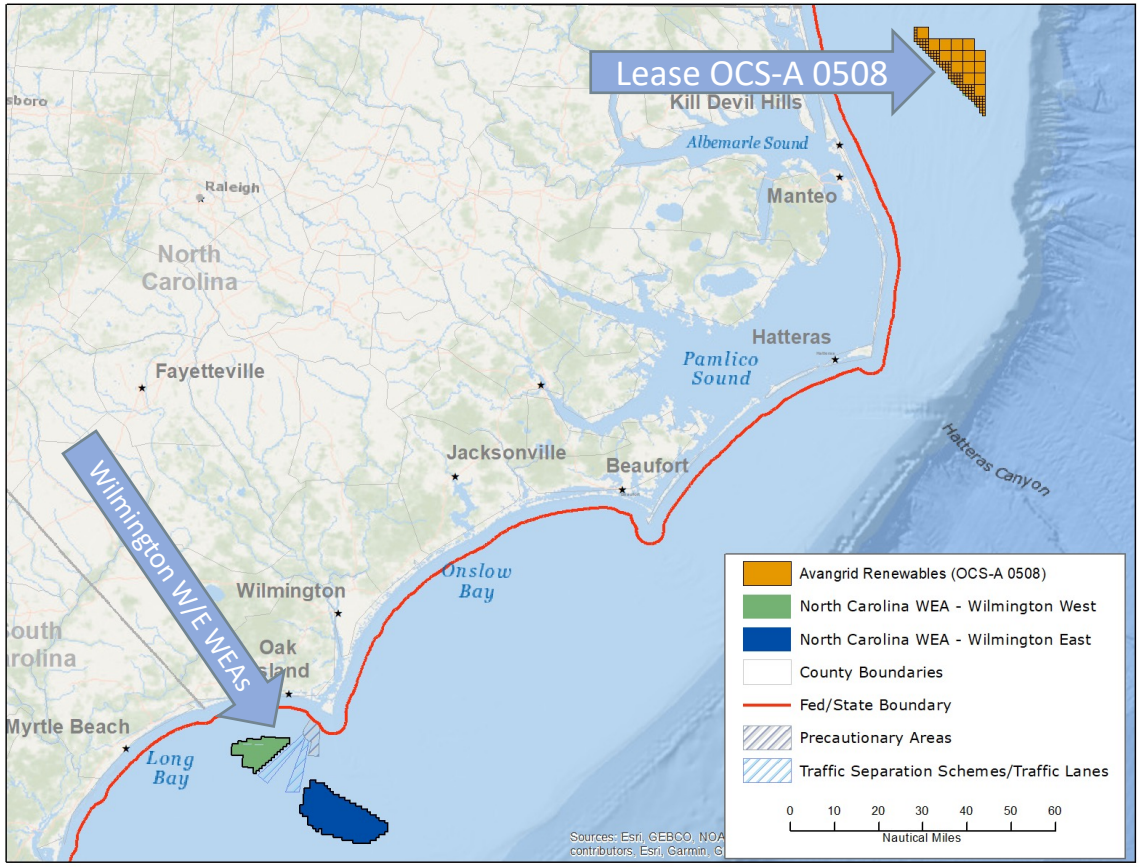


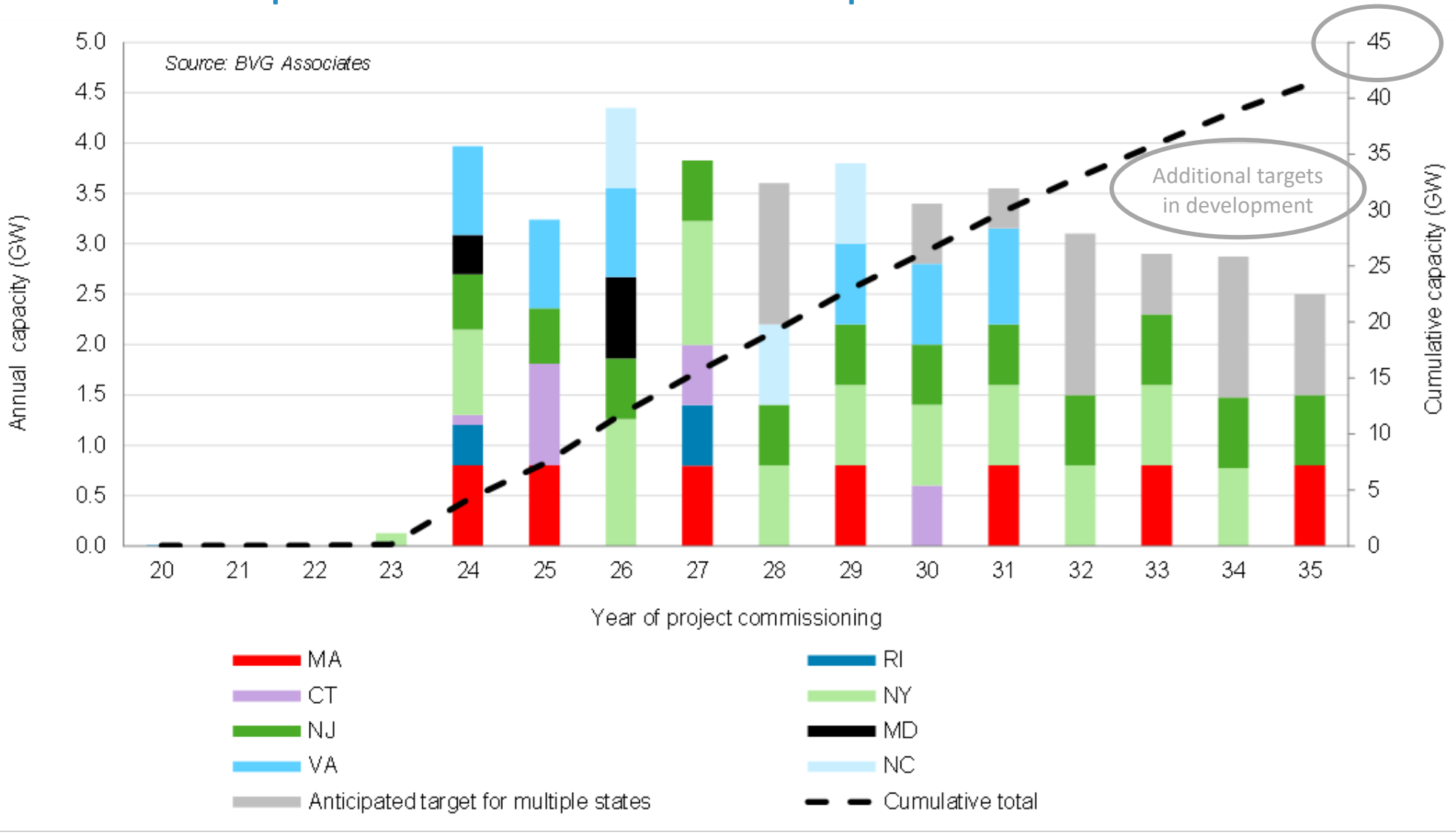
# NC Offshore Wind Areas (WEAs)

**Federal Bureau of Ocean Energy Management (BOEM) determines wind energy areas (WEAs) in federal waters, informed by extensive research & stakeholder input**

- **2014:** BOEM announced three WEAs after stakeholder engagement & deconfliction process
- **2017:** Avangrid Renewables, LLC, won BOEM's competitive lease sale for the Kitty Hawk WEA
- **~2026:** First of three 800 MW tranches will be operational; remaining operational in 2028 & 2030
- **March 2021:** Gov. Cooper asked BOEM to prioritize leasing NC WEAs & identify new WEAs before 7/1/2022
- **2021-2022:** BOEM leasing process, coordinated with NC stakeholders



# Projected installation for east coast OSW Development – all "anticipated" installations



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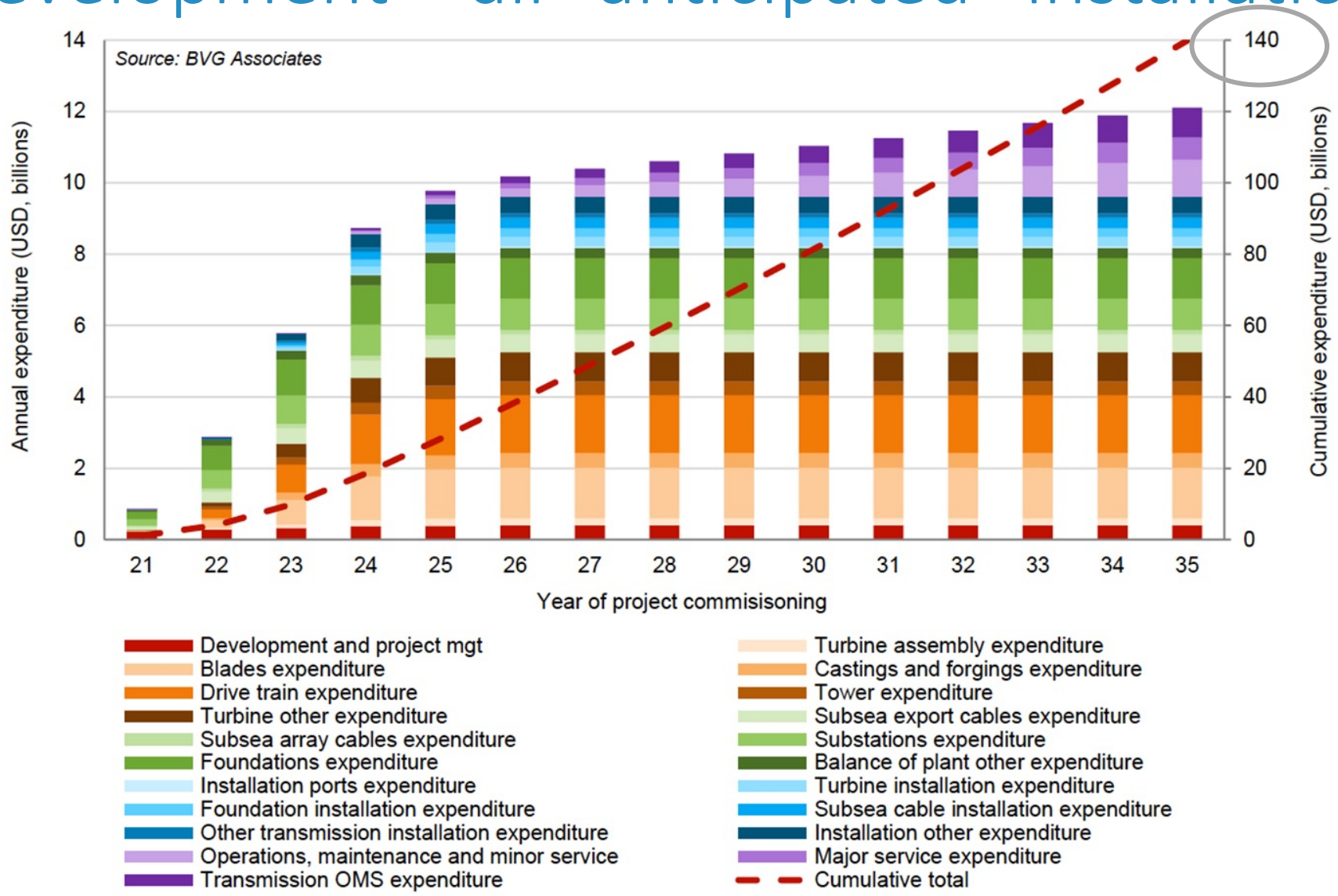
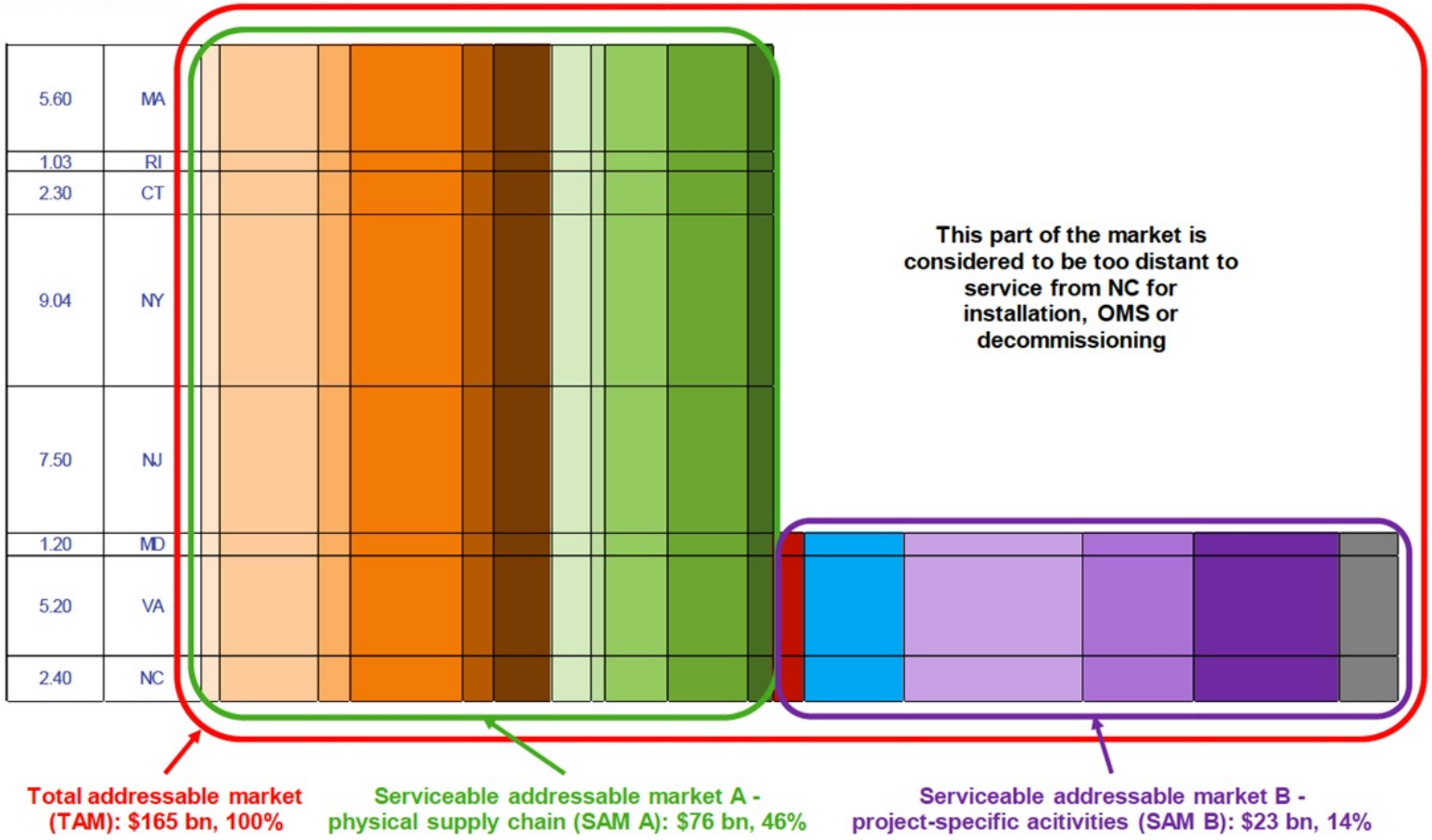


# Lifetime Expenditure by Component

| Developer and state target (GW) | State (north to south) | Lifetime expenditure (in proportion to $/MW) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbine assembly | Blades | Castings and forgings | Drive train | Tower | Turbine other | Subsea export cables | Subsea array cables | Substations | Foundations | Balance of plant other | Dev't and project mgt | Installation | Operation, maintenance and minor service | Major service | Transmission OMS | DECEX |
| 5.60 | MA | | | | | | | | | | | | | | | | | |
| 1.03 | RI | | | | | | | | | | | | | | | | | |
| 2.30 | CT | | | | | | | | | | | | | | | | | |
| 9.04 | NY | | | | | | | | | | | | | | | | | |
| 7.50 | NJ | | | | | | | | | | | | | | | | | |
| 1.20 | MD | | | | | | | | | | | | | | | | | |
| 5.20 | VA | | | | | | | | | | | | | | | | | |
| 2.40 | NC | | | | | | | | | | | | | | | | | |

Source: BVG Associates




- By state and not including the "anticipated" installations
- Approximately $100B in capital investment and operating expenditures along the Atlantic Coast are available to North Carolina.
- As the offshore wind market and development grows along the Atlantic Coast and North Carolina coast, North Carolina's economic opportunities increase.

# Turbine Size: Nacelle and Rotor

GE Haliade-X nacelle: 14 MW, 220m (721 ft) rotor, ~600 tons.

# Blade Size and the supply chain tension

GE Haliade-X: each blade is 107m (~351 ft) long, ~55 tons.

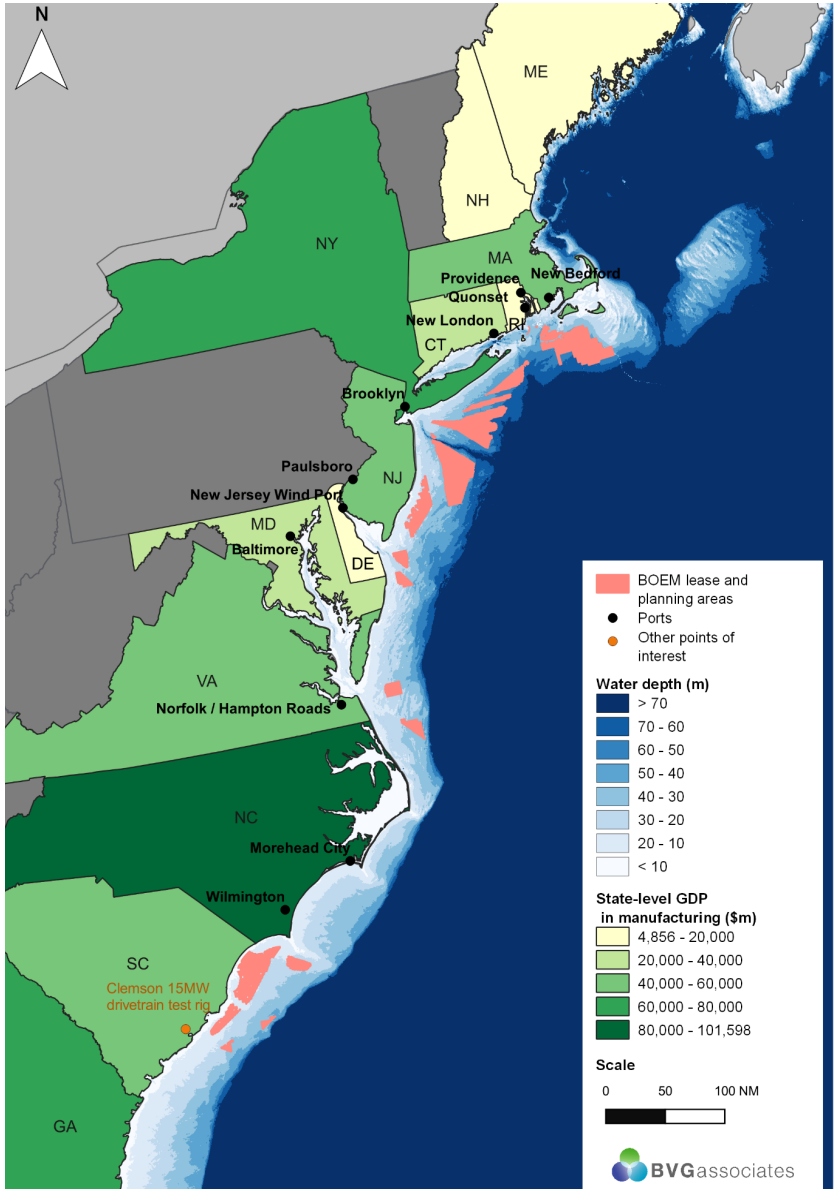
**Note tension between growing scale of components so more difficult to manufacture, and a global supply chain while need to expand manufacturing to meet demand and desire to put new factories in new markets to avoid risk and cost of transport, help meet local content expectations, and take pressure of the existing European capacity**

# Supply chain positioning for NC aims

1. **Leverage existing manufacturing strength** – build upon NC's manufacturing strengths and nation-leading economic conditions for component manufacturing to supply OSW market along East Coast and beyond

2. **Strengthen anchor companies** – build upon strong base of major manufacturing companies already established in NC, and attract additional ones, to grow and anchor industrial base and enable acceleration effect on wider supply chain

3. **Build momentum to transition into OSW** – actively support existing companies to pursue OSW supply with windfarm developers, major windfarm suppliers and OSW companies seeking local partners




# Active offshore wind projects

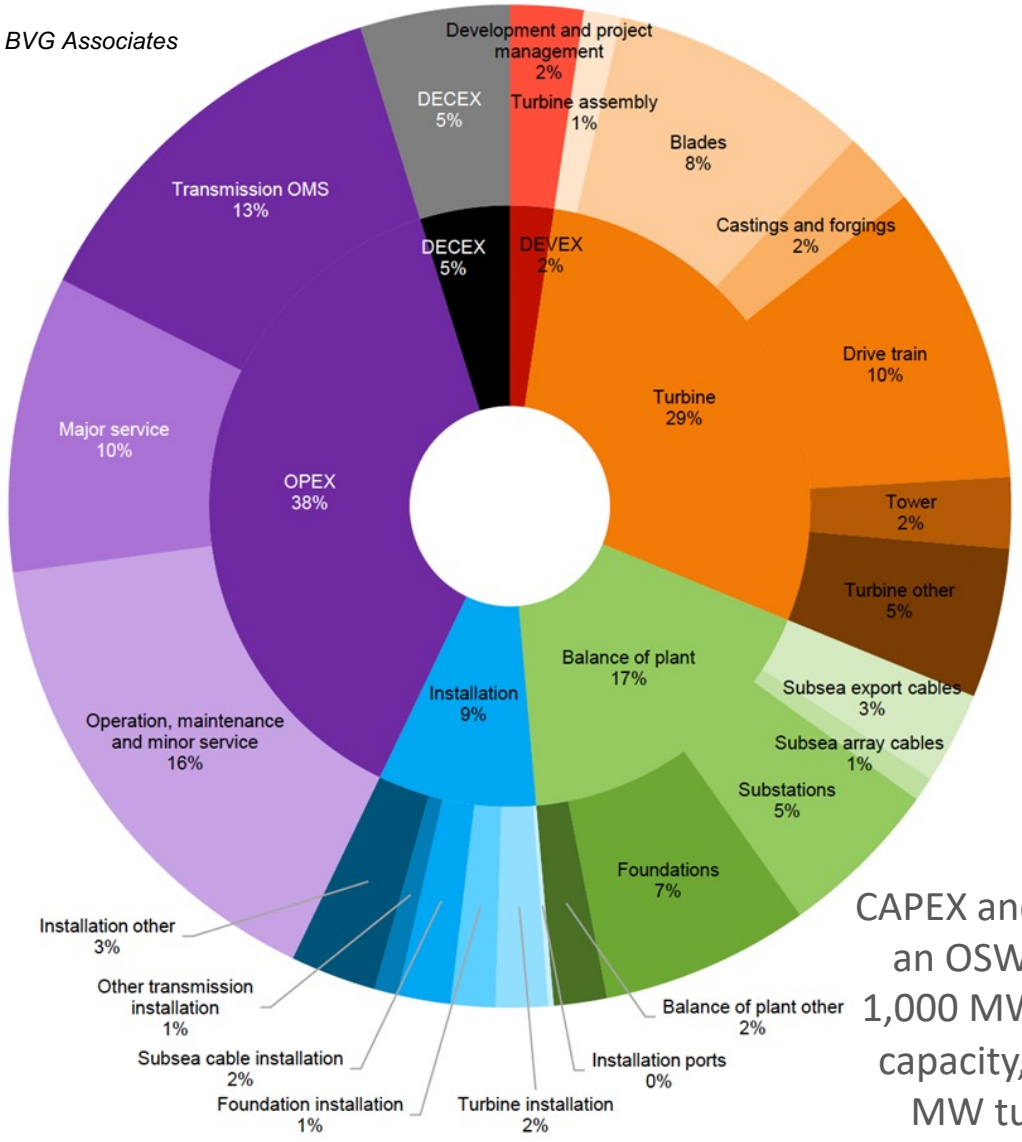
- North Carolina leading in manufacturing GDP
- Supply chain to focus on “Active OSW Projects”
- 45% of active East Coast projects in MD, VA, NC
- Sub-components to serve full East Coast market

**"Active Projects"** US East Coast by State and anticipated installation (snapshot Q1 2021)

| State | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | Total [MW] |
|---|---|---|---|---|---|---|---|
| Massachusetts | 800 | 804 | 804 | | | | 2,408 |
| Rhode Island | 400 | | | | | | 400 |
| Connecticut | 300 | | | | | | 300 |
| New York | 1,826 | | 1,260 | 1,230 | | | 4,316 |
| New Jersey | | 1,100 | | | | | 1,100 |
| Maryland | 270 | 120 | | | | | 390 |
| Virginia | 880 | 880 | 880 | | | | 2,640 |
| North Carolina | | | | 800 | 800 | 800 | 3,200 |
| **Total market** | 4,476 | 2,904 | 2,944 | 2,030 | 800 | 800 | **14,754** |
| **MD/VA/NC market** | 1,150 | 1,000 | 880 | 800 | 800 | 800 | **6,230** |

# OSW scope opportunities and anchor companies

*BVG Associates*

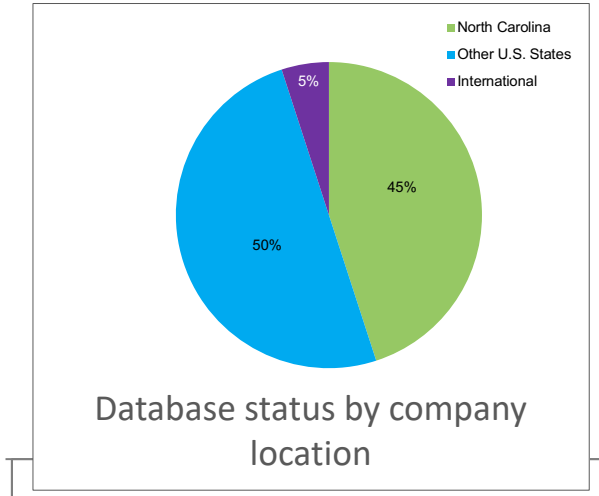



CAPEX and OPEX for an OSW farm of 1,000 MW installed capacity, using 15 MW turbines.

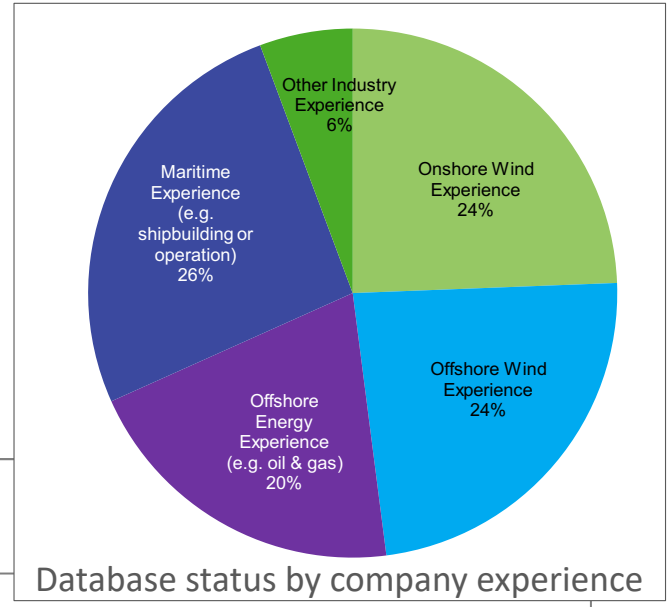
- **Initial focus on turbine and balance of plant components**
  - large castings, drives, forgings, bearings, electrical cabinets, transformers, converters, tower internals, etc.
  - secondary steel, substations components, design
  - IT infrastructure, remote monitoring, digital twin
- **As a second step, position for 25y + operation & maintenance**
  - O&M port staffing and material management
  - training, metocean monitoring, vessel operation, etc.
- **Collaborate with established "anchor companies"**
  - Duke Energy, Nucor, Hitachi ABB Power Grids, LS Cable, Avangrid Renewables, etc.
- **Build partnerships with future anchor companies** (Europe, Gulf, Eastern States, etc.)

# North Carolina Supply Chain Directory (March 2021)

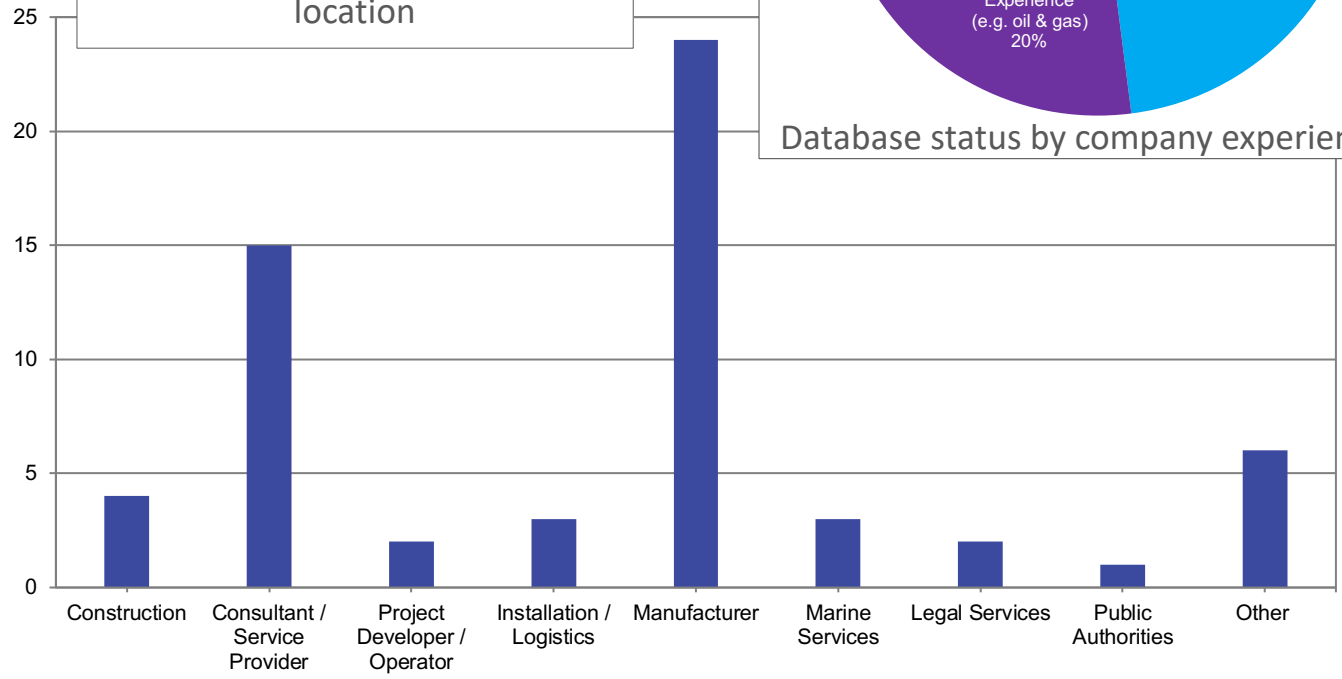

**North Carolina Supply Chain Directory**
Public registry as a first step to build visibility for companies serving or transitioning into the offshore wind industry. **60** firms signed up as of 3/2021




Database status by company location

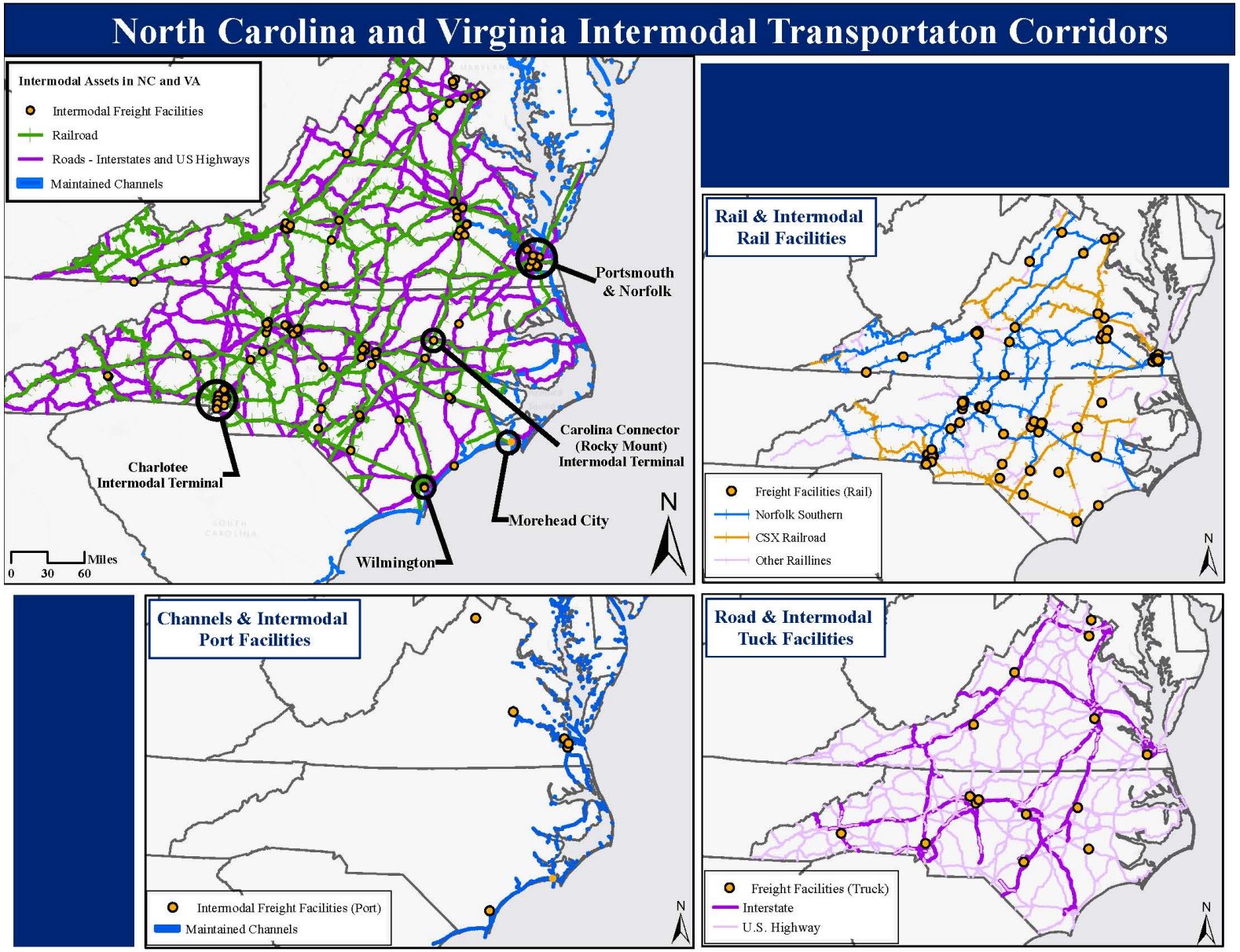



Database status by company experience



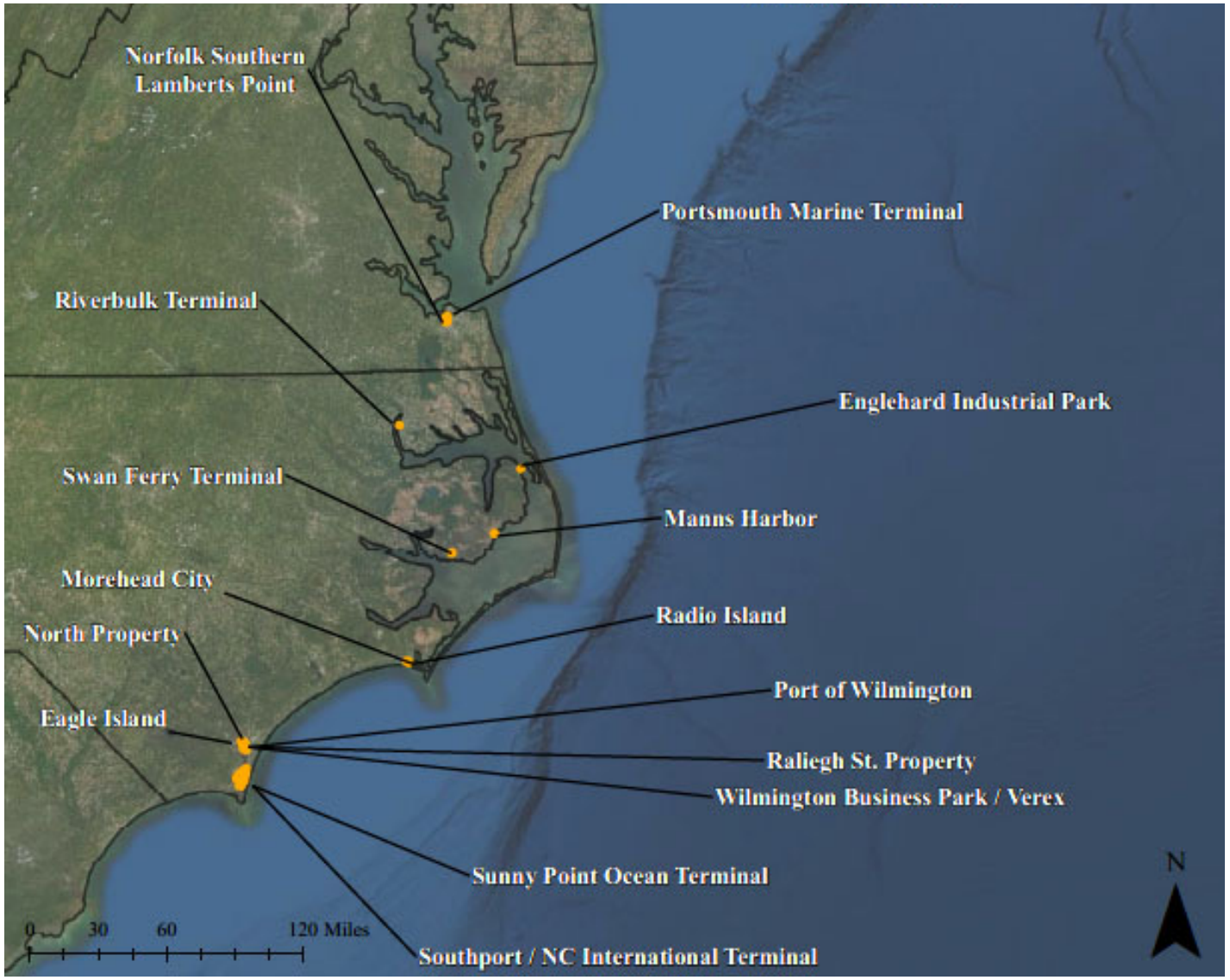

Database status by company sector

# Intermodal infrastructure overview



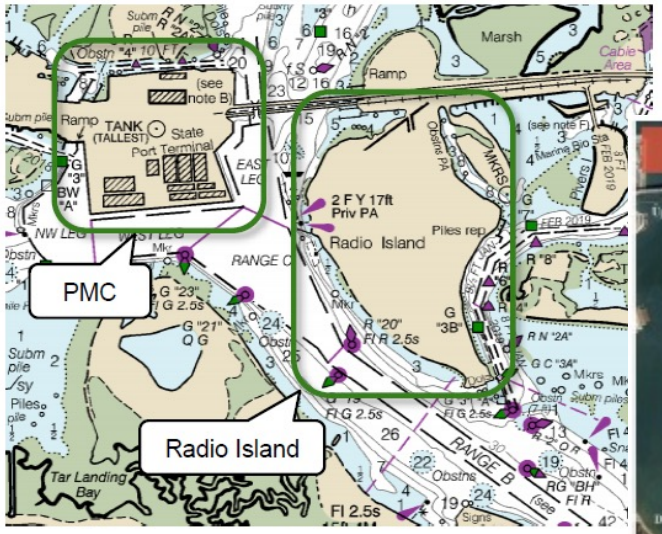

- Not just Ports – Manufacturing is North Carolina's Edge
- Intermodal – Fully Integrated Marine, Rail and Road System
- Connects State Manufactures to Product End-Users
- Ready Now to Support First-Wave Projects
- Both Intra- and Interstate Connections, Including to Virginia OSW Support Facilities

# Port facilities




- Evaluated Multiple NC Existing/Potential OSW Port Facilities
- Predominately Associated with Port of Morehead City and Port of Wilmington Areas for Large-scale Operations
- Integrate First-Wave Projects with Virginia
- Future Opportunities for Second and Third-Wave Projects off the Carolinas

# Wilmington and Morehead City potential








**Morehead City/Radio Island**

- **PMC**: Currently Available for Normal Marine Operations
- **Radio Island**: Available for Multiple Future OSW Uses as Market Matures

**POW and Environs**

- **POW**: Currently Available for Normal Marine Operations
- **Multiple Properties**: Available for Future OSW Uses
- Integrate Waterfront and non-Waterfront Properties

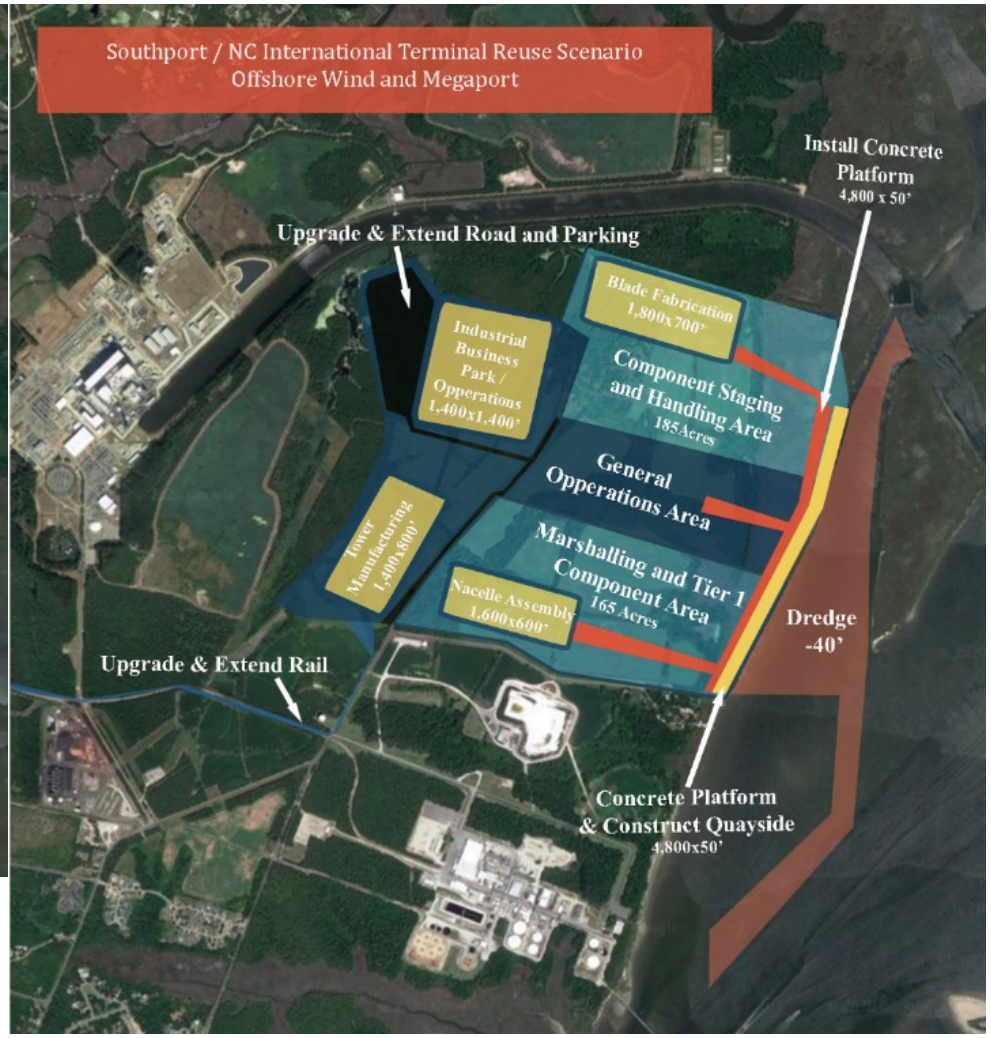
# Relative potential to the main east coast ports

| Facility | State | Score |
|---|---|---|
| Portsmouth Marine Terminal | VA | 60 |
| Norfolk Southern Lamberts Point | VA | 60 |
| South Brooklyn Marine Terminal | NY | 60 |
| Port of Providence | RI | 57 |
| Port of Wilmington | NC | 53 |
| New Bedford Marine Commerce Terminal | MA | 53 |
| Morehead City | NC | 52 |
| Port of Davisville (Quonset) | RI | 52 |
| Sunny Point Marine Terminal | NC | 52 |
| Bridgeport | CT | 49 |
| Radio Island | NC | 49 |
| Wilmington Business Park/Vertex Property | NC | 47 |
| North Property | NC | 46 |
| New Jersey OSW Port | NJ | 45 |
| Southport/NC International Terminal | NC | 42 |
| Eagle Island | NC | 39 |
| Raleigh Street Property | NC | 37 |

- Tier 1 manufacturing SWOT analysis of existing facilities
- Wilmington scores well but Portsmouth and Norfolk score better – good to avoid unnecessary competition
- Leverage existing North Carolina Manufacturing Strengths with Virginia for First-Wave Projects
- Leverage North Carolina Port Assets for Second and Third-Wave Projects

# Southport North Carolina International Terminal Property

Now




A Bright Future

- 600-acre NCSPA-owned property
- Is one of the only potential “mega-port” facility locations on the US East Coast
- Well situated to support future BOEM Lease Areas off both North and South Carolina

# North Carolina's business climate – strengths, gaps and implications for offshore wind

- Much of North Carolina's competitive edge in the offshore wind space revolves around the state's strengths in manufacturing, augmented by the state's long history as a leader in clean energy market development.

- Traditional industrial recruitment and retention strategies are potentially the most important tools for attracting and expanding opportunities for OSW component suppliers, while actions to expand the clean energy market in North Carolina have the dual benefit of expanding the total east coast market opportunity, as well as shifting the nexus of market development down the East Coast and closer to the North Carolina labor market.

- The menu of policy options includes a mix of best practices demonstrated by other states and new ideas that best take advantage of North Carolina's inherent strengths. Areas addressed were:

    - North Carolina Industrial/Manufacturing Policies
    - Expanding North Carolina's Clean Energy Market, and
    - Workforce

# Recommendations

- North Carolina has many options to support the growth and development of offshore wind. The recommendations identified are categorized into three categories of increasing level of state activity: Prepare, Facilitate, and Accelerate.
    - "**Prepare**" policies focus on information-gathering and formation of policy frameworks.
    - "**Facilitate**" policies aim to create conditions conducive to the expansion of offshore wind through removal of policy barriers and development of favorable infrastructure.
    - "**Accelerate**" policies directly support deployment of offshore wind through incentives and state/utility procurements.
- These three categories are not mutually exclusive and North Carolina may adopt policies from multiple levels in the different areas of recommendations at any one time.

# Recommendations - Define and accelerate North Carolina OSW project development strategy

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 6 | Designate a formal offshore wind point person in NCDEQ. | 7 | 7.4 | Prepare |
| 7 | Study wholesale market reform options and ensure that implications for OSW are considered. | 7 | 7.4 | Prepare |
| 8 | Accelerate Leasing of Existing WEAs in the Carolinas and Pursue Additional Area Designations. [Electricity consumption is large in Carolinas and will grow with decarbonisation] | 7 | 7.4 | Facilitate |
| 9 | Remove barriers to investment in grid infrastructure. | 7 | 7.4 | Facilitate |
| 10 | Identify permitting steps for onshoring transmission and land-based infrastructure. | 7 | 7.4 | Facilitate |
| 11 | Set an OSW deployment target for the State. | 7 | 7.4 | Accelerate |
| 12 | Create a specific OSW procurement mechanism. | 7 | 7.4 | Accelerate |
| 13 | Create more opportunity for OSW capacity expansion through decarbonization efforts. | 7 | 7.4 | Accelerate |

Top recommendation

# Recommendations - Support the multi-state regional supply chain cluster, SMART-POWER, making it the easiest place for developers and suppliers to do OSW business in the southeast and mid-Atlantic regions

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 14 | Promote regional collaboration in policy development and supply chain development, working with counterparts in Virginia and Maryland to align offshore wind needs with regional business capacity, to help secure business opportunities for regional state partners. | 7 | 7.3 | Prepare |

# Recommendations - Enable and sustain North Carolina's business opportunity through workforce development

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 34 | Conduct a job skills analysis. | 7 | 7.5 | Prepare |
| 35 | Develop an inventory of industry-relevant training already available. | 7 | 7.5 | Prepare |
| 36 | Promote the training opportunity to North Carolina. | 7 | 7.5 | Prepare |
| 37 | Promote the training opportunity to the OSW Industry. | 7 | 7.5 | Prepare |
| 38 | Establish a Wind Energy Technician Training Program. | 7 | 7.5 | Facilitate |
| 39 | Establish training partnership with the Mid-Atlantic Wind Training Alliance. | 7 | 7.5 | Facilitate |
| 40 | Provide funding for new infrastructure, equipment and curriculum. | 7 | 7.5 | Accelerate |

# Recommendations - Enable and grow North Carolina's business opportunity

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 15 | Actively support existing companies in the transition to OSW supply from North Carolina. | 5 | Summary | Prepare |
| 16 | Continue to promote and develop the NC Offshore Wind Supply Chain Registry. | 5 | Summary | Prepare |
| 17 | Designate a North Carolina OSW Director for Economic Development. | 7 | 7.3 | Prepare |
| 18 | Create an OSW economic development team. | 7 | 7.3 | Prepare |
| 19 | Organize and facilitate a North Carolina OSW Industry Task Force. | 7 | 7.3 | Prepare |
| 20 | Establish year-round schedule of regular outreach events – virtual or in person. | 7 | 7.3 | Prepare |
| 21 | Include "local benefit" considerations in future windfarm procurement mechanism, as some other States have done, to ensure that work will be delivered from NC. | 4 | Summary | Facilitate |
| 22 | Consider further integrating information about North Carolina companies with wider US and global offshore wind databases, while keeping the platform accessible via the NCDOC website. | 5 | Summary | Facilitate |
| 23 | Evaluate establishing or being part of a more advanced database, possibly in collaboration with Virginia and Maryland. | 5 | Summary | Facilitate |
| 24 | Organize "fact finding" visits to wind installations for local and state policymakers and business leaders. | 7 | 7.3 | Facilitate |

Top recommendation

# Recommendations - Enable and grow North Carolina's business opportunity

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 25 | Support research including public/private partnership development for OSW deployment. | 7 | 7.3 | Facilitate |
| 26 | Support public/private research collaboration for OSW advanced manufacturing and supply chain logistics. | 7 | 7.3 | Facilitate |
| 27 | Provide tailored coaching and mentoring to individual companies regarding OSW. | 7 | 7.3 | Facilitate |
| 28 | Work with utilities to Enable Large Energy Users to Directly Access OSW Resources. | 7 | 7.3 | Facilitate |
| 29 | Assist existing and new anchor companies with access to market including securing appropriate sites, transport and port access. | 5 | Summary | Accelerate |
| 30 | Create and fund a North Carolina Green Bank that can provide investment to support OSW firms. | 7 | 7.3 | Accelerate |
| 31 | Provide targeted incentive support to OSW-related firms. | 7 | 7.3 | Accelerate |
| 32 | Provide targeted incentive support for OSW innovation. | 7 | 7.3 | Accelerate |
| 33 | Reinstate and expand the Renewable Energy Equipment Manufacturer Tax Credit. | 7 | 7.3 | Accelerate |

Top recommendation

# Recommendations - Solicit and attract “anchor company” suppliers to North Carolina, with a focus on major components

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 1 | Continue to understand who the major, experienced supply chain companies are and their location decisions and their timescales. | 3 | Summary | Prepare |
| 2 | Engage with major suppliers and consider using the support from an offshore wind specialist to provide introductions and help secure their interest. | 3 | Summary | Prepare |
| 3 | Actively support connectivity and industry information sharing across the whole OSW supply chain. | 3 | Summary | Facilitate |
| 4 | Actively support existing high-tier North Carolina based companies to pivot to the domestic OSW market, especially where they already have relevant skills and experience, or supply to the domestic onshore wind market. | 3 | Summary | Facilitate |
| 5 | Attract, with speed, determination and tenacity, the short list of high-tier anchor tenants to NC before they finalize their location plans elsewhere, where these play to NC strengths. | 3 | Summary | Accelerate |

Top recommendation

# Recommendations - Strengthen and promote existing infrastructure assets and key strategic properties

| # | Recommendation in Chapter | Report section | Section | Prepare, Facilitate, Accelerate |
|---|---|---|---|---|
| 41 | Assess the competitiveness of an installation port along the southern North Carolina coast, as one input to the location of future lease areas off the coast. | 4 | Summary | Prepare |
| 42 | Assess further potential locations for OMS ports along the coast of North Carolina, as inputs the location of future lease areas. | 4 | Summary | Prepare |
| 43 | Evaluate developing Southport/North Carolina International Terminal Property: a 600-acre, North Carolina State Ports Authority (NCSPA) owned property that is one of the only potential "mega-port" facility locations on the US East Coast. | 6 | Summary | Prepare |
| 44 | Further explore using manufacturing sites next to CSX Carolina Connector at Rocky Mount for the manufacture of smaller components. | 6 | Summary | Prepare |
| 45 | Further explore using the Port of Wilmington and Port of Morehead City facilities with NCSPA, allowing North Carolina earlier access to supply OSW projects. | 6 | Summary | Prepare |
| 46 | Educate and promote O&M Facility Opportunities. Work with owners and operators of such facilities to develop their offerings. | 6 | Summary | Prepare |
| 47 | Further explore developing Radio Island, adjacent to the Port of Morehead City, for manufacturing and staging of Tier-1 and lower tier sub-components. | 6 | Summary | Facilitate |
| 48 | Further explore developing the North Property and the Wilmington Business Park/Vertex Property for manufacturing and staging of Tier-1 components and for use as a construction base port. | 6 | Summary | Facilitate |