2017 Massachusetts Offshore Wind Ports & Infrastructure Assessment

**Volume 2**: Engineering Assessment of Potential Site Redevelopment & Reuse Scenarios

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*Cover Photo: Deepwater Wind, Block Island Wind Farm – first offshore wind farm in the U.S.*

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Executive Summary

The emerging offshore wind industry presents important economic development opportunities for the Commonwealth of Massachusetts. MassCEC sponsored the 2017 Massachusetts Offshore Wind Ports & Infrastructure Assessment (Ports Assessment) to help capitalize on these opportunities by identifying and assessing additional waterfront sites in the Commonwealth that may be suitable for private investment and redevelopment as manufacturing and/or logistics assets by the offshore wind industry.

The three offshore wind developers with leases in waters south of Martha’s Vineyard have committed to using MassCEC’s New Bedford Marine Commerce Terminal as the primary area for the staging, assembly, and deployment of turbine components. That notwithstanding, the development of an offshore wind farm is a large undertaking, and the offshore wind industry has identified additional activities that will require secondary locations, including the construction and staging of foundations, manufacturing and staging of tower and turbine components, and long-term operations and maintenance. With these activities in mind, MassCEC has identified a series of waterfront properties in Massachusetts that could be acquired or leased and improved through industry-led investment to become suitable facilities for a number of offshore wind activities. MassCEC’s objective for this Ports Assessment is to provide a comprehensive and detailed evaluation of the 18 waterfront properties selected for assessment to inform the offshore wind industry as it considers secondary sites for manufacturing, staging, and support services for the offshore wind market in Massachusetts and along the East Coast.

The offshore wind industry supply chain that will develop in the U.S. over time will support a broad range of activities, including the manufacture of wind turbine components, towers, foundations, cables and related goods, as well as the production of goods and services to support long-term operations and maintenance. To better understand the range of port and infrastructure needs, MassCEC, through the Apex-Ramboll-Institutes Team (ARI Team), conducted an Offshore Wind Industry Needs Assessment (Needs Assessment) that included a review of existing European offshore wind port facilities and information gathering through direct engagement with offshore wind industry participants (including manufacturers, suppliers, and developers) to determine current infrastructure needs.

The Needs Assessment revealed that, for the U.S. to fully realize the growth potential of the offshore wind industry, infrastructure adaptation will involve a range of both port utilization methods and development schemes. Both large and small European ports have successfully adapted for use in offshore wind over the last decade, and the development of European offshore wind port infrastructure was gradual and proceeded at the pace that the industry required. Today, Europe benefits from relatively large clusters of combined manufacturing and marshalling ports for offshore wind construction.

Development of comparable offshore wind manufacturing, staging, and marshalling waterside facilities in the U.S. will also be challenging due to the limited availability of industrial waterfront property that can be reasonably converted from other uses. Additional challenges faced by some U.S. port facilities include air-draft limits due to bridges, reduced landside space available for laydown, vessel restrictions, and component handling logistics at quayside.

The ARI Team has identified several engineering strategies that could be employed to address many of the limitations of the Massachusetts waterside sites. These strategies rely upon adaptive orientation and staging of components to address the constraints of specific waterfront sites. Examples of this could include:
• Large component transport adaptation: monopiles and other foundation components can be transported on vessels in a horizontal position to address vertical clearance limits.

• Manufacturing adaptation: Gravity foundations and jacket foundations can be crafted in multiple stages at relatively space-constrained sites and then married in a staging area, at the marshalling port, or at the offshore wind farm.

• Logistics adaptation: Blades can be transported and stored in the horizontal position in cradles or cassettes.

The vast majority of ports in the U.S. have one or more challenges they must face as they adapt to this new industry, and so a specific and dynamic approach tailored to each port will be required. Successful deployment of offshore wind in the Northeast will likely require the use of several “feeder” port facilities where specific work-flow components are conducted, with the materials or infrastructure then transported to a centralized marshalling facility located in a port area with sufficient depths, quayside and air draft to support assembly and loading onto appropriate vessels. It is anticipated that this approach will support the use of increasingly large offshore wind components by allowing flexibility in the satellite ports that supply the offshore wind components to the assembly port.

MassCEC’s evaluation of 18 Massachusetts waterfront sites in this Ports Assessment involved identifying realistic redevelopment scenarios that provided a range of possibilities — from low cost and minimalistic redevelopment, to moderate and high-end cost for more permanent and long-term redevelopment scenario potentials. The ARI Team has adopted various logistics approaches, including the feeder approach, in its redevelopment scenarios for several of the sites, in part due to bridge restrictions within ports.

In creating the Redevelopment and Reuse Scenarios, MassCEC’s Assessment discovered that many offshore wind activities could reasonably be performed at a number of the sites in Massachusetts without performing the high-end-cost redevelopment. For the sites with larger acreage (such as Brayton Point – one of the largest available industrial waterfront sites in the Northeast), it may be more beneficial and cost-efficient to view the three Redevelopment Scenarios as redevelopment phases over time. At many of the sites reviewed, offshore wind manufacturing activities could be performed on smaller acreages and at a lower upfront costs initially, and larger portions of the sites could be incorporated into operations as manufacturers achieve a pipeline of project orders.

Chapters Two and Three of the Report present the detailed Engineering Assessment and Redevelopment Scenarios for each of the 18 waterfront sites assessed. MassCEC’s Assessment has identified multiple sites that could successfully host each offshore wind activity, including:

• Manufacturing and Staging of Monopile Foundations and Towers – 12 sites;
• Manufacturing and Staging of Blades – 12 sites;
• Manufacturing and/or Staging of Jacket Foundations – 4 sites;
• Manufacturing and Staging of Cables – 13 sites; and
• Operations and Maintenance Facility – 16 sites.

The prospective Redevelopment and Reuse Scenarios are depicted in the Ports Assessment as a series of graphics that provide a visual rendering of the potential reuse possibilities for the sites evaluated, and imagine ways in which these Massachusetts port facilities could effectively adapt to the potential of offshore wind.
Sites Listing

FALL RIVER/SOMERSET AREA SITES

Borden & Remington Complex – Fall River
Brayton Point Power Plant – Somerset
Fall River State Pier – Fall River
Former Montaup Power Plant – Somerset
Former Weaver’s Cove Energy Site – Fall River

NEW BEDFORD AREA SITES

Eversource Energy / Sprague Oil Site – New Bedford
Hathaway Mills – New Bedford
New Bedford State Pier – New Bedford
North Terminal – New Bedford
Revere Copper – New Bedford
Whale’s Tooth Parking Lot and New Bedford Railyard – New Bedford

BOSTON/QUINCY AREA SITES

Boston Autoport – Boston
East Boston Shipyard – Boston
Quirk Auto (Former Quincy Shipyard) – Braintree/Quincy
M-1 (Parcels 7&8) and Parcel M – Boston
Parcels V and V-1 – Boston
Parcels C-1 and C-2 – Boston
148 Condor Street – Boston
Introduction

This Volume 2 presents the results of the engineering assessment of potential site Redevelopment and Reuse Scenarios for the 18 Massachusetts sites that were analyzed as part of the overall Ports Assessment. The associated Existing Conditions Assessments for each site are presented in a separate companion document (Volume 1). Both volumes can be found at the Massachusetts Clean Energy Center’s (MassCEC) website at http://www.masscec.com/massachusetts-offshore-wind-ports-infrastructure-assessment.

The two volumes combined represent the 2017 Massachusetts Offshore Wind Ports & Infrastructure Assessment, which presents the assessment methodology and findings regarding the potential use of 18 Massachusetts port facilities by the developing U.S. offshore wind industry. The study’s intent was to collect, catalogue, present, and analyze information concerning the potential 18 Massachusetts waterfront properties and make that information available to the offshore wind industry with the goal of providing a broad range of useful research and information to developers, turbine and foundation manufacturers, and other entities that may be interested in locating offshore wind operations in Massachusetts. This Ports Assessment overlays the facility requirements for each of the potential manufacturing and long-term operations and maintenance activities with the existing conditions evaluated at each of the 18 sites, and evaluates which locations could best support specific activities.

This comprehensive Engineering Assessment that consolidates the all information generated was prepared and made available as both a report and an interactive web map in Fall 2017.

Background

The Commonwealth of Massachusetts has been preparing for the development of offshore wind and the economic development potential that this new U.S. industry can bring to the state. Massachusetts, through MassCEC, constructed and operates the Wind Technology Testing Center (WTTC) in Charlestown, Massachusetts, one of the largest indoor wind blade testing facilities in the world, and the New Bedford Marine Commerce Terminal (NBMCT), the nation’s first purpose-built marine terminal designed for the staging, assembly and deployment of offshore wind projects. Additionally, Massachusetts, through MassCEC, has conducted critical research in the form of a series of studies and assessments on the offshore wind resource and the environment surrounding the offshore wind lease areas, with the goal of jump-starting the U.S. offshore wind industry in Massachusetts. In August of 2016 Massachusetts added the final critical ingredient by passing legislation to provide offshore wind projects with a pathway to market. Passage of An Act to Promote Energy Diversity, the largest commitment to offshore wind by any state in the nation, puts Massachusetts at the forefront of advancing offshore wind and sets the stage for making Massachusetts a hub for the offshore wind industry. The legislation requires that electric distribution companies, in collaboration with the state, solicit proposals for 1,600 megawatts of cost-effective offshore wind over a 10-year period beginning on June 30, 2017.
Massachusetts as a Hub for Offshore Wind

There is a substantial, long-term need for new energy sources for Massachusetts. The regional grid operator reports that coal, oil and nuclear plants, representing almost fifteen percent of the region’s generating capacity, will retire between 2012 and 2020. Offshore wind represents a key means by which the Commonwealth can meet its future energy needs and meet its nation-leading greenhouse gas emissions goals. As such, offshore wind can be a key part of a long-term strategy of energy diversity, and represents a significant economic opportunity for the Commonwealth as these multi-billion dollar projects are constructed in Massachusetts.

The developers that hold leases in the offshore wind energy areas south of Martha’s Vineyard have extensive experience and financial backing. All three developers intend to build multiple offshore wind projects off the coast of Massachusetts and Rhode Island, with the first projects projected to be operational in the early 2020s. At least five additional offshore wind projects are proposed for sites off the coast of New York, New Jersey, Delaware, and Maryland. All of this development interest adds up to a significant pipeline of offshore wind projects in the region, beginning with Massachusetts’ commitment of 1,600 MW over the next 10 years.

Massachusetts has a skilled workforce able to meet the diverse needs of the offshore wind industry – from project development through manufacturing, fabrication, installation, and operations & maintenance. The three geographic regions that are the subject of this assessment have a proven maritime workforce with deep roots in the construction of ships, other maritime facilities, and power generation facilities.

On the signing of An Act to Promote Energy Diversity that ensures Massachusetts purchases 1,600 megawatts of offshore wind power:

“We believe, through the solicitation and procurement of long term contracts for… offshore wind power, Massachusetts and New England can remain a national leader in clean and renewable energy production. (This) bill spurs the development of an emerging offshore wind industry…and ensures this region’s ability to continue to lead both on reducing our carbon footprint, but also making sure we have the capacity and the power we need to support the region’s families and job creators and businesses…”

— Governor Charlie Baker
August 8, 2016
These key ingredients – a need for new energy, highly capable offshore wind developers, and a workforce with deep maritime history – set the stage for Massachusetts to become a hub for offshore wind development. In that light, the waterside facilities examined in this Assessment represent vital growth opportunities for offshore wind and the region, and valuable economic development opportunities for the Commonwealth.

**Opportunities for Massachusetts Ports**

The offshore wind industry, as it develops in the U.S., will need significant physical port, waterfront, and shipping infrastructure in order to take root.

Because proximity translates into cost savings in marine construction and shipping, Massachusetts ports are ideally situated to support and grow the offshore wind industry and the multiple proposed offshore wind farms slated for New England and eastern seaboard waters. With numerous waterside facilities located within 100 nautical miles (185 km) of multiple gigawatts of potential offshore wind farm development, the ports of Massachusetts represent the ideal place from which to launch the supply chain to serve the industry.

Massachusetts already hosts a key port asset created specifically for the offshore wind industry – MassCEC’s New Bedford Marine Commerce Terminal (NBMCT). This multi-purpose facility was specifically engineered to support the construction, assembly and deployment of offshore wind projects off the east coast of the United States. Although the majority of staging and deployment of turbine components will be done at the New Bedford Marine Commerce Terminal, the offshore wind industry has identified additional activities that will require secondary waterside locations.

A range of supply chain manufacturers interested in participating in the offshore wind industry will want to locate in close proximity to where project staging and deployment will occur. Numerous under-utilized waterside facilities exist within Massachusetts ports, and these properties may be available for redevelopment to meet the needs of the new offshore wind industry. They include former coastal power plant properties, former shipyard facilities, and industrial and marine industrial facilities. These facilities have existing waterside infrastructure and/or re-developable land and infrastructure that represent significant opportunities for manufacturing, fabrication, and operation and maintenance sectors of the offshore wind supply chain.

1 Information on MassCEC’s NBMCT can be found at www.masscec.com/nbmct.

*Aerial of the docking of a wind components vessel at MassCEC’s NBMCT in New Bedford, Massachusetts. This facility represents the first-in-the-nation purpose-built port facility to support the deployment of offshore wind projects.*
Overview of the Assessment Process

In order to ensure that Massachusetts remains the leader in the development of offshore wind, and in recognition of the fact that Massachusetts has a geographic advantage in its close proximity to The U.S Bureau of Ocean and Energy Management (BOEM) offshore wind energy lease areas, MassCEC commissioned this Ports Assessment to provide the offshore wind industry, and its associated supply chain, with the critical information it needs concerning existing port infrastructure in Massachusetts that may be suitable for offshore wind component manufacturing and fabrication.

This Ports Assessment will serve to:

- Inform private investment in Massachusetts waterside facilities for offshore wind supply chain manufacturing and fabrication;
- Jump-start the build-out of infrastructure needed to support growth of an American supply chain for the offshore wind industry; and
- Catalyze the development of an integrated offshore wind supply chain in Massachusetts.

As part of the Ports Assessment, MassCEC conducted an inventory of potential waterfront assets in Massachusetts that, either because of their underutilized nature or their applicability to the needs of the industry, could be redeveloped in ways that would support the development of an offshore wind industry in Massachusetts and the U.S. Out of this canvassing of potential sites, the list of study sites was distilled down to 18 sites that represent solid redevelopment potential. The sites chosen for the Ports Assessment, which are located along the Massachusetts waterfront from Boston south to Fall River, all have likely utility to the wind industry, and the owners of the sites are willing to consider potential long-term redevelopment scenarios in support of offshore wind development at their properties.

*The work under this assessment was completed in two phases.*

**VOLUME 1: EXISTING CONDITIONS ASSESSMENTS**

Volume 1 of the Ports Assessment presents the results of an in-depth review of the existing conditions of the 18 sites, including the results of on-site visual and survey measurements made at the sites to characterize the physical land area that currently exists, a review of the current uses of each site, and a comprehensive review and summary of available site and environmental information, including reviews of local, state, and federal sources of information concerning the site's and surrounding uses, environmental conditions, and existing infrastructure.

The 18 Massachusetts properties were selected for their suitability for marine industrial use based on property owner interest, physical attributes of the sites, accessibility to deep water and landside transportation infrastructure, and policy and regulatory compatibility.

The ARI Team, comprised of engineers and planners with specialized expertise in waterfront development, conducted site assessments at all properties. The ARI Team researched and compiled all publicly available information and data of relevance to use of the site by the offshore wind industry. With property owner and/or lessee consent, the ARI Team conducted both landside and waterside site visits to evaluate, catalog and photograph physical conditions and attributes.
The Existing Conditions Report for each site includes the following information:

- General location
- Ownership information
- Current use and historical use background
- State and municipal regulatory classifications and description
- Access and transportation
  > Nautical distance to MAWEA and RI/MA offshore wind areas
  > Waterfront and adjacent shipping channel route controlling depths
  > Distance to highways and rail
  > Overhead restrictions (for both land transit to property and water transit to wind energy areas)
- Dimensions
  > Acreage
  > Quayside length
- Existing physical site conditions and facilities
  > Existing conditions of site, quayside, and channel
  > Load-bearing capacity
  > On-site power and substation connections and other utilities
  > Infrastructure and buildings
  > Site access and security
  > Protection from storms/hurricanes
- Key environmental conditions/history/waivers (including wetlands, floodplains, soil, and surface water)
- Navigable airspace regulations
- Existing plans, designs, as-built surveys, O&M manuals, covenants, existing use limitations, and other relevant information

Refer to the Ports Assessment webpage to read Volume 1’s Intro to the Existing Conditions Report\(^2\) and Appendix A for links to the individual site pages for each of the 18 sites.

\(^2\) Read the Intro to the Existing Conditions Report.

Foundation component load-out at a European offshore wind port facility. Understanding the means and methods in which offshore wind component manufacturing and deployment is conducted is an important component as Massachusetts prepares for the offshore wind deployment here.
For Volume 2 of the Ports Assessment, the ARI Team conducted outreach to offshore wind industry developers, vendors, and experts to assess the industry infrastructure needs relative to port facilities for offshore wind component manufacturing, staging and operations and maintenance. In order to understand the port infrastructure needs of the offshore wind industry for each supply chain activity, the Needs Assessment began with a study of the European supply chain – how it developed from the first European offshore wind farms over three decades ago, and how it is likely to become involved in the U.S. offshore wind experience today. This investigation also involved understanding the existing supply chain for similar industries that already exist within the U.S., including the supply chain for the oil and gas industry in the Gulf of Mexico, and the U.S. manufacturing companies that are providing components for land-based wind farms in the U.S. The ARI Team then conducted interviews with approximately 40 developers, equipment vendors, and manufacturers to obtain feedback that would pair the needs profile for the offshore wind industry with the physical attributes of the port facilities in Massachusetts.

The focus of this phase of the Ports Assessment is on the needs of the industry in relation to the type of infrastructure that would have to be developed to conduct each supply chain activity in Massachusetts – and in particular the required port infrastructure. This included a range of considerations related to how the manufacturer typically uses a site, from general space and building requirements to specific requirements of manufacturing processes (such as quayside length or power requirements), to the type of vessels used to pick up or drop off components at the sites. The ARI Team also considered labor needs, technical skills requirements, and the need for surrounding business support.

Once a thorough assessment of the industry needs had been conducted, the ARI Team created a matrix of the supply chain desires, needs, and minimal requirements and used that matrix to match up supply chain elements with most suitable port facility opportunities.

The evaluation involved conducting conceptual design scenarios for potential upgrades, estimating potential costs of upgrades, and highlighting local permitting steps associated with design implementation. This final phase of the Ports Assessment was aimed at providing the offshore wind industry with (a) suggestions as to how the existing marine facilities in Massachusetts could be used, and (b) estimated upgrade costs, total project timeframes, and local permitting pathways.

Following the cataloging of potential reuses for the properties, an in-depth engineering assessment of how the properties might be modified to suit both generic and particular supply chain uses. ARI Team prepared redevelopment and reuse scenarios for each site showing a range of low to medium to high redevelopment activities, and how specific supply chain activities (such as component manufacturing, staging, and operations and maintenance (O&M)) might be adapted to the site to provide a framework that developers and manufacturers can use to assist in making decisions about where it makes the most sense to locate offshore wind component manufacturing, staging, and O&M facilities in Massachusetts.

This Volume 2 is divided into three main topic areas:

Chapter 1: A summary of the Offshore Wind Industry Needs Assessment – an examination of offshore wind industry needs for manufacturing, outfitting, staging, and deployment of major offshore wind project components, including the type, size, and layout of infrastructure;
Chapter 2: An Engineering Assessment – evaluation of which of the 18 properties studied could be adapted for use supporting offshore wind development in Massachusetts, and what that adaptation might look like; and

Chapter 3: A presentation of the Redevelopment and Reuse Scenarios – consideration of what redevelopment might occur at specific sites to support offshore wind manufacturing, staging, and long-term operations and maintenance.³

³ The Redevelopment and Reuse Scenarios presented herein are examples of ways in which the sites could be redeveloped and used by the offshore wind industry and are not intended to suggest that there are not a myriad of ways in which the sites could be redeveloped and used. The scenarios presented are intended to project a generic set of activities that could be undertaken at a given Site to prepare it for use as an offshore wind industry asset. It is recognized that each offshore wind manufacturing and supply chain activity has particular needs for port infrastructure. It is expected that the industry will determine what specific modifications would best serve their own particular needs.