6.0 Construction and Assembly

6.1 SUMMARY

The Maine Midcoast/Penobscot Bay area has the facilities and capabilities for the development of an early stage floating offshore wind farm. While there is no current activity in the region specifically related to off shore wind, there are existing industry resources and infrastructure with similar experience. There is also a valuable workforce with valuable experience working on complex maritime projects available. The current infrastructure is appropriate to support a project of limited size; however, additional investment will need to be made with in facility infrastructure and equipment for larger commercial scale projects exceeding ten (10) – 20 turbines.

6.1.1 Facilities

The Searsport Terminal at Mack Point located at the upper regions of Penobscot Bay has port space and support infrastructure available for an assembly and staging area. Nearby Sears Island has additional space available that could be developed for larger future projects. There is also additional port infrastructure and industrial water front real estate farther up the Penobscot River and in the surrounding Penobscot Bay area.

6.1.2 Assembly and Deployment

There is a deep-water area in the upper east side of Penobscot Bay that enjoys relative protection from larger sea states. This is an area that has been identified as a potential option to serve as a wet assembly and ballast area. There is also a nearby deepwater route that would allow deployment access out of the Bay. Junkins Ledge to the southwest of Vinalhaven Island represents concern due to the water depth and narrowness of the channel. Detailed studies of the subsea topography and consultation with local pilots would be required to ensure safe passage through this area if selected.

6.1.3 Companies with Expertise

Construction firms with local offices have appropriate experience and interests. One firm has manufacturing facilities in the upper Penobscot River/Bay system. These firms operate throughout the United States eastern seaboard; have experience with onshore wind power installation, marine construction, construction of offshore oil platforms and subsea cable installation. There are also moderately sized marine construction firms located in Penobscot Bay that may play a significant role in support services.

6.1.4 Equipment

Currently cranes exist in Maine with the capabilities to install turbines and blades at tower height. These may be mounted on barges for offshore work, or crane and barge equipment can be found readily in neighboring northeastern states. There are many more mid-sized and smaller cranes available to provide support services. Additional cranes for either requirement can be leased with in the northeast region with an expected lead time of two (2) to three (3) months. Local construction firms have existing relationships with the crane and equipment supply companies.

Barges currently located within the region are available for support, transportation, and midsized crane operations. However, larger barges required for turbine installation would need to be leased within the greater northeast region with an expected lead-time of three (3) months. Again, the local construction firms have existing relationships with the crane and equipment supply companies.

6.1.5 Maritime Skills and Heritage

The Maine Midcoast region has a strong shipbuilding heritage, including existing firms that build complex large navy craft, advanced tug boat builders and shipyards with experience building and repairing steel ferries and barges. These firms may be able to provide component fabrication and support services. Penobscot Bay is also home to Maine Maritime Academy. Many technically proficient graduates reside in the surrounding area.

6.1.6 Support Industries

In the region there are a number of medium and small steel fabrication companies with experience in providing services for marine infrastructure, power industries, bridge, and general construction. A number of large and small precision machining companies in Maine have extensive experience in providing services for power generation, defense and paper industries. The area also hosts an advance composite manufacturing sector that may play a role in providing repair services for blades and light weight corrosion resistant components. (Appendix D.1 (Section 10.4.1)).

6.2 LANDSIDE STORAGE AND ASSEMBLY FACILITIES/SITES

6.2.1 Searsport Terminal at Mack Point

The approach channel depth for Mack Point/Searsport is 33.2 ft. The guidelines for under keel clearance in Penobscot Bay are three (3) ft under keel in the bay, two (2) ft in the approach channel and one foot alongside the berth. The tide range in Searsport is ten (10) ft. Good anchorage is located about one mile southwest of Mack Point with good holding ground in about 50 ft of water.

The Searsport Terminal is 7.6 miles (10.5 km) to the north of the proposed wet storage/marine assembly area.

Tidal Range: ten (10) ft

Approach Channel and Turning Basin -35ft depth from mean low water (MLW)

Dry Cargo Pier

- 100 ft x 560 ft working surface
- Deck Load Capacity 1,000 psf
- Berth #1 (Eastern Side) 800+ ft long, -40 ft MLW
- Berth #2 (Western Side) 800+ ft long, -32 ft MLW

Intermodal Truck to Rail Facility

- Served by Montreal, Maine and Atlantic
- Over 6,500 ft of on-site rail siding interconnected with Canadian Pacific for double stack service to United States Midwest, central Canada, and Vancouver
- Double stack clearance
- Track Mobile to index and ship cars within the terminal

Storage Areas

- Outside Storage: 310,000 sq. ft (28,800 sq. m)
    - 7 pads
    - truck and rail loading racks
- Inside Storage: 101,000 sq. ft (9,400 sq. m)
    - 3 buildings, rail capable
- 70 plus acres for development
- 100 plus acres of additional industrial lay down area available with rail and road access within 1.5 mi of Searsport Terminal.

Equipment

- 2 Crawler Cranes 125T, 175T
- New High Capacity Mobile Harbor Crane: 120-140 ton
- Specialized trailers and heavy equipment transporters available
- Spreader bars
- Truck scales
- Lift trucks
- Specialized electrical hookup

People

- Full Service private stevedores
- 24 hour x 7 days x 365 days
- Multiple years heavy lift experience

6.2.2 Sears Island

Sears Island is owned by the State of Maine, with 330 acres (134 hectares) available for potential development directly adjacent to the terminal at Mack Point. The site includes:

- Causeway access to road
- Rail connections on the mainland
- Breakwater and dredged berth
- Direct access to the channel

6.2.3 Brewer, Eastern Manufacturing Facility

The Eastern Manufacturing facility is owned and operated by Cianbro Corporation. The facility is located on the Penobscot River: 36.25 miles (50 kilometers) from Searsport Terminal; one mile (1 mi) to the Interstate; half-mile (0.5 mi) to the Rail Terminal; and 5.4 miles to Bangor International Airport.

- 41 acres
- Administrative Space: 30,000 sq ft
- Warehousing space: 40,000 sq ft onsite 200,000 sq ft offsite.
- Engineered site for module, and large structure assembly with heavy haul road, and construction pad, 20,000 ton + capacity
- Bulkhead Capacity: 12,000 tons
- Pier/Moring Facilities: 122 m (400 ft) x 31 m (100 ft) x 5 m (16 ft) depth
- Mobile Cranes from 30 to 440 ton capacity
- Floating Crane capacity can be arranged per project requirements

6.2.4 Belfast

City Facilities: 13 ft draft, vessels up to 200 ft, 100 amp power. Channel dredged to 15 ft MLW and is home of Penobscot Bay Tractor Tug Company:

- FOURNIER TRACTOR is a 3,500 hp ASD tractor tug,
- MACK POINT is a 2,000 hp single screw tug with an 800 hp stern thruster
- CAPE ROSIER is a 1,800 hp single screw diesel electric tug.

6.2.5 Bucksport

The Webber pier is located in Bucksport on the Penobscot River and can accommodate vessels up to 700 ft length, 106 ft beam and a maximum draft of 35 ft (brackish) for docking at high water. At low water slack, the maximum draft is 28 ft (based on a 0 ft tide). The tide range in Bucksport is 11 ft. There are two bridges over the Penobscot River below Bucksport and the vertical clearance of the lower bridge is 135 ft.

6.2.6 Rockland Harbor

Rockland Harbor is near the mouth of Penobscot Bay and is protected by a breakwater. The harbor is approximately three (3) km diameter with depths at the center of the harbor at 20 m, five (5) m channels and commercial dockage MLW. Rockland Harbor provides commercial marine support services to the region.

- Prock (Full equipment and capabilities list with company profile)
    - Approximately three acres staging area
    - 200 ft of seawall wharf, 14 ft at low tide.
    - Room for temporary office trailers
- Available structures for interior storage and/or work
- Rockland Marine Corp. is a full service marine vessel repair yard with a marine railway able to carry vessels up to 60 m specializing in steel vessel repair and fabrication. Services include full machine shop, welding and fabricating, complete interior and exterior paint application, sandblasting and many other services.
- Access to rail through Maine Eastern Railroad: Bill Phillips 973-267-4300
- Marine Railway repair and new build yard for vessel up to 60 m

6.2.7 Other coastal support facilities

- Boothbay: Marine Railway repair and new build yard for vessels up to 60 m
- Bath: Drydock and full service repair and new build yard for vessels up to 250 m
- Portland: Drydock for vessels up to 55 m
    - Pier side repair for vessels up to 275 m

6.3 MARINE ASSEMBLY AREA

There is a marine and wet storage assembly area located approximately 0.9 nmi from Hewes Point, Islesboro Island that could be used as necessary. Consultation with Penobscot Bay Pilots was conducted prior to selection of this site. Shipping traffic can use the east passage of Penobscot Bay with no issue or impact.

- Assembly area assumed to be 500 m x 500 m

- Wet storage is assumed to be 1000 m x 1000 m in addition.
- 87.78 m MLW (288 ft)
- Duration of Use 40 days to 180 days
- Distance to Deployment Site 32 km (82 mi)
- Distance from Staging Site (Searsport) 10.5 km (7.6 mi)
- Distance from Eastern Manufacturing Facility, (Brewer) 60.5 km (37.6 mi)

6.4 COMMUNITY, SOCIAL, AND ENVIRONMENTAL PARTNERS

Island Institute is a partner in local community communication and relationship building.

Supporting the year-round island and working-waterfront communities of the GoM requires knowledge of many different topics. Over the past quarter-century, the Island Institute has collaborated with constituents on a wide variety of projects. While each project has included unique challenges, and each coastal community has its individual identity, the Institute has identified priorities to address needs shared by multiple communities.

The Island Institute has been paramount in the development of wind resources for local island communities. Past successes such as the Fox Island Wind Project have included a valuable partnership with the Institute.

The Island Institute will be an important partner in the social relations efforts related to any offshore development project.

6.5 LOCAL SERVICE PROVIDER CAPABILITIES

6.5.1 CIANBRO

Cianbro is an employee owned construction and fabrication company providing services throughout the United States serving a number of industries including energy, marine, civil and transportation. The 2,000 multi-skilled team members of Cianbro include qualified technicians in the following fields:

- Mechanical and Structural Trades
- Civil Trades
- Coatings Specialists
- Equipment Operators and Support
- Project Management, Engineering and Administrative Support Staff

Cianbro Eastern Manufacturing Facility Brewer

The facility is located on the Penobscot River: 36.25 miles (50 kilometers) from Searsport Terminal; one mile (1 mi) to the Interstate; half-mile (0.5 mi) to the Rail Terminal; 5.4 miles to Bangor International Airport.

Working and Storage Area

- 41 acres
- Administrative Space: 30,000 sq. ft
- Warehousing space: 40,000 sq. ft onsite; 200,000 offsite.
- Engineered site for module, and large structure assembly with heavy haul road, and construction pad; 20,000 ton + capacity

Pier and Waterfront Capacity

- Bulkhead Capacity: 12,000 tons
- Pier/Moring Facilities: 122 m (400 ft) x 31 m (100 ft) x 5 m (16 ft) depth
- Bulkhead/Barge Berth: 600 ft x 150 ft x 24 ft

Equipment

- Mobile Cranes from 30 to 440 ton capacity that can be used onsite Brewer or in Support operations at other locations.
- Turbine Installation:
- Manitowoc M18000 – 120 m Height; 60 Mt Capacity
- Manitowoc 1600 Series 3
- 400 tons @ 30 m; 46 tons @ 96 m
- With MAX-Er Attachment: 380 tons @ 42m; 67 tons @ 120m
- Cianbro cranes on barge
- Manitowoc M18000; 100 mt @ 91 m height above water
- Manitowoc 4100 – 222 mt @ 50 m height above water
- Additional cranes on barge can be arranged per project requirements using existing east coast resources
- 907 mt @ 64 m height above water
- 453 mt @ 60 m height above water
- Multi-wheeled transporter equipment available for use at the facility

Access to Vessels and specialized equipment, local labor with worldwide industrial partnerships:

- Existing relationships and access to United States Flag Vessels readily available on East Coast US – ABS classed ocean-going barge 76 m to 120 m Loa. Common sizes in New England area 45 m to 76 m range. Can be secured for scheduling purposes within a 3-month lead-time.
- Support Vessels
    - Area tug boat resources include several tractor tugs with 3000 to 6000 HP
        - Conventional Twin Screw tugboats are available throughout the area most in the 2500 to 4000 HP range.
    - Crew boats in the 32 m range are available in the area within 1 day mobilization
- Anchor Handling Capacity
    - Anchor handling can be completed on a small scale in a project area with available equipment. Large scale anchor handling with anchor handling boats in the 60 to 80 m range will most likely require the mobilization of a United States flag AHTS vessel from the Gulf of Mexico.
    - Area companies are willing and committed to developing these capabilities or relocating boats and trained personnel to support large scale operations

Fabrication Capabilities

- Coating Capabilities with Sophisticated Paint Endorsements SPE P2
- Steel Fabrication through two facilities both AISC, ASME certified
- CNC Equipment, 3D Modeling
- Pipe Fabrication and Coating
- 250+ Pipe Fabricators/Welders
- Application of New Technology
    - 3D Laser Scanning and Surveying,
    - 3D Work Packaging and Construction Sequencing.
    - PMI – Positive Materials Identification and Tracking
    - Electronic Crane Setup and Rigging Planning
    - Automated Pipe and Preparation Welding

Qualified Processes and Certifications

- Top 100 United States Equipment Owner
- QU/QC Program Based on ISO 9001
- Quality Workforce and Systems
- ASME Certifications – U,S
- AISC Certifications – STD, SBR, CBR
- SSPC Certifications – QP-1 and QP-2
- CWI/NACE QA/QC Inspectors
- ABS/DNV/Lloyds Class Compliant

Compatible Management Philosophies

- Safety
    - American College of Occupational and Environmental Medicine (ACOEM) – Healthiest and Safest Company in America
    - Wellness Council of America (WELCOA) Wellness Program Best in the United States
    - 2008 Gold S.T.E.P. Award
    - 2008 ABC Best of the Best Safety Award
    - 2008 OSHA Safety and Health Achievement Program (SHARP) Safety Award
    - 2009 Wellness Council of America – Platinum Award
- Quality and Production Efficiency
    - BC Contractor of the Year
    - ABC Excellence in Construction Award
    - Washington Building Congress Craftsmanship Award
    - American Society of Civil Engineers Outstanding Civil Engineering Achievement Award
    - American Council of Engineering Companies Engineering Excellence Award.
    - ABC Build American Award
- Schedule Reliability
    - Motiva Oil Refinery

- One of three (3) chosen companies from a field of 30 worldwide competitors.
- Produced and delivered under budget and under time.

6.5.2 GENERAL DYNAMICS Bath Iron Works

Shore support facilities

Bath Iron Works has approximately 25 acres available for working and staging.

Pier facilities

- Pier 4, 800 ft, 55 ft draft
- Pier 3N, 626 ft, 38 ft draft
- Pier 2N, 405 ft, 25 ft draft
- Pier 1S, 573 ft 32 ft draft

Working Facilities

- Blast and paint, three (3) buildings: 8,800 sq ft, 19,000 sq ft, 14,300 sq ft
- Calibration Laboratory: 640 sq ft
- Carpenter Shop: 14,280 sq ft
- Electrical: 5,929 sq ft
- Fabrication: 233,000 sq ft
- Industrial: 22,000 sq ft
- Machine Shop: 52,224 sq ft
- Mold Loft: 67,500 sq ft
- Office Space: 241,644 sq ft
- Paint: 5,000 sq ft
- Pipe: 42,148 sq ft
- Plate: 42148 sq ft
- Sheet Metal: 34,320 sq ft
- Sub-Assembly: 255,950 sq ft
- Ultra Hall: 66,804 sq ft
- Warehouse: 160,000

Floating Drydock

- Length: 750 ft
- Maximum Depth over Blocks: 42 ft
- Width: 140 ft
- Lift Capacity: 28,000 LT

Cranes: all on site, no offshore capability

- Bridge, 100 T
- Level Luffing: 300 T
- Level Luffing: 220 T
- Level Luffing: 50 T
- Level Luffing: 25 T
- Level Luffing: 25 T
- Level Luffing: 90 T
- Level Luffing: 60 T
- Level Luffing: 150 T
- Level Luffing: 300 T
- Mobile: 300 T
- Mobile: 100 T

Barges and Support Vessels: Provided by Winslow Marine (See Support Services)

6.5.3

Equipment list

- Cranes 2 – 440 tons, 97 m
    - 25 additional support cranes up to 250 ton capacity
- Barges
    - 5 barges capable of handling smaller capacity cranes
    - Barges available for lease for the 440 ton, readily available with limited lead time
- Support Vessels
    - 2 – 600 HP push boats

- Shore support facilities
- Dock yard facility 145 x 170 ft concrete pier 20 ft deep, Kennebec River, Woolwich
- 2 – Launching weights – 500 ton each
- Experienced with installing larger diameter pipelines in open ocean

6.5.4

Equipment list

- Cranes
    - 518 Linkbelt, 418 Linkbelt, 110 and 150 ton capacities.
    - 12 additional Cranes available for support less than 100 tons
- Barges
    - Three 48 ft x 140 ft crane barges capable of carrying 120 ton/37 m or 150 ton/46 m cranes.
- Support Vessels
    - Tugs, 2-twin screw 1000 HP, 1-single screw 650 HP, 1-300 HP push
    - 42 ft crew boat, 20 person capacity
- Resources and availability of additional equipment (rental)
    - Baldwin Crane & Equipment Corp. Availability usually within 2-3 months
        - Crawler cranes up to 500-ton: Manitowoc 888s, 999s and 2250s with heavy lift and extension attachments available.
    - Hughes Barges, for use with larger cranes, Readily available with short lead times.
- Shore support facilities
    - Approximately three (3) acres staging area
    - 200 ft of seawall wharf, 14 ft at low tide
    - Room for temporary office trailers
- Experienced as contractor with installation of USGC Buoys and offshore equipment
- Experienced with installation of submarine cables and pipelines

6.6 ADDITIONAL CRANE SOURCES AND AVAILABILITY

- Baldwin Crane & Equipment Corp. Availability usually within 2-3 months

    - Crawler cranes up to 500-ton: Manitowoc 888s, 999s and 2250s with heavy lift and extension attachments available.

- WH Green & Sons, Augusta, Maine
    - 22.5 ton – 450 ton Cranes, Max lift 105 m (5 tons at max extension)
        - Access to 500 ton capacity cranes through industry partnerships with two (2) month expected lead times.
- Marino Crane, Middletown, CT (Division of Barnhart, wind experience)
    - 11 crawler cranes from 100-300 ton capacity maximum 90 m

6.6.1 Additional Barge, Vessel and Tug Sources and Availability

- Penobscot Bay Tractor Tug Company, Belfast Maine:
    - FOURNIER TRACTOR is a 3,500 HP ASD tractor tug,
    - MACK POINT is a 2,000 HP single screw tug with an 800 HP stern thruster
    - CAPE ROSIER is a 1,800 HP single screw diesel electric tug.
- Winslow Marine, Falmouth Maine,
    - Tugs: Alice Winslow: twin screw, 3500 HP; Peggy Winslow, twin screw 2000HP; Patricia Winslow, twin screw 2000 HP; Charles Winslow, twin screw 800 HP; Elliott Winslow, single screw 2500 HP, Margery Winslow, single screw 1750 HP; 26 ft push boat 300 HP
    - Barges: Deck Barge, 150 X 54 X 10 ft, 2000 lb/sq ft; Crane Barge, 130 X 50 X 10 ft; Material/Crane Barge, 110 X 42 X 9 ft; Deck Barge, 60 X 30 X 4 ft; Deck Barge, 50 X 30 X 4 ft
- Hughes Barges, Edison, NJ. Capable of carrying larger cranes, readily available with short lead times.
- Atlantic Towing Limited, St. John, NB
    - Barge Charter
    - Coastal Towage
    - Deep Sea Anchor Handling
    - Offshore Support

6.6.2 Special Requirement Vessels and Equipment

Anchor Hauling, Mooring installation

Limited mooring equipment may be installed using local contractors with existing equipment. However, larger permanent moorings for the offshore platforms will require support form vessels from the United States Gulf Coast, or Atlantic Canada. Local companies are willing to obtain and operate such equipment when the market demand for these types of services matures with further development.

Mooring systems

- Yale Cordage
    - Capable of designing and manufacturing synthetic mooring system/pennant for offshore wind installation.
    - Provider of deep sea synthetic mooring pennant systems to NOAA, Woods Hole and other clients for accurate placement of offshore weather buoys in waters as deep as 2,000 m for periods exceeding three (3) years. Systems installed by SAIC Contractors.
    - Experience in designing mooring systems for offshore oil.