REQUIREMENTS FOR ADVANCED OFFSHORE WIND MARSHALING PORTS

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This quantitative summary is based on analysis of offshore wind ports and deployment methods (during 2017 - 2019) and on results from a DOE study of advanced deployment methods for offshore wind (Kempton 2017).[1]

This analysis concerns the marshaling harbor, also called staging port or deployment port.[2] Due to the nature of offshore wind deployment, marshaling ports have demanding requirements. Their characteristics have a substantial effect on the ocean wind project's cost, efficiency and speed of potential offshore wind deployments, potential turbine size, etc, so therefore it is important to meet specifications as much as possible in order to reduce costs and increase volume of business from the offshore wind industry (see GWEC, pp 37-38).

In planning the marshaling port, we take the perspective one should look for suitable characteristics of a location, which does not necessarily mean an existing port. For example, Siemens-Gamesa at Hull told me "There is no advantage from starting with a port. It is equal or better to just start with bare land adjacent to the water."

"Advanced" Offshore Wind marshaling port refers to a port that is prepared to support the coming 15 to 20 MW turbines, new support structures, and prepared to support new, faster, and more cost effective deployment methods. For example, advanced deployment could include accomplishing more assembly in the port, which in turn would require that the port accommodate taller and heavier structures on land. It could also mean a port with equipment able to move such structures from land into the ocean, and to then transport the structures to the ocean site.

Quantitative requirements for an advanced marshaling port are summarized in Table 1.

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[1] Information sources includes interviews with about 20 offshore wind and port specialists, touring three ports designed for offshore wind installation, Hull, England, Esbjerg, Denmark, and Bremerhaven Germany, and analyzing port efficiency for coming technologies for the US Dept of Energy. These findings have also been presented at the AWEA Offshore Wind conference, Washington, (Brett & Kempton 2018)

[2] Two additional types of ports needed for the offshore wind industry are manufacturing ports, and operations and maintenance (O&M) ports. Over the project lifetime, O&M ports host about 1/2 the person-years of jobs; although their peak staffing is smaller than the other two, total employment is greatest because their staff are employed throughout the ~25 year project life.

Table 1. Offshore wind marshaling harbor requirements.

	Imperial	Metric	Rationale
Land area	100-200 acres	40-80 ha	Possible but inefficient with as little as 40 ha; higher efficiency and new lower-cost deployment techniques with ~40 ha,; add large-component manufacturing on site if 80 ha. (Esjberg is 250 acres)
Channel depth	20-36 ft	6-11 m	Required to accommodate large, specialized jack-up vessels (higher number); lower number accommodates today's US liftboats
Vessel Width	150 ft	46m	Vessel+clearance is minimum harbor entrance width
Max current along quay	<5 knots	2.6 m/ sec	Supply and installation vessels have to turn before or after docking and load out; if current is too fast, vessel has to wait for next slack tide.
Quay length	1,300 ft	400 m	Today's deployment vessels are 140m length, should accommodate at least 2 simultaneously along quay.
Tidal range	(low is desirable)		Mooring and load out is more difficult with a large tidal range; today's typical load out is to vessel when it is up on spuds in harbor
Laydown area loading	1200 PSF	6 tonne/ m^2	Movement of structures (figures are required ground bearing pressure)
Quay/lift area loading	6000 /PSF	30 t/m^2	Crane loads require greatest load bearing.
Overhead air clearance	∞	∞	Limit now set by vessel's spud height above waterline, as well as towers deployed upright above deck (~120m). In future, greater clearance needed to allow upright assembled structure.
Labor hours	No restriction on quayside working hours		
Skilled labor	Locally available skilled workforce		

REFERENCES

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