Floating Wind Risk Management series

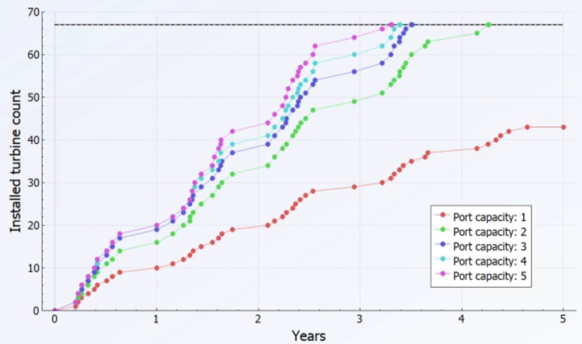
Chapter II – Impact of port capacity

DIFOWT — DE-RISKING IRELAND'S FLOATING OFFSHORE WIND TARGETS

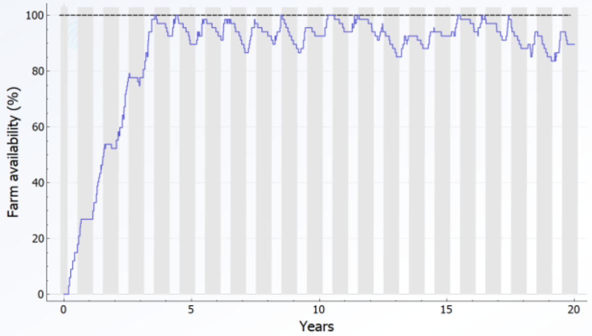
seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

The second chapter of the Floating Wind Risk Management series investigates the impact of a port's capacity to berth floating wind turbines. Port capacity has a significant impact on installation times and availability of floating wind projects. This chapter focuses on the analysis of the impact of changing a port capacity's, looking at installation times and operating availability. The outputs use evidence-based results produced using commercial software: TEMPEST™.

The scenario for the study of port capacity impact is a 1 GW FOW farm with 67 turbines 240 km from the port (Celtic Sea). The port has a single heavy lift crane, and its quayside capacity ranges from 1 to 5 turbines. The model focuses on the first 20 years of the farm, including installation and operational phase, excluding decommission. A 10-day turbine assembly task requiring the crane is assumed. Two installation fleets are available all year long for the 55-hour (excluding weather windows) installation of the FOWT. Corrective maintenance strategy is applied with two maintenance fleets available May-Aug (inclusive) to repair 2 major failures requiring tow-to-port (3% yearly FOWT failure requiring a crane, and a 7% failure rate with no crane needed). The results shown represent the P50 values from multiple simulations.



1 GW floating wind farm average turbine installation count per port capacity. Vessel availability all-year long



1 GW farm 20-year availability using a port with quayside capacity for 3 turbines and 2 maintenance fleets. Maintenance vessel non-availability period greyed out (Sep-Apr). Decommissioning not included

Port at full capacity

Commissioning phase

Port capacity	Reached full capacity	% time full
1	89 times	98.7%
2	72 times	82.7%
3	47 times	65.3%
4	33 times	53.9%
5	25 times	48.2%

Operational phase

Port capacity	Reached full capacity	% time full
1	62 times	89.9%
2	62 times	34.2%
3	35 times	14.5%
4	24 times	10.6%
5	11 times	3.8%

Number of times when the port reaches max capacity and percentage of time that the port is at full capacity. Commissioning phase (including repairs during this period) in the top and operational phase in the bottom.

Operational availability

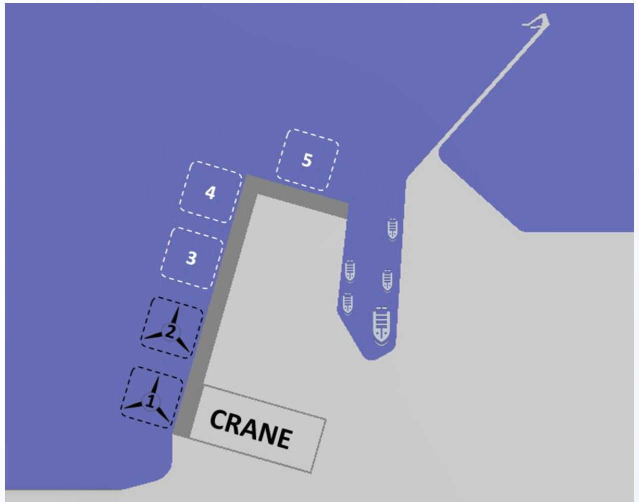
Maintenance fleets

Port capacity	1	2	3	4	5
1	69.4%	77.6%	78.9%	80.8%	82.8%
2	73.4%	93.8%	95.1%	95.3%	95.3%
3	75.5%	94.6%	95.2%	95.5%	95.5%
4	77.2%	94.8%	95.3%	95.6%	95.7%
5	77.3%	94.9%	95.4%	95.6%	95.7%

Maintenance fleets

Port capacity	1	2	3	4	5
1	52.0%	56.2%	56.2%	56.9%	57.0%
2	54.0%	62.7%	67.8%	70.5%	71.1%
3	55.1%	65.5%	74.8%	79.9%	81.4%
4	55.3%	67.3%	75.5%	84.8%	89.1%
5	55.3%	67.5%	78.3%	87.2%	93.6%

Effect of maintenance fleets and port capacity combination in operational availability. 1 GW farm (67 turbines) in the top and 3 GW installed (200 turbines) in the bottom



Ports with low capacity struggle to utilise the available weather windows effectively, leading to long installation times and poor farm availability. The simulations show that increasing the port capacity can improve the installability and availability metrics of a FOW farm, but there is a need to accompany more capacity with increased numbers of vessels to fully utilise the available weather windows. Results highlight how smaller ports might not keep up with the demands of the wind farm and see their capacity maxed out for long periods of time, especially during the commissioning phase. Ports are likely to service multiple wind farms where the challenges and impacts become more apparent when tow-to-port operations are required.

Vessel availability and vessel usage optimization are key metrics affecting a floating wind project; in the next chapter this parameter will be investigated.

Find out more

Next chapter: Vessel availability

TEMPEST — ENABLING OFFSHORE RENEWABLES