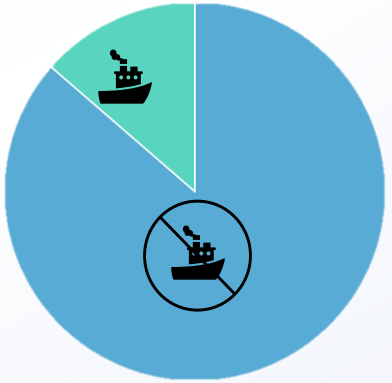
Floating Wind Risk Management series

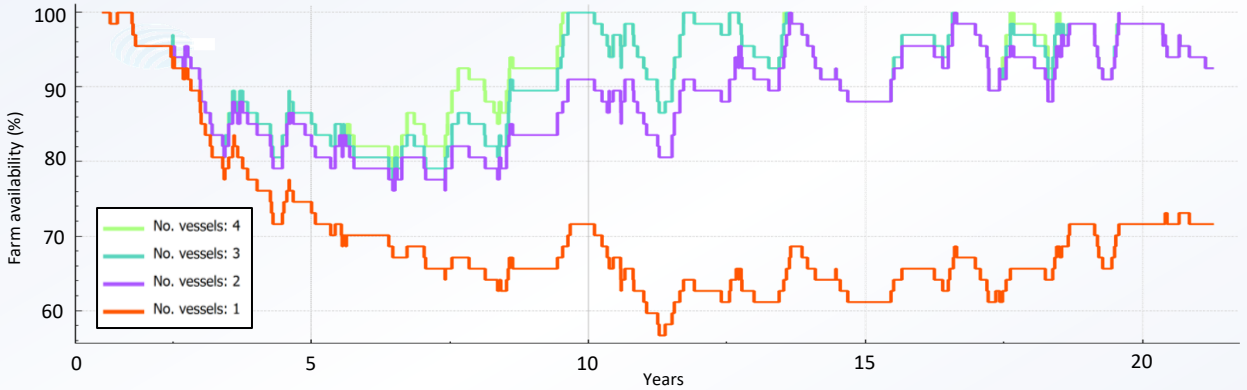
Chapter III – Impact of vessel availability

The third chapter of the Floating Wind Risk Management series investigates the impact of vessel availability. Better understanding of vessel availability within a project is essential for planning and derisking the O&M phase of a floating wind project. This chapter focuses on the analysis of the impact of hiring vessels for varying months of the year, including the number of vessels required to reach acceptable project availability values. The outputs use produced using commercial IO&M software: TEMPEST™.

The scenario for the analysis is a 1 GW FOW farm with 67 turbines 150 km from the port (Celtic Sea). The port has a single heavy lift crane, and its quayside capacity limited to two fully assembled turbines at any given time. The model focuses on a 20-year O&M phase of the farm. The vessels availability to work is varied as well as the number of vessels contracted at a given time. A failure is modelled which is assumed to include a major component exchange requiring the turbine to be towed back to port for repair. The onshore repair is completed within 4 days. The failures are randomly placed within the simulation with a failure rate representing 7% tow-to-port failures per year. Turbine installation takes 55-hour (excluding weather windows). The results shown represent the P50 values, unless otherwise identified, which are calculated from multiple simulations.



Vessel availability	Production-based availability			
Vessel fleets	**1**	**2**	**3**	**4**
July – Aug	54.5%	63.5%	68.0%	68.5%
Jun – Aug	60.6%	77.2%	87.0%	87.9%
May - Sept	70.1%	89.3%	91.8%	92.5%
All year	73.4%	92.1%	94.6%	94.8%



Vessel availability	Total vessel blocked time (years)			
Vessel fleets	**1**	**2**	**3**	**4**
July – Aug	1.6	2.9	4.5	6.1
Jun – Aug	2.3	4.9	7.5	10.0
May - Sept	4.1	8.3	11.2	14.2
All year	15.0	26.1	32.7	37.6

1 GW floating wind farm production-based availability and total blocked vessel time for varying vessel contracting times. Blocked vessels have work to be completed but are blocked due to permit, capacity or other work restrictions

Percentiles	No. days to respond, repair and reinstall a single tow-to-port failure											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
P90	197	166	168	138	110	88	89	312	299	289	258	228
P75	177	146	120	90	71	67	63	273	281	269	238	208
P50	159	128	100	73	54	45	43	131	249	246	220	190
P10	114	83	54	48	30	28	22	23	51	193	169	139
Fastest	76	70	42	23	22	23	16	16	16	50	159	129

Above: 1 GW floating wind farm production-based availability time series for a 20-year O&M phase (after full installation) with vessel availability during the period of May to September.
Below: Percentile statistics on elapsed time for the respond, repair and reinstallation for a T2P failure using a single vessel for maintenance.

A vessel hiring strategy for a short number of months during summer results in a challenge to reach an acceptable availability level for the floating wind farm. Even when 4 fleets are available to respond to the failures the availability is far from ideal. The simulations show that it is necessary to have vessels for the majority of the summer period to ensure a high farm availability. It can also be seen that the impact of 3 or 4 vessels appears minimal in this specific scenario, this is mainly due to the port capacity limiting any increased performance with the extra vessel. The all-year vessel availability provides a marginal increase in availability but due to the winter weather restrictions it can be see that there are a large number of blocked hours which would lead to significant impact on costs. Conducting any major maintenance in winter months will require innovative and robust offshore operations and even in the autumn months there is a risk that operations drift into the following year. This hilights that there will be significant pressure on vessel availability for summer months. In the next chapter marine operations sensitivity to weather windows will be investigated.

Find out more

Next chapter: Marine operations - Weather sensitivity