PO.ID 168

Offshore Installation Planner

Offshore Installation Planning, Tender Evaluation
Vessel sensitivity analysis, Optimisation of vessel combinations
Risk management & control

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Abstracts

A number of OWF developers have experienced significant additional costs as a result of unclear contractual specifications in relation to offshore installation performance requirements.

These costs have a direct effect on the total cost of energy.

Objectives

The impact of weather on the installation of offshore wind farms is of great importance

not only for planning purposes, but also for evaluation of Contractors during the tender process.

Early management of offshore installation activities is essential for controlling offshore wind project budgets and lowering costs of energy.

Long term consecutive time series data for significant wave height and wind speed are often available at an early stage in project development.

To combine the planning of installation activity with careful consideration of the weather conditions, a tool has been developed to simulate the potential number of installation cycles/working days with respect to the weather time series, and an infinite number of operations with individual input regarding duration, weather window and weather criteria.

Approach

The impact of weather on the Compared to the traditional approach based on weather windows, this newly developed approach provides a detailed picture of the potential number of installation cycles to be executed each month, with a specified degree of certainty (e.g. 80%).

The analysis is carried out according to the actual installation setup and actual year-to-year variation. In addition, the scenarios for individual activities and operations can be changed in the model set-up to account for their actual sensitivity to weather conditions.

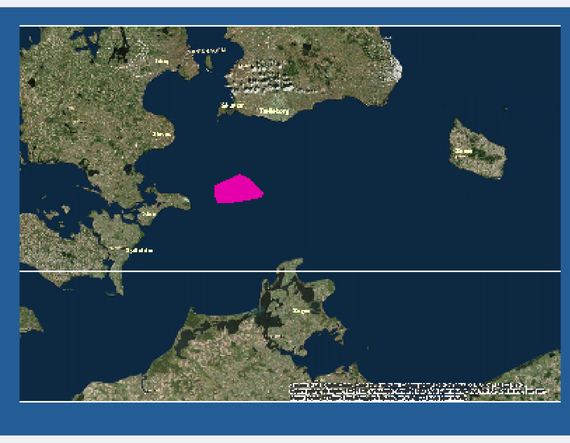
Methodology - Illustrated with a fictive case

Project Specification

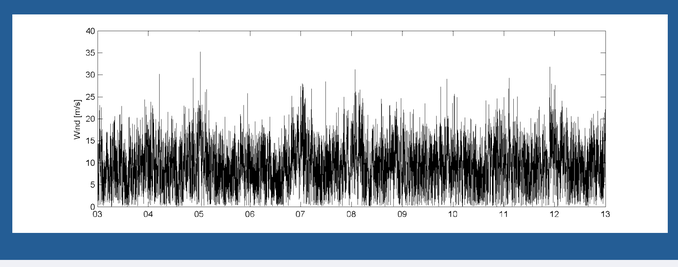
Kriegers Flak is located in the Baltic Sea with capacity for 600 MW corresponding to 75 8MW foundations assumed to be monopiles (MP/TP) installed

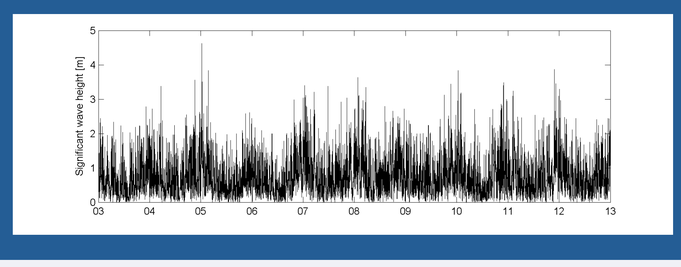
from May 1 to September 30 or
from October 1 to February 28

Distance to load out port 115km



Weather: 10 years conseqative time series of wind and waves





Setup 1: Jackup with room for 4 MP and TP

Installation activities and criteria per cycle

Loadout 4 x 3 hours for wind less than 12m/s
Transite to site 7kn or 9 hours for Hs<2.5m
Jackup preload 3 hours for Hs<1.75m
MP upending and piling 6 h for Hs<1.5m
TP installation, leveling and grout 5 h for Hs<1.5m
Cleaning and jack down 3 h for Hs<1.75m
Transite back to harbour 9 h for Hs<4m

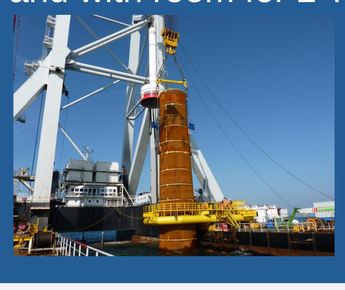
Survirval 5mHs 24 hours windows before and after

Setup 2: Floating crane to upend and with room for 2 TP

Installation activities and criteria per cycle:

Loadout 2 x 1.5 hours for wind less than 12m/s
Transite to site 5kn or 13 hours for Hs<=1.75m
Positioning 2 hours for Hs<1.5m
MP from tug to moonpool 1 h for Hs<=1.5ml
MP upending and piling 3 h for Hs<1.25m
TP installation, leveling and grout 5 h for Hs>1.0m
Leave position 1h for Hs<=1.5m
Transite back to harbour 13h for Hs<2.0m

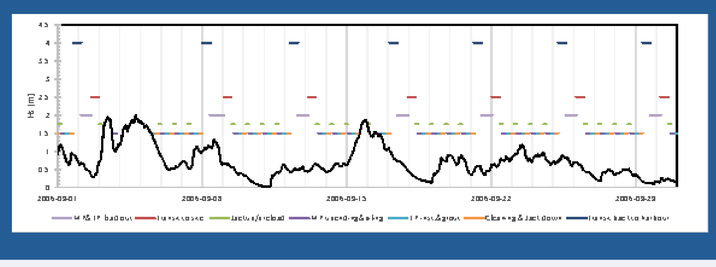
Survirval 2.5mHs 24 hours windows before and after



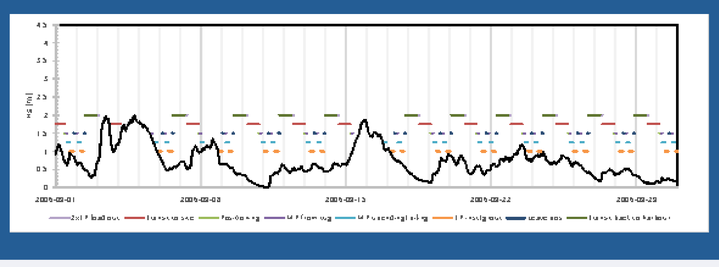
OIP

Offshore Installation Planner

Setup 1: Potential windows - Jackup



Setup 2: Potential windows - Floating Crane



Setup 1: Potential number of installations

Year															
Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Sum	P80%	P50%	P20%
1	22.4	23.4	18.6	26.4	17.5	18.2	25.5	24.5	27.3	22.4	226.3	19.2	22.5	25.6
2	24.2	27.6	20.8	26.0	16.8	22.3	24.0	25.5	19.4	25.4	226.3	20.6	23.4	25.0
3	30.0	25.7	27.1	26.9	23.0	23.8	28.0	30.0	23.8	29.2	271.4	25.5	27.0	29.4
4	25.1	26.1	26.9	29.1	28.8	26.3	28.0	29.1	27.1	26.7	273.0	26.2	27.0	28.7
5	30.0	28.2	30.0	29.0	29.3	29.9	27.7	26.2	30.9	27.0	288.9	27.6	29.1	30.0
6	26.4	26.2	29.0	30.0	26.2	27.2	25.2	28.1	29.1	28.1	275.5	26.2	27.8	29.0
7	31.0	28.2	30.0	30.0	28.2	30.0	30.0	30.0	27.0	31.0	293.2	28.2	30.0	30.2
8	27.0	30.0	30.0	29.0	29.1	27.9	30.0	28.0	26.2	30.0	288.2	27.7	29.2	30.0
9	29.0	22.2	29.0	26.9	26.0	25.5	25.2	22.3	26.2	26.0	267.2	24.2	26.0	27.3
10	24.2	24.5	28.0	29.7	28.1	25.1	26.4	25.6	24.0	28.0	260.6	24.7	25.6	28.0
11	27.2	28.6	26.3	24.4	24.4	17.8	21.2	20.7	26.3	26.2	222.4	21.1	24.4	26.2
12	23.4	22.7	26.1	19.2	22.4	26.0	27.1	25.2	16.1	22.4	210.3	21.5	23.4	26.0
1st date	2020-07-24	2020-07-28	2020-07-22	2020-07-22	2020-07-21	2020-07-24	2020-07-25	2020-07-26	2020-07-25	2020-07-23		2020-07-28	2020-07-25	2020-07-22
No days	25.0	22.4	23.6	23.2	23.8	24.7	23.0	26.8	23.8	23.8		23.7	23.6	23.7
P20% according to the above calculated number of days												27.8	25.6	23.7

1st date:	2020-07-27 2020-07-25 2020-07-23
Weather days:	6.2 3.8 3.0
Learning:	5.5 5.3 5.2

Setup 2: Potential number of installations

Year															
Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Sum	P80%	P50%	P20%
1	15.4	21.1	11.7	20.9	8.2	14.7	20.2	18.1	23.6	17.8	173.0	14.1	18.3	20.9
2	22.6	20.9	15.6	23.1	13.4	15.6	17.7	20.4	18.1	17.2	178.7	15.1	17.3	21.2
3	24.0	21.1	21.4	24.0	19.2	17.8	26.0	25.6	23.7	24.0	227.8	20.2	23.4	24.2
4	20.9	23.2	22.0	24.9	22.2	23.4	24.6	24.0	20.2	24.5	230.3	21.2	23.2	24.6
5	23.0	23.2	27.2	26.0	24.9	24.4	23.4	23.5	24.5	23.2	252.4	24.2	25.1	26.2
6	22.0	21.1	24.2	26.0	23.1	22.2	20.0	25.6	24.6	24.2	234.0	21.2	23.6	24.5
7	23.0	26.4	26.7	28.0	22.0	24.5	24.2	26.4	24.2	24.0	255.4	24.2	25.7	26.5
8	23.1	24.6	23.2	27.1	24.0	23.2	23.2	24.2	23.2	26.0	246.0	23.2	24.4	25.5
9	24.0	20.2	24.0	22.9	19.2	17.5	20.0	16.2	21.2	21.1	206.5	19.0	20.7	23.1
10	20.5	17.1	24.0	19.9	24.7	19.4	22.0	16.2	19.1	20.9	208.4	18.7	20.2	22.4
11	21.5	16.9	22.9	14.0	18.7	13.2	14.0	16.6	22.0	20.9	180.7	14.0	17.2	21.6
12	14.9	20.5	21.1	15.5	19.2	21.1	22.9	18.7	10.9	19.1	184.7	15.4	19.2	21.1
1st date	2020-08-08	2020-08-10	2020-08-02	2020-08-04	2020-08-13	2020-08-13	2020-08-15	2020-08-05	2020-08-10	2020-08-08		2020-08-12	2020-08-08	2020-08-08
No days	94.7	101.1	92.6	92.0	104.9	102.3	106.8	98.0	101.0	99.2		104.2	99.1	94.2
P20% according to the above calculated number of days												102.2	100.4	94.7

1st date:	2020-08-11 2020-08-08 2020-08-08
Weather days:	14.5 12.1 6.1
Learning:	6.4 6.2 5.9

Setup 1 & 2, Budget P20%, P50% & P80%

Setup	Day Rate	P80%	P50%	P20%	Season
	EUR	mEUR	mEUR	mEUR	
Jackup	220000	19.342	18.799	18.413	Summer, start May 1st
Crane	175000	17.966	17.678	16.524	
Jackup	220000	23.207	22.507	21.647	Winter, start October 1st
Crane	175000	24.046	23.271	22.287	

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