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Requirements and technology for Offshore Decommissioning Logistics

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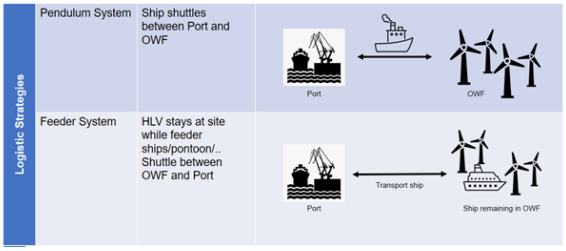
A report "Pre-Decommissioning Marine Operations of Offshore Wind Parks" has been issued. The conclusion of the study is that in the Pre-decommissioning phase, preparatory activities can be undertaken by deploying smaller and cheaper vessels equipped with remotely operated vehicle (ROV) to make the site ready for removal and decommissioning process. The document describes the operations required in the pre-decommissioning phase in an event-driven format.

The decommissioning process of offshore wind turbines (OWTs) can be divided into 3 different phases. The pre-decommissioning phase make the site ready for disassembly and removal of the offshore wind turbine components. While in the actual disassembly and removal phase, all components are removed. The post-decommissioning phase contains another analysis and assessment of the site to ensure that operations have been conducted according to agreed standards. It will also be controlled that there is no further impact on maritime environment and shipping. The sets of actions have been formulated throughout our studies in an event-driven format.



In parallel, a heavy load carrier vessel has been designed for a presumably optimzed transportation of wind turbine components from the site to port and vice versa. In addition to the LNG powered engines, the vessel is equipped with a solar system and a wind-assisted propulsion system. Due to an optimized arrangement of the main deck and of the lower decks, the ship is able to transport more components per trip. All these factors will have an impact on the overall project time, costs, and the CO_2 emission.

In addition to technical aspects, the work on a discrete event-driven logistical simulation for the off- and onshore supply chain has started. To make simulations as simple but realistic as possible, different parameters were discussed and defined which have a direct influence on reducing costs and CO2 emissions. Besides different logistical strategies, the study includes various dismantling strategies under the influence of weather, sea-state, distances etc. Similar to the construction of OWTs there are two main logistical strategies. On one hand the "pendulum-system" and on the other hand a so-called "feeder-system". The first strategy illustrates the deconstruction and transportation in the sense of shuttling between the Offshore Wind Farm and the port(s). While with the feeder-system, the dismantling vessels remain at site. The

dismantled components will be transferred to small cargo or heavy load carrier vessels, the so called feeder vessels, which shuttle between the port(s) and the OWF.

In regard to the dismantling processes, the possibilities of “One-Piece-“ or “Two-Piece-“Removal, the “Star Configuration-“, “Bunny Ear-“ and “Part-by-Part-“ Removal arise. While with the “Part-by-Part” – method, all components are disassembled individually, the “One-Piece-Configuration” describes the removal of a complete OWT including rotor, nacelle, tower, transition piece and foundation in one single operation. Similar to that the “Two-Piece-Removal” illustrates dismantling the whole top-structure (rotor, nacelle, tower) and the sub-structure[1] plus foundation together in two steps. Removing the complete rotor at first, followed by the nacelle, tower and substructure is known as the “Star Configuration”. Last but not least the “Bunny Ear-Configuration”. This setup contains dismantling one blade in the first operation and afterwards removing the remaining blade(s) together with the hub followed by the nacelle, tower and substructure.

As already mentioned, a simulation should be designed as simple but realistic as possible. To achieve this, we are dependent on the expertise of our project partners. In this context, two workshops have been held in the last three months with the Port of Oostende and the Port of Grenaa. There essential onshore processes and parameters were identified and defined.

Read the Report Here

[1]**Substructure:** Term referring to the part of the support structure for an offshore wind turbine which extends upwards from the seabed and connects the foundation and the tower. (Please refer to DNV-OSS-901)