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D7.10 Recommendations for platform design under considerations of O&M, logistics, manufacturing and decommissioning

The content of this deliverable relates to recommendations on floating substructure design. Findings are based on WP5 - industrialisation of floating wind turbine systems - as well as other WPs related to this topic and the presented results address different phases of the lifecycle.

First, emphasis is drawn on large scale manufacturing. Different logistics and transport systems are available at production sites. In order to optimise logistical processes, the floater design, existing transport and crane systems and their load carrying capacity, among other things, must be taken into consideration. SPMTs are recommended for transportation of large blocks within the shipyard due to their modularity. Cranes need sufficient lifting capacity and height to carry the different floater components. In order to reduce offshore operations, wind turbine assembly at or near the manufacturing facility is recommended. For large-scale manufacturing of steel floaters, the use of building shipyards instead of repair shipyards is beneficial. A detailed layout of the facility must be developed and available capacity in terms of the equipment, workspaces and manpower needs to be evaluated thoroughly. Pre-fabrication of (sub)blocks during fabrication, taking place at a separate site dedicated to handling the production of steel components, is highly recommended. The design must also be subdivided accordingly, and it is highly recommended to involve the manufacturer during the planning in order to consider best manufacturing practices and, eventually, incorporate design changes. Unlike the steel floater manufacturing, the methodology proposed for concrete floaters is more flexible in terms of site selection. Mobile concrete construction plants offer cost and time saving benefits. The use of pre-fabricated rebars instead of pre-cast concrete sub-blocks is also an option.

The installation procedure of a FOWT following manufacture generally consists of load-out, transit to site and hook-up to mooring lines and dynamic cable. To facilitate the installation process and minimize costs, three main logistical aspects have to be considered: vessel requirements, distance from port to site and weather impact. The weather majorly impacts the installation procedure due to sensitivities of required marine operations to wave height and wind speed. This impact increases for larger distances. It may therefore beneficial to invest in closer ports and upgrade its infrastructure. High investments must be compared to the alternatives including higher risks regarding weather forecast and higher vessel costs. Furthermore, the floater towing speed, draft and other requirements, mooring and dynamic cable hook-up procedures and other technical aspects greatly influence installation, particularly for TLPs.

Workability considerations for O&M are mainly driven by the dynamic behavior of a floater design and environmental conditions. The combination of wave height and period is more relevant than the magnitude of the wave height only. Floating structures in general show large amplitude motions with low response frequencies. An evaluation of the frequency response of these structures is advised in order to check if the response spectrum lies within the frequency range that corresponds to the provocation of nausea and discomfort, which possibly increases the downtime.

For floating wind substructures, only limited information about the decommissioning process is available. Generally, floating devices will be detached from the mooring lines and towed to the shore for further decommissioning. Mooring lines may be recovered while pile anchors remain in the sea bed. This is a clear advantage over fixed-bottom structures. The decommissioning can be done, after the floaters are towed back to the port followed by recycling or disposal of the employed materials like steel, concrete, synthetics, etc.