D6.1 – Risk Management for Deep Water Substructures

This report provides an overview of risk management for deep water floating wind turbine substructures. It includes a description of risk identification, analysis, evaluation and treatment process which can be applied to any floating wind substructure concept. The process utilises a number of standardised tools and references, including a risk register, risk impact and likelihood scales, and a risk matrix.

The methodology developed draws on good practice for risk assessment and risk management and is designed to be flexible enough to apply to different types of risk. This document deals with four categories of risk - technology risks, manufacturing risks, health, safety and environmental risks, and commercial risks. Each of these areas of risk is considered for all stages of the technology's lifecycle process - from design through to decommissioning. Although each of these types of risk has different dimensions or key indicators of risk to be measured, the principles of the risk assessment are the same for each. This is important as only the use of a consistent framework allows risks to be drawn together to form an understanding of overall risk.

- In the area of technology risk assessment, a functional composition analysis of floating wind technology has been used to develop a standard functional taxonomy. This taxonomy allows a structured review of specific concepts to identify the relative novelty of each functional element. Risk assessment is then focused on the novel elements of the technology.

- In health, safety and environmental (HSE) risk assessment, standard parts of the technology lifecycle have been set alongside standard types of HSE risk. These can be utilised to perform a structured assessment of HSE risks.

- In the area of manufacturing risk assessment, the concept of manufacturing readiness levels (MRLs) has been used to develop a structured framework for assessment of manufacturing risks (including socio-economic risks).

- To assess commercialisation risks, the concept of a commercial readiness index (CRI) has been employed to relate commercial and technology readiness levels (TRLs) and develop a structured approach to identifying and assessing commercialisation risks.

In the context of the LIFES50+, the methodology developed shall be used to produce deliverables 6.2 – 6.5 (*Risk assessment of the substructure*, *HAZID risk report for the specific HSE implications of the design*, *O&M risk register* and *Review of key commercial risks*). Additionally, the produced methodology will also form an integral part of deliverable 2.5 (*Global evaluation procedure including risks*) concerned with developing a truly representative levelised cost of energy tool that accounts for the risks associated with the uncertainties related to floating wind substructures.

Finally, whilst the methodology for risk assessment was developed for the purpose of assessing four different floating wind substructure designs of the LIFES50+ project, the process is applicable to other new floating wind substructure designs and, in theory, other floating substructures outside wind energy.