Challenge 1.3
—
Serial production

Integrated design process in supply chain	Medium-term	Medium priority

Description and scope

A floating wind power plant is constructed from components made by various suppliers. Each component is designed and manufactured according to some overall specifications, which ensure that it can connect into the system and function as intended together with the other components (for example the wind turbine is designed according to stated limits on the tolerable nacelle angles and accelerations and the floating platform is designed to obey these limits).

Currently each supplier optimises their individual part, within the limits set by the overall specifications. This results in a sub-optimal performance for the system as unforeseen interactions between components can lead to poor performance and even failures. A better and more reliable overall performance is achieved by considering the impacts of each local design change on the entire system, through an integrated design and analysis framework. This would remove unnecessary contingency at each step in the design process.

Research is needed to establish best practices for the integrated design and analysis of floating wind power plants. From a supply chain perspective, some sort of "glue code", or framework, is needed that can integrate supplier-specific models into a system-wide analysis, or workflow. Initial steps towards such a framework have been made (for instance the FUSED-Wind software, and the work of IEA Wind Task 37) and these should be bolstered by an expanded and sustained development effort, geared towards commercial deployment.

Recommended research actions

- Development of holistic models that can capture the dynamics of the entire system.
- Assessment of the mechanical path from atmosphere to aerodynamics to structures to moorings.
- Research into the electrical path from drivetrain to generator to cables to substation to grid, and the feedback controls at the turbine and plant levels.
- Incorporation of assembly and installation needs in the glue code of the supply chain. Designs should suit scalability and should be optimised for industrialisation.

Milestones

- Development of holistic models that can capture the dynamics of the entire system by 2022.