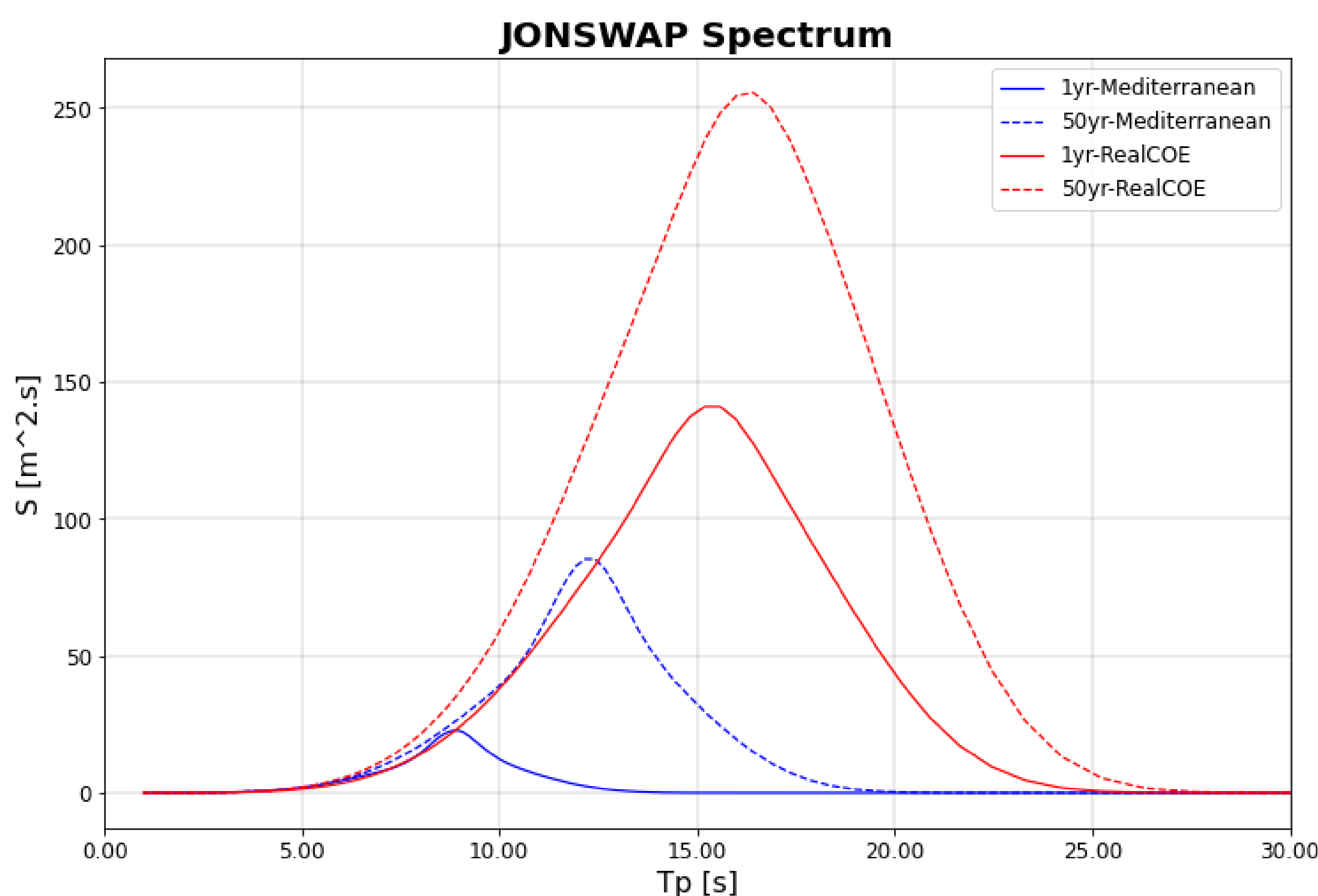


Impact of Environmental Conditions Variation



Extreme sea state spectrum comparison between ReaLCoE study and a Mediterranean metocean data.

Site Conditions Drive Floating Offshore Wind Turbine (FOWT) Design

The dimensions of floating offshore wind platforms and their mooring systems are dictated not only by the capacity and thrust loads of the turbines, but also by the environmental conditions at the site. In harsh metocean environments such as those in the south of Brittany – chosen site location for the ReaLCoE project – extreme sea states necessitate larger platform components and larger mooring systems components to ensure structural survival and adequate fatigue margins at the tower base and mooring components. Alternatively, deploying the same turbine size/capacity in milder regions such as the Mediterranean Sea allows for a significant reduction in platform size and mooring components size. This environmental sensitivity highlights the need to balance turbine specifications with local wave, wind and current profiles when optimizing a floating system to achieve a cost-effective and durable design.

Benefits of Milder Metocean Conditions on Platform Design

Milder environmental conditions enable significant structural optimization, such as reducing the platform's freeboard and lowering the total lightship weight. Less severe waves reduce structural fatigue, enabling structural engineers to reduce plate thickness and structural reinforcements. This directly translates into time and cost savings during the construction phase. Furthermore, the reduced risk of green water and wave slamming in less extreme sea states minimizes the need for secondary structure maintenance and replacement and maintenance of equipment mounted on the column tops. This leads to lower long-term operational and replacement costs.

Consequences of Harsher Metocean Conditions on Mooring Design

Due to the nonlinearity of mooring systems, more extreme waves can lead to a high increase in mooring line tension, requiring stronger and larger components. Mooring component sizes are already close to manufacturability limits, as such designing a mooring system may become very challenging. To fulfill strength requirements, extra mooring lines can be added, resulting in higher procurement and installation costs. More complex systems can also be designed but may be associated with higher risks and costs.

ReaLCoE's vision is to unleash the full potential of offshore wind energy
€35/MWh LCoE Goal, +12MW WEC Capacity, ~32 mio € Total Budget, 42 month project duration



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Further information about the ReaLCoE Programme can be found on our website: ReaLCoE.eu