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Developing the Next Generation 12+ MW Offshore Wind Turbine for Clean and Competitive Electricity

Unlocking Cost and Availability Benefits Through In-Situ Major Component Replacements

In Work Package 4 – "Optimization of operation, service and maintenance concepts", the project partners assessed the impact of a shortlist of innovations on the availability and operational expenditure (OPEX) of fixed-bottom and floating wind farms through operational scenario simulation. In Task 4.4, it was found that wind turbine (WTG) major component replacements (MCR) are the main OPEX contributor in floating wind farms.

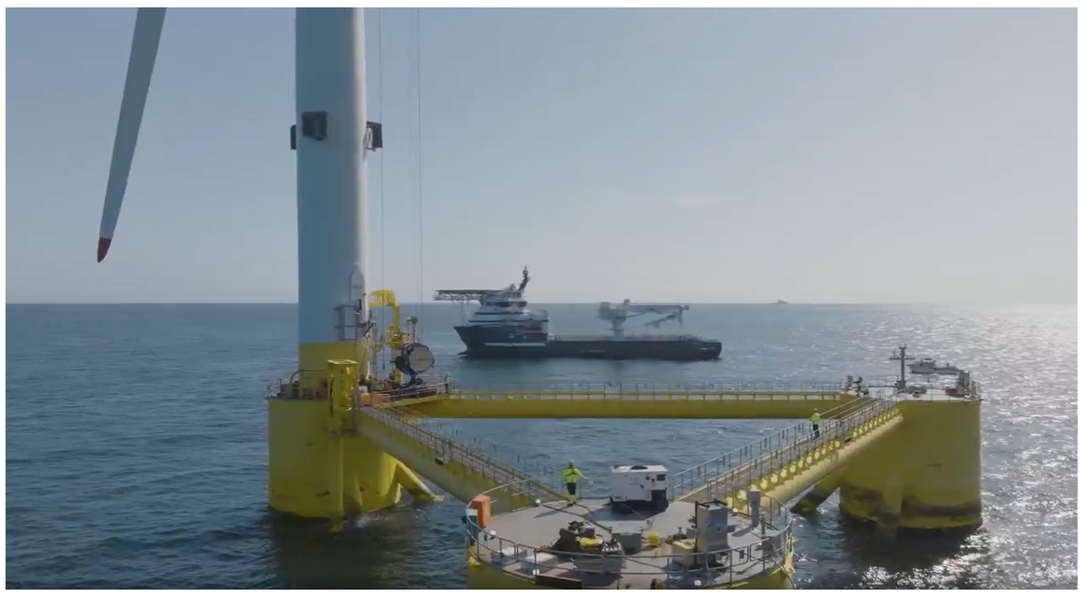
This fact sheet focuses on the floating wind case study which is based on a 600MW project, ~35km off the coast in the South Brittany region, in France.

The simulations were performed in UWiSE O&M Planner, a Monte Carlo simulation tool developed by TNO from 2017 onwards.

Reduced logistical challenges

In Task 4.4, a Baseline scenario assuming tow-to-port WTG MCR was compared with a scenario in which some of the WTG components, namely the transformer, could be replaced in-situ by a self-erecting crane. Pitch system, blades and drive train modules were still assumed to require a tow-to-port operation for repair or replacement.

Self-hoisting crane from Liftoff at Kincardine Offshore Wind Farm in 2024 (Credits: Cobra).



In-situ WTG major component replacement at Kincardine Offshore Wind Farm (Credits: Cobra).

Increased availability and revenues

The simulation results indicate that wind farm OPEX increases, however, energy-based availability improves, leading to higher overall revenues. The increase in OPEX is primarily driven by higher offshore logistics costs, whereas the reduction in revenue losses results from faster mobilization, which minimizes wind farm downtime.

Fine-tunning simulation models

In 2024, the first in-situ WTG MCR on a floating platform took place[2]. This WTG generator replacement was performed using LiftOff's GenHook™ techology on a WTG hosted in one of the five WindFloat platforms deployed in the Kincardine offshore wind farm.

As the industry matures and experiences first-of-a-kind operations, the simulation models, namely the cost, weather limits and actitivity duration inputs, should be fined-tuned to reflect the state-of-the-art.

Source

1. "Deliverable 4.4 Optimised O&M Calculator Tool" (Confidential)
2. "World's First In-Situ Major Component Exchange on Floating Wind Turbine Successfully Completed." LiftOff – Major Component Exchange, LiftOff, liftoff-mce.com/new/press-release/. Accessed 20 Jan. 2026.

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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