Low-cost offshore wind energy

An EU-funded project introduced novel strategies and state-of-the-art tools to reduce costs for offshore wind farm developments and increase its competitiveness.

Offshore wind is an important energy component that could contribute towards securing Europe’s commitments to climate change, energy security and a low-carbon economy. Continued cost reduction is highly necessary to maximise the potential of offshore wind resources and realise the socio-economic benefits of this fully industrialised and emerging sector.

Logistical integration and optimisations in the supply chain, installation, operation and maintenance are very likely to help achieve cost reduction targets. The primary objective of the EU-funded project LEANWIND was to develop technologies and strategies to help solve current and future industry issues and produce integrated tools for full life-cycle cost and logistical analysis.
The consortium led by the University College Cork spreads over 11 different countries and brings together experts from multiple sectors. These included oil and gas, maritime, shipping and offshore wind industries with representatives across the supply chain including developers, utilities, turbine suppliers, vessel owners, shipbuilding, classification societies and academics.

The need for lean

LEANWIND, as the name suggests, sought to leverage lean methodologies that have benefited other industries for decades. “Lean thinking’ refers to a dynamic, knowledge-driven process focused on the end user that an industry applies to eliminate wasteful stages and streamline processes. Ultimately, it is about creating value,” explains project manager Jimmy Murphy. Introducing the lean process in the offshore wind industry is a novel development in the field.

The consortium applied this new lean paradigm to each of the critical project stages: sub-structure and vessel design, wind farm logistics, operation and maintenance, and health and maintenance. The LEANWIND approach ensures that unnecessarily complex or wasteful stages of the development process are removed, flow between the required stages is streamlined, and quality is enhanced. The improved overall cost and time efficiency achieved will contribute to the industry sustaining its current cost competitiveness in more challenging operating environments. Properly applied, lean management will improve quality, reliability as well as health and safety standards across the project supply chain and throughout the wind farm lifecycle.

Innovative designs, tools and strategies

Moving into greater water depths with larger turbines represents the next big step for offshore wind power generation. The LEANWIND project sought to sustain cost and efficiency savings as the industry evolves into more extreme sites and larger turbines. The expected European installed offshore wind capacity is estimated to reach 23.5 GW by 2020.

Regarding installation and decommissioning, project partners developed novel foundations and vessels that improve efficiency and promote the use of lean processes. Having selected test sites that are representative of current and future farms, partners successfully developed substructures such as XL monopiles, jacket and gravity-based foundations for an 8-MW turbine and a floating concept for a 5-MW turbine. These lighter yet equally stable designs help reduce material costs and minimise the need for expensive heavy lift vessels.

In operations and maintenance, project developments included novel planning and day-to-day scheduling tools, risk-based maintenance strategies, condition-monitoring software and a remote presence device. Together, these can reduce the need to travel to wind farms, thereby minimising costs and risks. Furthermore, design of a new operation and maintenance vessel will facilitate personnel activities as farms moving even further from shore. Features included substantial personnel capacity and a motion-compensated gangway that allows access at wave heights up to 2.5 metres.
State-of-the-art logistics and financial models optimised efficiency across the lifecycle at each stage of the supply chain. The team rigorously tested and validated these models and used them to provide recommendations for potential cost savings on future wind farm sites.

Innovative LEANWIND solutions should help meet key industry needs and support continued success and cost reductions, particularly for the more extreme sites in the future. This will help to guarantee the competitiveness of offshore wind and ensure EU leadership in the renewable energy sector.

**Keywords**

LEANWIND, offshore wind, supply chain, operation and maintenance, cost reduction, lean principles

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