

Project: Optimising offshore wind farm collector networks

Key focus: cable layout optimisation, turbine placement, energy storage, lifetime cost reduction

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Background

Competition with other types of generation and within the industry itself provides an incentive for developers to build offshore wind farms (OWFs) with a low levelised cost of energy (LCOE) amongst other design factors. As such, there is a need for the designs of OWFs to be optimised as best as possible, reducing costs - both capital expenditure (CAPEX) and operational and maintenance expenditure (OPEX) - and maximising energy capture. The electrical infrastructure of an offshore wind farm is one of the largest single costs ranging from 10-30% of CAPEX, making it a good candidate for optimisation and cost reduction.

Project description

This research project looks into several stages of wind farm optimisation on electrical infrastructure including turbine placement (Figure 1), cable layout and selection (Figure 2) and energy storage sizing and placement (Figure 3).

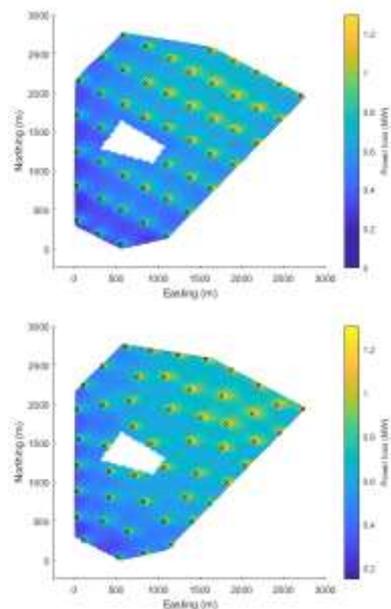


Figure 1 - Turbine placement

Energy storage can provide many services and benefits to the grid but an increasing area of interest is investigating if distributed offshore energy storage can provide benefits to wind farm owner/operators and asset owners. One hypothesis investigated in this project is the use of energy storage placed in the OWF to smooth the power generation and therefore reduce the required cable ratings. Secondary revenue streams and grid services may be possible alongside this mode of operation for further financial benefits.

Research outcomes/impact

At utility scale, small improvements in designs can lead to large increases in energy capture and reduced investment costs and electrical losses. These improvements must also compromise the effect on operational activities and OPEX such that the total lifetime cost is not increased. Considered holistically, wind farm designers and developers will be able to build cheaper and, more efficient wind farms with a more competitive LCOE. The planned project output is a practical optimisation tool that will be able to provide overall optimised wind farm designs.

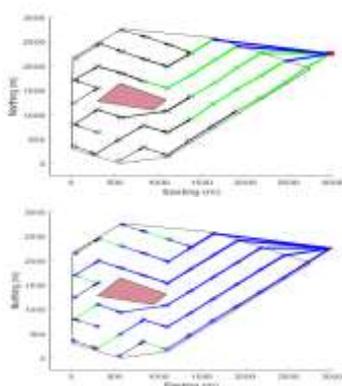


Figure 2 - Cable selection

Project Sponsorship:

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