PROJECT

Wind-12
Cable Routing Optimisation Tool

BUSINESS NEED

Improving the quality of solutions in offshore wind farm layout cable optimization, even for a small margin, leads to significant costs savings. However, finding optimality in cable layout problems with large number of turbines, requires excessive computational power memory and processing time, which may not be available to developers during the decision-making stage of a project.

PARTNERS INVOLVED

- SSE: John Cunningham
- SP: Simon Catmull

THE SOLUTION

This project developed a cable layout optimisation code based on a hybrid linear programming algorithm with decomposition strategies to allow for large number of turbines to be handled effectively. These strategies included graph theory algorithms and ant colony optimisation.

The optimization algorithm proved effective to find optimality in study cases up to 122 turbines using standard PCs where conventional solutions running in supercomputers could not. The developed code was provided as a module capable of integrating with the existing turbine layout optimisation tools developed in MATLAB by SSE. Additionally, an equivalent Python formulation of the code was developed for integration with Iberdrola/SPR's in-house Python tools.

BUSINESS BENEFITS

- Cable layout optimisation algorithm capable of handling large number of turbines in a standard PC.
- Modular code capable of integrating with existing MATLAB and Phyton-based turbine layout optimisation tools from SSE and SP.

"The optimisation of an inter-array cable layout reduces cable lengths, shortens installation time, and decreases electrical losses. It is an important opportunity to make a project more competitive in a CfD auction."

James Myers
Electrical Engineer – Offshore
SSE Renewables

NEXT STEP:

Optimal overplanting for offshore wind energy systems.