# Cable Routing Optimization for Floating Offshore Wind Farms Integrated with Offshore Oil and Gas Platforms Considering Wind Scenarios

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## Abstract

Floating offshore wind farms (FOWFs) are considered one of the fastest-growing types of renewable energy technologies and are superior to bottom-fixed offshore wind farms due to their low requirement of seabed conditions. The cost of dynamic submarine cables constitutes a significant proportion of the overall capital cost for FOWFs, making optimization of the cable connection layout a critical aspect of modern wind farm design. To this end, we propose a mixed-integer quadratic programming (MIQP) model that takes into account the impact of the wake effect in various wind scenarios. Our proposed objective is to minimize both the cost of cable investment and power losses.

In contrast to traditional FOWFs that require expensive offshore substations and high-voltage transmission cables, the FOWFs presented in this paper are designed to directly supply energy to independent power systems located on nearby offshore oil and gas platforms (OOGPs). We employ the Benders decomposition algorithm to solve our proposed MIQP model, with two valid inequalities introduced to accelerate convergence speed during the decomposition process. These valid inequalities are formulated based on technical/physical analysis and a greedy-based heuristic initialization. We demonstrate the validity and fast convergence speed of our approach through several FOWF case studies.

## Keywords:

Floating offshore wind farms; Cable connection layout; Power losses; Wake effect; Wind scenarios; Offshore oil and gas platforms

## Biography: