Optimizing wind farm cable routing considering power losses - DTU Orbit (22/10/2018)

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Wind energy is the fastest growing source of renewable energy, but as wind farms are getting larger and more remotely located, installation and infrastructure costs are rising. It is estimated that the expenses for electrical infrastructure account for 15-30% of the overall initial costs, hence it is important to optimize off-shore inter-array cable routing. The routing should connect all turbines to one (or more) off-shore sub-station(s) while respecting cable capacities, no-cross restrictions, connection-limits at the substation, and obstacles at the site. The objective is to minimize both the capital that must be spent immediately in cable and installation costs, and the future reduced revenues due to power losses. The latter goal has not been addressed in previous work. We present a Mixed-Integer Linear Programming approach to optimize the routing using both exact and math-heuristic methods. In the power losses computation, wind scenarios are handled efficiently as part of the preprocessing, resulting in a MIP model of only slightly larger size. A library of real-life instances is introduced and made publicly available for benchmarking. Computational results on this testbed show the viability of our methods, proving that savings in the order of millions of Euro can be achieved.

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