

# OPTIMISATION OF WIND FARMS

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According to the German government, the portion of renewable energies in electricity generation should rise from currently just over 30% to 40-45% in 2025 and 55-60% in 2035. With its latest amendment to the Renewable Energy Sources Act (EEG) from 2016, the Federal Government is emphasising its interest in reducing the costs of energy system transformation. In order to take account of the strong competition, the development costs of renewable technologies will inevitably have to be further reduced.



Wirbelschleppen in einem Offshore Windpark

The construction of a wind farm is preceded by many considerations. Roughly speaking, each wind turbine (WTG) produces a certain output. The more turbines are installed at one location the higher the installed capacity but the more turbines there are the higher the mutual shading (WAKE). The higher the shading the greater the energy loss and the greater the turbulence within the system. These turbulences lead to a natural oscillation of individual parts of the system. As a rule, a WTG is designed for a lifetime of 20-25 years. The higher the eigenmodes of vibration the shorter the life expectancy of the wind turbine. Actually, there is a complex interrelated issue: Which layout lasts the longest and generates the most energy? What can such a scenario look like? The more installed plants, the better? Or fewer systems but longer service life and less maintenance?

**Problem:** Develop a layout that maximizes the installed power while respecting load criteria. Consider for a given/your self-developed layout how the WAKE can be reduced. Can a throttling of individual wind turbines lead to an increase on the overall park level?