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Enhancement of Wind Farm Power Density by an Oblique Linear Configuration

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**Abstract:**

An optimum layout of turbines in a wind farm can be measured by a parameter called wind power density. This is essentially the power generated by the turbine per unit area. This paper attempts to demonstrate how the parameter could be increased by an oblique array configuration. In this numerical study, multiple helical Savonius turbines were used to compare the performances of different wind farm layout designs by using a finite element CFD solver. The optimum spacing between turbines was first determined for three turbine array configurations. It was then extended to a nine turbine array in V formation. Three wind farm configurations were considered namely all in clockwise (CW) or counterclockwise direction (CCW) and the other is a combination of CW and CCW direction. The wind power density for each configuration was then compared. The nine turbines arranged in V formation has improved its power density by 4 to 5 times when compared to nine isolated turbines in a wind farm.