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CFD Analysis of Rotating Two-Bladed Flatback Wind Turbine Rotor

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Abstract

The effects of modifying the inboard portion of the NREL Phase VI rotor using a thickened, flatback version of the S809 design airfoil are studied using a three-dimensional Reynolds-averaged Navier-Stokes method. A motivation for using such a thicker airfoil design coupled with a blunt trailing edge is to alleviate structural constraints while reducing blade weight and maintaining the power performance of the rotor. The calculated results for the baseline Phase VI rotor are benchmarked against wind tunnel results obtained at 10, 7, and 5 meters per second. The calculated results for the modified rotor are compared against those of the baseline rotor. The results of this study demonstrate that a thick, flatback blade profile is viable as a bridge to connect structural requirements with aerodynamic performance in designing future wind turbine rotors.