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Adjoint Airfoil Optimization of Darrieus-Type Vertical Axis Wind Turbine ROMAN FUCHS, HENRIK NORDBORG, HSR University of Applied Sciences, Rapperswil — We present the feasibility of using an adjoint solver to optimize the torque of a Darrieus-type vertical axis wind turbine (VAWT). We start with a 2D cross section of a symmetrical airfoil and restrict us to low solidity ratios to minimize blade vortex interactions. The adjoint solver of the ANSYS FLUENT software package computes the sensitivities of airfoil surface forces based on a steady flow field. Hence, we find the torque of a full revolution using a weighted average of the sensitivities at different wind speeds and angles of attack. The weights are computed analytically, and the range of angles of attack is given by the tip speed ratio. Then the airfoil geometry is evolved, and the proposed methodology is evaluated by transient simulations.

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