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SDBD Plasma Actuator and Geometric Optimization for Optimal Flow Control of Wind Turbine Blades THOMAS CORKE, THEODORE WILLIAMS, ALEKSANDAR JEMCOV, JOHN COONEY, University of Notre Dame — A Quantitative Design Optimization approach for active flow control using SDBD plasma actuators is presented. The approach couples passive geometric changes and plasma actuator design to produce a "compliant flow" that maximizes control authority. Aerodynamic shape optimization tools employed in this study make use of the adjoint formulation of the Navier-Stokes equations for incompressible flows. These are solved to obtain shape derivatives that are used in a gradient optimization procedure to produce aerodynamic shapes that are flow-control compliant. Coupling of compliant geometries and flow control devices are able to provide dynamic lift control to wind turbine blades. The effect of the plasma actuator is included as a body force distribution in the flow governing equations. The optimization seeks designs that effectively utilize a SDBD plasma actuator and are aerodynamically compliant to realize increased energy production on wind turbine blades.

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