Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Drag reduction in large wind turbines through riblets: evaluation of different geometries ROGER ARNDT, LEONARDO CHAMORRO, FOTIS SOTIROPOULOS, University of Minnesota — Achieving skin friction drag reduction by use of riblets has been a topic of intensive research throughout the last several decades. The majority of the effort on this topic has been based on both numerical (mainly DNS) and experimental (wind tunnel and fluid channel) approaches. Yet, despite these valuable endeavors, the fundamental mechanisms that induce the drag reduction are still not well established. In this study, wind tunnel experiments were performed to quantify the drag reduction for a wind turbine airfoil caused by different V-grooved riblet configurations. A full-scale 2.5MW Clipper wind turbine airfoil section (of 1 meter chord length, typical of the 88% blade span) was placed in the freestream flow of the wind tunnel at the Saint Anthony Falls Laboratory, University of Minnesota. The drag forces the airfoil experienced were measured for different riblet configurations and at different angles of attack, all with a constant Reynolds number of Re=2.2 millions (based on the airfoil chord length). Layouts of both complete and partial airfoil coverage, of riblets, were considered in the study. Force sensors were used to measure Lift and Drag but more accurate Drag forces were obtained through wake surveys using a pitot static probe. The measurements will be used to help develop and test the performance of near-wall boundary conditions in the context of RANS and hybrid RANS/LES models.

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Date submitted: 05 Aug 2011 Electronic form version 1.4