KEYNOTE LECTURE

AN OVERVIEW OF NUMERICAL SIMULATION FOR WIND TURBINE AERODYNAMICS

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ABSTRACT

Modeling of wind turbine aerodynamics deals with the prediction of performance of individual turbines as well as wind farms, based on characterization of flows and forces, as well as the design of airfoils and rotor-blade geometries. Such simulation involves modeling flows across a large bandwidth of length scales ranging from a few millimeters for airfoils to tens of meters for a wind farm. CFD on high performance computing clusters has become an integral design tool in these efforts to characterize the aerodynamic behavior to varying degrees of fidelity. In this lecture, the design objectives for the various components of the wind turbine and the state of the art modeling techniques being used by the wind industry and academia to model flows across different length scales are discussed and their limitations will be explored.