Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

An overset curvilinear/immersed boundary framework for high resolution simulations of wind and hydrokinetic turbine flows[1] IMAN BORAZJANI, SURESH BEHARA, GANESH NATARAJAN, FOTIS SOTIROPOULOS, St. Anthony Falls Lab, University of Minnesota — We generalize the curvilinear/immersed boundary method to incorporate overset grids to enable the simulation of more complicated geometries and increase grid resolution locally near complex immersed boundary. The new method has been applied to carry out high resolution simulations of wind and hydrokinetic turbine rotors. An interior fine mesh contains the rotor blades and is embedded within a coarser background mesh. The rotor blades can be treated either as immersed boundaries or using curvilinear, boundary-conforming overset grids. The numerical methodology has been generalized to include both inertial and non-inertial frame formulations. The method is validated by applying it to simulate the flow for the NREL wind turbine rotor for various turbine operating points. Inviscid, unsteady RANS and LES simulations are carried out and compared with experimental data. Preliminary results will also be presented for the hydrokinetic turbine rotor installed at the Roosevelt Island Tidal Energy project in New York City.

[1]This research is supported by XCEL Energy RDF Grant RD3-42 and DOE's Advanced Water Power Projects program grant DE-FG36-08GO18168 and the Minnesota Supercomputing Institute.

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Date submitted: 05 Aug 2009 Electronic form version 1.4