

Abstract Submitted  
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**Design and analysis of small wind turbine blades with wakes similar to those of industrial scale turbines**<sup>1</sup> ARASH HASSANZADEH, JONATHAN NAUGHTON, University of Wyoming — A new design approach has been developed for wind turbine blades to be used in wind tunnel experiments that study wind turbine wakes. The approach allows wakes of small scale (2 m diameter) wind turbine rotors to simulate the important physics of wakes generated by a “parent” industrial scale wind turbine rotor despite the difference in size. The design approach forces the normalized normal and tangential force distributions of the small scale wind turbine blades to match those of the “parent” industrial scale wind turbine blades. The wake arises from the interaction between the flow and the blade, which imparts a momentum deficit and rotation to the flow due to the forces created by the blade on the flow. In addition, the wake dynamics and stability are affected by the load distribution across the blade. Thus, it is expected that matching normalized force distributions should result in similar wake structure. To independently assess the blades designed using this approach, the “parent” industrial scale and small scale wind turbine rotors are modeled using a free vortex wake method to study the generation and evolution of the two wakes.

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