

University of Notre Dame
Strategic Academic Planning Committee
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Proposal Cover Sheet

Proposal Type: Full Grant XXX Seed Grant

Proposal Title: CENTER FOR ENHANCED WIND ENERGY DESIGN



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Participants:

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1 Abstract

We propose to establish a national “Center for Enhanced Wind Energy Design” (eWiND) that is aimed at making significant improvements in wind energy systems that are needed to meet the growing demand for clean sustainable energy. This follows the U.S. Department of Energy goal for 20% Wind Energy by 2030. The mission of the laboratory will be to seek optimum designs and operation of next-generation wind energy systems that account for the important interplay between business, technology and human factors. This will address enhanced energy capture, significant changes in power storage and transmission, “smart grids” to level surges, market flexibility, policy development, and environmental regulation for wind turbine siting. It will also stress design diversity that will range from large multi-megawatt wind farms, to urban micro-generators. This process will identify knowledge gaps where additional research is needed, and as a result, drive the national research agenda for wind energy. To address the multi-disciplinary challenges, we have assembled a diverse team of faculty from the Colleges of Engineering, Science and Arts and Letters, and the Schools of Law and Architecture. They bring expertise in the areas of aerodynamics, acoustics, computational fluid dynamics, atmospheric turbulence, wind engineering, design optimization, active flow control, power storage, industrial design, energy efficient architecture, energy sustainability, business practices, and environmental law. In addition, a group of Industry Partners made up of providers and end-users of wind energy technology, will be formed to help frame the important issues. Promising new technology will be demonstrated on two specially instrumented research wind turbines we propose to locate in White Field. These facilities will be a central focus for pre-college, undergraduate and graduate student projects, and act as a laboratory for new wind energy courses. The graduate and undergraduate students involved with this program will be exposed to research problems with a new perspective - as part of a whole interdisciplinary design team - where they see the whole system as well as the cutting-edge components that make up specific research projects. Technology transition will be exploited through an extensive network of programs for entrepreneurial development at the University of Notre Dame, that include the new ESTEEM Masters program, the Innovation Park technology incubator, and a number of state and privately funded venture capital groups that work closely with the university. One such group has already requested an exclusive license to eWiND technology that could significantly accelerate its commercialization. The Center will initially focus on four test bed demonstrations consisting of “Enhanced Capture Turbines” and “Minimum Cost Turbines” that will involve radical new rotor designs that incorporate active flow control from inception, and two large multi-disciplinary systems involving an “Optimal Regional Wind Grid” and an “Optimum Wind-powered Community,” with the former significantly impacting wind utility usage and cost, and the latter being highly relevant to poorer developing parts of the world.