



U.S. Department of Energy

Energy Efficiency and Renewable Energy

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Wind Energy Program Technology Portfolio



Low Wind Speed Technology Phase II: Reducing Cost of Energy through Rotor Aerodynamics Control

Global Energy Concepts, LLC

Project Description: The WindPACT Rotor Study evaluated a wide range of wind turbine configurations and their impact on overall cost of energy (COE). These studies assumed baseline approaches consistent with current designs that use tapered twisted blades and collective pitch actuation for aerodynamic control. A wide range of other technologies can modify rotor aerodynamics and geometry, and may reduce COE. This study explores two major technologies:

- Devices or methods that can be used to actively alter the local aerodynamic properties of the rotor blade. These devices would typically have response times about the same as, or faster than, a full-span, variable-pitch system. Reduced systems loads, increased energy capture, or some combination of these may reduce COE.
- An actively controlled variable-diameter rotor. Its primary advantage is increased energy capture; the engineering challenge is to mitigate cost increases caused by increased loading and added mechanical systems.

The goals of this project are to:

- Develop detailed performance and loads for active aerodynamic and geometry control parameters at a rating consistent with the current market for utility-scale turbines.
- Incorporate the most current technology in controls, materials, and mechanisms.
- Identify technical barriers to achieving Low Wind Speed Technology Project COE targets, and suggest ways to surmount these barriers.

Researchers and turbine designers can use the results with COE models to determine how much such systems could add to the cost of a wind turbine without increasing the COE, and determine how much a proposed approach is likely to reduce the COE.

Project Type: Conceptual Design Study
Total Project Budget: \$199,678
Industry Cost Share: \$0
DOE Cost Share: \$199,678
Planned Project Duration: August 2004–March 2006

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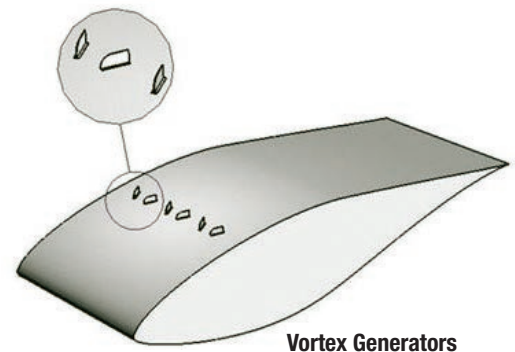
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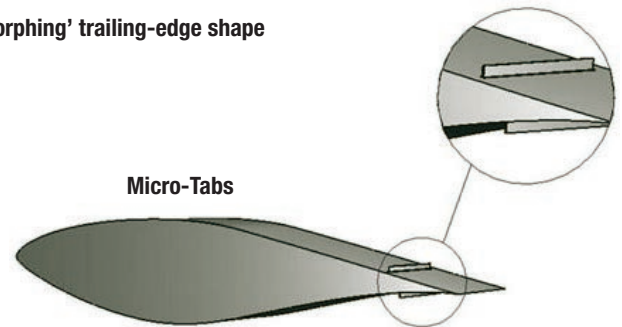
Current Status: Project Underway



Vortex Generators



'Morphing' trailing-edge shape



Micro-Tabs

Candidate devices for active aerodynamic control.

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