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Wind Energy Program Technology Portfolio

Low Wind Speed Technology Phase I: Prototype Multi-Megawatt Low Wind Speed Turbine

General Electric Wind Energy, LLC

Project Description: Parametric design studies conducted by the U.S. Department of Energy, the National Renewable Energy Laboratory, and their subcontractors show that advanced wind turbine architectures offer significant cost of energy reductions relative to current technologies. Cost of energy improvements could be realized concurrently along three separate avenues:

- Reduce costs and increase efficiencies with advanced turbine components.
- Place turbines on innovative tall towers to partially negate atmospheric shear layer effects and augment energy capture.
- Enhance energy capture via larger rotor diameters and innovative rotor configurations.

These parametric studies indicate that several techniques can be combined to make these improvements. Many, such as decreasing drivetrain weight to make taller towers more cost effective and introducing novel rotor designs that decrease loads and allow larger rotor diameters, are interrelated. Emerging control strategies, coupled with increased instrumentation, can help to cost-effectively integrate these major elements.

Within this context, GE Wind Energy is developing an advanced prototype turbine to significantly reduce energy costs in low wind speed environments. This effort will pursue an evolutionary path that benefits from technology demonstrations of hybrid composite blades and advanced controls at the multimegawatt level. This subcontract also will erect and test a substantially larger turbine to characterize advanced technology. The focus will be to develop advanced technologies; however, it will also exploit the economic advantages of value engineering turbine architectures at the multimegawatt level. To mitigate the risks of more ambitious technology concepts, parallel efforts will seek the limits to which blade and drivetrain designs can be pushed within the constraints of the baseline hardware. Preliminary targets for advanced technology development include a tower taller than 100 meters, a drivetrain in the multimegawatt class, and a rotor that exceeds 100 meters in diameter. Overall, this balanced development approach will deliver advanced technologies integrated into a prototype turbine that can significantly lower commercial energy costs, as well as technology adaptations that are suitable for decreasing the machine cost of energy.

Concept illustration of a GE multi-megawatt low wind speed turbine.

Project Type: Prototype Development
Total Project Budget: $18,867,498
Industry Cost Share: $10,774,968
DOE Cost Share: $8,092,530
Planned Project Duration: March 2004–February 2008

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Current Status: Project Underway

DOE/GO-102006-2196
March 2006