SAND 2000-0478
Unlimited Release
Printed March 2000

The Use of Carbon Fibers in Wind Turbine Blade Design: a SERI-8 Blade Example

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Sandia Contract: BE-6196

Abstract

The benefit of introducing carbon fibers in a wind turbine blade was evaluated. The SERI-8 wind turbine blade was used as a baseline for study. A model of the blade strength and stiffness properties was created using the 3D_Beam code; the predicted geometry and structural properties were validated against available data and static test results. Different enhanced models, which represent different volumes of carbon fibers in the blade, were also studied for two design options: with and without bend-twist coupling. Our studies indicate that hybrid blades have excellent structural properties compared to the all-glass SERI-8 blade. Recurring fabrication costs were also included in the study. The cost study highlights the importance of the labor-cost to material-cost ratio in the cost benefits and penalties of fabrication of a hybrid glass and carbon blade.