

# THE SANDIA 100-METER ALL-GLASS BASELINE WIND TURBINE BLADE: SNL100-00

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## Abstract

Sandia National Laboratories (SNL) Wind Energy Technologies Department, as part of its ongoing R&D efforts, creates and evaluates innovative large blade concepts for horizontal axis wind turbines to promote designs that are more efficient aerodynamically, structurally, and economically. Recent work has focused on the development of a 100-meter blade for a 13.2 MW horizontal axis wind turbine, a blade which is significantly longer than the largest commercial blades of today (approximately 60 meters long). This report documents the development of the Sandia 100-m All-glass Baseline Wind Turbine Blade, which employs conventional architecture and fiberglass-only composite material reinforcement. Follow-on studies for this baseline will include a variety of innovations targeting reductions in weight and improvements in structural and aerodynamic performance.

The report begins with a review of several large utility-grade machines (3-6 MW). Available 5 MW turbine models (with 61.5 meter blades) are identified and described. Geometric scaling of these models is performed to produce aeroelastic turbine models with 100-meter blades, which are analyzed to demonstrate the important effects of scale for large blades. Based on these preliminary analyses, we proceed to develop the Sandia 100-m all-glass baseline blade model. A detailed composite layup and geometry are provided. Analyses of the baseline model for design loads from international standards are presented to demonstrate acceptance of the design with respect to strength, fatigue, deflection, and buckling. In future work, it is envisioned that this model will provide a starting point for consideration of blade innovations with potential performance and cost improvements and will be targeted toward the offshore environment.