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Analysis of a Composite Blade Design for the AOC 15/50 Wind Turbine Using a Finite Element Model

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Abstract

A fiberglass blade was designed for the Atlantic Orient Corporation (AOC) 15/50 wind turbine through the use of finite element (FE) modeling techniques. In this initial design phase, the goals were: 1) make the blade as stiff as the previously designed laminated wood blade, 2) minimize resonant operating conditions, 3) design the blade to withstand extreme wind conditions, and 4) make the blade compatible with reasonable manufacturing techniques. The modeling assumptions used are discussed and the final results, for this initial design phase, are presented. Based on the FE model, the designed blade will be able to withstand extreme wind conditions through elastic deformation, and resonant operating conditions will be minimized.

This document is an overview of the design and manufacturing synthesis data of composite wind turbine blades for applications to the Sandia National Laboratories' NuMAD wind turbine blade design tool.