

D. W. Lobitz and P. S. Veers, "Aeroelastic Behaviour of Twisted-Coupled HAWT Blades," Proceedings of the 1998 ASME Wind Energy Symposium, January 1998.

AEROELASTIC BEHAVIOR OF TWIST-COUPLED HAWT BLADES

Don W. Lobitz and Paul S. Veers

Sandia National Laboratories
Albuquerque, New Mexico 87185-0439

ABSTRACT¹

As the technology for HAWT development matures, more novel techniques are required for the capture of additional amounts of energy, alleviation of loads and control of the rotor. One such technique employs the use of an adaptive blade that could sense the wind velocity or rotational speed in some fashion and accordingly modify its aerodynamic configuration to meet a desired objective. This could be achieved in either an active or passive manner, although the passive approach is much more attractive due to its simplicity and economy. As an example, a blade design might employ coupling between bending and/or extension, and twisting so that, as it bends and extends due to the action of the aerodynamic and inertial loads, it also twists modifying the aerodynamic performance in some way. These performance modifications also have associated aeroelastic effects, including effects on aeroelastic instability. These aeroelastic effects are the topic of this paper. To address the scope and magnitude of these effects a tool has been developed for investigating classical flutter and divergence of HAWT blades. As a starting point, an adaptive version of the uniform Combined Experiment Blade will be investigated. Flutter and divergence airspeeds will be reported as a function of the strength of the coupling, and also be compared to those of generic blade counterparts.

¹ This work was supported by the United States Department of Energy, Sandia National Laboratories under Contract DE-AC04-94AL85000.