



Certificate

Germanischer Lloyd
WindEnergie GmbH

GL Wind Certificate No. ZZ 001A-2005

This Certificate attests that the Computer Codes

FAST and ADAMS® incl. AeroDyn Module

developed / extended by **NREL**
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401-3393
USA

have been evaluated by Germanischer Lloyd WindEnergie GmbH (GL Wind).

The programs FAST version 5.1 of NREL and ADAMS® 2003 of MSC.Software (NREL adapted ADAMS® for modeling HAWTs by linking it with AeroDyn module version 12.57) have been used in a comparative analysis for two different wind turbines. The calculated loads were compared with those from analyses using GL Wind's own aeroelastic code DHAT V19.

Comparison of results was carried out for a number of defined load cases, both extreme and fatigue, for the wind turbine types

- UAE turbine, two-bladed rotor, 10 m rotor diameter, 11 kW rated power, stall controlled
- WindPACT 1.5, three-bladed rotor, 70 m rotor diameter, 1.5 MW rated power, pitch controlled, variable speed

and show good agreement. The results have been documented in GL Wind Evaluation Report No. 72042, "Design Codes FAST and ADAMS for Load Calculations of Onshore Wind Turbines", dated May 26, 2005.

Considering the results it can be stated that the codes have been evaluated for the above mentioned wind turbines and can be considered as suitable programs for the calculation of onshore wind turbine loads for design and certification.

Hamburg, June 6, 2005
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Germanischer Lloyd
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i.V. A. Andrea

By DAP German Accreditation System for Testing
accredited Certification Body for products
The accreditation is valid for the fields of certification
listed in the certificate



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