



Certificate

Germanischer Lloyd
WindEnergie GmbH

GL-Wind Certificate No.: ZZ 001A-2003

This Certificate attests that the Computer Code

GH BLADED

developed by **Garrad Hassan and Partners Ltd.**
St. Vincent's Works
Silverthorne Lane
Bristol BS 2 0QD
England

has been tested by Germanischer Lloyd WindEnergie GmbH (GL-Wind) since September 1997.

The program GH Bladed, version 3.41a, has been installed on a Pentium 4 PC, 2 GHz under WINDOWS XP. The program has been used in comparative analyses within the certification of different wind turbines. The calculated loads were compared with those from analysis using GL-Wind's own set of aeroelastic programs.

Comparison of results was carried out for

- a 600 kW-class wind turbine with active stall
- a 600 kW-class wind turbine with active pitch
- a 800 kW-class wind turbine with variable speed, stall controlled
- a 1,0 MW-class wind turbine with constant speed, stall controlled
- a 1,5 MW-class wind turbine with variable speed, pitch controlled
- a 2,0 MW-class wind turbine with variable speed, pitch controlled
- a 2,5 MW-class wind turbine with variable speed, pitch controlled

and showed good agreement.

Considering the results it can be stated that the program has been validated for the a.m. wind turbine classes and can be considered a suitable program for the calculation of both onshore and offshore wind turbine loads for design and certification.

Hamburg, 6th February 2003
An/Blun

Germanischer Lloyd
WindEnergie GmbH


ppa. Dr. G. Wacker


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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