AALBORG UNIVERSITY

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Abstract: For the last 5-10 years, design analysis using probabilistic methods has been used in special applications, e.g. offshore platforms and bridges. Experience from these applications can be used in developing a probabilistic design basis for wind turbines.

However, on two main points the wind turbine is quite different from the typical civil engineering structures mentioned above.

1. Most civil engineering structures are one-of-a-kind productions, whereas wind turbines are series productions.
2. Wind turbines can be considered as a machine where the control system influences the magnitude of the loads.

The first difference should allow for a more refined reliability assessment and a larger cost reduction even by small decreases in the safety factors. The second difference makes the determination of the loads more complex because the influence of the control system and its reliability must be taken into account.

The main objective of the project is to clear the path for probabilistic design. This is reached through two major aims.

1. Formulating and exploring the basic probabilistic models that will make design of wind turbines directly on probabilistic basis possible.
2. To explore the optimal safety level for wind turbines.

The probabilistic design approach and the optimal safety level will be important in designing wind turbines such that an optimal balance between material consumptions and expected consequences of failure can be determined. The benefit of this optimal balance will be a cost reduction.

Supervisor: Professor John Dalsgaard Sørensen

Opponents: Associate Professor Poul Henning Kirkegaard, Aalborg Univeersity, Head of Department Peter Hauge Madsen, Risø-DTU, and Senior Researcher Peter Friis Hansen, Det Norske Veritas.

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