DEPARTMENT OF ENERGY TECHNOLOGY
AALBORG UNIVERSITY

PhD Public Defence

Title: Design Tool for Wind Turbine Generators – Direct Drive
(Proposed Solutions for Direct Drive Darreius Generators)

Location: Pontoppidanstræde 101, Room 23

Time: Tuesday 1 July 2014 at 13.00

PhD defendant: Krisztina Monika Leban

Supervisor: Associate Professor Ewen Ritchie

Moderator: Associate Professor Peter Omand Rasmussen

Opponents: Associate Professor Kaiyuan Lu, Dept. of Energy Technology, AAU (chairman)
Professor Maria Imecs, Technical University of Cluj□Napoca, Romania
Professor Torbjörn Thiringer, Chalmers Technical University, Göteborg, Sweden

All are welcome. The defence will be in English.

After the public defence there will be an informal reception in Pontoppidanstræde 101 room 25/27.

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Abstract:

The current work offers a comparison of the proposed machine geometries for 5MW generator candidates with the prospective of up scaling to 20MW.

As a first step, a set of suitable Designs several suitable machine types for the 5MW design were investigated.

A comparison of the selected machine types in view of up-scaling to 20 MW was performed. As an example fitness criterion, the use of active materials for the generators was considered. Based on this, suggestions for 20 MW generators were made. The results are discussed and future work, directions and suggestions for potential improvement were listed.

The main aim of the work is to construct a flexible tool that enables testing of different ideas and concepts regarding the generator design, not to obtain a specific design of the machine.
The design is obtained analytically at first; then visualised in 3D CAD and evaluated in FEM. An optimisation patch is available for improving the design. The tool is destined for engineers that are involved in the design of wind turbine systems.

The visualisation of the design in work is important for the overall assessment of the machine concept. The tool provides facilities for reporting on a shaped design: list of geometrical and electromagnetic quantities, pictures of the machine itself (3D particular drawing); FEM electromagnetic profile, dynamic simulation model results and characteristic curves.

The structure of the design tool is modular and independent so that new machine types and geometries can be designed by reusing recombining and altering the different calculation modules. The design algorithm is transparent as logging of location and comments is used throughout the program. The purpose of this is to enable further development of the design tool by several contributors.

The tool was validated by both software and laboratory tests on a prototype and by comparing results with literature reporting of similar machines.