Methodology for testing subcomponents; background and motivation for subcomponent testing of wind turbine rotor blades - DTU Orbit (16/12/2018)

Methodology for testing subcomponents; background and motivation for subcomponent testing of wind turbine rotor blades

This report aims to provide an overview of the design methodology followed by wind turbine blade structural designers, along with the testing procedure on full scale blades which are followed by testing laboratories for blade manufacturers as required by the relevant standards and certification bodies' recommendations for design and manufacturing verification. The objective of the report is not to criticize the design methodology or testing procedure and the standards thereof followed in the wind energy community, but to identify those items offered by state of the art structural design tools that cannot be verified through the currently followed testing procedures and recommend ways to overcome these limitations. The work is performed within Work-Package WP7.1 entitled "Improved and validated wind turbine structural reliability - Efficient blade structure" of the IRPWIN programme. The numerical investigations performed are based on the INNWIND.EU reference 10MW horizontal axis wind turbine [1]. The structural properties and material and layout definition used within IRPWIN are defined in the INNWIND.EU report [2]. The layout of the report includes a review of the structural analysis models used for blade design, highlighting the current state of the art. The review of the full-scale blade testing procedure is performed under Section 3, followed by the discussion on the issues of verification of design and manufacture performed through testing. Finally, methodologies for testing blade subcomponents and/or blade parts are described in 5. The present report is complemented by all details of the comparison of blade test loads against design loads on the reference blade, as provided in Annex 1. These data will facilitate direct comparisons in fine points of interest along the reference blade for the load cases considered. The recommendations of this report are relevant for the design and testing of wind turbine subcomponents, in order to verify the numerical analysis tools used in the structural design of wind turbine blades.

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