New Guidelines for the Certification of Offshore Wind Turbines

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ABSTRACT

The offshore wind energy market is developing fast. Turbines, substations and offshore sites are increasing in size and they are in more challenging environments. Therefore, the industry requires vigilance in maintaining standards to keep pace with technology developments, enabling safe deployment and long term operation. Certification of wind farms, wind turbines and their components is state-of-the-art and a must in most places around the world. It helps to attract investors, satisfy insurers and to bring offshore project development on the next level. Furthermore assessment to harmonised regulations is an active support of export and eases market entries. Accompanied by certification of training systems or maintenance services it provides comprehensive backup for the whole project. Therefore it is important to know the certification processes and guidelines as well as the keystones of their development for all parties involved in a project lifecycle.

This paper puts focus on the latest guideline developments for GL 2012 and describes the outcome and latest innovations of GL Renewables Certification (GL RC) and its wind and marine energy committee for certification of offshore wind turbines and projects. Issues like load assumptions, floating wind turbines and risk based approval are some of them. A comparison to existing requirements is given and the benefits of Type and Project Certification for manufacturers, banks and insurances making use of the different certification schemes as well as guidelines will be described. The modules and procedures to obtain Type and Project Certificates are shown in detail.

The new guideline follows the main developments in offshore wind industry. One is the increase in size of turbines and the mitigation of loads using advanced, “intelligent”, control systems which sometimes are complex and thus prone to errors. As a consequence examination and testing of control systems is part of the guideline. Another issue is that turbines are installed in waters where the first generation monopile solutions are not feasible any more. New structures like jackets are used in big numbers putting additional challenges to the structure and foundation design. In the guidelines novel analysis methods are required e.g. for piles under cyclic axial loading considering the high frequency of tension cyclic loads typical for wind turbines. Finally floating wind turbines are planned for installation at several parts of the world, imposing new challenges e.g. regarding stability and mooring safety requirements. These are well known in offshore oil and gas industry but have to be adapted to consider the unmanned type of structure and the installation of the wind turbines in big numbers in farms.

Finally technical notes, accompanying the guidelines, for specific items as grouted connections are addressed. In the past grouted connections of wind turbines have shown several problems. Proposals for new analysis requirements allowing safe grouted connections for wind turbines shall be discussed in more detail in near future.

KEY WORDS: Offshore wind turbines, guidelines, type certification, project certification, design assessment

INTRODUCTION

The procedures to obtain Type and Project Certificates are described on the basis of GL 2012: Guideline for the Certification of Offshore Wind Turbines, Edition 2012 (GL, 2012).

Type Certification comprises Design Assessment, Implementation of the design-related requirements in Production and Erection, Evaluation of Quality Management and Prototype Testing. Project Certification is based on Type Certification and covers the aspects of Site Design Conditions, Site-specific Design Assessment, Surveillance during Production, Transport and Erection as well as Witnessing of Commissioning and Periodic Monitoring. The individual modules are concluded with Statements of Compliance. Certificates are issued upon the successful completion of the relevant modules.

The most important part of the Type Certification is the assessment of the design documentation (specifications, drawings, verifications, test reports, etc.), a thorough design review with respect to the requirements defined in the a.m. guideline and other codes and standards. It is generally carried out in two sequential steps. The first part covers all aspects of the safety and control concept as well as the load assumptions and load calculations.

During the second part of the Design Assessment all components of the system are being examined. At the end of the Design Assessment manuals and procedures for transport, erection, start-up, commissioning, operation and maintenance are checked for suitability, completeness and compliance with the assumptions in the design