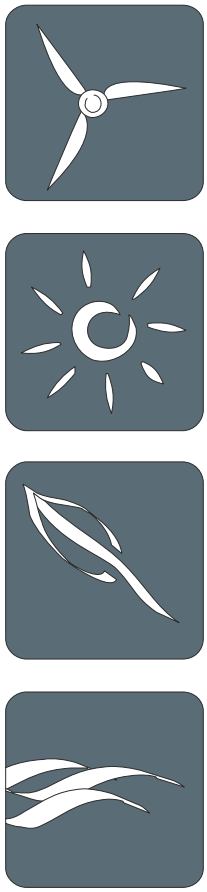
Technical Guidelines
for Power Generating Units



Part 8:
Certification of the Electrical Characteristics of Power Generating Units and Systems in the Medium-, High- and Highest-voltage Grids

Revision 2
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Certification of the Electrical Characteristics of Power Generating Units and Systems in the Medium-, High- and Highest-voltage Grids

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The following parts are available:

	Part 1	Determination of Noise Emission Values
	Part 2	Determination of Power Curves and Standardised Energy Yields
	Part 3	Determination of the Electrical Characteristics of Power Generating Units in the MV, HV and HiV Grid
	Part 4	Demands on Modelling and Validating Simulation Models of the Electrical Characteristics of Power Generating Units and Systems
	Part 5	Determination and Application of Reference Yield
	Part 6	Determination of Wind Potential and Energy Yields

	Part 7	Maintenance of Wind Farms
	Part 8	Certification of the Electrical Characteristics of Power Generating Units and Systems in the Medium, High and Highest-voltage Grids

Foreword

The preparation of these Technical Guidelines for Wind Turbines (also known, since 1998, as FGW Guidelines) began in 1992 with the objective of presenting measuring methods allowing determination of reliable and comparable data for wind turbines (WTs) based on state-of-the-art technology. The measurements from these three fields - power curve, noise emissions and electrical characteristics - should serve as the foundation for assessment of WTs, e.g. in permit issues, when assessing grid connection options or for reliable yield calculations.

In the meantime, the individual Technical Guidelines and the test reports compiled by independent measuring institutes are widely recognised in their fields. Power curves form the basis for purchase agreements and finance commitments, measured noise emission values are adopted both for sales contracts and in the course of approval procedures. Measurements of electrical characteristics in accordance with this Technical Guideline are required by the transmission system operators for the purpose of calculations with regard to connections to their grids.

The demands on power generating units and systems are formalised with the publication of the BDEW medium voltage guideline (Technical Guideline: Generation Systems in the Medium-voltage Grid) in June 2008. The medium voltage guideline is aimed at any type of generating unit, i.e. including photovoltaic systems or cogeneration plant, beside wind turbines. The conformity verifications for the generating units and systems must be provided in the shape of unit or system certificates.

The BDEW medium voltage guideline also represents a basis for the demands placed on the electrical characteristics of wind turbines with a connection to the medium-voltage grid introduced by statutory ordinance (System Services Ordinance – *SDL*WindV – draft dated 02.03.2009; Source: http://www.erneuerbare-energien.de/inhalt/43342/) in the course of the revision of the Renewable Energy Sources Act (*EEG*) dated 01.01.2009. The System Services Ordinance refers to the Transmission Code 2007 for the corresponding demands in terms of the high- and highest-voltage levels and defines a number of specifications. These demands resulting from the *EEG* generally apply to all new systems. In addition, the ordinance introduces a verification procedure for operating wind turbines, which can lead to the payment of what is called the system services bonus even for these previously operating systems.

This Guideline aims to provide common ground between manufacturers, system and grid operators, testing institutes and certification agencies and a coordinated framework for the corresponding inspection and/or certification procedures and specifications.

Compilation of these guidelines

The contents of the Technical Guidelines are the responsibility of the respective technical committees and working groups. The following bodies were involved in the compilation of this Guideline by the working groups: Independent measuring institutes, emission protection agencies of the Federal Republic of Germany, manufacturers of power generating units (PGUs) and their components, grid operators, institutes and universities, engineering consultancies, Forum Netztechnik/Netzbetrieb im VDE (FNN), and Fördergesellschaft Windenergie e.V. (FGW).

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1 Introduction

Representatives of the following groups were involved in the compilation of this FGW Guideline, Part 8: Certification of the Electrical Properties of Power Generating Units and Systems in the Medium-, High- and Highest-voltage Grids (TG8):

grid operators;

manufacturers of power generating units and their components;

recognised institutes and universities;

certifications agencies of power generating units and their components.

All parties involved have expressed the desire that this Guideline should be viewed as a common working basis for answering questions concerning the certification of the electrical characteristics of PGUs and PGS'.

The aim of this Guideline is to improve application of the regulations issued by the grid operators, in particular the guideline for the connection and parallel operation of generation systems in the BDEW medium-voltage grid /1/ (hereafter referred to as the "BDEW Medium-voltage Guideline) and the unit and system certificates required therein by issuing a uniform implementation regulation for certification procedures, their areas of application and for determining measurement results as well as for validation of PGU models and the simulation of system performance and by introducing a standardised formal treatment of these certification procedures. In addition, the Guideline aims to provide a common basis for the verification procedures with regard to the electrical characteristics for connecting these systems to the medium-, high- and highest-voltage grids and for remuneration of the system services bonus for previously operating systems in accordance with Section 6 No. 2 and Section 29(2) Sentence 4 of the Renewable Energy Sources Act (*EEG*), as demanded in the Wind Turbine System Services Ordinance (System Services Ordinance – SDLWindV) /2/.