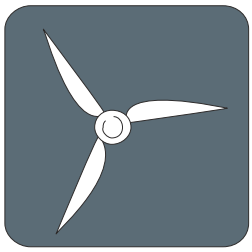
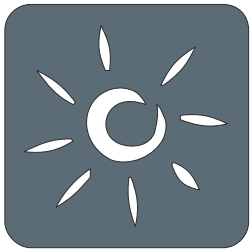
Technical Guidelines

for Power Generating Units

Part 3

Determination of
electrical characteristics of
power generating units connected to
MV, HV and EHV grids





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Determination of electrical characteristics of power generating units connected to medium voltage, high voltage and extra-high 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 MV, HV and EHV grids

Part 4 Requirements for modelling and validation of 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 properties of power generating units and systems in MV, HV and EHV grids.

Foreword

The preparation of the Technical Guidelines for Wind Turbines (also known as FGW Guidelines since 1998) began in 1992 with the objective of outlining measurement methods for the 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 gaining permission for wind farm projects, in assessing grid connection options or to enable the reliable calculation of energy-yield.

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

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, environmental 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)*.

Measurements and their recognition

Measurements in accordance with the Technical Guidelines can be carried out by any qualified measuring institute. A test report covering the measurements must be compiled; the principal results can be summarised in an extract of the test report applying the specifications provided in this guideline (FGW master data sheet).

It should be noted that, over and above the specifications described in these Technical Guidelines, the agency requested to recognise the measurements may place further demands on the measuring institute. PGU measurement certifiers operating in accordance with EN ISO/IEC 17025, for example, require a measuring institute to be accredited.

FGW conformity

Independent measuring institutes can emphasise the quality of their work by the use of a conformity seal. The seal is applied at the bottom of the test report (or extract of the test report). After supplying a proof of certain quality characteristics, independent measuring institutes can apply for an entitlement to use the conformity seal. These quality characteristics are published on the FGW website.

Content

1 Introduction

Representatives of the following groups participated in the compilation of the Technical Guideline for Power Generating Units (PGUs), Part 3 (TG3):

grid operators;

manufacturers of PGUs and their components;

recognised institutes and universities;

certifiers.

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

This Technical Guideline is based on IEC 61400-21 /3/. This standard addresses the determination of the electrical characteristics of WTs.

Standardised determination of measurement results and the uniform formal treatment thereof will allow improved application of the rules and 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/ (hereinafter referred to as the “BDEW medium-voltage guideline”).

Grid operators assume that only test reports which conform to FGW specifications (see Foreword and specimen test report in Part 3, Annex B) apply with regard to the assessment of the grid connection of PGUs.

The FGW keeps a list in which “Extracts of the Test Report” for measuring electrical characteristics of PGUs are recorded. Manufacturer's entries are voluntary. The list is updated twice yearly and distributed to interested parties. If no measurements are available, the electrical characteristics can be estimated by a recognised measuring institute. This estimate must be compiled on the basis of the “Extracts from the Test Report”. The estimate can only be carried out for prototypes and pilot series and may be entered into the list of “Extracts from the Test Report”.