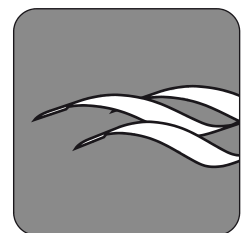
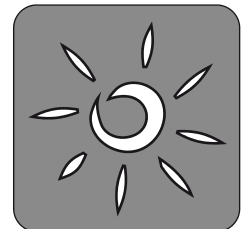
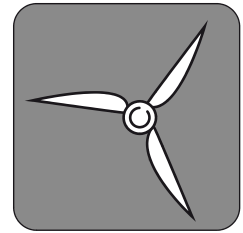


# Technical Guidelines

## for Wind Turbines

PART 10 (TG 10)  
**Determination of Site Quality after  
Commissioning**

Revision 2  
Dated 31/03/2021



**FGW**  
Published by:  
FGW e.V.  
Fördergesellschaft Windenergie  
und andere Dezentrale Energien

# Determination of Site Quality after Commissioning

Dated 31/03/2021

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In the interest of easier legibility, a gender-neutral differentiation is not used here. Any gender-specific terminology always refers to all genders.

**The following parts of the FGW Technical Guidelines 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 and Systems, Storage Systems as well as for their Components in Medium-, High- and Extra-High Voltage Grids
- Part 4:** Demands on Modelling and Validating Simulation Models of the Electrical Characteristics of Power Generating Units and Systems, Storage Systems as well as their Components
- Part 5:** Determination and Application of Reference Yield
- Part 6:** Determination of Wind Potential and Energy Yields
- Part 7:** Operation and Maintenance of Power Plants for Renewable Energy
  - Category A:** Miscellaneous section
  - Category A1:** Plant responsibility
  - Category B3:** Specialist Application Notes for Monitoring and Testing Foundations and Supporting Structures for Wind Turbines
  - Category D2:** State Event Cause Code for Power Generating Units (Zustands-Ereignis-Ursachen-Schlüssel, ZEUS)
  - Category D3:** Global Service Protocol (GSP)
  - Category D3 – Attachment A:** XML Schema Documentation
- Part 8:** Certification of the Electrical Characteristics of Power Generating Units, Systems and Storage Systems as well as their Components on the Grid
- Part 9:** Determination of High Frequency Emissions from Renewable Power Generating Units
- Part 10:** Determination of Site Quality after Commissioning

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## Foreword

For onshore wind energy, the EEG 2017 amended the reference yield method in addition to introducing tenders. With the switch from two-stage to single-stage reference yield method, the concept of site yield is also being redefined. The FGW has developed guidelines for determining the site yield of wind turbines (WT) in line with this new definition. These specifications relate on the one hand to determining the site yield before commissioning and on the other hand to determining the site yield after commissioning, which is necessary for the verification of the site quality, and they are to be applied to all wind turbines that are remunerated via the new, single-stage reference yield method. These Guidelines describe the procedure for verifying site quality after commissioning. According to the EEG 2017, this verification must be carried out after five, ten and fifteen years.

The procedure developed by the FGW is based on the requirements of the EEG 2017 and is intended to be implemented in guidelines. These Guidelines are based on the specifications in Annex 2 of the EEG 2017.

Revision 2 of these Guidelines was prepared by the Expert Committee Operating Data & Site Yield. Changes compared to Revision 1 relate to the requirements and framework conditions of validation of assignment lists according to Chapter 3.4.

These guidelines are an English translation of a prior german version. In any case of distinction between both revisions of TG 10 the german version is valid.

# Contents

<b>Abbreviations used .....</b>	<b>iv</b>
<b>Symbols and units .....</b>	<b>v</b>
<b>Terms and definitions .....</b>	<b>vi</b>
<b>1 Legal requirements.....</b>	<b>1</b>
1.1 Change of the definition of site yield in the EEG .....	1
1.2 Operation data to be maintained .....	1
1.3 Determination of site yield following commissioning .....	2
<b>2 Data retention and duties of the operator.....</b>	<b>3</b>
<b>3 Categorisation of status messages .....</b>	<b>5</b>
3.1 Relevant energy quantities for determining site yield .....	5
3.2 Categorisation of operating conditions within the meaning of EEG 2017.....	6
<b>3.2.1</b> Intended operation.....	8
<b>3.2.2</b> Restrictions for reasons related to licenses and/or permits .....	8
<b>3.2.3</b> Restrictions or unavailable for other reasons .....	10
<b>3.2.4</b> Restrictions due to feed-in management .....	11
<b>3.2.5</b> Restrictions due to optimised marketing.....	11
3.3 Data gaps .....	11
3.4 Validation of assignment lists.....	12
<b>3.4.1</b> Authorisation and requirements .....	12
<b>3.4.2</b> Validity .....	12
<b>3.4.3</b> Scope .....	12
<b>3.4.4</b> Process .....	13
<b>3.4.5</b> Documentation .....	14
<b>3.4.6</b> Exception .....	15
<b>4 Calculation of time-based availability.....</b>	<b>16</b>
4.1 Preparation of the 10-minute time series .....	16
4.2 Handling and application of the status message assignment.....	17
<b>4.2.1</b> Handling of validated, ambiguous status messages .....	17
<b>4.2.2</b> Handling of unvalidated status messages .....	17
<b>4.2.3</b> Creation of project-specific assignment lists .....	18
<b>4.2.4</b> Handling of project-specific improperly assigned status messages .....	18
4.3 Transfer of the EEG categories to the 10-minute data .....	18
4.4 Plausibility check of the data used .....	19
4.5 Calculation of time-based availability.....	20
<b>5 Determination of turbine-specific energy quantities .....</b>	<b>21</b>

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5.1	Completion of the power data .....	22
5.2	Reconciliation of turbine meter and transfer point data .....	22
5.3	Correction of losses between turbine meter and transfer station .....	23
5.4	Determination of turbine-specific feed-in management and direct marketing measures .....	24
<b>6</b>	<b>Determination of site yield .....</b>	<b>25</b>
6.1	In case a time-based availability of 98% or more is determined.....	26
6.2	In case a time-based availability between 97% and 98% is determined.....	26
6.3	In case of time-based availability of less than 97% .....	26
<b>6.3.1</b>	Derivation of a consistent wind time series .....	27
<b>6.3.2</b>	Determination of power curves to be applied.....	28
<b>6.3.3</b>	Determination of target power values.....	30
<b>6.3.4</b>	Determination of the fictitious energy quantities.....	30
<b>7</b>	<b>Writing a report under TG 10.....</b>	<b>31</b>
7.1	Determination of site quality.....	31
7.2	Prerequisites for the calculations .....	31
<b>8</b>	<b>Report format .....</b>	<b>32</b>
8.1	Formal report specifications.....	32
8.2	Minimum information on the data basis .....	32
8.3	Documentation of the results .....	32
8.4	Excerpt from the report for the principal (template).....	33
	<b>Contents - Annexes.....</b>	<b>34</b>
Annex A	Self-declaration for data backup.....	35
Annex B	Certificate for submission to the grid operator.....	36
Annex C	Definition of the term “availability” in accordance with EEG 2017 (for information purposes).....	37
Annex D	Certificate of conformity .....	43
	<b>Bibliography .....</b>	<b>45</b>

## Abbreviations used

BImSchG	Federal Immission Control Act ( <i>Bundesimmissionsschutzgesetz</i> )
DIBt	Deutsches Institut für Bautechnik
DIN	Deutsches Institut für Normung e.V. (German Institute for Standardisation)
EEG	German Renewable Energy Sources Act ( <i>Erneuerbare-Energien-Gesetz</i> )
FGW e. V.	FGW e.V. - Fördergesellschaft Windenergie und andere Dezentrale Energien
IEC	International Electrotechnical Commission
NTF	Nacelle Transfer Function
REV	Reference yield method
SCADA	Supervisory Control and Data Acquisition
SG	Site quality (quality factor in EEG 2017)
TA-Lärm	Technical Instructions on Noise Abatement ( <i>Technische Anleitung zum Schutz gegen Lärm</i> )
TG	Technical Guidelines
WT	Wind turbine(s)

## Symbols and units

Symbol	Meaning	Unit
$a_{Share\ Epro,WTi}$	Proportion of energy yield produced by the wind turbine according to 10-minute data from WT <sub>i</sub> in the wind farm	
$E_{Failure,WTi}$	Energy loss of WT <sub>i</sub> in the wind farm caused by unavailability	kWh
$E_{Feed-inMan,farm}$	Energy quantities not generated by feed-in management according to grid operator's accounts for the entire wind farm, billed via a common metering system	kWh
$E_{Feed-inMan,WZi}$	Energy quantities of WT <sub>i</sub> not generated by feed-in management in the wind farm	kWh
$E_{OM,farm}$	Energy quantities not generated by optimised marketing according to the direct marketer's accounts for the entire wind farm, billed via a common metering system	kWh
$E_{OM,WTi}$	Energy quantities of WT <sub>i</sub> not generated by optimised marketing in the WT <sub>i</sub> in the wind farm	kWh
$E_{Pro,WTi}$	Produced energy yield according to time-integrated power values of the 10-minute data for WT <sub>i</sub> in the wind farm	kWh
$E_{Prod\_scal,WTi}$	Scaled energy yield according to time-integrated power values of the 10-minute data for WT <sub>i</sub> in the wind farm	kWh
$E_{Meter,farm}$	Produced energy yield according to the grid operator's accounts for the entire wind farm, which is billed via a common metering system	kWh
$P$	Power of WT	kW
$P_{10min,WTi}$	Power values of WT <sub>i</sub> of the 10-minute data (SCADA data)	
$P_{10min\_scal,WTi}$	Power values of WT <sub>i</sub> of the 10-minute data (SCADA data) scaled using $SF_{Park}$	
$P_{Rated}$	Rated power of WT	kW
$R$	Published reference yield (with the reference site conditions according to EEG 2017) determined in accordance with TG 5 for the WT type and hub height under assessment	kWh
$SE_{y,WTi}$	Site yield ("Standortertrag") of the WT <sub>i</sub> in the wind farm after y years of operation	kWh
$SF_{Farm}$	Scaling factor	
$SG_{y,WTi}$	Site quality ("Standortgüte") of the WT <sub>i</sub> in the wind farm after y years of operation	%
$t_{Cat\ k}$	Total duration within the evaluation period in which EEG category k (0, 1, 2, 3 or 4) applies	s
$V_{t,WTi}$	Time-based availability ("Verfügbarkeit") of the WT <sub>i</sub> in the wind farm based on EEG categorisation	%
$v$	Wind speed	m/s
$y$	Last year of operation which the evaluation period refers to. Determination of site quality after y years. (y = 5 years; y = 10 years; y = 15 years)	



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## Terms and definitions

**10-minute data:** The following Guidelines use the term "10-minute data" for the averaging period, however, it is not intended to define 10 minutes as the only possible averaging period. Generally, the averaging interval of the SCADA system can be transferred if it is in the range of five to fifteen minutes. In contrast to the event/status log, these 10-minute data are a time series with continuous time stamps.

**Application of status message assignments:** Application of the relevant status message assignment, in order to assign the status messages available to the categories in accordance with Chapter 3.

**Assignment validation:** Successful validation of the categorisation and assignment of status messages in accordance with Chapter 3.4 and preparation of a certificate of conformity (in TG10 Rev. 0 referred to as certification of assignment lists).

**Authorised person:** A person approved by the FGW Advisory Board "EEG Categorisation" to issued certificates of conformity.

**Certificate of conformity:** Assignment list published by FGW for which the assignment of EEG categories (Chapter 3) to operating states was proven by means of an assignment validation.

**Commissioning:** Definition in accordance with Section 3 No. 30 EEG 2017 [1]: "[...] the first putting into operation of the installation following the establishment of its technical readiness for operation [...]; the technical readiness for operation presupposes that the installation has been installed firmly at the place envisaged for permanent operations and is permanently furnished with the necessary equipment for the generation of alternating current; the replacement of the generator or of other technical or structural parts following initial commissioning shall not alter the time of commissioning".

**Energy meter:** Value of the system-internal recording of the energy supply (e.g. meter installation or software calculation based on current, voltage, time).

**Evaluation period:** The evaluation period is 60 months. The first evaluation period ( $y = 5$ ) starts upon commissioning of the WT. The second evaluation period ( $y = 10$ ) starts at the end of the first evaluation period, and the third evaluation period ( $y = 15$ ) starts at the end of the second evaluation period.

**Event/Status log:** Automatically generated log of all system events, showing the start and end time of each event.

**Fictitious quantity of electricity:** The term "fictitious quantity of electricity" is defined in EEG 2017 Annex 2 No. 7.2 [1] and describes the lost energy quantities that the system operator could have fed in. The term "energy quantity" is preferred in the following Guidelines.

**Operating condition information:** Information in the 10-minute data extending beyond the status message, which can add to or replace the status information under the conditions described in Chapter 4.3.

**Power curve set:** Day and night power curves of a WT belonging together (day from 6 a.m. to 10 p.m. according to TA Lärm [2])

**Status message:** Entry in the event/status log

**Status message assignment:** An assignment of status messages to the categories defined in Chapter 3.

**Target power:** Potential power that the WT would have produced based on prevailing wind conditions and its current power performance.

**Test laboratory:** An institution accredited in accordance with DIN EN ISO/IEC 17025 to determine the site quality after commissioning in accordance with FGW TG 10.

**Unvalidated status messages:** Status messages the assignment of which to the categories in Chapter 3 is not subject to a conformity assessment.

**Validated assignment list:** Assignment list of all status messages in the categories under Chapter 3 incl. exceptions under Chapter 4.3, for which a certificate of conformity exists.