



NSAI
Standards

Irish Standard Recommendation
S.R. CLC/TS 61400-26-2:2017

Wind turbines - Part 26-2: Production-based availability for wind turbines

S.R. CLC/TS 61400-26-2:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

CLC/TS 61400-26-2:2017

Published:

2017-09-01

This document was published under the authority of the NSAI and comes into effect on:

2017-09-19

ICS number:

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeán Náisiúnta na hÉireann

National Foreword

S.R. CLC/TS 61400-26-2:2017 is the adopted Irish version of the European Document CLC/TS 61400-26-2:2017, Wind turbines - Part 26-2: Production-based availability for wind turbines

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CLC/TS 61400-26-2

September 2017

ICS 27.180

English Version

Wind turbines -
Part 26-2: Production-based availability
for wind turbines
(IEC/TS 61400-26-2:2014)

Éoliennes -
Partie 26-2: Disponibilité fondée sur la production
pour les éoliennes
(IEC/TS 61400-26-2:2014)

Windenergieanlagen -
Teil 26-2: Erzeugungsbasierte Verfügbarkeit
von Windenergieanlagen
(IEC/TS 61400-26-2:2014)

This Technical Specification was approved by CENELEC on 2017-07-17.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

CLC/TS 61400-26-2:2017

European foreword

This document (CLC/TS 61400-26-2:2017) consists of the text of IEC/TS 61400-26-2:2014 prepared by IEC/TC 88 "Wind energy generation systems".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC/TS 61400-26-2:2014 was approved by CENELEC as a Technical Specification without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61400-1:2005	NOTE	Harmonized as EN 61400-1:2005 (not modified).
IEC 61400-12-1:2005	NOTE	Harmonized as EN 61400-12-1:2006 (not modified).
IEC 61400-12-2:2013	NOTE	Harmonized as EN 61400-12-2:2013 (not modified).
IEC 61400-25-1:2006	NOTE	Harmonized as EN 61400-25-1:2007 (not modified).
IEC 61400-25-2:2006	NOTE	Harmonized as EN 61400-25-2:2007 (not modified).
IEC 61400-25-3:2006	NOTE	Harmonized as EN 61400-25-3:2007 (not modified).
IEC 61400-25-4:2008	NOTE	Harmonized as EN 61400-25-4:2008 (not modified).
IEC 61400-25-5:2006	NOTE	Harmonized as EN 61400-25-5:2007 (not modified).
IEC 61400-25-6:2010	NOTE	Harmonized as EN 61400-25-6:2011 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	series	International Electrotechnical Vocabulary	-	-
IEC/TS 61400-26-1	2011	Wind turbines - Part 26-1: Time-based availability for wind turbine generating systems	CLC/TS 61400-26-1	2017

This page is intentionally left blank



IEC TS 61400-26-2

Edition 1.0 2014-06

TECHNICAL SPECIFICATION



**Wind turbines –
Part 26-2: Production-based availability for wind turbines**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.



IEC TS 61400-26-2

Edition 1.0 2014-06

TECHNICAL SPECIFICATION



**Wind turbines –
Part 26-2: Production-based availability for wind turbines**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE



ICS 27.180

ISBN 978-2-8322-1618-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviations	8
3.1 Terms and definitions.....	8
3.2 Abbreviations.....	9
3.2.1 Information available	9
3.2.2 Information unavailable.....	11
4 Information model.....	12
4.1 General.....	12
4.2 Allocation of production terms to the information categories.....	14
4.3 Mean-value based information	15
4.4 Limitations	15
4.5 Entry and exit points	15
4.6 Information category priority	16
Annex A (informative) Possible methods for the determination of potential energy production.....	17
A.1 General.....	17
A.2 Specific power curve and velocities methods	17
A.2.1 General	17
A.2.2 Nacelle anemometer wind measurement with power curve	17
A.2.3 Upstream wind measurement with power curve	18
A.2.4 Met mast wind measurement with correction factors and power curve	18
A.3 Power-based methods	19
A.3.1 General	19
A.3.2 Average production of wind farm.....	19
A.3.3 Average production of representative comparison turbines	20
A.3.4 Data acquisition with comparison chart/database.....	21
A.3.5 Average wind speed of wind farm	21
Annex B (informative) Production-based availability indicators – examples	23
B.1 General.....	23
B.2 System operational production-based availability (“WTGS user’s view”).....	23
B.2.1 General	23
B.2.2 System operational production-based availability algorithm based on mandatory information categories only.....	23
B.2.3 Turbine operational production-based availability algorithm – including optional information categories	24
B.3 Technical production-based availability (“WTGS manufacturer’s view”).....	25
B.3.1 General	25
B.3.2 Technical production-based availability based on mandatory information categories only	25
Annex C (informative) Capacity factor and other performance indicators.....	27
C.1 General.....	27
C.2 Capacity factor.....	27
C.3 Production ratio	28

Annex D (informative) Verification scenarios – examples	29
D.1 General.....	29
D.2 Application scenarios	29
D.2.1 General	29
D.2.2 Scenarios under FULL PERFORMANCE.....	29
D.2.3 Scenarios under PARTIAL PERFORMANCE.....	31
D.2.4 Scenarios under TECHNICAL STANDBY.....	34
D.2.5 Scenarios under OUT OF ENVIRONMENTAL SPECIFICATION.....	34
D.2.6 Scenarios under REQUESTED SHUTDOWN	35
D.2.7 Scenarios under OUT OF ELECTRICAL SPECIFICATION	37
D.2.8 Scenarios under SCHEDULED MAINTENANCE.....	37
D.2.9 Scenarios under PLANNED CORRECTIVE ACTION	38
D.2.10 Scenarios under FORCED OUTAGE.....	38
D.2.11 Scenarios under SUSPENDED	40
D.2.12 Scenarios under FORCE MAJEURE	40
D.3 Calculation of production-based availability indicators according to Annex B	41
D.3.1 General	41
D.3.2 System operational production-based availability algorithm based on mandatory information categories only (“WTGS user’s view”)	41
D.3.3 Turbine operational production-based availability algorithm – including optional categories (“WTGS user’s view”)	42
D.3.4 Technical production-based availability based on mandatory information categories only (“WTGS manufacturer’s view”)	44
Annex E (informative) Considerations of competing assignment of lost production.....	46
Bibliography.....	47
Figure 1 – Information category overview.....	12
Figure 2 – Extended information category model.....	13
Figure 3 – Information categories, addition of layer 2 and layer 3, mandatory categories.....	14
Figure A.1 – Step 1: Calculation of wind speed based on working wind turbine 1 to n	22
Figure A.2 – Step 2: Estimation of lost production for WTGS not in FULL PERFORMANCE	22
Figure E.1 – Example of simultaneous degrading and derating	46
Table D.1 – FULL PERFORMANCE: By definition, actual energy production is equal to the potential energy production	29
Table D.2 – FULL PERFORMANCE: Actual energy production is less than potential energy production	30
Table D.3 – FULL PERFORMANCE: Actual energy production greater than potential energy production	31
Table D.4 – Partial performance – Derated: Grid constraint	31
Table D.5 – Partial performance – Derated: Grid constraint, actual energy production less than potential energy production.....	32
Table D.6 – Partial performance – Derated: Output constraint due to excessive noise from the WTGS.....	32
Table D.7 – Partial performance – Derated: Dirt on blades constrained performance	33

Table D.8 – Partial performance – Derated: Ice accumulated on blades has been detected and the WTGS is allowed to operate although the power performance is derated	33
Table D.9 – Partial performance – Degraded: WTGS deterioration known to the WTGS user	34
Table D.10 – TECHNICAL STANDBY: WTGS is cable unwinding	34
Table D.11 – Out of environmental specification: Calm winds	34
Table D.12 – Out of environmental specification: High winds	35
Table D.13 – Out of environmental specification: Temperature too high	35
Table D.14 – REQUESTED SHUTDOWN: Ice on blades is detected and WTGS user requests shutdown of the WTGS	35
Table D.15 – Requested shutdown: Sector management	36
Table D.16 – Requested shutdown: Noise nuisance	36
Table D.17 – Out of electrical specification: Low voltage	37
Table D.18 – SCHEDULED MAINTENANCE: WTGS is under scheduled maintenance work by the WTGS manufacturer within the time allowance agreed by the maintenance contract	37
Table D.19 – PLANNED CORRECTIVE ACTION: WTGS manufacturer performs corrective action to the WTGS at his discretion outside the time allowance of scheduled maintenance	38
Table D.20 – Forced outage: Short circuit	38
Table D.21 – Forced outage: Corrosion	39
Table D.22 – Forced outage: Overheating	39
Table D.23 – SUSPENDED: Suspended repair work due to storm with lightning	40
Table D.24 – FORCE MAJEURE: no access to the WTGS due to flooding impacting infrastructure	40
Table D.25 – System operational production-based availability algorithm based on mandatory information categories only (“WTGS user’s view”)	41
Table D.26 – Turbine operational production-based availability algorithm – including optional categories (“WTGS user’s view”)	43
Table D.27 – Technical production-based availability based on mandatory information categories only (“WTGS manufacturer’s view”)	44

INTERNATIONAL ELECTROTECHNICAL COMMISSION

WIND TURBINES –

Part 26-2: Production-based availability for wind turbines

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61400-26-2, which is a technical specification, has been prepared by IEC technical committee 88: Wind turbines.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
88/455/DTS	88/483/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61400 series, under the general title *Wind turbines*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual edition of this document may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The intention of this technical specification is to define a common basis for exchange of information on performance indicators between owners, utilities, lenders, operators, manufacturers, consultants, regulatory bodies, certification bodies, insurance companies and other stakeholders in the wind power generation business. This is achieved by providing an information model specifying how time designations shall be split into information categories. The information model forms the basis for how to allocate time for reporting availability and reliability indicators.

The technical specification defines generic terms of wind turbine systems and environmental constraints in describing system and component availability, lifetime expectancy, repairs and criteria for determining overhaul intervals. The specification defines terminology and generic terms for reporting energy based generating unit availability measurement. A generating unit includes all equipment up to the point of electrical connection. Availability measurements are concerned with fractions of time and energy a unit is capable of providing during service, taking environmental aspects into account. Environmental aspects will be wind and other weather conditions, as well as grid and substation conditions. The specification furthermore defines terminology and terms for reporting performance indicators based on energy production. Mandatory information categories defined in the technical specification are written in capital letters; optional information categories defined in the technical specification are written in bold letters.

The project scope is accomplished by separating the technical specification into three parts:

- IEC TS 61400-26-1, which specifies terms for time-based availability of a wind turbine generating system;
- IEC TS 61400-26-2, which specifies terms for production-based availability of a wind turbine generating system;
- IEC/TS 61400-26-3, which specifies terms for time-based and production-based availability of a wind power station.

Part 2 is an extension of Part 1 that deals with the use of production elements based on the information model defined in Part 1. The structure and interrelations in the applied information model are defined in Part 1 and apply to the production based extensions made in Part 2.

The intention of Part 2 is to define a common basis for exchange of information on production-based availability. This is achieved by using the information model specifying how time and energy designations shall be split into information categories and assigned to production terms.

NOTE The point of electrical connection is defined individually from one project to the other, but is normally understood as the electrical low voltage or high voltage terminals of the wind turbine generating system connecting to the feeder cables.

WIND TURBINES –

Part 26-2: Production-based availability for wind turbines

1 Scope

This part of IEC 61400 provides a framework from which production-based performance indicators of a WTGS (wind turbine generator system) can be derived. It unambiguously describes how data is categorised and provides examples of how the data can be used to derive performance indicators.

The approach of this part of IEC 61400 is to expand the time allocation model, introduced in IEC TS 61400-26-1, with two additional layers for recording of the actual energy production and potential energy production associated with the concurrent time allocation.

It is not the intention of this Technical Specification to define how production-based availability shall be calculated. Nor is it the intention to form the basis for power curve performance measurements, which is the objective of IEC 61400-12.

This document also includes informative annexes with:

- examples of determination of lost production,
- examples of algorithms for production-based indicators,
- examples of other performance indicators,
- examples of application scenarios.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org/>)

IEC TS 61400-26-1:2011, *Wind turbines – Part 26-1: Time-based availability for wind turbine generating systems*

3 Terms, definitions and abbreviations

For the purposes of the present document, the following terms, definitions and abbreviations apply, as well as the relevant terms and definitions contained in IEC TS 61400-26-1 and IEC 60050-415.

3.1 Terms and definitions

3.1.1

site conditions

conditions affecting the energy production of the WTGS, e.g. topographic, climatic and meteorological conditions, sector management, electrical environment and contractual constraints

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-