SLOVENSKI STANDARD
oSIST prEN IEC 61400-15-1:2023

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Sistemi za proizvodnjo energije na veter - 15-1. del: Vhodni pogoji glede primernosti mesta namestitve vetrnih elektrarn

Wind energy generation systems - Part 15-1: Site suitability input conditions for wind power plants

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ICS:

27.180	Vetrne elektrarne	Wind turbine energy systems

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88/912/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 61400-15-1 ED1	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
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IEC TC 88 : WIND ENERGY GENERATION SYSTEMS

SECRETARIAT:	SECRETARY:
Denmark	Mrs Christine Weibøl Bertelsen
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
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TITLE:

Wind energy generation systems – Part 15-1: Site suitability input conditions for wind power plants

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Wind energy generation systems – Part 15-1: Site suitability input conditions for wind power plants

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International Standard IEC 61400-15-1 has been prepared by WG 15 "Assessment of wind resource, energy yield and site suitability input conditions for wind power plants", of IEC technical committee 88: Wind energy generation systems

The text of this International Standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The National Committees are requested to note that for this document the stability date is ....

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

This part of the IEC 61400 defines a framework for assessment and reporting of the turbine suitability conditions for both onshore and offshore power plants.

1 Scope

a) The scope of this IEC 61400-15-1 standard is to define a framework for assessment and reporting of the wind turbine suitability conditions for both onshore and offshore wind power plants. This includes: Definition, measurement, and prediction of the long-term meteorological and wind flow characteristics at the site

b) Integration of the long-term meteorological and wind flow characteristics with wind turbine and balance of plant characteristics

c) Characterizing environmental extremes and other relevant plant design drivers

d) Addressing documentation and reporting requirements to help ensure the traceability of the assessment processes

The framework will be defined such that applicable national norms are considered and industry best practices are utilized. This framework defines the minimum set of parameters. Additional parameters may be used if needed.

The meteorological and wind flow characteristics addressed in this document relate to wind conditions, where parameters such as wind speed, wind direction, turbulence intensity, wind shear, inflow angle,air density or air temperature are included to the extent that they affect the structural integrity of a wind turbine.

According to IEC 61400-1 and IEC 61400-3 site specific conditions are wind conditions, other environmental conditions, soil conditions, ocean/lake conditions and electrical conditions. All of these site specific conditions other than site specific wind conditions and related atmospheric variables addressed herein are out of scope for this standard.

This standard is framed to complement and support the scope of related IEC 61400 series standards by defining environmental input conditions. It is not intended to supersede the design and suitability requirements presented in those standards. Specific analytical and modelling procedures as described in IEC 61400-1, IEC 61400-2, IEC 61400-3-1 and IEC TS 61400-3-2 are excluded from the scope of this standard.

2 Normative references

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.

IEC 61400-1:2019, Wind energy generation systems – Part 1: Design Requirements

IEC 61400-3-1: Wind energy generation systems - Part 3-1: Design requirements for fixed offshore wind turbines

IEC 61400-12-1:2017, Wind energy generation systems – Part 12-1:Power performance measurements of electricity producing wind turbines

ISO 2533:1975 Standard Atmosphere

ISO/IEC 21778:2017, Information technology — The JSON data interchange syntax

ISO/IEC 10646:2017, Information technology — Universal Coded Character Set (UCS)

ISO 3166, COUNTRY CODES

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. All the below parameters are expected to represent the climate conditions over the design lifetime of the wind turbine and apply at hub height.

3.1
inflow angle
The inflow angle is defined as the angle between a horizontal plane and the wind velocity vector at hub height. The inflow angle is positive if the wind velocity vector is pointing upwards. Referred to as flow inclination angle in IEC 61400-1:2019.

3.2
mean ambient turbulence intensity
The turbulence intensity (TI) is defined as the ratio of the wind speed standard deviation to the mean wind speed determined from the same set of measured wind speed data and taken over a period of 10 minutes and based on at least 1 Hz sampling frequency. The mean value is the average of a subset of the turbulence intensities. The subset typically represents a bin within a wind speed- and wind direction matrix.

3.3
standard deviation of turbulence intensity
The standard deviation is defined as a sub set of the turbulence intensities (TI). The sub set typically represents a bin within a wind speed- wind direction matrix.

3.4
associated data source
Primary data source used to derive wind conditions for a given turbine location. This can include, but is not limited to, meteorological towers, remote sensing devices, production data or model data.

3.5
number of samples
The number of data points which form the basis of the associated parameter value

3.6
mean wind shear
Wind shear (or power law) exponent as defined in IEC 61400-1:2019 and estimated across the rotor swept area

3.7
average turbulence intensity at 15m/s
Mean ambient turbulence intensity over all wind directions in the 15m/s wind speed bin. Bin width defined as 14.5-15.5 m/s

3.8
annual mean ambient temperature
Annual mean ambient temperature at the site

3.9
annual wind speed frequency distribution
Annual distribution of occurences as a function of wind direction and/or wind speeds

3.10
Weibull distribution
The probability distribution function

3.11
Coefficient of variation of the annual maximum extreme wind speed
Standard deviation divided by the mean value of the annual maximum extreme wind speed

93 **3.12 extreme ambient turbulence intensity**
94 Extreme ten minute value of the ambient turbulence intensity with a return period of 50 years as a
95 function of wind speed
96

97 **3.13 omni-direcitonal**
98 Refers to one value describing all direction sectors
99

100 **3.14 site suitability/turbine suitability**
101 The given combination of site conditions and turbine properties impacting structural integrity

4 Symbols and abbreviated terms

4.1 Symbols and units

φ	annual mean inflow angle	[deg]
I	mean ambient turbulence intensity as defined in 3.7	[-]
σ_σ	standard deviation of estimated wind speed standard deviation	[-]
α	mean wind shear (or power law) exponent	[-]
α_{eff}	effective wind shear exponent	[-]
θ_{mean}	annual mean ambient temperature	[deg C]
d	displacement height	[m]
D	rotor diameter	[m]
z_{hub}	hub height	[m]
V_{50}	extreme wind speed (averaged over 10 minutes) with a recurrence interval of 50 years	[m/s]
Ve_{50}	expected extreme wind speed (averaged over three seconds), with a recurrence time interval of 50 years.	[m/s]
ρ	air density	[kg/m3]
V_{ave}	annual mean wind speed at hub height	[m/s]
C	scale parameter of the Weibull distribution function	[m/s]
k	shape parameter of the Weibull distribution function	[-]
C_{CT}	turbulence structure correction parameter	[-]
P	air pressure	[hPa]
T	air temperature	[K]
V_{xy}	horizontal component of wind speed	[m/s]
V_z	vertical component of wind speed	[m/s]
RH	relative humidity	[%]