SLOVENSKI STANDARD

SIST EN IEC 61400-27-2:2020

01-december-2020

Sistemi za proizvodnjo energije na veter - 27-2. del: Električni simulacijski modeli - Validacija modela (IEC 61400-27-2:2020)

Wind energy generation systems - Part 27-2: Electrical simulation models - Model validation (IEC 61400-27-2:2020)

Windenergieanlagen - Teil 27-2: Elektrische Simulationsmodelle - Validierung der Modelle (IEC 61400-27-2:2020)

Systèmes de génération d'énergie éolienne - Partie 27-2: Modèles de simulation électrique - Validation des modèles (IEC 61400-27-2:2020)

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ICS:

27.180	Vetrne elektrarne	Wind turbine energy systems

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Wind energy generation systems - Part 27-2: Electrical simulation models - Model validation (IEC 61400-27-2:2020)

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CENELEC

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

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European foreword

The text of document 88/763/FDIS, future edition 1 of IEC 61400-27-2, prepared by IEC/TC 88 "Wind energy generation systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61400-27-2:2020.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2021-05-18
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2023-08-18

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The text of the International Standard IEC 61400-27-2:2020 was approved by CENELEC as a European Standard without any modification.

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

IEC 61400-21-2	NOTE	Harmonized as EN IEC 61400-21-2[1]
IEC 61400-25 (series)	NOTE	Harmonized as EN 61400-25 (series)

[1] To be published. Stage at the time of publication: prEN IEC 61400-21-2:2020.

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 Where 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.

Publication	Year	Title	EN/HD	Year
IEC 60050-415	1999	International Electrotechnical Vocabulary - Part 415: Wind turbine generator systems	-	-
IEC 61400-21-1	2019	Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines	EN IEC 61400-21-1	2019
IEC 61400-27-1	-	Wind energy generation systems - Part 27-1: Electrical simulation models - Generic models	-	-

IEC 61400-27-2

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INTERNATIONAL STANDARD

Wind energy generation systems –
Part 27-2: Electrical simulation models – Model validation

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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WIND ENERGY GENERATION SYSTEMS –

**Part 27-2: Electrical simulation models –
Model validation**

FOREWORD

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International Standard IEC 61400-27-2 has been prepared by IEC technical committee 88: Wind energy generation systems.

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

FDIS	Report on voting
88/763/FDIS	88/772/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61400, published under the general title *Wind energy generation systems*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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

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

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

IEC 61400-27-2 specifies model validation procedures for electrical simulation models of wind turbines and wind power plants.

The increasing penetration of wind energy in power systems implies that Transmission System Operators (TSOs) and Distribution System Operators (DSOs) need to use dynamic models of wind power generation for power system stability studies.

The purpose of this International Standard is to specify validation procedures for dynamic models, which can be applied in power system stability studies. The IEEE/CIGRE Joint Task Force on Stability Terms and Definitions [1][1] has classified power system stability in categories according to Figure 1.

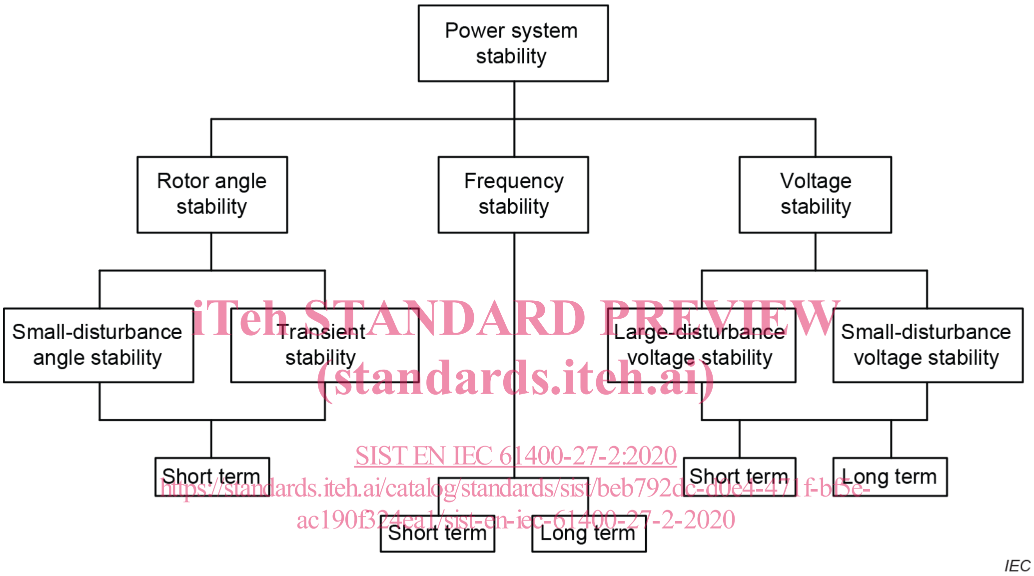

Figure 1 – Classification of power system stability according to IEEE/CIGRE Joint Task Force on Stability Terms and Definitions [1]

Referring to these categories, the models to be validated have been developed to represent wind power generation in studies of large-disturbance short term stability phenomena, i.e. short term voltage stability, short term frequency stability and short term transient stability studies referring to the definitions of IEEE/CIGRE Joint Task Force on Stability Terms and Definitions in Figure 1. Thus, the models are applicable for dynamic simulations of power system events such as short-circuits (low voltage ride through), loss of generation or loads, and system separation of one synchronous area into more synchronous areas.

The validation procedure specified in this document assesses the accuracy of the fundamental frequency response of wind power plant models and wind turbine models. This includes validation of the generic positive sequence models specified in IEC 61400-27-1 and validation of positive sequence as well as negative sequence response of more detailed models developed by the wind turbine manufacturers.

1 Figures in square brackets refer to the Bibliography.

The validation procedure has the following limitations:

– The validation procedure does not specify any requirements to model accuracy. It only specifies measures to quantify the accuracy of the model[2],[3].
– The validation procedure does not specify test and measurement procedures, as it is intended to be based on tests specified in IEC 61400-21-1 and IEC 61400-21-2[4].
– The validation procedure is not intended to justify compliance to any grid code requirement, power quality requirements or national legislation.
– The validation procedure does not include validation of steady state capabilities e.g. of reactive power, but focuses on validation of the dynamic performance of the models.
– The validation procedure does not cover long term stability analysis.
– The validation procedure does not cover sub-synchronous interaction phenomena.
– The validation procedure does not cover investigation of the fluctuations originating from wind speed variability in time and space.
– The validation procedure does not cover phenomena such as harmonics, flicker or any other EMC emissions included in the IEC 61000 series.
– The validation procedure does not cover eigenvalue calculations for small signal stability analysis.
– This validation procedure does not address the specifics of short-circuit calculations.
– The validation procedure is limited by the functional specifications in Clause 5.

The following stakeholders are potential users of the validation procedures specified in this document:

– TSOs and DSOs need procedures to validate the accuracy of the models which they use in power system stability studies;
– wind plant owners are typically responsible to provide validation of their wind power plant models to TSO and/or DSO prior to plant commissioning;
– wind turbine manufacturers will typically provide validation of the wind turbine models to the owner.
– developers of modern software for power system simulation tools may use the standard to implement validation procedures as part of the software library;
– certification bodies in case of independent model validation;
– education and research communities, who can also benefit from standard model validation procedures.

2 Specification of requirements to model accuracy is the responsibility of TSOs e.g. in grid codes. The scope of IEC 61400-27-2 is to provide a standard for how to measure accuracy and this way remove indefiniteness.

3 Clause 7 specifies a large number of measures for model accuracy. The importance of the individual measure depends on the type of grid and type of stability study. Annex D describes limits to the possible accuracy of the models.

4 Under consideration.