ICS 27.180
CCS F 11

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 36237-2023

Replacing GB/T 36237-2018

Wind energy generation systems - Generic electrical simulation models

Issued on: May 23, 2023 **Implemented on: May 23, 2023**

Issued by: State Administration for Market Regulation, China National Standardization Administration

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foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standardization Documents"

drafting:

This document replaces GB/T 36237-2018 "Electrical Simulation Model of Wind Turbine Generating Sets": Compared with GB/T 36237-2018, except

Apart from structural adjustments and editorial changes, the main technical changes are as follows:

a) The terms and definitions of "quasi-steady state of the system", "reaction time", "response time", "stabilization time", "transient interval" and "unbalance degree" are deleted

meaning (see 3:1 of the:2018 edition);

b) Added "Power Equipment", "Grid Variables", "Generator Symbol Convention", "Auxiliary Equipment", "High Voltage Ride Through", "Fault Ride Through" and "Basic

Terms and definitions of "unit", "extensible interface", "access point" and "module" (see 3:1);

c) Increased the functional specifications of the wind farm model (see 5:3);

d) Added specifications for auxiliary equipment model and wind farm model structure (see 6:3, 6:4);

e) Added specifications for grid interface module, wind farm control module, communication module and electrical component module (see 7:8~7:11):

This document identically adopts IEC 61400-27-1:2020 "Wind Power Generation System Part 27-1: General Model for Electrical Simulation Model":

The following minimal editorial changes have been made to this document:

--- In order to coordinate with existing standards, change the name of the standard to "General Electrical Simulation Model of Wind Power Generation System":

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

This document specifies a standard dynamic electrical simulation model for wind turbines and wind farms: Wind turbine models can be used in wind power

farms or independent distributed wind turbines: In addition to the wind turbine model, the wind farm model may contain auxiliary equipment commonly used in wind farms:

equipment models, such as static var generators:

With the increasing penetration of wind power in the power system, transmission system operators (TSOs) and distribution system operators (DSOs)

The dynamic model of wind power system needs to be used for power system stability analysis: Models built by wind turbine manufacturers are capable of simulating

However, it is not suitable for the stability analysis of large-scale wind power connected to the power system: Because detailed manufacturer-proprietary models do not

It will only increase the complexity of the system, increase the simulation time, and require a large amount of input data:

This document specifies a general dynamic model for wind power systems that can be used for power system stability analysis: American Electrical and Electronics Engineer

Stability terms and definitions [11] 1) The joint working group of the Association and the International Large Grid Organization (IEEE/CIGRE) analyzed the power system stability:

class, as shown in Figure 1:

Figure 1 The classification of power system stability by the IEEE/CIGRE Stability Terms and Definitions Joint Working Group[11]

Based on the above classification, the model is suitable for the study of large-disturbance short-term stability of wind power generation, such as short-term voltage stability, short-term frequency stability, etc:

and the short-term transient power angle stabilization in Figure 1: Therefore, the model is suitable for dynamic simulation of power system events, such as short circuit (low voltage breakdown

more), off-line or load shedding [12], system disconnection, etc:

The general electrical simulation model should be able to characterize the dynamic characteristics of the wind farm access point (hereinafter referred to as "grid connection point") and the output of the wind turbine:

At the same time, it is suitable for the simulation research of large power grids: Therefore, the simplified model should be able to characterize the typical response of the existing technology:

Note: The wind farm access point is also called the grid connection point of the wind farm:

The electrical simulation model specified in this document is mainly aimed at the wind turbine fundamental frequency positive sequence 2) model, which has the following limitations:

1) Numbers in square brackets cite references:

2) This document covers both symmetrical and asymmetrical faults, but only the positive sequence component of the fundamental frequency is specified for asymmetrical faults:

---The model is not suitable for long-term stability analysis:

--- The model is not suitable for studying subsynchronous problems:

---The model is not suitable for studying fluctuations caused by changes in wind speed in time and space, that is, the model does not cover turbulence, tower shadow, wind shear

Change, wake:

--- The model is not suitable for the study of harmonics, flicker, or other electromagnetic compatibility (EMC) disturbances in the IEC 61400 series standards:

---Wind power generation system is a highly nonlinear system, the simplified model of the system in this document is not suitable for model small signal stability

Analysis of eigenvalue calculations:

--- This document does not involve short-circuit calculation characteristics:

---The model is not suitable for studying the island operation of wind turbines without synchronous generators:

---The model is not suitable for scenarios where the short-circuit ratio is less than 3: The short-circuit current limit depends on the wind turbine type, control mode and its

he set: When the wind turbine manufacturer can specify a lower short-circuit ratio application scenario, the application scenario should be based on IEC 61400-

27-2 for verification:

--- The model is limited to the functional specifications in Chapter 5:

The following stakeholders are potential users of the models in this document:

---The transmission system operator and the distribution system operator are the end users of the model, which are used to plan and dispatch the power system in operation

system stability analysis;

---The wind farm developer is generally obliged to provide the simulation model of the wind farm to the power grid company before the wind farm is connected to the grid for trial operation;

---Wind turbine manufacturers generally provide wind turbine models to wind farm developers;

--- The development unit of power system simulation tool software uses this document to establish a standard wind turbine simulation model in the software library;

---A certification body that independently conducts model verification of wind turbines;

---Consulting agencies use the model on behalf of grid companies and/or wind farm developers;

--- Due to the confidentiality of the manufacturer's proprietary model, education and research groups can use this document for modeling:

General Electric Simulation Model of Wind Power Generation System

1 Scope

This document specifies a standard electrical simulation model for wind turbines and wind farms: The models involved are applied to power system stability

The analyzed positive sequence simulation model in time domain is suitable for dynamic simulation of power system short-term stability:

This document defines common terms and parameters for electrical simulation models:

This document specifies electrical simulation models for common topologies/configurations of wind farms: The wind farm model mainly includes wind turbines, wind farm

Control and auxiliary equipment: The wind farm model is described in a modular manner, which can be applied to wind farms and different types of wind turbines:

This document specifies electrical simulation models for the general topology/design/configuration of wind turbines: The purpose of the model is to characterize the wind turbine

The electrical characteristics of the unit: The wind turbine model is described in a modular way, which can be applied to different types of wind turbines: wind power