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Wind energy generation systems - Guide for the integrated analysis of floating offshore wind turbines

风能发电系统 漂浮式海上风力发电机组一体化计算分析导则

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11 National Standards of the People's Republic of China Floating offshore wind power generation system Integrated Calculation and Analysis Guidelines for Generator Sets Published on 2026-04-

30 Implemented on August 1, 2026 State Administration for Market Regulation The State Administration for Standardization issued a statement.

1.Scope This document specifies the integrated design of the wind turbine-nacelle assembly and tower, floating foundation structure, and anchoring system for floating offshore wind turbine generators. The technical requirements for integrated computational analysis mainly include the basic data, loads and operating conditions, numerical models, and calculation methods required for integrated computational analysis. Results compilation, analysis, and evaluation, etc. This document applies to the integrated calculation and analysis of floating offshore horizontal axis wind turbine generators.

4 General Requirements

4.1 Integrated calculation and analysis should obtain meteorological, marine hydrological, engineering geology, floating foundation structure and anchoring system, dynamic submarine cables, wind turbines - Information on cabin components, etc.; when information is lacking, it can be determined by methods such as engineering analogy.

4.2 Integrated calculation and analysis should be conducted based on the focus, including aerodynamic performance, blade deformation and load, tower deformation and load, and mechanical system load. Analysis of load and vibration, motion response and load of floating foundation structure, motion response of dynamic submarine cable, and load of anchoring system.

4.3 Integrated calculation and analysis should consider the coupling relationship of floating offshore wind turbine generators based on the analysis purpose, the object of interest, and the completeness of the data. Simplify.

4.4 The integrated calculation and analysis conditions should meet the requirements of key components such as wind turbine blades, transmission system, tower, floating foundation structure, and anchoring system. It can assess and verify safety requirements.

4.5 The loads and evaluations of integrated calculation analysis shall comply with GB /Z 44047, NB/T 11084, NB/T 10105 and NB/T 11378. Regulation.

5 Basic Information

5.1 Wind Conditions The wind condition data required for the calculation should be included.

a) Air density, wind speed and direction distribution, wind shear index, turbulence intensity, probability density function parameters of wind speed, etc., with turbulence intensity needing to be considered. The effect of wake effect of wind turbine units in a wind farm.

b) Representative annual average wind speeds at hub height and 10m above sea level, and maximum wind speeds at different return periods. Typhoons are frequent. The region should

collect typhoon-related information.

5.2 Sea State

5.2.1 Water level data should include the relationship between the engineering site and the datum, water depth, tidal characteristics, high tide level, low tide level, tidal range, and duration of rising and falling tides. Values and design tide levels for different return periods.

5.2.2 Salinity, density and temperature of seawater.

5.2.3 Ocean current data should include stratified current velocities and directions at different return periods for different locations within the site area.

5.2.4 Wave data should include wave direction, wave height, and wave period at different return periods, and should preferably be described in the form of wave scatter plots, contour lines, etc. High-period joint distribution characteristics.

5.2.5 Marine biological data should include marine biological growth thickness, density, distribution characteristics, etc.

5.2.6 Sea ice data should include the ice-free period, ice-free water level, ice rink area distribution and movement characteristics, and different reproduction numbers for the sea area where the wind farm is located. The design parameters include ice thickness and mechanical properties.

5.3 Combined wind and wave distribution

5.3.1 The statistical content of the combined wind and wave distribution mainly includes.

a) The combined distribution direction of wind and waves should be statistically analyzed by sector, with each sector not exceeding 30 degrees.

b) Statistically analyze the probability distribution of wave height and wave period in different directions at certain wind speed intervals;

c) Calculate the joint probability of wind and waves in all directions at certain wind speed intervals.

5.3.2 The wave height difference should not exceed 0.5m, and the period difference should not exceed 0.5s; the wind speed range should cover both the incoming and outgoing wind speeds. The speed interval should not exceed 2 m/s, and preferably not exceed 1 m/s.

5.4 Engineering Geology Geological data should include seabed topography, rock (soil) layer distribution and lithological characteristics and mechanical properties of each layer, seismic motion parameters and corresponding data. The basic intensity of the earthquake.

5.5 Wind Turbine - Nacelle Components, Tower and Control Systems

5.5.1 The information on the wind turbine-nacelle assembly and tower should include.

a) Security level;

b) Wind turbine cone angle and drive shaft pre-tilt angle;

c) Blade or equivalent airfoil parameters;

d) Materials, dimensions, mass, center of gravity, and moment of inertia of blades, hubs, nacelles, and towers;

e) Hub center height;

f) Cabin tilt angle and acceleration requirements;

g) Thrust curve and power curve.

5.5.2 Control system data should preferably include.

a) Control system type and main parameters;

b) Control system logic and strategies.

5.6 Floating Foundation Structure Floating foundation information should include the following.

a) Master Dimensions and General Layout Drawings;

b) Structural layout and material properties;

6.1 Calculate the load

6.1.1 The input loads for integrated calculation and analysis should include driving loads, gravity loads, aerodynamic loads, wave loads, flow loads, and marine organism attachment. The load should be considered, and sea ice load, seismic load, impact load, etc. should also be taken into account.

6.1.2 The driving load shall include the torque control load of the generator and converter, the driving load of yaw and pitch, and the mechanical braking load.

6.1.3 Aerodynamic loads should take into account the effects of tip losses, hub losses, tower shadow effects, and aeroelasticity. The motion of floating foundation structures should also be considered. The impact.

6.1.4 Wave Load.

a) Wave loading takes into account all potential effects, including water depth, marine organism attachment, structure type, scale, shape, and response characteristics;

b) Wave loading should take into account the effects of nonlinear waves and the rise of the free wave surface;