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**ENERGY INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

NB/T 11653-2024

**Technical specification for geohazards investigation of offshore
wind power projects**

海上风电场工程地质灾害勘察技术规程

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Foreword

This document was issued on 24 September 2024 by the National Energy Administration of the PRC and takes effect on 24 March 2025.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 27.140, Chinese classification P 61.

This specification was prepared in accordance with the requirements of the plan of the National Energy Administration for the formulation and revision of industry standards in the energy field. The drafting group carried out extensive investigation and research, carefully summarised practical experience, and prepared this specification on the basis of wide consultation.

The main technical content of this specification is: general provisions; terms; basic requirements; the contents and methods of geohazards investigation; the analysis and evaluation of geohazards; the monitoring of geohazards; and the geohazards investigation report.

This specification is administered by the National Energy Administration, and the General Institute of Hydropower and Water Resources Planning and Design is the chief drafting organization.

1 Scope

NB/T 11653-2024 is the Chinese specification for investigating the geological hazards of the seabed under an offshore wind farm. It exists because the ground an offshore turbine stands on is not static, and the three ways it moves are each capable of destroying a foundation that was correctly designed for the soil as surveyed. A submarine landslide can carry a slope of seabed sediment sideways along a shear surface under the action of currents, gravity or an earthquake, taking the pile with it. Submarine shallow gas - methane, carbon dioxide, hydrogen sulphide and ethane trapped in the shallow sediments - can be released by pile driving, and a gas blowout during installation is both a loss of bearing capacity and an ignition hazard on the vessel above it. Active sand dunes and sand waves migrate continuously under waves, tides and currents, and a dune that moves off a monopile takes several metres of embedment with it while a dune that moves onto a cable leaves it buried far deeper than designed - which is why the specification defines the sand dune index, the ratio of wavelength to height, and the asymmetry index, the ratio of stoss to lee slope projections, since asymmetry is what reveals the direction and rate of migration. The document sets what has to be established for each hazard: for landslides the topography, extent, thickness, composition and causal type, with the physical and mechanical parameters of the soil, and for rock landslides the weak interlayers and zones that govern slope stability; for shallow gas the type, composition, occurrence form, distribution and pressure; and for dunes and waves the distribution, wave height, wavelength and crest line form with sediment particle analysis. It requires a combination of data collection, geophysical prospecting, drilling, cone penetration testing and laboratory testing, and then covers the analysis and evaluation of each hazard in turn, the monitoring of each, and the investigation report. Three appendices give the classification of the three hazard types, the selection of geophysical prospecting methods, and the method of calculating soil mechanical parameters from cone penetration test indices. It also requires

safety risk control measures, an emergency plan, and the recovery of waste slurry, fuel and refuse from the survey vessels. It was issued on 24 September 2024 by the National Energy Administration and takes effect on 24 March 2025.

1.0.1 This specification is formulated in order to standardise the technical requirements for the investigation, evaluation and monitoring of geohazards in offshore wind power projects, and to guarantee the quality of the investigation work and of its results.

1.0.2 This specification applies to the investigation of geohazards in offshore wind power projects, namely submarine landslides, submarine shallow gas and active submarine sand dunes and sand waves.

1.0.3 In addition to complying with this specification, the investigation of geohazards in offshore wind power projects shall also comply with the provisions of the relevant current national standards.

2 Terms

2.0.1 submarine landslide

The phenomenon in which the rock and soil mass of a submarine slope, under the action of external forces such as currents, gravity or earthquake, moves predominantly horizontally along a continuous shear failure surface or shear failure zone.

2.0.2 submarine shallow gas

Gas accumulated in the shallow sediments of the seabed, composed principally of methane, carbon dioxide, hydrogen sulphide and ethane.

2.0.3 submarine active sand dunes and sand waves

Submarine sand dunes and sand waves that are in a state of motion under the action of ocean waves, tides and currents.

2.0.4 sand dune or sand wave index

The ratio of the wavelength of a sand dune or sand wave to its height.

2.0.5 asymmetry index

The ratio of the horizontal projected length of the stoss slope of a sand dune or sand wave to the horizontal projected length of its lee slope.

3 Basic requirements

3.0.1 The types of geohazard of an offshore wind power project shall principally include submarine landslides, submarine shallow gas and active submarine sand dunes and sand waves. The classification of submarine landslides, submarine shallow gas and active

submarine sand dunes and sand waves should comply with the provisions of Appendix A of this specification.

3.0.2 Before the field work of the geohazards investigation of an offshore wind power project is carried out, the natural conditions and the working conditions of the project site shall be understood, and an outline of the geohazards investigation of the offshore wind power project shall be prepared.

3.0.3 Safety risk control measures and an emergency plan shall be established for the geohazards investigation operations of an offshore wind power project, and the production waste and domestic refuse produced by the investigation operations, such as waste slurry and fuel oil, shall be recovered.

4 Contents and methods of investigation for geohazards

4.1 General requirements

4.1.1 The geohazards investigation of an offshore wind power project shall establish the type, the distribution, the scale, the causal mechanism and the relevant parameters of the geohazards.

4.1.2 The geohazards investigation of an offshore wind power project shall use a combination of methods comprising data collection, geophysical prospecting, drilling, cone penetration testing and laboratory testing. The selection of the geophysical prospecting methods for geohazards of offshore wind power projects should comply with the provisions of Appendix B of this specification.

4.2 Contents of the geohazards investigation

4.2.1 The investigation of a submarine landslide shall include the following:

1 establish the topography and landforms, the distribution, the thickness, the material composition and the causal type of the submarine soil landslide, and give the physical and mechanical parameters of the soil mass;

2 establish the topography and landforms, the stratigraphic lithology, the distribution and character and causal type of the weak interlayers and weak zones of the submarine rock landslide, carry out testing of the physical and mechanical properties of the rock mass, establish in particular the deformation characteristics of the weak interlayers and weak zones that affect slope stability, and give the physical and mechanical parameters of the rock mass and of those weak interlayers and zones.

4.2.2 The investigation of submarine shallow gas shall establish the type, the composition, the occurrence form, the distribution and the pressure of the shallow gas.

4.2.3 The investigation of active submarine sand dunes and sand waves shall establish the distribution, the wave height, the wavelength and the crest line form of the active dunes and