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

NB/T 11683-2024

**Technical guidelines for solar energy resource observation of
solar thermal power projects**

光热发电工程太阳能资源观测技术导则

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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 27.100, Chinese classification P 60.

This standard was prepared in accordance with the requirements of the Notice of the General Department of the National Energy Administration on issuing the second batch of the supplementary plan for the formulation and revision of industry standards in the energy field for 2018, document Guo Neng Zong Tong Ke Ji [2018] No. 191. The drafting group carried out extensive investigation and research, carefully summarised practical experience, referred to the relevant advanced international and domestic standards, and prepared this standard on the basis of wide consultation.

The main technical content of this standard is: general provisions; terms and abbreviations; basic requirements; construction of the solar radiation observation site; observation instruments and equipment; solar radiation observation; observation of other meteorological elements; operation and maintenance of the observation equipment; data collection, storage and transmission; and quality control and compilation of the observation data.

This standard is administered by the National Energy Administration, was proposed by the Electric Power Planning and Engineering Institute, is under the routine administration of the Power Generation Design Standardization Technical Committee of the Energy Industry, and China Power Engineering Consulting Group Northwest Electric Power Design Institute Co., Ltd. is responsible for the interpretation of the specific technical content.

Chief drafting organization of this standard: China Power Engineering Consulting Group

Northwest Electric Power Design Institute Co., Ltd.

Participating drafting organizations of this standard: Public Meteorological Service Centre of the China Meteorological Administration; China Power Engineering Consulting Group North China Electric Power Design Institute Co., Ltd.; Inner Mongolia Energy Construction Investment (Group) Co., Ltd.; Inner Mongolia Electric Power Survey and Design Institute Co., Ltd.; China Power Engineering Consulting Group Southwest Electric Power Design Institute Co., Ltd.

1 Scope

NB/T 11683-2024 is the Chinese technical guideline for measuring the solar resource at the site of a concentrating solar thermal power project. It exists because a CSP plant lives or dies on one number that a photovoltaic plant barely cares about: direct normal irradiance. A PV panel converts diffuse light as well as direct beam, so on a hazy day it still produces; a parabolic trough or a heliostat field can only concentrate the beam, and diffuse light passes straight through the focus and is lost. That makes DNI the entire resource, and DNI is both harder to measure and more variable than global irradiance - it is sensitive to aerosol, to thin cirrus and to dust that a pyranometer would hardly register. A CSP project is financed for twenty-five years on the strength of an on-site measurement campaign, and an error of a few percent in the measured DNI moves the whole business case, which is why this document is about metrology rather than about power plants. It defines the radiation quantities precisely - global horizontal, direct, direct normal, direct horizontal and diffuse radiation, irradiance and irradiation, sunshine duration set at the 120 W/m² threshold, and duration of possible sunshine - and it distinguishes the two ways of getting DNI: the direct measurement system, using a pyrliometer on a tracker, and the indirect system, computing DNI from measured global and diffuse radiation. It covers the tracker itself, separating passive tracking by time algorithm and angle sensors from active tracking by a light balance sensor. Around that it sets the site selection and the layout of the observation field, the installation and commissioning of the instruments, the choice of observation system and of the basic and optional instruments, the observation procedures for direct normal, global horizontal and diffuse radiation, and the observation of the other meteorological elements including the special weather phenomena that matter for a mirror field. It then covers the verification and calibration of the equipment, its inspection and maintenance, the collection, storage and transmission of the data, and the quality control and compilation of the observed data. Four appendices give the performance indicators and classification of the pyrliometer and of the pyranometer, the methods for checking the observed data, and the monthly report format. It was issued on 24 September 2024 by the National Energy Administration and takes effect on 24 March 2025.

1.0.1 This standard is formulated in order to keep pace with the development of solar energy resource observation technology, to meet the needs of the construction of solar

thermal power projects, and to standardise the technical content and methods of solar energy resource observation for such projects.

1.0.2 This standard applies to the observation of the solar energy resource and of the other related meteorological elements for solar thermal power projects.

1.0.3 The observation of the solar energy resource for a solar thermal power project shall adopt new technologies and new equipment actively and prudently.

1.0.4 In addition to complying with the requirements of this standard, the observation of the solar energy resource for a solar thermal power project shall also comply with the provisions of the relevant current national standards.

2 Terms and abbreviations

2.1 Terms

2.1.1 global horizontal radiation

The sum of the direct radiation and the diffuse radiation received by a horizontal surface from within the 2π solid angle above it; also called total radiation on a horizontal surface.

2.1.2 direct radiation

The radiation emitted from the solar disc and from a small solid angle around it; also called direct solar radiation.

2.1.3 direct normal radiation

The direct radiation received on a plane perpendicular to the solar rays.

2.1.4 direct horizontal radiation

The direct radiation received on a horizontal surface.

2.1.5 diffuse radiation, scattering radiation

Solar radiation that has been scattered by air molecules, by cloud and by the various particles in the air into radiation without direction, but whose monochromatic composition is unchanged.

2.1.6 irradiance

The radiant energy received by an object per unit time and per unit area. Note: the unit of measurement of irradiance is the watt per square metre (W/m^2).

2.1.7 irradiation

The integrated total of the irradiance over a given period of time. Note: the unit of measurement of irradiation is the joule per square metre (J/m^2).