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Technical specification for solar energy resource real-time monitoring of photovoltaic power station

光伏发电站太阳能资源实时监测技术规范

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Technical specification for solar energy resource real-time monitoring of photovoltaic power station

1 Scope

This standard specifies the technical specification for site selection, data measurement, installation of measuring equipment, instrument calibration and maintenance, measurement data collection and transmission, and measurement data storage and arrangement for solar energy resource real-time monitoring of photovoltaic power station.

This standard applies to photovoltaic power station.

2 Normative references

The following documents for the application of this document are essential. For dated references, only those dated references apply to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 19565 Pyranometer

QX/T 55 Specifications for surface meteorological observation. Part 11: Measurement of radiation

QX/T 56 Specifications for surface meteorological observation. Part 12: Measurement of sunshine

3Terms and definitions

The following terms and definitions apply to this standard

3.1

Photovoltaic (PV) power station

The generating system that uses the photovoltaic effect of photovoltaic cell and directly converts solar radiation energy into electrical energy. Generally it includes transformers, inverters and PV array, as well as related auxiliary facilities, etc.

3.2

Direct normal irradiance

Irradiance on a plane that direct solar radiation is perpendicular to the beam.

3.10

Diffuse irradiance, scattering irradiance

In addition to the contribution of direct irradiance, it is the radiant flux irradiating to unit area from sky.

3.11

Global solar irradiance

It is the total solar radiation flux of incidence on the horizontal surface of unit area, also known as total radiant emmittance.

3.12

Sunshine duration

It is the sum of time interval that direct solar radiation irradiance is greater than or equal to 120W/m^2, also known as sunshine duration.

3.13

Duration of possible sunshine

Without any shadowing conditions, when the center of the sun enters from eastern horizon into western horizon in the place, it is the time of light reaching the ground.

4 Site selection of test-station

4.1 Meteorological monitoring equipment shall be built within photovoltaic power station, because it is easy for observers to observe.

4.2 In meteorological information collection system, there shall be no obstruction for the above plane of sensing element of environmental information observing instrument; if not satisfied, the altitude-difference should be maintained by more than 10 times-distance from the obstacles, so as to reduce the impact of surrounding environment on equipments.

5 Data measurement

5.1 Total irradiance

c) Measurement accuracy: less than 5%:

d) Working environment temperature: -40 °C ~ + 60 °C.

5.4 Sunshine duration

Use heliograph to observe. Sunshine recorder accumulates automatically the sunshine duration of the day, the unit is h. Observations of heliograph shall meet the requirements of QX/T 56. The technical parameters required are as follows:

a) Measuring range: 0 ~ 24h;

b) Measurement accuracy: less than ± 0.1h;

c) Resolution rate: 0.1h;

d) Working environment temperature: -40 °C ~ + 60 °C.

5.5 Wind speed

Use wind speed sensor to observe. The wind speed sensor samples once per second, and automatically calculates and records the arithmetic mean wind speed every 5 minutes, the unit is m/s. The technical parameters of wind speed sensor are as follows:

a) Measuring range: 0m/s ~ 60m/s;

b) Measurement accuracy: ± 0.5m/s (3m/s ~ 30m/s):

c) Working environment temperature: -40 °C ~ + 60 °C.

5.6 Wind direction

Use wind direction sensor to observe. Wind direction and wind speed are synchronous acquisition. Automatically calculate and record vector average wind direction every 5min, the unit is (°). The technical parameters of wind direction sensor are as follows:

a) Measuring range: 0 ~ 360 °;

b) Measurement accuracy: ± 5 °;

c) Working environment temperature: -40 °C ~ + 60 °C.

5.7 Environment temperature

Use thermometer to observe. The thermometer samples once every 10s, and collects 6 samples every minute. Delete 1 maximum and 1 minimum; the arithmetic average of the remaining four samples is the instantaneous value of the minute.

d) Check whether the shading of scattered radiation meter completely shade the sensing surface and the glass cover of instruments, or adjust immediately.

8 Acquisition and transmission of measurement data

8.1 Use data acquisition device to gather data. The technical parameters requirements of data acquisition device are as follows:

a) Have the functions of collecting, calculating and recording all measuring elements of this specification;

b) Have the functions of remote data transmission and remote configuration and maintenance;

c) Be able to fully save the amount of data collected at least 1 month;

d) Have the function of regularly automatic timing;

e) Have the functions of network failure data caching and data self-recovery;

f) Have the function of fault alarm.

8.2 Measurement data transmission shall use wireless or wired transmission, the normal operation rate of transmission data shall be no less than 95%.

8.3 Measurement data transmission interval shall not exceed 5min, and time delay shall be less than 1min.

8.4 Data format

The specific data format of recorded and transmitted measurements is described in Table 1.

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