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PEOPLE'S REPUBLIC OF CHINA**

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**Proton exchange membrane fuel cell power supply systems for
distribution substations**

变电站用质子交换膜燃料电池供电系统

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1 Scope

China's national standard for proton exchange membrane fuel cell power supply systems used in electrical distribution substations. It specifies the terms and definitions, the system composition and the technical requirements, beginning with the conditions of use. A substation needs a backup supply for its own protection, control and communication equipment, and that supply must work precisely when the grid it sits on has failed. The traditional answer is a battery bank, which is reliable and has a limited endurance measured in hours, or a diesel set, which has fuel and starts unreliably after months of standing. A fuel cell fits the gap: it runs as long as hydrogen is supplied, has no combustion and almost no moving parts, starts predictably, and is silent enough for an urban site. The proton exchange membrane type is chosen for backup duty because it operates near ambient temperature and can therefore go from cold to full output in seconds rather than hours.

This Standard specifies the system composition, technical requirements, test methods, marking, packaging, transportation and storage of the proton exchange membrane fuel cell power supply system for power distribution substation. This Standard applies to the proton exchange membrane fuel cell DC backup power supply system for power distribution substation using hydrogen as fuel.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 3785 (all parts) Electroacoustics - Sound Level Meters

GB/T 4208 Degrees of Protection Provided by Enclosure (IP Code)

GB/T 9254-2008 Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement

GB/T 19826-2014 General Specification and Safety Requirements for DC Power Supply Equipment of Power Projects

GB/T 27748.1 Stationary Fuel Cell Power Systems - Part 1: Safety

GB/T 27748.3 Stationary Fuel Cell Power Systems - Part 3: Installation

GB/T 28816 Fuel Cell - Terminology

GB/T 31036-2014 Proton Exchange Membrane Fuel Cell Backup Power System - Safety

GB/T 31037.1-2014 Fuel Cell Power System Used for Industrial Lift Truck Applications -

Part 1: Safety

JB/T 5777.2-2002 General Specification for Control and Protection Panel (Cabinet, Desk) of Secondary Circuit of Power System In Figure 1, the fuel treatment system refers to the system that is composed of chemical and/or physical treatment equipment and related heat exchangers and controllers, which are required by the fuel cell power supply system to prepare fuel and pressurize it, if necessary. An oxidant treatment system refers to a system that is used to meter, regulate, treat, and possibly pressurize incoming oxidant for use by a fuel cell power supply system.

5 Technical Requirements

5.1 Use conditions The proton exchange membrane fuel cell power supply system for substations should be able to operate normally under the following environmental conditions:

- The working environment temperature is: $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$;
- Ambient relative humidity: 10% ~ 95%, non-condensing;
- The altitude does not exceed 2000m.

5.2 System technical requirements

5.2.1 General safety requirements The proton exchange membrane fuel cell power supply system (hereinafter referred to as "system") shall meet the requirements specified in GB/T 27748.1 and GB/T 27748.3.

5.2.2 Appearance and structure The appearance and structure of the system shall meet the following requirements:

- The appearance of the system shall be clean, without mechanical damage, and the interface contacts shall not be rusted;
- The surface of the system shall have product identification, and the identification shall be clear;
- The communication interface, power supply interface, dry contact interface, hydrogen interface, etc. of the system shall be clearly marked.

5.2.3 DC power supply capability

5.2.3.1 DC bus output voltage The maximum variation range of the DC bus output voltage shall be 90% ~ 110% of the nominal voltage of the DC system.

5.2.3.2 Fault discharge capacity After the system completes the discharge for the specified time under the rated power, the switching-on impulse discharge test is carried out, and the impulse current is superimposed 8 times to simulate the fault current. During the three