Electric Power Industry Standard of the People's Republic of China

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DL/T 5391—2007

Design Technical Code of Dispatching Communication of Electric Power System

电力系统通信设计技术规定

（英文版）

Issue Date: July 20, 2007

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Reviewed by : Northwest Electric Power Design Institute

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Foreword

This code is prepared as arranged by the *Notice on Printing and Distributing Industrial Standards Project Plan of the Year 2006* (FGBGY [2006] No. 1093) issued by the General Office of the National Development and Reform Commission.

The communication network of electric power systems is one of the national dedicated communication networks. Though having much in common with ordinary public communications, the power system communication has a lot of peculiarities. The interruption-free operation of power system and its abrupt change of operation status require highly reliable and fast communications. In respect of safety, real time, reliability, and availability, public communications could hardly meet the requirements of electric system, and economically, the communications operators cannot provide all the facilities required for the power sector. Therefore, it is necessary to establish a special communication network which suits the operational safety requirements of electric systems.

With the development of the electric power industry, the demand of electric power systems on communication is increasingly higher. Meanwhile, the boom of telecommunication technologies makes it possible to build a modern power communication system. New technologies are continuously introduced in addition to the existing ones for the development of new communication lines and modernized communication networks. This brings forward an urgent need for a unified design technical code for power system communication design to ensure the safe, reliable, high-quality, and

cost-effective operation of power networks. This code is prepared to meet the above need.

In accordance with the technical development and engineering practices of power system communication, this code highlights the technology of digital communication and reserves the power line carrier communication technology unique to the electric power system.

This code is proposed by the China Electricity Council.

This code is solely managed and interpreted by the Technical Committee on Electric Power Planning and Engineering of Standardization Administration of Power Industry.

This code is drafted by the Northwest Electric Power Design Institute.

The leading author of this code is Li Shun.

Any comments and suggestion for improvements during the implemention of this code are to be addressed to the Standardization Center of China Electricity Council at No.1, Ertiao Lane, Baiguanglu Rd., Beijing, China.

This code is translated by SUNTHER Translation & Solutions under the authority of China Electric Power Planning & Engineering Association.

Contents

1 Scope

This code specifies the services and requirements of power system communication (special communication for power system or power communication), standardizes and unifies the design technical regulations of major communication modes of power systems.

This code applies to the planning and design of power system communication, design of access system (including medium and large sized power plants and substations), and feasibility study and preliminary design of grids at provincial level and above. This code may be taken as a reference for the design of power system communication at district level.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this code. For dated references, subsequent amendments (excluding the contents of errata) to, or revision of, any of these publications do not apply. However, parties to agreements based on this rule are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

GB/T 4110 *Pulse Modulation Communication System Hierarchy*

GB/T 4705 *Coupling Capacitors and Capacitor Dividers*

GB/T 7255 *Single Sideband Power-line Carrier Terminals*

GB/T 7329 *Coupling Devices for Power Line Carrier Systems*

GB/T 7330 *Line Traps for a.c. Power Systems*

GB/T 7437 *The Transmission Performance Objectives for Public Analogue Toll Telephone Automatic Switching Network*

GB 7611 *Characteristics of the Electrical Interface at Hierarchical Bit Rate for Digital Network*

GB/T 13159 *Networking Specifications for Digital Radio Systems*

GB/T 14430 *Planning of Single-sideband Power Line Carrier Systems*

DL/T 524 *Specification for Power Line Carrier Transceiver Dedicated to Protection*

DL/T 788 *All Dielectric Self-supporting Optical Fiber Cable*

DL/T 832 *Optical Fiber Composite Overhead Ground Wires*

DL/T 888 *Electric Power System Dispatching Exchange Specification of DTMF Signaling*

DL/T 1040 *The Grid Operation*

DL/T 5025 *Technical Code of Engineering Design for Digital Microwave Communication Project of Electric Power System*

DL/T 5062 *Design Technical Rules for Transmission of Protection Information on Radiolink System*

DL/T 5092 *Technical Code for Designing 110 kV-500 kV Overhead Transmission Line*

DL/T 5157 *Design Technical Code of Dispatching Communication Exchange Network of Electric Power System*

DL/T 5189 *Technical Code for Designing Power Line Carry Communication*

DL/T 5218 *Technical Design Specifications for 220 kV-500 kV Substations*

DL/T 5225 *Technical Rule of Communication Design for 220 kV-500 kV Substation*

DL/T 5392 *Specifications of Engineering Design for Digital Synchronization Network of Electric Power System*

YD/T 799 *Specifications and Test Methods for Valve-regulated Lead Acid Battery for Telecommunications*

YD/T 1058 *High Frequency Switching Power Supply System for Telecommunications*

YD/T 1073 *Combined Solar Power System for Telecommunications*

YD/T 1095 *Uninterruptible Power Systems for Communications*

YD 2011 *Specifications on Lightning Discharges and Earthing Design for Microwave Stations*

YD 5003 *Specifications of Engineering Design for Telecommunication Private Premise*

YD 5004 *Standards of Engineering Design for Digital Microwave Relay Telecommunication System (PDH Part)*

YD 5080 *Design Specification of Network Management System of SDH Optical Fiber Cable Telecommunication Project (tentative)*

YD/T 5088 *Specifications of Engineering Design for Synchronous Digital Hierarchy (SDH) Microwave Relay Telecommunication System*

YD/T 5089 *Specifications of Engineering Design for Digital Synchronization Network*

YD/T 5095 *Specifications of Engineering Design for SDH Long-haul Optical Fiber Cable Transmission Project*

ITU-T Recommendation G.703—1998 *Physical/Electrical Characteristics of Hierarchical Digital Interfaces*

ITU-T Recommendation G.704—1998 *Synchronization Frame Structures Used at 1,544, 6,312, 2,048, 8,448 and 44,736 kbit/s Hierarchical Levels*

ITU-T Recommendation G.712—1992 *Transmission Performance Characteristics of Pulse Code Modulation Channels*

ITU-T Recommendation G.713—1998 *Performance Characteristics of PCM Channels between 2-wire Interfaces at Voice Frequencies*

ITU-T Recommendation G.781—1994 *Structure of Recommendations on Multiplexing Equipment for the Synchronous Digital Hierarchy (SDH)*

ITU-T Recommendation G.783—2000 *Characteristics of Synchronous Digital Hierarchy (SDH) Equipment Functional Blocks*

ITU-T Recommendation G.812—1998 *Timing Requirements of Slave Clocks Suitable for Use as Node Clocks in Synchronization Network*

ITU-T Recommendation G.813—1996 *Timing Characteristics of SDH Equipment Slave Clocks (SEC)*

ITU-T *Recommendation* G.842—1997 *Interworking of SDH Network Protection Architectures*

ITU-T Recommendation G.957—1995 *Optical Interfaces for Equipments and Systems Relating to the Synchronous Digital Hierarchy*

ITU-T Recommendation V.11—1996 *Electrical Characteristics for Balanced Double-current Interchange Circuits Operating at Data Signaling Rates up to 10 Mbit/s*

3 General

3.0.1 Power system communication is defined as the dedicated communication which meets the requirements of electric power systems by transmitting and exchanging information in forms of symbols, signals, texts, images, voices or information of any other nature required for operation and management of power systems via optical fiber, wired, and wireless systems or any other electromagnetic systems. In a narrow sense, the power system communication is restricted to the system communication, mainly providing communication among power plants, substations, dispatching stations and headquarters to meet the requirements of communication regarding production and management.

3.0.2 The power system communication provides an information channel and a means of information exchange for power dispatch, reservoir dispatch, teleprotection, safety automation devices, dispatch automation, electric energy metering system, power market and its technical support system, load control, and information management system for power production. The power system communication is mainly for electricity production, and it also serves infrastructure construction, flood control, and administrative management.

3.0.3 Power system communication is an indispensable part to the grid operation. In planning, designing and constructing the primary part of power system, the communication shall be undertaken accordingly.

3.0.4 The design of power system communication shall be done when the design of power system and the management principles of

grid dispatch are substantially finalized. It should be done together with the secondary parts of the power system, such as relay protection and dispatch automation.

3.0.5 As required by the national policies on communication technologies and according to the features of power production, the power system communication shall be mainly in the form of digital fiber, supplemented by microwave, mobile communication, satellite communication, and other forms where feasible, to build the backbone network into an integrated digital communication network which may suit the requirements of power systems and various types of information.

3.0.6 Based on the dispatch and production management mode of electric power systems, the power system communication networks are to be under unified dispatch and hierarchical management.

3.0.7 Power system communication networks shall be established on a level basis and accessed on a layer basis. While designing a communication network, the sharing of communication resources at all levels shall be fully considered to develop and use the existing resources.

4 Service Types and Transmission Bandwidth

4.1 Service Types of Power System Communication and Their Basic Functional Requirements

4.1.1 The services of power system communication are generally classified into the following four types based on the media and application:

1 Voice services, including dispatch calls, conference calls, production management calls and administrative calls.

2 Data services, including data of system relay protection and grid safety automation device, data of dispatch automation, data of power market, data of management information system and office automation system, and data of grid dynamic supervisory control system.

3 Video services, including video conference, video surveillance in power plants and substations.

4 Multi-media services, including information retrieval, scientific computation and information processing, e-mails, Web application, video texts, multi-media conferences, video on demand, video broadcasting, and e-commerce.

4.1.2 Basic Functions of Power System Communication and Their Special Requirements

1 Dispatch Call Transmission

1) Generation, transmission, and distribution operators communicate with each other using dispatch calls, which must be kept available at all times. The traffic volume of