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**P**

**DL/T 5136—2001**

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**Technical Code for Designing of  
Electrical Secondary Wiring in  
Fossil Fuel Power Plants  
and Substations**

**火力发电厂、变电所二次接线  
设计技术规程**

**(英文版)**

Date: December 26, 2001

Implementation Date: May 1, 2002

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Issued by the State Economic and Trade Commission of the People's Republic of China

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Fossil Fuel Power Plants  
and Substations**

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Reviewed by: Northwest Electric Power Design Institute

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BEIJING, 2013

## Foreword

This code is a revision to NDGJ 8—1989 *Technical Code for Designing of Electrical Secondary Wiring in Fossil Fuel Power Plants and Substations* as required by item 59 of the *Notice on Issuance of Plan for Development and Revision of Electric Power Industry Standards (First Batch) (Jizong (1996) Document No. 40)* issued by the former Ministry of Power Industry.

This code is developed to incorporate the design experience from 1990s, with particular attentions paid to large-scale units and high voltage technologies. New technologies and products are adopted to reflect internationally advanced technologies, and due consideration are given to opinions of construction and operation entities. Alignment with national standards is stressed to ensure higher reliability and operability of construction design. This code specifies the basic principles for design of secondary wiring. It is made up of 13 chapters and 10 appendices, in which the following items are added in addition to the modifications and supplements made to original provisions:

- 1) Computer-based supervision of electrical system of power plants and network section of substations and power plants;
- 2) Fault recorder and AC Uninterrupted Power Supply (UPS) System;
- 3) Grounding and anti-interference measures;
- 4) I/O quantities of generator-transformers, substation transformers and network section of power plants in appendices.

All appendices to this code are normative except for Appendix J,

which is informative.

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

Chief development organizations of this code: Northwest Electric Power Design Institute of State Power Corporation.

Chief drafting staffs of this code: Zhao Kunming, Chen Xueyong, Yang Yuehong, Li Xiaobo, and Meng Xuan.

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

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## 1 Scope

This code specifies the principles and standards for designing electrical secondary wiring of power plants and substations. It applies to newly-built fossil fueled power plants with rated capacity of 12 MW-600 MW per unit and newly-built 35 kV-500 kV substations with rated capacity of 5 MVA and above per transformer. It also provides references for expansion and betterment projects.

## 2 References

The following normative references contain provisions which, through reference in this text, constitute provisions of this standard for dated references, subsequent amendments to (excluding error corrections), or revisions of, any of these publications do not apply. When this code is published, the standards of the indicated editions are all effective and in force. These standards may have their revised editions, and parties to adopt this code shall negotiate the possibility of adopting the latest editions of the standards indicated below.

DL/T 5137—2001 *Technical Code for Designing Electrical Measuring and Energy Metering Device*

GB 50049—1994 *Code for Design of Small-size Power Plant*

GB 50227—1995 *Code for Design of Installation of Shunt Capacitors*

GB 50217—1994 *Code for Design of Cables of Electric Work*

GBJ 50065—1983 *Code for Design of Grounding of AC Electrical Equipment Specifications for the Design of Grounding (Earthing) of Industrial and Civil Electric System*

SDJ 8—79 *Specifications for Design of Grounding (Earthing) of Electrical Equipment*

GBJ 59—1983 *Specifications for the Design of Industrial and Civil 35 kV Power Substations*

GB 14285—1993 *Technical Code for Relaying Protection and Security Automatic Devices*

GB 50059—1992 *Design Code for Substation (35-110 kV)*

DL 5000—1994 *Technical Code for Designing Fossil Fuel*

*Power Plants*

DL/T 5044—1995 *DC System Technical Code for Designing Fossil Fuel Power Plants and Substation*

DL/F 5103—1999 *Design Code for Unattended Substation of 35 kV-110 kV*

SDJ 2—1988 *Technical Code for Designing 220-500 kV Substation*

## 3 Terms and Symbols

### 3.1 Terms

#### 3.1.1

##### **Central Control Room**

The centralized control room for main electrical systems and equipment in power plants and substations.

#### 3.1.2

##### **Unit Control Room**

The control room for a unit consisting of the boiler, turbine, generator and the main auxiliary machineries and equipment.

#### 3.1.3

##### **Network Control Room in Power Plant**

The control room for main electrical equipment in step-up substations.

#### 3.1.4

##### **Centralized Control Center**

The control center for electrical equipment of power plants and unattended substations of power systems.

#### 3.1.5

##### **Relay Room**

The room accommodating the relay protection and automation devices, transducers, energy integrating and recording instruments, and auxiliary relay panels.

#### 3.1.6

##### **Electronics Room**

The room accommodating protection and automation devices for

electrical and instrumentation and control (I&C) systems in power plants.

3.1.7

**Auxiliary Panel**

The vertical switchboard accommodating control, signal, instrument, relay and terminal blocks.

3.1.8

**Mimic Panel**

The panel that mimics electrical wiring and displays operating status and parameters.

3.1.9

**Mosaic Control Panel**

Control panels with mosaic screen.

3.1.10

**Mimic bus**

Schematic diagrams on the panel (desk) that mimics the main circuit and busbars.

3.1.11

**Mini-busbar**

Conductors providing common connection points for secondary wiring on control or relay panels.

3.1.12

**Terminal Block**

The appliance used for connection or fixing of terminals of cable core wires or wires between secondary equipment.

3.1.13

**Central Signaler**

The device used to give out fault and abnormal alarms in power plants and substations.

3.1.14

**Flash Alarm**

Alarm devices with flashing function.

3.1.15

**Fault Alarm**

The alarm signals given for emergency tripping of circuit breakers.

3.1.16

**Abnormal Alarm**

The alarm signal given for abnormality of equipment.

3.1.17

**Control with Strong Power Source**

The control mode with rated control voltage of 110 V DC or above.

3.1.18

**Control with Weak Power Source**

The control mode with rated control voltage of 60 V DC or below.

3.1.19

**One to One Control**

The control mode with one switch or button for each controlled object.

3.1.20

**Blocking against Misoperation**

The blocking to prevent electrical misoperation.

3.1.21

**Special Standby Power**

Standby power source for special use.

3.1.22

**Mutual Standby Power**

Standby power sources acting as backup for each other.

3.1.23

**High Speed Change-over (HCO)**

The emergency change-over of high-voltage auxiliary power supplies of power plants to be completed within 0.1 s.

3.1.24

**Voltage Check Change-over (VCO)**

The emergency change-over of high-voltage auxiliary power supplies to be performed only when the working busbar voltage is lower than 25% of the rated value.

3.1.25

**Parallel Change-over (PCO)**

The change-over operation for which the opening order for the circuit breaker of the high-voltage auxiliary power supply and the closing order for the circuit breaker of the standby power source are issued simultaneously.

3.1.26

**Series Change-over (SCO)**

The change-over operation for which the circuit breaker of the standby power supply can close only after the circuit breaker of the high-voltage auxiliary power supply opens.

3.1.27

**Central Synchronizing**

The synchronizing mode with the synchronization instruments and relevant synchronization selector switches installed on one same panel and all synchronization operations performed on the same panel.



3.1.28

**Distributed Synchronizing**

The synchronizing mode with the synchronization instruments installed on a small rotary panel or the central signal panel, and relevant synchronization switches installed on panels within the effective view distance of the operators and the synchronization selector switches distributed on other panels.

3.1.29

**Excitation System**

A combination of devices used to provide adjustable excitation current for synchronous generators, which includes excitation power source (DC exciter, AC exciter or excitation transformer and rectifier), automatic voltage regulator, manual control device, de-excitation, protection, monitoring devices and instruments.

3.1.30

**Rated Field Current ( $I_{fn}$ )**

The excitation current of the synchronous generator under rated operation conditions.

3.1.31

**Rated Field Voltage ( $U_{fn}$ )**

The DC voltage across the excitation winding of the synchronous generator under rated operation conditions.

3.1.32

**No-load Field Current ( $I_{f0}$ )**

The excitation current for the synchronous generator to generate rated voltage under no-load condition at rated speed.

3.1.33

**No-load Field Voltage ( $U_{f0}$ )**

DC voltage across the excitation winding of synchronous