



Hengyi Industries Sdn Bhd
恒逸实业（文莱）有限公司

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Electrical Equipment and Operation Management System

电气设备及运行管理制度

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	Electrical Equipment and Operation Management System 电气设备及运行管理制度				
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1 Purpose

目的

The System aims is hereby formulated in order to enhance the management on the maintenance and troubleshooting for the electrical devices as well as the operation of the substation of the Company, thus ensuring a safe, stable and long-term operation of the electrical power system and the electrical devices of production units.

为了加强公司电气设备维护、检修及变配电所运行管理，保证电力系统和各生产装置电气设备的安全、稳定、长周期运行，特制定本制度。

2 Scope of Application

适用范围

The System is applicable to the electrical management in all departments of the Company and in the contractors who are responsible for the maintenance and troubleshooting of the production units.

本制度适用公司所属各部门及负责生产装置维护检修的各承包商的电气管理。

3 Terms and Definitions

术语和定义

3.1 Temporary power supply: the temporary power supply facilities used in production, maintenance, construction or urgent repair.

临时用电：指因生产、检修、施工或抢修而接的临时用电设施。

3.2 “Three-three plus Two-five” system: it refers to “Three permits”(work permit, operation permit and temporary electricity utilization permit), “Three diagrams”(primary system diagram, secondary circuit diagram and cable routing diagram), “Three periodical activities”(periodical maintenance, periodical test and periodical cleaning); “Five regulations” (maintenance regulation, test regulation, operation regulation, safety regulation and accident handling regulation), “Five records”(maintenance record, test record, operation shift record, accident record and equipment defect record).

三三二五制是指：三票（工作票、操作票、临时用电票），三图（一次系统图、二次回路图、电缆走向图），三定（定期检修、定期试验、定期清扫），五规程（检修规程、试验规程、运行规

程、安全规程、事故处理规程），五记录（检修记录、试验记录、运行值班记录、事故记录、设备缺陷记录）。

3.3 Emergency power supply device: black-start generator set and EPS power unit.

事故电源设备：黑启动发电机组和 EPS 电源装置。

4 Management Responsibilities

管理职责

4.1 Specified administrative authority

归口管理部门

4.1.1 Equipment Management Department is the centralized management department of electrical equipment, responsible for organizing the formulation of electrical equipment management system, organizing the preparation and review of technical regulations and standards for electrical equipment, maintenance and overhaul, and troubleshooting plans, and supervising their implementation.

机械动力部为电气设备的归口管理部门，负责组织制定电气设备管理制度，组织编制、审核电气设备、维护、检修等技术规程和标准、故障处理预案，并监督执行。

4.1.2 Be responsible for the Company's electrical equipment management, as well as organizing to solve the important and complex technical issues of the electrical equipment.

负责全公司电气设备管理；负责组织处理电气设备的重大、复杂技术问题。

4.1.3 Be responsible for managing, coordinating and monitoring the lightning and static electricity protection efforts.

负责防雷防静电的管理协调和工作监督。

4.1.4 Be responsible for reviewing the update, upgrade, scrapping, overhaul schedule, spare parts plan, and overhaul and emergency repair schemes of electrical equipment.

负责审核电气设备的更新、改造、报废、检修计划及备品备件计划；审核电气设备检修和抢修方案。

4.1.5 Be responsible for organizing to investigate, analyze and respond to severe accidents of electrical equipment.

负责组织重大电气设备事故的调查、分析和处理。

4.1.6 Be responsible for approving and managing the outsourcing of electrical works and equipment repair.

负责电气工作和设备修理外委审批和外委工作管理。

4.1.7 Be responsible for organizing to prepare the electrical equipment records according to the Company's equipment management system.

负责按公司设备管理制度组织编制电气设备台帐。

4.2 Coordinated management departments

协同管理部门

4.2.1 Materials Supply Dept. is responsible for the purchase and quality assurance of the electrical equipment, as well as providing the technical documents and data related to the electrical equipment purchased.

物资装备部负责电气设备的采购及其质量保证；提供所采购的电气设备技术文件和资料。

4.2.2 HSE Dept. is involved in the safety and environmental protection management throughout the operation of electrical equipment.

HSE 管理部参加电气设备运行的全过程中有关安全、环保工作的管理。

4.3 Executive departments

执行部门

4.3.1 Equipment Operation Departments

各装置运行部门

4.3.1.1 Responsible for the daily inspection and use management (including professional cooperation) of electrical equipment, lightning protection and anti-static facilities within the battery limit of this department.

负责部门界区内电气设备、防雷、防静电设施的日常巡检及使用管理（包含专业配合工作）

4.3.1.2 Be involved in the type selection and acceptance of main electrical equipment inside the battery limit, as well as routine patrol inspection for motors (including operating column) and lighting fixtures.

参与界区内主要电气设备的选型、验收；定期巡检电动机（含操作柱）、照明灯具。

4.3.2 Lab Dept.

质量检验部

Be responsible for the outsourcing of the analysis and test of transformer oil and sulfur hexafluoride gas.

负责变压器油、六氟化硫气体的分析检测外委。

4.3.3 Electrical Operation Dept.

电气运行部

4.3.3.1 Electrical Operation Dept. is an executive department for electrical equipment, operation and power dispatching. Meanwhile, it undertakes the professional management of the Company's electrical operation and power dispatching.

电气运行部是电气设备、运行及电力调度的执行部门，同时负责全公司电气运行及电力调度的专业管理。

(1) Be responsible for preparing the electrical specification, fault handling plan and operating specification.

负责编制电气操作规程、故障处理预案及运行规程。

(2) Be responsible for the Company's power transmission, distribution and transformation operation and management, as well as voltage control of power generation done by the Power Dept. and its electrical operation management.

负责全公司输电、配电、变电操作和运行管理；负责热电部发电电压控制和电气运行管理。

(3) Be responsible for technology, operation, safety, maintenance and field management of the Company's electrical equipment.

负责全公司电气设备的技术、运行、安全、维护和现场管理。

(4) Be responsible for formulating the maintenance and update schedules of electrical equipment, as well as implementing the update, maintenance and repair work.

负责编制电气设备各类修理、更新计划，负责实施更新和检维修作业。

(5) Be responsible for selection and technical exchange of electrical equipment, signing and receipt acceptance of technical appendixes, and exchange on new electrical products and technologies.

负责电气设备的选型、技术交流，负责技术附件的签订和收货验收。负责电气新产品、新技术的交流。

(6) Be responsible for managing the basic technical data of electrical equipment, and generating and completing the electrical equipment records and data.

负责电气基础技术资料的管理，建立完善电气设备台帐、资料。

(7) Responsible for relay protection technology, setting, inspection and operation maintenance; Responsible for regular inspection and maintenance of lightning protection and antistatic.

负责继电保护技术、定值、检验和运行维护；负责防雷、防静电的定期检查及维护。

(8) Be responsible for management of the dispatching of the Company's electric power system.

负责公司电力系统调度管理。

(9) Be responsible for relationship and coordination between the Company's power grid management and the government electric power department (corporation).

负责公司电网管理及政府电力部门（公司）的工作联系与协调。

(10) Be responsible for approving temporary power supply, as well as operating, maintaining, inspecting and managing temporary electric equipment.

负责临时用电的审批和临时用电设备的运行、维护、检查和管理。

(11) Be responsible for dealing with the field electrical failures, as well as participating in the investigation, analysis and handling severe electrical equipment and operation accidents.

负责现场电气故障的处理；参与重大电气设备和运行事故的调查、分析和处理。

(12) Be responsible for applying the outsourcing of electrical works and equipment repair and maintenance.

负责电气工作和电气设备修理设备检修外委申请。

5 Management Content

管理内容

5.1 Electrical operation management

电气运行管理

5.1.1 Basic requirements

基本要求

5.1.1.1 Strengthen management on the operation of electrical power system, to ensure a safe, reliable and economic operation of these systems as well as a safe and smooth production of the units.

加强电力系统运行管理，确保电力系统安全可靠和经济运行，实现装置的安全平稳生产。

5.1.1.2 Based on the principles of Unified Dispatching and Level-to-Level Administration, establish an operation management organization to develop a complete, appropriate operation and dispatching regulation.

依据“统一调度、分级管理”的原则，设立运行管理机构，制定、完善有关的运行、调度规程。

5.1.1.3 The electrical equipment shall be safe and reliable, and systems shall operate in a stable and economic manner.

电气设备安全、可靠，系统运行稳定、经济。

5.1.1.4 Both the name and serial number of electrical equipment shall be satisfactory.

电气设备命名、编号符合双重要求。

5.1.1.5 The electrical power system shall be with miniaturized unit, automated dispatching and networked communication.

电力系统实现保护装置微机化、调度自动化、通讯网络化。

5.2.1.6 For the electrical power system dispatching and communication, at least two different types of reliable communication devices in good conditions shall be provided, along with voice recording equipment; the electrical power dispatching and operation positions must be provided with recording telephones.

电力系统调度通讯至少有两种以上不同方式的通讯装置，并配备录音设备，保证完好可靠；电力调度岗位及电气运行岗位必须配备录音电话。

5.2.1.7 The remote control and monitoring device and mimic board of the electrical power system shall provide accurate data and correct signal.

电力系统远动监控装置和模拟屏必须保证数据准确，信号正确。

5.1.2 Power supply quality management

供电质量管理

5.1.2.1 Switch the equipment such as arc suppression coil and compensation capacitor promptly, with changes in the operation mode of power grid.

根据电网运行方式的变化，及时做好消弧线圈、补偿电容等设备的投切。

5.1.2.2 Establish measures to improve the power supply of system, and regulate frequency and voltage appropriately when necessary.

制定提高系统供电质量的措施，做好频率、电压的调整工作。

5.1.2.3 Identify the voltage monitoring and control point according to the characteristics of power grid, and take appropriate technical actions in accordance with specified allowable voltage deviation, to ensure the supply voltage is up to standard.

根据电网特点，确定电压监视控制点，按电压允许偏差值的有关规定，合理采取技术措施，确保供电电压符合标准。

5.1.2.4 Based on the actual conditions of power grid, include the harmonic control in the management on normal system operation, and take scientific and effective technical actions to keep the harmonic content conform to *GB/T 14549 Quality of Electrical Energy Supply – Harmonics in Public Supply Network*.

根据电网的实际状况，把谐波治理工作纳入系统正常运行管理，采取科学有效的技术措施，使谐波含量符合《电能质量公用电网谐波》（GB/T 14549）的要求。

5.1.2.5 The generator set shall incorporate advanced automation technologies with time, to ensure the frequency is stable in the isolated grid operation.

发电机组应随着自动化技术的发展，采取先进技术，确保电网孤网运行时的频率稳定。

5.1.3 Power generation/supply and energy saving management

发/供用电及节能管理

5.1.3.1 Electrical Operation Dept. assists Scheduling & Dispatch Dept. in establishing the annual and monthly power generation/supply plan according to the Company's annual and monthly production plan as well as the power consumption quota of products.

根据公司年度、月度生产计划和各种产品的耗电定额，电气运行部协助计划调度部编制年度、月度发/供用电计划。

5.1.3.2 Electrical Operation Dept. reviews the electricity bill from meter reading, makes an electricity consumption report for current month based on charged electricity quantity and meter reading, receives and reviews the bill from purchased electricity, and then forwards to Finance Dept. for settlement.

电气运行部负责审核抄表结算电费单，每月根据收费电量和抄表电量编制当月用电量报表；负责接收外购电收费单据，审核后转财务管理部结算。

5.1.3.3 Electrical Operation Dept. reports the actual electricity consumption of last month and unit electricity consumption of products to Scheduling & Dispatch Dept. by 2nd of every month.

电气运行部每月 2 日前将上月实际用电量、产品用电单耗等上报计划调度部。

5.1.3.4 Temporary power supply is subject to Clause 5.4.2.

临时用电按 5.4.2 条执行。

5.1.3.5 Electrical Operation Dept. shall establish energy saving measures specific to electrical equipment, thus to reduce the electricity consumption and increase the Company's benefits.

电气运行部应制订电气设备的节能措施，降低电耗，提高企业经济效益。

5.1.3.6 Under the premise that the grid safety and power supply quality are secured, fully utilize existing equipment, and take technical actions such as appropriate and economic operation, system reactive power optimization, load allocation and enhanced line loss management, to reduce the system loss.

保证电网安全和供电质量基础上，充分利用现有设备，通过合理安排经济运行方式、优化系统无功、调配负载、加强线损管理等技术措施，降低系统损耗。

5.1.3.7 Optimize the reactive power of generator according to the distribution of reactive power flow; based on the combination of local compensation and centralized compensation, deploy the static and dynamic reactive power compensators properly, and switch and stop the reactive power compensators promptly, to improve their operation and reduce electric energy loss.

根据无功潮流分布情况，优化发电机无功出力，按就地补偿和集中补偿相结合的原则，合理配置静态和动态无功补偿装置，及时投、停无功补偿设备，提高其运行水平，降低电能损耗。

5.1.3.8 Proactively promote proven, efficient and energy-efficient electrical equipment, and employ lasted technologies, processes, equipment and materials, to make the electrical equipment less energy consumed.

积极推广成熟的高效节能电力设备，采用新技术、新工艺、新设备、新材料，降低用电设备的能耗。

5.1.3.9 Electrical Operation Dept. shall make analysis on economic operation monthly, develop corrective measures and plans against any problem, and report these measures and plans to Equipment Management Dept.

电气运行部应进行月度经济运行分析，对存在的问题制定整改措施和计划，同时上报机械动力部。

(1) Illumination shall be provided by efficient and energy-efficient LED lamps and with energy-efficient control devices.

装置照明宜采用 LED 高效节能灯具及节能控制装置。

(2) Transformer used shall be efficient and low-consumption.

选用高效低耗型变压器。

(3) Applicable AC frequency converter shall be used.

合理选用交流变频调速装置。

5.1.3.10 System harmonics shall be governed effectively to reduce harmonics loss.

有效治理系统谐波，降低谐波损耗等。

5.1.4 Electrical power system and accident handling and management

电力系统及事故处理管理

5.1.4.1 Define the operation mode of electrical power system, as follows:

编制电力系统的运行方式，内容如下：

(1) According to the calculations in terms of system stability, flow and short circuit, define the normal and special operation modes, relay protection and automatic device setting schemes; and low-cycle (low-voltage) load shedding scheme.

按系统稳定、潮流、短路计算结果，确定系统正常运行方式、特殊运行方式；系统继电保护及自动装置整定方案；低周（低压）减载方案

(2) Annual dispatching plan, primary equipment maintenance schedule, and newly-built and expanded equipment operation schedule.

月度调度计划、主要设备检修进度表、新建、改扩建设备投运进度表。

(3) The highest (lowest) voltage level of system, and the voltage deviation at the voltage monitoring point.

系统最高（低）时的电压水平，电压监控点的电压偏差值。

(4) Severe accident anticipation and emergency response.

重大事故预想和应急处理措施。

(5) Proposed system improvements and test plans.

系统改进意见和试验计划。

5.1.4.2 Prepare the relay protection and automatic equipment configuration schemes and protection configuration diagrams, conduct setting calculations, submit for approval, issue them after approval, and oversee their implementation.

编制继电保护和自动装置的配置方案、保护配置图，定值计算、送审、下达，并监督执行。

5.1.4.3 Based on the principle of “Integration of Management and Control”, improve the construction of power dispatching information network and database.

按“管控一体化”原则，完善电力调度信息网和数据库的建设工作。

5.1.4.4 Prepare load balancing schemes, oversee the implementation of power utilization plan, and develop and implement strictly the power rationing and low-cycle load shedding or quick load shedding schemes based on the requirements of production units.

编制负荷平衡方案，监督计划用电的执行，依据生产装置的要求，制订限电拉路顺序及低周减载或负荷快速联切方案并严格执行；

5.1.4.5 The dispatching automation system of electrical power system shall be provided with 4 remote capabilities (remote signaling, metering, control and adjustment), and the unattended substation shall be equipped with television monitoring system.

电力系统调度自动化系统应具备“四遥”（遥信、遥测、遥控、邀调）功能，无人值守变电站应安装电视监控系统。

5.1.4.6 Accident handling principle

事故处理原则

(1) Prevent the accident from spread promptly, eliminate the causes of the accident, and remove the threat to person and equipment.

迅速限制事故发展，消除事故根源并解除对人身和设备安全的威胁。

(2) As a top priority, always assure the service power of power station in every way possible. 用一切可能的方法，首先保证电站厂用电。

(3) Recover the power supply for the units in blackout as quickly as possible. 尽快对已停电的装置恢复供电。

(4) Adjust the operation mode of the electrical power system, to recover its normal operation mode as quickly as possible.

调整电力系统运行方式，尽快恢复其正常运行方式。

5.1.4.7 Accident handling procedure

事故处理程序

(1) When an accident occurs, the field operator on duty shall handle according to specific regulations and report it to the power dispatcher timely.

事故发生后，现场值班人员应按有关规程处理并及时向电力调度汇报。

(2) The power dispatcher shall make correct judgment according to the accident conditions, deal with it promptly, and report to the superior and Scheduling & Dispatch Dept.

电力调度根据事故现象，正确判断，迅速处理，并汇报主管领导及生产调度。

(3) In case of a severe system accident, it is necessary to organize involved personnel to analyze the accident and establish countermeasures.

重大系统事故，要组织有关人员分析，制定相应的反事故措施。

5.1.5 Management of five-prevention of high-voltage electrical equipment

高压电气设备“五防”管理

5.1.5.1 Any HV electrical equipment that has a risk of misoperation, shall be provided with an anti-misoperation device that is required to prevent the following (five-prevention):

能引起误操作的高压电气设备，均应装设防误装置，防误装置应能实现下述“五个”功能（简称“五防”）：

(1) Accidental ON/OFF of breaker.

防止误分、误合断路器。

(2) On-load turnon/turnoff of isolation switch.

防止带负荷拉、合隔离开关。

(3) Hot-line layout (connection) of grounding wire (grounding knife-switch).

防止带电装设（合）接地线（接地刀闸）。

(4) Closing the circuit breaker (isolation switch) together with grounding wire (grounding knife-switch).

防止带接地线（接地刀闸）合断路器（隔离开关）。

(5) Accidental access to charging interval.

防止误入带电间隔。

5.1.5.2 HV switch cabinet operated shall have “five-prevention” functions.

在运的高压开关柜必须具有“五防”功能。

5.1.5.3 Anti-misoperation device operated shall not be unlocked without permission. Any unlocking necessary for solving device defect or accident shall be approved by the person in charge, recorded and recovered to normal states afterwards.

任何人不得擅自对运行中的防误装置解锁。如因装置缺陷或事故处理等确需解锁操作时，必须经分管领导同意，并作记录，事后应及时恢复正常状态。

5.1.5.4 The power supply required for the device shall be separated from the relay protection of equipment and the power supply of control circuit.

装置要求所用电源应与设备的继电保护、控制回路的电源分开。

5.1.5.5 The device shall be protected against dust, foreign matters, rust and blockage. For the outdoor anti-misoperation devices, waterproof and moistureproof measures shall be taken.

装置应做到防尘、防异物、防锈、不卡涩，户外的防误装置应有防水、防潮措施。

5.1.5.6 Defensive measures for power transformation and distribution room against small animals

变配电室防小动物管理

(1) Cable trench outlet and other holes of the power transformation and distribution room shall be sealed.

变配电室必须对电缆沟口及其它孔、洞进行封堵处理。

(2) Windows and doors of the power transformation and distribution room shall be made of non-combustible materials, in good condition and closed tightly. The windows shall be equipped with wire net against small animals, and the doors shall be opened outwards and equipped with at least 50cm high rat guard.

变配电室门窗应采用非燃材料，保持完好，关闭严密，窗户应装设防止小动物的护网，门应向外开启，并加设高度不低于 50 厘米的防鼠板。

(3) When tapping on the wall of power transformation and distribution room as well as switch cabinet test and overhaul are necessary during construction, provisional measures against entry of small animals shall be taken timely, and such holes shall be sealed immediately at the end of construction.

因施工需要在变配电室墙开孔、洞和进行开关柜试验、检修作业时，要及时采取防小动物进入的临时措施，施工结束所开孔、洞应及时封堵。

(4) Interval, protective net and door of the electrical equipment shall be in good condition.

电气设备的间隔、护网、门应保持完好。

(5) The doors of high and low voltage switches and other electrical operation equipment must be closed during operation, and the cable holes at the bottom must be blocked.

高低压开关等电气运行设备的门在运行中必须关闭，其底部的电缆孔洞必须封堵。

(6) The bus of newly-built power transformation and distribution room and switch cabinet shall be sealed bus duct or isolated bus.

新建变、配电室和开关柜的母线应采用封闭母线槽或绝缘母线。

(7) The door shall be kept closed behind any person in and out of the power transformation and distribution room.

人员出入变配电室，必须随手关门。

5.1.6 Management of relay protection and automatic safety device

继电保护和安全自动装置管理

5.1.6.1 Relay protection is subject to Centralized Leadership and Level-to-Level Management.

继电保护实行“统一领导、分级管理”。

5.1.6.2 Relay protection shall be undertaken by the person with appropriate professional skills. Sole-duty or part-time duty personnel shall be designated to the calculation of relay protection setting value, and such personnel shall be kept relatively stable.

继电保护工作应由具有一定专业技术水平的人员承担。继电保护定值计算应设专职或兼职人员，并保持人员相对稳定。

5.1.6.3 Main relay protection and automatic safety devices (hereafter referred to as "protection device") include: monitoring device for the functions such as data acquisition and processing, remote control and communication; protection device of the equipment; automatic reclosing, standby equipment, and automatic and quick switching devices (fast switching device, quick load shedding device) of reserve power; system stability control device; auto-starting device of motor; automatic adjustment of excitation, automatic self-synchronization and quasi-synchronization of generator, automatic load reduction by frequency, oscillation or prediction (load shedding, generator shedding, disconnection, etc.), microcomputer "five prevention" device, fault wave recorder and other automatic devices to secure the system; and connection control and protection, automatic safety device secondary circuit and components.

继电保护和安全自动装置（以下简称保护装置）主要包括：完成数据采集和处理、遥控和通信等功能的监控装置；设备的保护装置；自动重合闸、备用设备及备用电源自投装置、快切装置（备用电源快速切换装置、负荷快速联切装置）；系统稳定控制装置；电动机自启动装置；自动调整励磁、发电机自同期与准同期、按频率自动减负荷、振荡或预测（切负荷、切机、解列等）、微机“五防”装置、故障录波装置及其它保证系统安全的自动装置等；连接控制与保护、安全自动装置二次回路与元件。

5.1.6.4 Enhance management shall be implemented for relay protection and automatic safety device. The relay protection setting values shall be calculated in accordance with relevant national and industrial regulations and requirements, and managed in a closed loop. Actions of the relay protection and automatic safety device shall be evaluated and analyzed periodically, to improve the management.

加强继电保护和安全自动装置管理，继电保护定值计算应符合国家、行业相关规范和要求，定值管理实行闭环管理。定期开展继电保护和安全自动装置动作评价、分析工作，提高管理水平。

5.1.6.5 Relay protection and automatic safety device shall be technologically advanced, proven, reliable, and integrated of management and control.

继电保护和安全自动装置应选用技术先进、成熟可靠的产品，并具备“管控一体化”功能。

5.1.6.6 Microcomputer protection and automatic device shall have functions of fault and operation recording and export, clock, clock synchronization and automatic detection.

微机保护及自动装置应具有故障、操作记录及输出功能、时钟及时钟同步功能，装置自动检测功能。

5.1.6.7 10KV and above line and 10KV power supply tie line of plant substation shall be provided with fiber-optical longitudinal differential protection.

10 千伏及以上线路和装置变电所的 10 千伏电源联络线应装设光纤纵差保护。

5.1.6.8 Generator, 66KV line and transformer shall be provided with special fault wave recorder with clock and clock synchronization functions.

发电机、66 千伏线路及变压器应设置具有时钟及时钟同步功能的专用故障录波器。

5.1.6.9 The monitoring device of substation shall be provided with UPS.

变电站监控装置应配置不间断电源。

5.1.6.10 Inspection periods and items of protection device shall conform to relevant national and industrial regulations and requirements.

保护装置的检验周期、检验项目应按国家、行业的相关规范和要求执行。

5.1.6.11 For any work on the protection device and secondary circuit, records shall be made in the work permit and secondary safety measure work permit.

保护装置及二次回路上工作，必须填写工作票和二次工作安全措施票。

5.1.6.12 The protection device qualified in inspection shall be encrypted and password information shall be filed in written form in Electrical Operation Dept. The operating personnel shall accept the relay protection after its completion, to inspect that the removed wires, elements and marks are return to original positions and pressing plate and test handover records are clear. The device shall only be put into operation after acceptance.

保护装置检验合格后应加密，密码资料在电气运行部书面备案。在继电保护工作完毕后，运行人员应进行验收，如检查拆动的接线、元件、标志是否恢复正常，压板位置、试验交接记录所写内容是否清楚等，验收合格后方可投入运行。

5.1.6.13 When the protection device is put into operation at the first time or changed, the operator shall check the setting value and relevant precautions with the on-duty power dispatcher prior to the device operation.

保护装置在新投入或经过变更时，运行人员必须和当值电力调度员进行整定值及有关注意事项的核对，无误后方可投入运行。

5.1.6.14 Clocks of remote control, monitoring, relay protection and automatic safety devices and fault wave recorders shall be accurate and consistent.

远动、监控、继电保护、安全自动装置及故障录波等装置时钟应准确、一致。

5.1.7 Management of safety appliance

电气安全用具管理

5.1.7.1 Before use, the insulating safety appliance shall be inspected visually for any crack, scratch, blur, hole, breakage and other exterior injury as well as clean surface. After use, the appliance shall be stored in accordance with the following requirements:

绝缘安全用具使用前，应进行外观检查，外表有无裂纹、划痕、毛刺、孔洞、断裂等外伤，并检查表面是否清洁，使用后应正确保管，保管方法要求如下：

(1) Storage place shall be dry and ventilated, and insulating rod shall be suspended or placed on a holder, without contact with wall.

存放在干燥通风的场所，绝缘杆应悬挂或架在支架上，不应与墙面接触。

(2) Insulating gloves shall be stored in a closed cabinet and separated from other tools and instruments.

绝缘手套应存放在密闭的橱内，并与其他工具仪表分别存放。

(3) Insulating boots shall be stored in a cabinet and not used as ordinary rain boots.

绝缘靴应存放在橱内，不应作为一般雨鞋使用。

5.1.7.2 Electroscopic is a safety appliance to check if there is no voltage on the electrical equipment. HV electroscopic shall be stored in a dampproof box in a dry place.

验电器是检验电器设备是否确无电压的一种安全用具，高压验电器应存在防潮的匣内，并放在干燥的地方。

5.1.7.3 Grounding wire is the most direct measure to protect the personnel from electric shock. It shall be numbered and stored in a specified place; the storage place number shall be consistent with the wire number.

接地线是保证工作人员免遭触电伤害最直接的保护措施，接地线应分别编号，并存放在规定位置，放置位置编号应与接地线编号一致。

5.1.7.4 Signboards draw the personnel's attention to safe work and procedure compliant operation; its surface shall be kept clean and complete.

标示牌提醒工作人员注意安全施工及按规程进行操作，应保持表面清洁完整。

5.1.7.5 Main safety appliances for aerial work include lifting board, ladder, climber, safety belt, waist strap and helmet.

高空作业安全用具主要包括升降板、梯子、脚扣、安全带、腰绳、安全帽等。

5.1.7.6 In addition to proper use and storage, the safety appliance shall be tested regularly and the test cycle and standards shall conform to *Work Regulations of Electrical Procedures*.

对安全用具除正确使用、妥善保管外，还应定期进行试验，试验周期和标准应遵守《电力安全工作规程》有关规定。

5.2 Management of electrical equipment

电气设备管理

Electrical equipment shall be managed in accordance with relevant regulations and requirements specified by Equipment Management Dept. for equipment management.

电气设备管理应当执行机械动力部设备管理的相关规定及要求。

5.2.1 Generator

发电机

5.2.1.1 Generator set shall be inspected routinely and regularly by permanent staff to eliminate potential operation risks and defects promptly, and be maintained specially.

对机组进行定人、定时巡检，及时消除运行隐患和缺陷，并开展“特护”活动。

5.2.1.2 Overhaul shall be scheduled according to the cycle and items specified in regulations, and a complete technical file for generator overhaul shall be created.

按规程规定的周期、项目安排检修，建立健全发电机检修技术档案。

5.2.1.3 Measures shall be taken to guarantee a safe and stable isolated grid operation of generator.

应制定发电机孤网运行安全、稳定措施。

5.2.1.4 Operational safety and precautions of generator set:

发电机组操作安全 and 注意事项：

(1) Prior to operation and maintenance of generator set, the generator user manual shall be read and understood.

使用及维护发电机组前，必须阅读并理解发电机组用户手册。

(2) Generator set shall be operated and maintained by specially trained personnel who have knowledge of safety precautions and operation & maintenance procedures.

发电机组须由受过专项培训的人员维护操作，维护操作人员必须掌握安全预防措施及操作维护程序。

(3) Operation personnel shall not start the generator set when it is in an abnormal state.

操作人员不得在机组异常情况下开机。

(4) Generator set shall be shut down before cleaning, maintenance and repair by the maintenance personnel.

维护人员对机组清洁、维护、修理时，必须在停机状况下进行。

5.2.2 Transformer

变压器

5.2.2.1 Substations with first order and second order load shall be equipped with 2 or (if technical economy allows) more transformers. When one of them is switched off, capacities of other transformers shall meet first order and second order load.

一、二级负荷的变电站（所）应装设 2 台变压器，当技术经济比较合理时，可装设 2 台以上变压器。当断开 1 台时，其余变压器的容量应能满足一、二级负荷。

5.2.2.2 Oil-immersed power transformer shall be provided with fire-fighting equipment and emergency oil discharge facilities according to the specifications. Chromatographic analysis shall be carried out at least every six months for 66 KV or 8000 KVA and above oil-immersed power transformer, The outlet (or near zone) short circuit. When any abnormality is found, tracking and analysis shall be enhanced.

油浸电力变压器应按规范设置消防设施和事故排油设施。油浸电力变压器色谱分析，66 千伏或 8000 千伏安及以上每半年分析一次；出口（或近区）短路后应分析一次，发现异常加大跟踪分析力度。

5.2.2.3 In the event of an accident, the emergency overload capability of transformer is permitted, and the overload value shall be in accordance with the specification or manufacturer's regulations.

在事故情况下，允许使用变压器的事事故过负荷能力。其过负荷的数值应按规范或制造厂的规定执行。

5.2.2.4 Transformer shall be operated, maintained and tested according to the requirements of the manufacturer.

变压器要按制造厂使用要求进行运行、维护、试验等。

5.2.2.5 Reactor, transformer, arc suppression coil, capacitor and other equipment shall also be subject to the above provision.

电抗器、互感器、消弧线圈、电容器等设备参照上述条款执行。

5.2.2.6 Capacitance current shall meet the actual needs of the system in different operation modes, and have a wide range of adjustment considering the future development of system; the device shall have a stable performance and reliable operation when the system is either normal or failed.

必须满足系统不同运行方式下电容电流的实际需要，并考虑今后系统的发展，应具有较宽的调整范围；系统正常和故障情况下装置的性能稳定、动作可靠。

5.2.3 Motor

电动机

5.2.3.1 Under the grid voltage that conforms to relevant regulations, the motor shall operate at the rated capacity.

在电网电压符合相关规定时，电动机应保证额定容量运行。

5.2.3.2 The motor in operation shall be checked for its sound, running current, running voltage, temperature rise, vibration, exciting current (for synchronous motor) and commutator (for DC motor). Important motors shall be monitored for their condition; items such as partial discharge of winding, insulation and bearing temperature of high-voltage motors shall be detected; and the monitoring results shall be recorded for analysis, so as to guide the motor maintenance.

对运行中的电动机应检查其声音、运行电流、运行电压、温升、振动和同步电动机的励磁电流及直流电动机的换向器。重要电机应进行状态监测，检测高压电动机绕组局部放电、绝缘、轴承温度等项目，并把监测结果记入台帐进行分析，指导电动机检修。

5.2.3.3 Allowable temperature of the motor bearing shall conform to the specifications provided by the manufacturer, or not exceed (if manufacturer's specifications unavailable): for sliding bearing, 90°C (oil outlet flow temperature shall not greater than 65°C); for rolling bearing, 85°C. Lubricating oil and grease for the motor bearing shall match the bearing operating temperature and rotation speed.

电动机轴承允许温度，应遵守制造厂的规定，无制造厂规定时，应遵照以下规定：对于滑动轴承，不得超过 90°C，出油温度不应高于 65°C；对于滚动轴承，不得超过 85°C；电动机轴承用的润滑油、脂，应符合轴承运行温度及转速的要求。

5.2.3.4 Allowable temperature rise of motor shall be subject to Table 1.

电动机允许温升参照表 1 执行。

Table 1 Allowable temperature rise of motor

表 1 电动机允许温升表

Insulation grade 绝缘材料等级	A	E	B	F	H	C
Allowable temperature of insulation °C 绝缘材料允许温度°C	105	120	130	155	180	Above 180 180 以上
Allowable temperature rise of motor K 电机的允许温升 K	60	75	80	105	125	125

5.2.3.5 The motor shall be filled with lubricating oil regularly according to its running condition, and lubrication records shall be established.

根据电动机运行状况定期注油，并建立润滑台帐。

5.2.3.6 Stand-by motor shall be inspected periodically to ensure it is in good standby state.

备用电动机应定期检查，确保处于完好备用状态。

5.2.4 Electric power line

电力线路

5.2.4.1 66KV power cable shall be operated and managed according to relevant specifications and the following requirements. The single-core power cable shall not have an eddy current loop, the grounding wires at the middle connection shall be cross-connected, and grounding shall be done through the voltage protector earth box. To facilitate testes, removable connection device shall be provided between the cable terminal and the transformer of GIS power cable transformer unit circuit. For preventive test of the power cable of GIS power cable transformer unit circuit, insulation test of outer sheath shall be carried out only, rather than main insulation voltage-withstand test.

按相关规范做好 66 千伏电力电缆的运行管理，还应遵循的要求：单芯电力电缆不得存在涡流回路，中间接头处接地线应进行交叉互联，经过电压保护器接地箱接地；GIS 电力电缆线路变压器组回路的电缆终端头与变压器之间，宜装设可拆卸的连接装置，便于试验；GIS 电力电缆线路变压器组回路的电力电缆的预防性试验，一般不做主绝缘耐压试验，只做外护套绝缘检测试验。

5.2.4.2 Power line shall be provided with visible marks in accordance with regulations (including at the cable head). Any construction organization shall not work in the power line protection area without approval.

电力线路应按规范要求设置明显的标志设施（包括电缆头位置）。在电力线路防护区内动土，施工单位必须按规定提前办理动土许可手续。

5.2.4.3 Line inspection shall be enhanced. The operating line shall be inspected at least once a month and inspection shall be recorded. In case of typhoon, rainstorm, abnormality, fault trip and other events, the line shall be inspected specially, and preparation shall be made to prevent accidents. Induced voltage and current of outer cable sheath, cable tray, grounding box, cable trench, drainage well, and etc shall be checked periodically.

加强线路巡视工作。每月对运行线路至少进行 1 次定期巡视，并做好记录；遇台风、暴雨、线路异常、故障跳闸等情况，需对线路进行特殊巡视，并做好预防事故的准备工作；定期检查电力电缆外护套感应电压、电流，电缆桥架、接地箱、电缆沟及排水井等。

5.2.4.4 Analysis on line operation shall be strengthened. The running condition of line, the defects of equipment and the causes of line faults and trip shall be analyzed carefully and relevant preventive measures shall be taken.

加强线路运行分析。对线路运行状况、设备存在缺陷以及所发生的线路故障及跳闸事故原因进行认真分析，并制定防范措施。

5.2.5 High-voltage switchgear 高压开关设备

5.2.5.1 Measures to prevent accidents and improve technologies shall be taken, according to the accidents, faults, operation and overhauls of switchgear as well as the checking computation results of breaking short-circuit current of breaker. Earthing knife-switch shall not

be installed on the power supply side of 66KV and 10KV metal armored incoming switch cabinet.

根据开关类设备的事故、故障、运行、检修情况以及断路器开断短路电流的核对验算结果，制定反事故措施和技术改进措施。66 千伏、10 千伏金属铠装式进线开关柜电源侧不得装设接地刀闸。

5.2.5.2 Newly installed switchgear shall receive commissioning test before operation, and operating switchgear shall receive preventive test according to regulations. Preventive test shall be carried out on the newly installed substation bus in a year, on the operating bus according to regulations. Imported equipment shall be operated, maintained and tested according to the manufacturer's requirements.

新安装的开关设备，投运前必须进行交接试验，运行中的开关设备应按规定进行预防性试验；新安装变电站（所）的母线，一年内应进行预防性试验，运行中的母线应按规定进行预防性试验。对引进设备要按照制造厂使用要求进行运行、维护、试验等。

5.2.5.3 Main items of GIS commissioning and acceptance include visual inspection, electrical test, gas test, mechanical test and data archiving.

GIS 交接验收项目主要包括：外观检查、电气试验、气体试验、机械试验、资料归档等。

5.2.5.4 Although minor and major repair of GIS is generally every 4 years and every 15 years respectively, they shall be carried out according to the overhaul cycle of production unit or the manufacture's recommendations.

GIS 小修一般为 3 年 1 次，大修 15 年 1 次，宜结合生产装置停车检修周期或按制造厂建议进行小修或大修。

5.2.5.5 Plan of the gas cell structure of GIS shall be available and posted on the wall. GIS distribution room shall be provided with good natural and forcible ventilation facilities. Online monitoring device of SF6 gas and oxygen content shall meet relevant national standards, and the operation position shall be equipped with portable SF6 leakage detector.

GIS 应有气室结构平面图，并上墙。GIS 配电室内应装设良好的自然通风和强迫通风设施。SF6 气体及氧含量在线监测装置应符合国家相关标准，运行岗位应配置便携式 SF6 泄漏检测仪。

5.2.6 UPS

UPS 电源系统

5.2.6.1 UPS shall be provided in the power supply system for the process control instrument of production plant.

生产装置过程控制仪表电源的供电系统应配置 UPS。

5.2.6.2 UPS shall operate in a good environment, where temperature of $(25\pm 5)^{\circ}\text{C}$ and relative humidity of 40%-70% are recommended, necessary moistureproof and dustproof measures shall be taken and air conditioning equipment with a capability of dehumidification shall be provided.

UPS 应具备良好的运行环境，运行环境温度以 $(25\pm 5)^{\circ}\text{C}$ 、相对湿度 40%-70% 为宜，并采取必要的防潮、防尘措施，装设带有除湿功能的空调设备。

5.2.6.3 The Electrical Operation Dept. shall establish UPS operation & maintenance regulations and fault response plan, and continuously improve the ability to deal with sudden failures.

电气运行部编制 UPS 的操作、维护管理规定、故障应急预案，不断提高处理突发故障的能力。

5.2.6.4 UPS operation personnel shall have appropriate expertise, operate and manage the UPS in accordance with regulations, inspect the UPS periodically, and record abnormal situations timely.

UPS 运行操作人员应具备 UPS 专业知识，做好 UPS 运行管理，按规定进行各项操作，定期进行巡视检查，发现异常情况及时记录。

5.2.6.5 UPS battery should be tested on-line for internal resistance once every six months, and the capacity check and activation charge and discharge test should be conducted once every three years or with the maintenance of the device.

UPS 电池应每 6 个月进行 1 次内阻在线检测，每 3 年或者随装置检修进行 1 次容量检查及活化充、放电试验。

5.2.7 Frequency converter

变频调速装置

5.2.7.1 Length of the power cable of high-voltage frequency converter shall conform to the manufacturing specification.

高压变频器电源电缆的长度应符合制造说明书的要求。

5.2.7.2 The personnel operating the frequency converter shall have appropriate expertise, inspect the frequency converter periodically, and record abnormal situations timely.

变频调速装置运行操作人员应具备相应专业知识，定期进行巡视检查，发现异常情况应及时记录。

5.2.7.3 Technical personnel shall analyze the operation regularly, and take preventive measures against the problems (if any) to ensure safe operation.

技术人员应定期进行运行分析，针对存在的问题及时采取预防措施确保安全运行。

5.2.7.4 Measures to improve harmonic control and shielding shall be taken considering the nonlinear characteristics of the frequency converter, in order to: ensure that the harmonic component of frequency converter connected to the bus system meet national standards; reduce the harmonic pollution of power system and interference to adjacent equipment; and identify the "electronic groove" of bearing caused by high frequency shaft current of motor resulting from the frequency converter harmonic.

根据变频器非线性特点，应考虑完善谐波治理和屏蔽措施，确保变频器接入母线系统谐波分量满足国标要求，减少对电源系统的谐波污染和对相邻设备的干扰，拟制定变频器谐波导致电动机高频轴电流造成轴承的“电子刻槽”现象。

5.2.8 Emergency power supply

事故电源设备

5.2.8.1 The operation and maintenance procedures of emergency power unit shall be established, and observed by the operation and maintenance personnel.

编制事故电源设备的运行维护规程。设备操作、维护人员必须遵守设备运行维护规程。

5.2.8.2 The emergency power unit shall be inspected periodically, and abnormal situations (if any) shall be recorded and solved timely.

定期对事故电源装置进行巡视检查，发现异常情况应及时记录、处理。

5.2.8.3 The emergency power supply shall be isolated from the mains reliably, without asynchronous paralleling with the mains.

事故电源必须与市电系统可靠隔离，严禁同市电系统非同期并列。

5.2.8.4 At least 1 generator commissioning shall be carried out every month and be recorded. Monthly at least 1 generator test run and good test record.

5.2.9 DC power unit

直流电源设备

5.2.9.1 The DC system is generally equipped with two buses; the DC network shall adopt radiation power supply, and be provided with appropriate fuse or DC breaker.

直流系统一般设置两段母线，直流网络宜采用辐射供电方式，并应配置合适的熔断器或直流断路器。

5.2.9.2 Each battery set in the DC system shall be provided with a microcomputer monitoring device, and its signal shall be available for uploading.

直流系统中宜按每组蓄电池组设置一套微机监控装置，其信号应能上传。

5.2.9.3 The DC system should be equipped with a battery pack with appropriate capacity. The internal resistance of the battery should be tested online once every six months, and the capacity check and activation charge and discharge test should be conducted once every three years or with the maintenance of the device.

直流系统应配置容量合适的蓄电池组，电池应每 6 个月进行 1 次内阻在线检测，每 3 年或随装置检修进行 1 次容量检查及活化充、放电试验。

5.2.9.4 The battery should operate under an ambient temperature of $(25\pm 5)^{\circ}\text{C}$.

蓄电池的运行环境温度以 $(25\pm 5)^{\circ}\text{C}$ 为宜。

5.2.9.5 Two sets of modular high-frequency switching power unit should be used as the rectification charging equipment of DC power supply, and operation and maintenance regulations of DC power unit should be established.

直流电源的整流充电设备一般宜选用两套模块组合式高频开关电源装置，并编制直流电源设备的运行维护规定。

5.2.9.6 The DC power supply shall be inspected periodically, and abnormal situations (if any) shall be recorded and solved timely.

定期对直流电源进行巡视检查，发现异常情况应及时记录、处理。

5.2.10 Lighting equipment

照明设备

5.2.10.1 Lighting equipment shall be inspected and maintained regularly to ensure it is in good condition and meet the needs of field work.

定期检查维护照明设备，保证照明设备状况良好，满足现场工作需要。

5.2.10.2 The maintenance of lighting equipment shall strictly follow relevant provisions, with safety measures taken. In the flammable and explosive places, lamps shall not be replaced on live line.

照明设备的检修应严格遵守有关规定，做好安全措施，在易燃易爆场所禁止带电更换灯具。

5.2.10.3 In the event of blackout of normal lighting power supply, emergency lighting shall be able to switch on automatically.

当正常照明电源失电时，事故照明应能自动投入。

5.2.10.4 Other electrical loads shall not access the emergency lighting circuit.

在事故照明回路中不得接入其他用电负荷。

5.2.10.5 The safety lighting shall be managed in accordance with relevant work safety, supervision and management system of Sinopec.

安全照明管理按照中国石化安全生产监督管理制度的有关规定执行。

5.2.10.6 The aviation obstruction signal light of tower, stack and other high-rise buildings shall comply with the provisions of the aviation department, and the protection signal light of port, wharf and other structures shall comply with the regulations of the maritime authority.

塔、烟囱等高建筑物的航空障碍信号灯，应符合航空部门的规定，港口、码头等建构筑物的防护信号灯应符合海事局部门的规范。

5.2.11 Integrated automation network communication system

综合自动化网络通讯系统

5.2.11.1 The management level of the integrated automation system shall have an extensive communication protocol library that contains both international and domestic standard protocols, enabling reliable communication with the power grid dispatching automation system as well as with the common intelligent equipment in the field.

综合自动化系统管理层应具有包括国际国内标准规约在内的较丰富的通讯规约库，向上既能与电网调度自动化系统实现可靠的通讯，向下又能与现场常用智能设备实现可靠的通讯。

5.2.11.2 The integrated automation system shall be configured fully considering the informatization requirement of electrical systems, and generally shall have the following functions:

综合自动化系统的配置方案应充分考虑电气系统信息化发展需要，通常应具备以下功能：

(1) Status monitoring of all equipment of substation;

变电站（所）内所有设备的状态监视；

(2) Operating parameter measurement of key equipment;

重要设备运行参数的测量;

(3) Required equipment remote control;

必要的设备遥控;

(4) Linkage and interlocking of the equipment in the substation and between substations;

变电站(所)内及站(所)间设备的联动和闭锁

(5) Statistics, analysis and printing of operating data and information;

运行数据及信息的统计、分析、打印;

(6) Forwarding the substation internal data to the plant-wide power monitoring rooms.

变电站(所)内数据向全厂电力监控室转发功能。

5.2.11.3 In addition to common electrical equipment and protection devices, the integrated automation system shall monitor equipment according to actual field situation, such as fault wave recorder, on-line detector, DC unit, low current earthing device, arc suppression coil automatic compensator, UPS device, and AC frequency converter.

综合自动化系统所监视设备的范围除了常规的电力设备和保护装置外,还应根据现场实际情况,包括故障录波装置、在线检测装置、直流装置、小电流接地选线装置、消弧线圈自动补偿装置、UPS 装置、交流变频调速装置等在内的设备。

5.2.11.4 The microcomputer protection device shall have functions and protection characteristics that meet the field needs, with high reliability, rapidity and accuracy, stable performance, and capabilities of anti-interference, fault recording, fault wave recording and GPS time synchronization, so as to meet the requirements of operation monitoring, fault handling, commissioning test and data communication.

微机保护装置的功能和保护特性应满足现场需要,具有较高的可靠性、速动性和精确性,性能稳定,抗干扰能力强,具有故障记录、故障录波和 GPS 对时功能,满足运行监视、故障处理、调试试验和数据通讯的需要。

5.2.11.5 A reliable network communication structure with data transmission speed that meets the operational requirements shall be used according to the actual situation. For important substations, redundant system shall be applied.

应根据实际情况,采用可靠的、数据传输速度满足运行需要的网络通讯结构,重要的变电站应采用冗余系统。

5.2.12 Management of explosion-proof electrical equipment

防爆电气设备管理

5.2.12.1 Management of explosion-proof electrical equipment shall be normalized in strict accordance with existing national standards and specifications.

根据现行的防爆电气设备国家标准和规范要求,严格规范防爆电气设备管理工作。

5.2.12.2 The explosion-proof electrical equipment engineering shall be designed in accordance with existing national standards and specifications.

防爆电气设备工程的设计应符合现行的国家标准和规范要求。

5.2.12.3 Selection of electrical equipment for the places with an explosion risk

爆炸危险场所的电气设备选型

(1) Safe, reliable, cost-effective and applicable explosion-proof electrical equipment shall be selected.

防爆电气设备的选型原则是安全可靠，经济合理。

(2) The explosion-proof electrical equipment that meets the requirement of explosion-proof structure in the explosion hazard place shall be selected.

根据爆炸危险场所区域等级对电气设备防爆结构的要求选择相应的电气设备。

(3) The level and category of the explosion-proof electrical equipment selected shall not be below that of the explosive substances in the place. If there are two or above explosive substances, the higher level and category shall take precedence.

选用防爆电气设备的级别和组别，不应低于该区域内爆炸性物质的级别和组别。当存在两种以上爆炸性物质时，应按危险程度较高的级别和组别来选用。

(4) The electrical equipment and lines in the explosion dangerous places shall also match the chemical, mechanical, climatic, windy, dusty and other environmental conditions in the surrounding.

爆炸危险场所内的电气设备和线路，应同时符合周围环境中化学、机械、气候、风沙等不同环境条件对电气设备的要求。

5.2.12.4 The engineering installation, supervision and construction acceptance of explosion-proof electrical equipment shall follow the construction and acceptance specifications of electrical equipment in explosion hazard environment.

防爆电气设备的工程安装、监理与施工验收应遵循爆炸危险环境电气装置施工及验收规范。

5.2.12.5 The explosion-proof electrical equipment shall be operated and maintained in accordance with *Electrical Safety Regulations for Explosive Hazardous Areas*, and the conformity shall be inspected regularly.

防爆电气设备的运行与维护应按《中华人民共和国爆炸危险场所电气安全规程》规定执行，并定期检查执行情况。

5.2.12.6 The explosion-proof electrical equipment shall be overhauled in accordance with *GB3836.13 Maintenance of Electrical Equipment in Explosive Gas Environment* and relevant regulations, and by the personnel who have been trained in explosion-proof electrical equipment.

防爆电气设备的检修按《爆炸性气体环境用电气设备的检修》（GB3836.13）和有关规定执行，防爆电气设备的检修人员应经过防爆电气设备知识的培训。

5.3 Management of power dispatching

电力调度管理

5.3.1 Dispatching management

调度管理内容

5.3.1.1 The power dispatcher shall follow the command of production scheduler and balance the electric power according to the instruction of production planning and production scheduling. For adjustment of power load, the chief of duty shall follow the command of power dispatcher and adjust the operation of boiler and steam turbine according to the requirement of power balance. When the change in heat engine system may affect the generation load and cause power shortage, the shift supervisor shall report timely to the power dispatcher who then report to the production scheduler for taking measures. Any instruction from the Brunei power grid dispatcher to the power dispatcher shall be implemented unconditionally and immediately. If there is an obvious mistake in or doubt about the instruction, the power dispatcher shall immediately report to the specific leader in Electrical Operation Dept. and implement the instruction after review and approval.

电力调度服从生产调度指挥，根据生产计划和生产调度的指令，做好电力平衡；调整电力负荷时，值长服从电力调度指挥，根据电力平衡要求，调整锅炉汽机运行；热机系统发生变化，可能影响发电负荷、电力不足时，值长及时向电力调度汇报，电力调度向生产调度汇报，采取措施；电力调度接到文莱电网调度指令时，原则上应无条件立即执行，当指令明显错误或存在重大疑问时，电力调度应当立即汇报电气运行部分管领导，经审核批准后执行。

5.3.1.2 The power dispatcher is responsible for organizing and directing the operation, load balancing, relay protection configuration, remote communication and accident handling of electrical power system;

电力调度负责组织指挥电力系统的运行操作、负荷平衡、继电保护配置、远动通讯、事故处理等；

5.3.1.3 The main responsibilities of the power dispatcher include: execute the operation mode of this system; manage the operation of the equipment within the jurisdiction; command the system accident handling, investigate and analyze accidents, and take measures to improve the safe and economic operation of the system; manage the operation of relay protection, automatic devices, communication and remote control equipment within the jurisdiction; supervise the implementation of planned electricity consumption and participate in the preparation of load balancing schemes; participate in the formulation and implementation of power rationing and low-cycle (low load) shedding schemes; communicate the operation command of the external system;

电力调度的主要职责包括：执行本系统的运行方式；对调度管辖设备进行操作管理；指挥系统事故处理，调查分析事故，制定提高系统安全经济运行的措施；管辖范围的继电保护、自动装置、通讯和远动设备的运行管理；监督计划用电的执行情况，参与编制负荷平衡方案；参与制订并执行限电拉路顺序及低周（低压）减载方案；转达外系统的操作命令；

5.3.1.4 Manage the load of the electrical power system: strictly control the load limit of each operation department according to the power distribution plan of the electrical power system; according to the characteristics of the electrical power system and the requirements of the production units, formulate and implement the power rationing measures strictly under the

organization of the Scheduling & Dispatch Dept.; always be informed of operating parameters and load changes of the electrical power system, and organize load adjustment.

负责电力系统的负荷管理：依据电力系统的电力分配计划，严格控制各运行部的负荷限额；依据电力系统特点及生产装置的要求，在计划调度部的组织下，制订限电措施并严格执行；应随时掌握电力系统的运行参数及负荷变动情况，组织进行负荷调整。

5.3.2 Management of dispatching operation

调度操作管理

5.3.2.1 The equipment within the jurisdiction shall be dispatched as directed; for the equipment within the jurisdiction of Brunei power grid dispatcher, the power dispatcher shall contact the Brunei power grid dispatcher;

调度管辖设备的操作，必须按调度命令执行；文莱电网调度管辖设备，由电力调度负责与文莱电网调度联系；

5.3.2.2 Dispatching shall be implemented in accordance with relevant procedures (advance notice, repetition, implementation, reporting and acknowledgement) and recorded, with correct terms used.

调度操作应执行预告、命令、复诵、执行、汇报、确认的程序，并做好录音，正确使用调度术语；

5.3.2.3 With the change in power grid operation mode, the electrical operation team leader shall report the on-off status of arc suppression, filtering, compensation capacitor and other equipment in time.

根据电网运行方式变化，要求电气运行班长及时汇报消弧、滤波、补偿电容等设备的投切情况。

5.3.2.4 Be responsible for issuing the operating instructions of electrical equipment within the jurisdiction and commanding the adjustment of generator output, system voltage, system power factor and etc.

负责管辖电力设备操作指令的下达和指挥发电机出力、系统电压、系统功率因数等的调整。

5.3.2.5 Direct the handling of electrical system accidents.

指挥电力系统事故处理。

5.3.2.6 Before the pumps of 1000 kW and above are started, the operation department shall notify the electric power dispatcher, and the electric power dispatcher shall confirm the permission before starting.

1000 千瓦及以上机泵启动前由运行部通知电力调度，由电力调度确认许可后方可启动。

5.4 Management of electrical equipment maintenance and overhaul

电气设备维护与检修管理

5.4.1 Requirements for management of electrical equipment maintenance and overhaul

电气设备维护与检修管理内容

5.4.1.1 Be informed of the construction and installation of the electrical equipment on the site.

了解、熟悉、掌握建设期间现场相关电气设备的施工安装。

5.4.1.2 Supervise the installation quality, three inspections and four determinations, commissioning and operation of the electrical equipment during construction, to lay a better foundation for subsequent electrical equipment maintenance.

建设期间监督相关电气设备的安装质量、三查四定、调试投用，为今后更好进行电气设备维护打基础。

5.4.1.3 Be responsible for the professional maintenance, repair, servicing and inspection of the electrical equipment in relevant region, to ensure the safe, stable, long-time, full and optimal operation of the equipment.

负责相应区域电气设备专业的维护、维修、保养、巡检，保证设备的安、稳、长、满、优运行。

5.4.1.4 As directed by the Client's electric team leader, perform the power outage and power transmission of low-voltage distribution (single circuit).

根据委托人电气班长的指令，执行低压配电（单一回路）的停送电操作任务。

5.4.1.5 Maintenance of protection devices

保护装置的维护

(1) For the work on protection devices and secondary circuits, available work permit shall be provided;

有关保护装置及二次回路的工作必须有工作票；

(2) Before work on the protection devices and secondary circuits, the operator shall review the work permit and safety measures of the relay protection personnel, and shall take effective actions to prevent any possible misoperation of the protection devices caused by any work.

在保护装置及二次回路上工作前，运行人员必须审查继电保护工作人员的工作票及其安全措施，凡可能引起保护装置误动作的一切工作，运行人员必须采取防止保护装置可能误动作的有效措施；

(3) Operators must regularly inspect the protection device and its secondary circuit. If any abnormality is found, it shall be reported to power dispatching and relevant personnel in time; According to the allowable load current or allowable load curve set by the protection device, the load flow of electrical equipment or lines is monitored. If you find any abnormal situation that may cause the protection device to malfunction, you should contact the relay protection department in time and report to the relevant personnel according to the division of jurisdiction. In case of emergency, the protection device can be stopped first and reported immediately afterwards. If defects and abnormal conditions are found in the protection device and secondary circuit, records shall be made, and the relevant departments shall be notified and urged to eliminate and deal with them;

运行人员必须对保护装置及其二次回路进行定期巡视。如发现异常，应及时汇报电力调度和有关人员；按保护装置整定所规定的允许负荷电流或允许负荷曲线，对电气设备或线路的负荷潮流进行监视。如发现可能使保护装置误动的异常情况时，应及时与继电保护部门联系，并按管辖范围的划分向有关人员汇报。紧急情况下，可先行将保护装置停用，事后立即汇报。发现保护装置及二次回路存在缺陷及不正常情况，应做出记录，通知及督促有关部门消除及处理；

(4) For the signal of relay protection action, it must be confirmed by the on-duty team leader and the personnel on duty, restored after accurate recording and reported to relevant departments in time according to the division of the jurisdiction;

对继电保护动作时的信号，必须经值班长与值班人员共同确认，准确记录后，方可复归，并按管辖范围的划分及时向有关部门汇报；

(5) Under normal circumstances, the voltage transformer and line side voltage transformer (or voltage extraction device) of the substation are not allowed to exit the operation. When exiting the operation, the impact on the protection device should be fully considered, the consent from the competent department of relay protection should be obtained, and preventive measures should be taken;

正常情况下，变电所的电压互感器和线路侧电压互感器（或电压抽取装置）不允许退出运行，必须退出运行时应充分考虑到其对保护装置的影响，并征得继电保护主管领导的同意，采取防范措施；

(6) In order to avoid misoperation of electronic equipment such as comprehensive relay protection and microcomputer protection device due to electromagnetic signal interference, it is strictly prohibited to use walkie-talkies, mobile phones and other electronic devices within 2m of such equipment when operating. Cooling and dust prevention measures should be set up in the operation site; and the installation location of such equipment must be set up with obvious warning signs;

为避免综合继电保护、微机保护装置等电子设备受电磁信号的干扰而发生误动作，在该类设备运行时，其周围 2m 内严禁使用对讲机、手机等电子器具，运行场所应设置降温、防尘措施；该类设备的装设地点必须有明显的警示标识；

(7) When allowed by the production device, the protection device should be used regularly for the close-open test of circuit breaker and automatic switching test of incoming lines and section (bus tie) switch to verify the correctness of protection action;

生产装置许可的情况下，应定期利用保护装置进行一次断路器分合闸试验、进线、分段（母联）开关的分合闸自动投切试验，以检验保护动作的正确性；

(8) Due to the limitation of continuous operation of production devices, protection devices that cannot be inspected periodically according to the regulations must be reported to change the process.

因生产装置连续运行限制，不能按照规程规定周期进行检验的保护装置，必须报请变更流程。

5.4.2 Management of temporary power supply 临时用电管理

5.4.2.1 Where temporary power is required for construction or other reasons, the permit for temporary power supply must be obtained.

凡在施工或其它原因需临时用电者，一律办理临时用电票。

5.4.2.2 See "Regulations on Management of Temporary Power Supply" for the handling procedures for temporary power supply permit and the safety technology for temporary power supply.

临时用电票办理程序及临时用电安全技术见“临时用电安全管理规定”

5.4.2.3 Management requirement for temporary power supply:

临时用电管理要求:

(1) The power supply and shutdown of refining plant area and other explosion hazardous areas should be carried out according to the "Hot Work Permit". At the end of each day, all temporary power supply should be disconnected and the substation switched out. The substation will supply power after seeing the "Hot Work Permit" every day, and other operations should be supplied after seeing the power permit. Explosion-proof power supply, electrical equipment and tools conforming to the explosion-proof grade must be used in explosion hazardous areas;

炼油装置区及其它爆炸危险场所的送、停电按“用火作业许可证”动火时间执行。每天用电结束，应断开一切临时电源，变电所拉闸。变电所每天见“用火作业许可证”送电，其它用电作业见用电票送电。爆炸危险场所必须使用符合防爆等级的防爆电源、用电设备及工具；

(2) The validity period of the temporary power supply permit should not exceed half a month. If the permit is continued to be used beyond the specified period, the user should go through the formalities according to the temporary power supply procedures in advance;

临时用电票有效期不超过半个月，超期继续使用，须提前按临时用电办理程序办理手续；

(3) Organizations using temporary power supply should not change the location and content of power use, and are not allowed to arbitrarily increase the power consumption. Once such situation occurs, power supplied to the organization should be immediately cut off;

临时用电单位不得变更用电地点和内容，禁止任意增加用电负荷，一旦发生此类现象，供电单位应立即停止供电；

(4) Only operators with electrician certificates are allowed to install temporary power lines. Unauthorized access to temporary power supply is strictly prohibited, and electrical faults should be removed by personnel of electrical discipline;

安装临时用电线路的作业人员，必须具有电工操作证方可作业。严禁擅自接用临时电源，电气故障应由电气专业人员排除；

(5) Management personnel of the Equipment Management Dept., Electrical Operation Dept. and HSE Dept. have the right to manage power users and the obligation to supervise the safe power use within their jurisdictions;

机械动力部、电气运行部和 HSE 管理部管理人员有权对用电者进行管理，有义务监察所辖范围内的安全用电；

(6) Special personnel should be responsible for the maintenance and management of temporary power supply facilities. Daily patrol inspections must be carried out, and inspection records and treatment notices of hidden dangers must be established to ensure the temporary power supply facilities are in good conditions. Pause of temporary power supply should be

conducted by disconnecting power supply at the connection point;

临时供电设施的维护、管理，要落实专人负责。每日必须进行巡回检查，建立检查记录和隐患处理通知单，确保临时供电设施完好。临时电源暂停使用时，应在接入点处切断电源；

(7) For temporary power supply by other organizations, the on-duty personnel of the Electrical Operation Dept. should be responsible for specifying the power supply. Organizations using the power supply must strictly implement these regulations. For power users who violate the management regulations, the electrical personnel of the Electrical Operation Dept. have the right to cancel their power use qualification; when the circumstances are serious, they should be handed over to the relevant department of the Company for punishment;

外单位临时用电，由电气运行部电气值班人员负责指定电源，用电单位必须严格执行本规定，对违反管理规定的用电者，电气运行部电气人员有权取消其用电资格，情节严重的，交公司有关部门给予处罚；

(8) Temporary power supply: when the temporary power supply is completed, the user should timely notify the electrical personnel on duty, and the electrician should remove the temporary power line, and the non-electrical personnel of the user should not remove it without permission. After the completion of power use by other organizations, the temporary power lines should be removed, and the electrical personnel on duty should be notified for inspection and acceptance. 临时用电：临时用电结束后，使用单位应及时通知电气值班人员，由电工拆除临时用电线路，使用单位非电气作业人员不得私自拆除。外单位用电结束后，拆除临时用电线路，应通知电气值班人员，检查验收。

5.4.3 Test management

试验管理

5.4.3.1 Before the new substation is put into operation, the test items and standards should be in accordance with the electrical equipment handover test standards of electrical installation projects. Maintenance and electrical test of the substation in operation should be conducted according to the preventive test procedures of electrical equipment. For electrical equipment that cannot be regularly repaired or tested as required due to long-period operation of devices, technical evaluation of its operation status should be organized. The technical evaluation should be carried out in combination with comprehensive factors such as the status monitoring of electrical equipment, technical status and service life of equipment, conditions of previous maintenance, cleaning and tests, equipment operation environment, load, system configuration and operation mode; the policy of "safety first and prevention first" should be continuously complied with. The evaluation results should include whether it is possible to extend the maintenance, test cycle, extend the period of safety precautions and extend time. After being reviewed by the Equipment Management Dept., it should be submitted to the leader in charge for approval. The number of equipment for delayed maintenance and test as well as extended time should be determined based on the principle of strict control. The extended time should

not exceed one year at most, and any abnormality occurred during the extended period should be dealt with immediately. Cleaning work should take the pollution situation of the site into consideration, shortening the cleaning cycle to the possible extent. If the electrical equipment needs to be repaired and tested on schedule after evaluation and confirmation, conditions must be created to arrange the maintenance and test.

新建变电所投运前，试验项目和标准按电气装置安装工程电气设备交接试验标准。已投运变电所检修和电气试验按电气设备预防性试验规程执行。由于装置长周期运行原因确实无法按规定周期进行检修、试验的电气设备，应组织对其运行状况进行技术评估。技术评估应结合电气设备状态监测、设备的技术状况和使用年限、以往检修、清扫、试验情况、设备运行环境、负荷以及系统配置及运行方式等综合因素进行，要坚持“安全第一、预防为主”的方针。评估结果应包括是否可以延长检修、试验周期、延期期间的安全保障措施及延长时间，机械动力部审查后，交分管领导批准。确定延期检修、试验设备数量及延长时间均应坚持从严控制原则，延长时间最长不超过一年，延期期间出现异常应立即处理。清扫工作应结合现场污秽情况，尽量缩短清扫周期。如经过评估确认需按期检修、试验的电气设备，必须创造条件安排检修、试验。

5.4.3.2 Management of electrical test.

电气试验管理。

(1) The Electrical Operation Dept. should establish the equipment preventive test records and files for the whole process, which should be complete, continuous and practical. The results of each test should be compared with the results of previous tests of the equipment, and the comprehensive evaluation should be made after a comprehensive analysis is conducted according to change rules and trends, with reference to relevant test regulations; and the preventive test records should be filled in. The test reports should be classified and bound into a book (each book should specify the test category, procedure based, test equipment model, etc.), which should be included in the "preventive test file". The testing organization should submit the pre-test summary to the Equipment Management Dept. within one month after the preventive test is finished, and submit the lightning protection & grounding and static test summary to the Equipment Management Dept. before April 15 every year.

电气运行部要建立全过程的设备预防性试验台帐、档案，做到完整、连续、符合实际。每次试验结果应与该设备历次试验结果相比较，参照相关的试验规程，根据变化规律和趋势，进行全面分析后做出综合评价，填入预防性试验台帐。并将试验报告单分类装订成册（每册应写明试验类别、依据的规程、试验设备型号等），归入“预防性试验档案”中。试验单位在预防性试验结束后一个月内将预试总结报机械动力部，防雷接地、静电测试总结在每年4月15日前报机械动力部。

1) The test report is the evidence of test results, so the testing organization must establish a strict verification and review system, to ensure the reliability of data;

试验结果的证据是试验报告单，试验单位必须建立严格的校对、审核责任制度，做到数据可靠；

2) The test report must be signed or sealed by two qualified personnel and signed or sealed by the special person in charge of supervising the preventive test of the testing organization;

试验报告单必须要有两名有试验资格的人员签字或盖章，并有试验单位预防性试验监督专责人签字或盖章；

3) In addition to correctly recording the test data, the test report should also record the nameplate and main technical parameters of the tested equipment, temperature and humidity during the test, weather conditions and subtle phenomena or changes that can possibly explain poor insulation during the test;

试验报告单除应正确记录试验数据外,还应记录被试设备的铭牌及主要技术参数、试验时的温度和湿度、天气状况和试验中可观察到的细微的、有可能说明绝缘不良的现象或变化情况;

4) In addition to the written report, an electronic version valid for the current period should also be provided;

试验报告单除有书面报告单外还应有当期有效的电子版;

5) The handover test report shall be kept permanently, and the preventive test report shall be kept for at least two test cycles;

交接试验报告单应永久保留,预防性试验报告单应至少保留两个试验周期;

6) The testing organization must establish a management system for the maintenance and use of test equipment and instruments.

试验单位必须建立试验设备和仪器仪表的维护保养和使用管理制度。

5.4.4 Management of grounded and neutral connected devices

接地与接零装置管理

5.4.4.1 Grounding and neutral connection of electrical equipment is an important measure to ensure personal and equipment safety. The range of grounding and neutral connection is as follows:

电气设备的接地与接零是保证人身和设备安全的重要措施。接地与接零范围如下:

(1) Bases and enclosures of motors, transformers, switches and other electrical equipment.
电机、变压器、开关及其他电气设备的底座和外壳。

(2) Metal frame of indoor and outdoor power distribution devices, and metal bars and metal doors close to live parts.

室内、外配电装置的金属架构及靠近带电部分的金属遮栏、金属门。

(3) Metal pipes for indoor and outdoor wiring.

室内、外配线的金属管。

(4) Transmission devices of electrical equipment, such as the operating mechanism of switch.
电气设备的传动装置,如开关的操动机构等。

(5) Frames of switchboard, control console, etc.

配电盘与控制操作台等的框架。

(6) The secondary winding of current transformers and voltage transformers.

电流互感器、电压互感器的二次绕组。

(7) Shell of cable boxes and metal sheath of cables.

电缆接线盒的外壳及电缆的金属外皮。

(8) Metal structures for overhead lines.

架空线路的金属杆塔。

5.4.4.2 Steel frames of buildings and installations should be well grounded against lightning, and facilities such as equipment, industrial pipelines, storage tanks and silos should have reliable anti-static grounding devices.

建筑物、装置钢构架应有完好的防雷接地，设备、工业管道、储罐、料仓等设施应有可靠的防静电接地装置。

5.4.4.3 For easy inspection and detection, the connection between lightning protection / anti-static downlead and grounding device can be adopted with connecting clamp and connected with stainless steel screws according to the specific situation, or connected by welding.

为方便检查检测，防雷防静电引下线与接地装置的连接根据具体情况可以采用断接卡并用不锈钢螺丝连接，或采用焊接连接。

5.4.4.4 The secondary circuit and anti-interference grounding should be implemented in accordance with the key implementation requirements of relay protection specified in the 25 *Major Anti-Accident Measures of State Power Grid Corporation*.

二次回路及抗干扰接地按照《国家电网公司二十五项电网重大反事故措施》继电保护专业重点实施要求执行。

5.4.4.5 Safety inspection contents of grounding device:

接地装置的安全检查内容：

(1) Conditions of the contact between the grounding downlead and each connection point should be checked, to see whether there is any damage, fracture or corrosion.

检查接地线引下线和各连接点的接触是否良好，有无损伤、折断和腐蚀现象。

(2) For soil zones containing heavy acid, alkali, salt or metal minerals and rocks and other chemical components, regular spot checks should be carried out on the excavated ground under the grounding device to observe the corrosion of the grounding body.

对含有重酸、碱、盐或金属矿岩等化学成分的土壤地带，应定期对接地装置的地下部分挖开地面进行抽查，观察接地体腐蚀情况。

(3) The variation of grounding resistance measured should be check and analyzed to see if it conforms to relevant regulations.

检查分析所测量的接地电阻值变化情况，是否符合有关规定要求。

(4) After each time of maintenance, intactness of the contact between the grounding lead and the electrical equipment and grounding network should be checked. Repairs should be made in time when looseness or dislocation occurs.

设备每次检修后，应检查接地线与电气设备及接地网的接触情况是否完好，如有松动脱落现象应及时补修。

5.4.4.6 Inspection and detection period of grounding devices:

接地装置的检查、检测周期：

(1) The grounding network of the substation should be inspected twice a year.

变电所的接地网每年检查二次。

(2) According to the operation situation, the grounding wire and zero wire of production equipment should be checked regularly twice a year.

生产装置设备的接地线及零线根据运行情况，每年应定期检查 2 次。

(3) Grounding leads of various lightning protection devices should be inspected twice a year. 各种防雷装置的接地线每年检查二次。

(4) For grounding devices in corrosive soil, the local ground generally should be excavated once every 5 ~ 6 years for inspection according to the operation after installation.

对有腐蚀性土壤的接地装置，安装后应根据运行情况一般每 5~6 年挖开局部地面检查一次。

(5) The lightning protection grounding of the spherical tank area is tested every quarter, and the other areas are tested every six months the first time from March 1 to April 15, and the second time from September 1 to October 15.

球罐区的防雷接地每季度测试一次，其他区域每半年测试一次，时间：第一次3月1日~4月15日，第二次9月1日~10月15日。

(6) The lightning protection and anti-static facilities of the second and third types of buildings (structures) are tested once or twice a year.

对第二、三类建（构）筑物防雷防静电设施，每年检测二次。

5.4.5 Management of electrical fire fighting

电气消防管理

5.4.5.1 Electrical fire fighting management must be carried out in accordance with relevant safe production procedures and regulations issued and formulated by the State, and the operation maintenance, maintenance management and personnel training of equipment should be strengthened.

电气消防管理必须按国家颁发、制定的有关安全生产规程、制度执行，加强设备的运行维护、检修管理和人员培训。

5.4.5.2 The design and construction of new construction, reconstruction and expansion works or projects should meet the requirements of relevant state regulations on fire fighting, and can only be put into operation after passing the commissioning acceptance. For equipment already in operation, temporary measures should be taken if it does not comply with relevant fire fighting provisions and rectification should be made within a limited period of time.

凡新建、改扩建工程或项目的设计、施工应符合国家有关消防规定的要求，并经调试验收合格后方可投入运行。对已经投运的设备，若不符合有关消防规定的应采取临时措施并限期整改。

5.4.5.3 The passageways and roads inside and outside the substation should be kept unblocked.

变电所内、外的通道、道路应保持畅通。

5.4.5.4 Equipment or the site should be equipped with necessary fire fighting facilities and qualified respiratory protective devices as required. Fire fighting facilities on site should not be

used for other purposes.

设备或场所应配置必要的消防设施，并根据需要配备合格的呼吸保护器。现场消防设施不得移作他用。

5.4.5.5 Sundries and other articles should not be piled up around the fire fighting facilities on site.

现场消防设施周围不得堆放杂物和其他物品。

5.4.5.6 The automatic fire alarm or fixed fire extinguishing apparatus should be kept in good condition and conform to design and technical regulations.

保持火灾自动报警装置或固定灭火装置完好，并使其符合设计技术规定。

5.4.5.7 When the work is interrupted or finished, the site should be cleaned and inspected to eliminate hidden fire hazard.

工作间断或结束时应清理和检查现场，消除火险隐患。

5.4.5.8 It is strictly prohibited to be stored inflammable and explosive materials in the substation.

变电所内严禁存放易燃易爆物品。

5.4.5.9 Telephone numbers of the fire department should be set up at a striking position of the substation.

变电所在醒目位置悬挂火警电话号码。

5.4.5.10 When fire occurs on electrical equipment, it should be reported to the on-duty person in charge and the power dispatching; the power supply of relevant equipment should be cut off immediately, and emergency isolation and stop measures should be taken.

电气设备发生火灾时应报告值班负责人和电力调度，并立即将有关设备的电源切断，采取紧急隔离措施。

5.4.5.11 Electric shock should be avoided when putting out fire on electrical equipment.

在电气设备上灭火时应防止触电。

5.4.5.12 When fire occurs on electrical equipment, it is prohibited to use conductive fire extinguishing agent to put out the fire. It is prohibited to use dry powder extinguisher and dry sand to put out fire in case of fire in rotating motors. Operation and maintenance personnel should master the application methods of common fire fighting equipment.

电气设备发生火灾时，严禁使用能导电的灭火剂进行灭火。旋转电机发生火灾时，禁止使用干粉灭火器和干砂直接灭火。运行维护人员应掌握常用灭火器材使用方法。

5.4.5.13 Fire prevention measures for cables are: sealing, blocking, coating, isolating, packaging, etc. Specifics should be carried out in accordance with the *Acceptance Standards for Design and Construction of Fire Prevention Measures for Cables* currently in effect.

电缆防火措施有：封、堵、涂、隔、包等。具体执行现行《电缆防火措施设计和施工验收标准》。

5.4.6 Management of overvoltage protection and anti-pollution flashover

防过电压、防污闪管理

5.4.6.1 Lightning damage is very destructive to production and personal safety. Harm to electrical equipment by direct lightning strike, lightning counterattack and induced lightning overvoltage should be given full attention during design and operation and effective preventive measures should be taken.

雷害对生产和人身安全危害很大，设计和运行中应充分重视直接雷击、雷电反击和感应雷电过电压对电气设备的危害并采取有效预防措施。

5.4.6.2 Electronic equipment has low tolerance to overvoltage. Comprehensive protective measures such as shunt, voltage sharing, shielding, grounding, protection (clamping) should be taken to prevent electronic equipment from being struck by indirect lightning.

电子设备对过电压的承受能力很低，应有综合防护措施，如分流、均压、屏蔽、接地、保护（箝位）等，防止电子设备遭感应雷击。

5.4.6.3 Lightning conductors should be installed along all 66 KV and above overhead lines for critical loads.

供重要负荷的 66 千伏及以上架空线路应沿全线架设避雷线。

5.4.6.4 Pollution flashover is seasonal and regional, so measures must be taken to prevent insulation flashover accidents of outdoor power equipment, and monitoring and analysis of pollution should be strengthened.

污闪具有很强的季节性和区域性，必须采取措施预防户外电力设备绝缘闪络事故发生，对污秽情况应加强监测分析。

5.4.6.5 The anti-pollution flashover ability should be improved and anti-pollution flashover measures should be taken at locations with serious pollution issues.

污秽较严重地区要提高防污闪能力，采取防污闪措施。

5.4.6.6 For the neutral ungrounded system or arc suppression coil grounding system, effective measures should be actively taken to prevent internal overvoltage. When the capacitance current of single-phase ground fault exceeds the allowable value specified in the regulation, arc suppression coils (automatic compensation device for arc suppression coils should be used) and other technical measures should be adopted. The arc suppression coil grounding system should be operated in over-compensation mode, and the over-compensation value should meet the requirements of regulations.

对于中性点不接地或消弧线圈接地系统，要积极采取有效措施，防止内部过电压。当单相接地故障电容电流超过规程规定的允许值，应采用消弧线圈（宜采用消弧线圈自动补偿装置）等技术措施。消弧线圈接地系统应采用过补偿方式运行，过补偿值应符合规程要求。

5.4.6.7 In order to avoid resonance overvoltage in the power system, the capacitor voltage transformer or the electromagnetic voltage transformer with higher excitation saturation point should be used for 66 KV and above, and the electromagnetic voltage transformer with higher excitation saturation point should be used for 35 KV and below.

为避免电力系统产生谐振过电压，66 千伏及以上应选用电容式电压互感器或励磁性能饱和点较高的电磁式电压互感器，35 千伏及以下应选用励磁性能饱和点较高的电磁式电压互感器。

5.4.6.8 In the neutral ungrounded system of the same voltage class, the number of neutral ground of the voltage transformer should be reduced to avoid resonance.

同一电压等级中性点不接地系统中应减少电压互感器中性点接地的数量，以免发生谐振。

5.4.6.9 To prevent ferromagnetic resonance of the voltage transformer, resonance suppressing resistors should be connected in series between the neutral point of the voltage transformer and the ground, or other special technical measures should be adopted, such as connecting the microcomputer resonance suppressing device to the secondary open triangle winding of the voltage transformer.

防止电压互感器铁磁谐振，宜在电压互感器中性点与地之间串接消谐电阻，或采用其他专门的技术措施，如在电压互感器二次开口三角形绕组中接入微机消谐装置。

5.4.6.10 Zinc oxide arrester should be correctly chosen; its rated voltage and continuous operating voltage should meet the requirements of regulations. Tests on lightning arresters should be strengthened and online detection technology should be actively developed in accordance with the requirements of regulations.

正确选用氧化锌避雷器，其额定电压和持续运行电压应符合规程要求。应根据规程要求，加强对避雷器的试验，积极开展在线检测技术。

5.4.7 Defect treatment of electrical equipment

电气设备缺陷处理

5.4.7.1 If defects are found on the electrical equipment, the operator should contact the electrical maintenance personnel in time and fill in the maintenance work permit, and leave the defects to the electrical maintenance personnel for handling after taking safety measures.

发现电气设备缺陷，操作人员应及时联系电气维护人员并填写维修作业票，落实安全措施后交电气维护人员处理。

5.4.7.2 After receiving the maintenance work permit, the maintenance personnel shall eliminate the defects in time, sign on the record for confirmation, feed back the handling results to the leader in charge, and keep the record in the technical document of equipment in time.

维护人员接到维修作业票后，应及时消除缺陷，在记录上签字确认，将处理结果反馈给主管领导，并及时记录在设备技术档案中。

5.4.7.3 The defect record of electrical equipment should be established, containing content such as equipment defect description, discovered by, date of discovery and elimination], which should be filled in timely and accurately.

建立电气设备缺陷记录，必须有设备缺陷内容、发现人、发现及消除日期等内容，做到及时准确填写。

5.4.7.4 For defects that cannot be eliminated at the moment due to the lack of conditions (such as the need to stop equipment operation of, stop the main system, etc.), the maintenance organization should propose a plan to eliminate the defects, which should approved and coordinated by the Equipment Management Dept. to eliminate the defects, and the operation

and maintenance department should take measures to prevent the expansion of defects.

对因条件不具备（如需停运设备、倒停主系统等）一时不能消除的缺陷，检修单位应提出消除缺陷的计划，机械动力部审批，协调安排消除缺陷，同时运行维护部门应做好防止缺陷扩大的措施。

5.4.7.5 Hidden electrical hazards should be timely managed in accordance with the requirements of relevant anti-accident measures of the power industry and the treatment scheme for hidden electrical hazards.

电气隐患按照电力行业有关反事故措施要求和电气隐患治理方案，及时安排治理。

5.4.8 Management of electrical equipment renewal and scrapping

电气设备的更新和报废管理

5.4.8.1 Renewal of electrical equipment should be carried out in a planned and focused manner in accordance with the safe power supply and development planning of the Enterprise.

电气设备更新应当按照企业的安全供电和发展规划，有计划、有重点地进行。

5.4.8.2 Renewal of electrical equipment should be implemented in accordance with the management measures for equipment renewal.

电气设备更新按设备更新管理办法执行。

5.4.8.3 The management of electrical equipment scrapping should be implemented in accordance with the management measures for fixed assets.

电气设备报废管理按固定资产管理办法执行。

5.4.8.4 Renewal provisions for electrical equipment

电气设备更新规定

(1) Electrical equipment deemed obsolete by the State should be renewed in a timely manner. 国家明令淘汰的电气设备应及时更新。

(2) The service life of substation and distribution equipment is 15 ~ 20 years.

变配电设备运行寿命 15~20 年。

(3) The service life of microcomputer protection and monitoring equipment is 10 ~ 15 years.

微机保护及监控设备运行寿命 10~15 年。

(4) The service life of overhead power lines is 20 ~ 25 years, and that of power cable lines is 15 ~ 20 years.

架空电力线路运行寿命 20~25 年，电力电缆线路寿命 15~20 年。

(5) The service life of power electronic equipment is 8 ~ 10 years.

电力电子设备运行寿命 8~10 年。

(6) Related equipment should be comprehensively evaluated according to the accident situation, service life, load rate, operating environment and other factors, which should be the main basis for renovation.

相关设备应根据事故情况、运行年限、负荷率、运行环境等因素进行综合评价，作为更新改造的主要依据。

5.4.9 Management of technical materials

技术资料管理

5.4.9.1 Materials to be kept by the Equipment Management Dept.

机械动力部需保存的资料

(1) Design documents and materials of the main substation, records of key equipment.

主变电站的设计文件、资料，关键设备台帐。

(2) Accident analysis and handling report of key equipment.

关键设备事故分析处理报告。

(3) Plans of regular electrical repairs, regular tests and regular cleaning, as well as evaluation reports of delays.

电气定期检修、定期试验、定期清扫计划及延期评估报告。

(4) Equipment overhaul and renewal plan.

设备大修、更新计划。

(5) Operation summary of equipment (monthly, semi-annual, annual).

设备工作总结（月度、半年、年度）。

(6) Notice of fixed relay protection value, record and evaluation of relay protection actions.

继电保护定值通知单、继电保护动作记录及评价。

(7) Emergency Plan.

事故应急预案。

5.4.9.2 The Electrical Operation Dept. should have the following technical data and drawings:

电气运行部应具备下列各项技术资料和图纸：

(1) Records of all power supply and transformation equipment and equipment files.

所有输变电设施设备台帐和设备档案。

(2) Simulation diagram of primary electrical system, diagram of cable or overhead line route, and secondary connection diagram.

电气一次系统模拟图，电缆或架空线路走向图，二次接线图。

(3) Maintenance work permit, switching operation permit, and temporary power supply permit.

检修工作票，倒闸操作票，临时用电票。

(4) "Five regulations" of electrical discipline.

电气“五规程”。

(5) Records such as the *Duty Record* and *Equipment Defect Record*.

《运行值班记录》、《设备缺陷记录》等记录。

(6) Plans of regular electrical repairs, regular tests and regular cleaning, as well as evaluation reports of delays.

电气定期检修、定期试验、定期清扫计划及延期评估报告。

(7) Equipment overhaul and renewal plan.

设备大修、更新计划。

(8) Test report of electrical equipment.

电气设备试验报告。

(9) Operation summary of equipment (monthly, semi-annual, annual).

设备工作总结（月度、半年、年度）。

(10) Emergency Plan.

事故应急预案。

(11) Notice of fixed relay protection value (including the calculation sheet), record and evaluation of relay protection actions, system impedance diagram, short circuit capacity table of system.

继电保护定值通知单（包括计算书）、继电保护动作记录及评价、系统阻抗图、系统短路容量表。

(12) Statistical statement of electric quantity.

电量统计报表

6 Inspection and Supervision

检查与监督

The Equipment Management Dept. should inspect the management of electrical equipment in each operation department and assess situations where the System is being violated.

机械动力部对各运行部的电气设备管理情况进行检查，对违反本制度的进行考核。

7 Associated Procedures and Records

关联程序和记录

7.1 Associated procedures

关联程序

7.1.1 Special Maintenance Procedures for Large Units and Key Equipment (HYBN-T2-07-0054-2024-2)

大机组和关键设备电气特级维护程序 HYBN-T2-07-0054-2024-2

7.1.2 Handling Procedures for Abnormalities and Accidents of Electrical Equipment (HYBN-T2-07-0055-2024-2)

电气设备异常及事故处理程序 HYBN-T2-07-0055-2024-2

7.1.3 Maintenance and Repair Procedures for Electrical Equipment (HYBN-T2-07-0056-2024-2)

电气设备检维修程序 HYBN-T2-07-0056-2024-2

7.2 Associated records

关联记录

N/A.

无。

8 Supplementary Rules

附则

8.1 The System is under the jurisdiction of Equipment Management Dept.

本制度由机械动力部归口管理。

8.2 The System is drafted by Equipment Management Dept.

本制度起草部门：机械动力部。

8.3 Equipment Management Dept. is responsible for the interpretation of the System.

本制度解释权归机械动力部拥有。

8.4 Revision, preparation and approval of the System are shown in Table 2:

本制度版本编制和审批情况见表 2:

Table 2 Revision, preparation and approval of document

表 2 文件版本编制和审批情况

2	2024-04-01	Wang Lei Guo Chonghuo 王磊、郭崇伙	Zhao Tingyun 赵挺云	Xu Ye 徐野	Chen Liancai 陈连财
Revision 版本	Issued date 颁布日期	Prepared by 编制人	Reviewed by 审核人	Authorized by 审定	Approved by 批准人