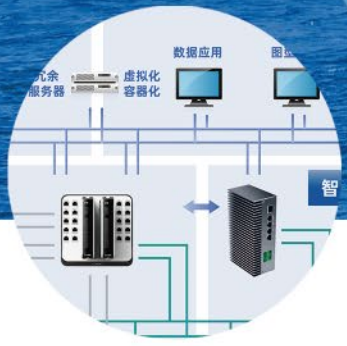
SIFANG



Hydropower/Pumped Storage Integrated Solutions and Product Catalogue

BEIJING SIFANG AUTOMATION CO., LTD.

COMPANY PROFILE

SIFANG

Beijing Sifang Automation Co., LTD. (referred to as Sifang Co., stock code :601126), a leading enterprise in the field of power automation, was founded in 1994 by Professor Yang Qixun, one of the first academicians of the Chinese Academy of Engineering. Headquartered in Beijing, the company has R&D and production bases in Nanjing, Wuhan, Baoding and Huzhou, as well as overseas subsidiaries in India, the Philippines and Kenya. The company is committed to providing comprehensive power and energy solutions and services for the energy and power industry, large public utilities, industrial power-consuming enterprises, and various parks, buildings and other scenarios.

Based on complete independent intellectual property rights and an independent and controllable development system, Sifang Co., Ltd. has a series of relay protection products covering various voltage levels from 10 kV to 1000 kV, as well as product categories including primary and secondary integrated switches, power electronics, new energy storage, smart Internet of Things, and industrial intelligent control.

Technical Innovation

The company leads development through technological innovation. Many of its technologies and products have been applied for the first time in the industry and have broken foreign monopolies. It holds important qualifications including National High-tech Enterprise, National Enterprise Technology Center, and National Demonstration Enterprise for Technological Innovation. It has won two second prizes of the National Science and Technology Progress Award, more than 160 other national and provincial-level science and technology awards, and participated in more than 20 national key research and development projects.

810+
Granted Invention Patents
(1000+ Authorized Patents)

490+
Published Standards

620+
Registered Software Copyrights

- National high-tech enterprises
- National enterprise Technology Center
- National innovative pilot enterprise
- National technological innovation demonstration enterprise
- China's Top 100 Enterprises with comprehensive competitiveness in software and information technology services
- China's Top 20 Software Innovation Enterprises
- China's top ten innovative software enterprises
- Beijing Engineering Laboratory of Key Technologies of Energy Internet
- Beijing Engineering Technology Research Center for Smart Microgrid Control
- Beijing Design Innovation Center
- Beijing Patent Demonstration Unit
- Software Capability Maturity Model Integration (CMMI) Level 5 certification
- Faculty Workstation Postdoctoral workstation

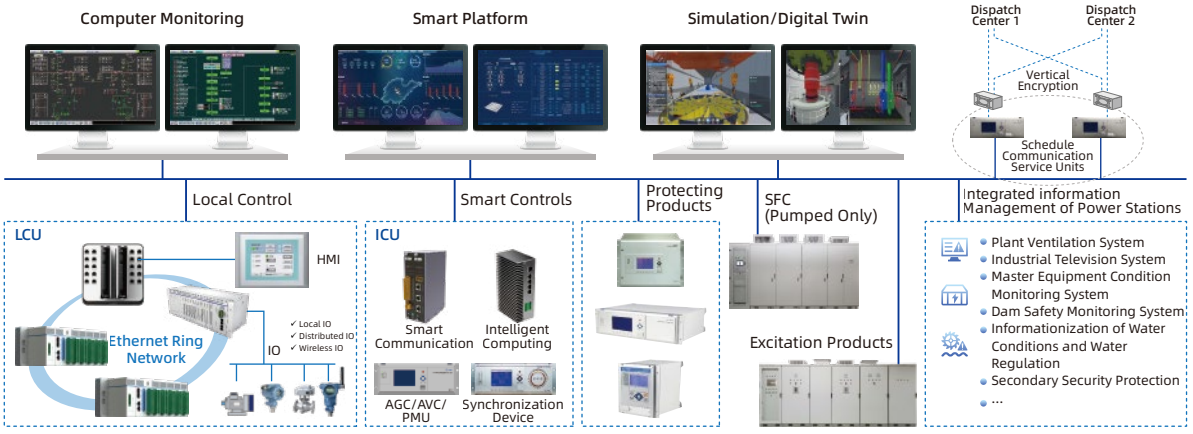
CONTENTS

Hydropower/Pumped Storage Integrated Solutions and Product Catalogue

Hydroelectric/Pumped Storage Overall Solution

Overview of the Solution

Sifang Co., Ltd. has been deeply involved in the energy and power sector for a long time. It is a professional R&D, production, sales and service enterprise, with business covering many links of power generation, transmission, transformation, distribution, consumption and storage. For the hydropower sector, we have developed integrated power station solutions that integrate automatic control and electrical systems, as well as automatic and intelligent systems, covering the core control and protection systems of hydropower, such as computer monitoring, relay protection, excitation, starting system (SFC), oscillation monitoring and data intelligence center, etc.



Sifang Co., Ltd. can provide the following system integration solutions and services:

- Computer Monitoring Systems
- Protection System
- Excitation System
- SFC (Pumped Storage Only)
- AGC/AVC, PMU
- Simulation Training and Digital Twin Systems
- Smart Hydropower Platform
- Factory Ventilation System
- Industrial Television System
- Master Equipment Condition Monitoring System
- Dam Safety Monitoring System
- Informationization of Water Conditions and Water Regulation
- System Security Protection Assessment Service
- ...

Advantages of the Plan

PROBLEMS EXIST

01 High Control Requirements

- The unit can be flexibly started and stopped, and quickly responds to power demand changes.
- Pumped storage units have a pumping mode with many control branches and complex conversions, in addition to supporting black start, line charging, SFC, and BTB requirements.

02 More Interaction Between Machines and Networks

The power station has limited reservoir capacity, cannot sustain long-term stable operation independently, and must respond to real-time grid dispatch.

03 There is a Need to Save Copper Cables

The distance from the generator floor to the turbine and spiral case floors is significant, and instruments/sensors are dispersed. Using extensive copper cabling would result in high costs and poor interference resistance.

SOLUTIONS

01 High Reliability Solutions

- Fully redundant system: power, controller, I/O, and bus redundancy.
- Multiple protections: hot-swappable, isolated circuits, three-proof coating.
- Low power consumption: efficient power control, high junction temperature tolerance.
- Reliability logic: callable nested algorithm blocks.
- Multi-node network: variable transmission, information interaction, incremental program download.

02 Digital Network-connected Solutions

Complete AGC/AVC, PMU, and other grid-connected products to meet the needs of dispatching centers.

03 Cost-saving Solutions

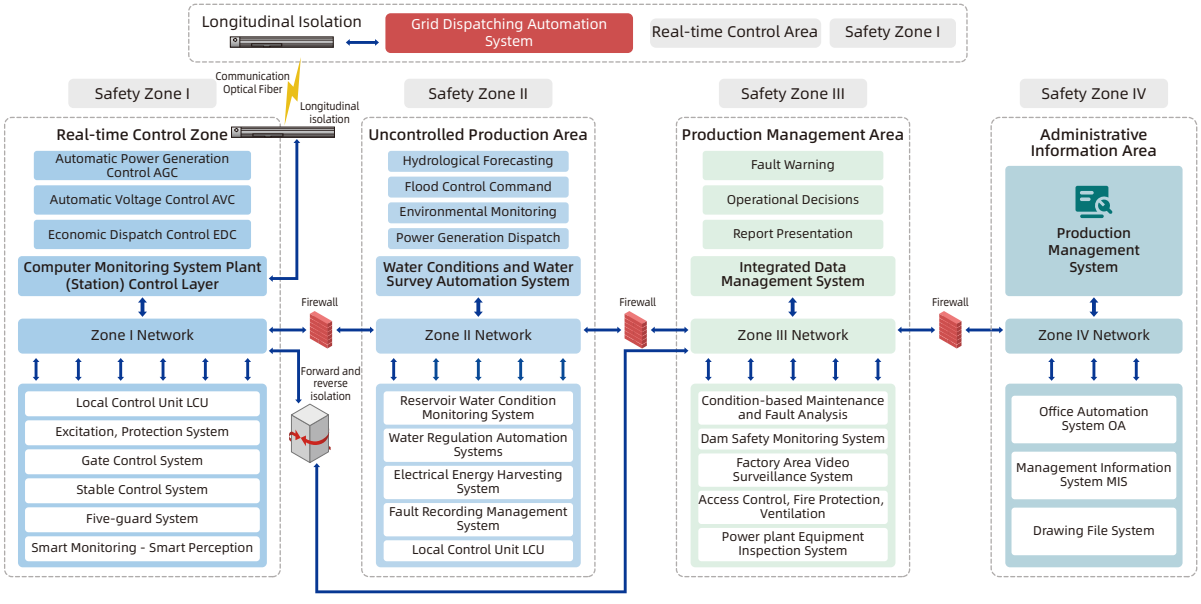
Dual Ethernet ring technology and distributed remote I/O reduce copper cable use and enhance reliability.

04 Smart Solutions

Provide intelligent solutions based on reliable automation, meeting personalized needs, enhancing customer experience, and supporting unmanned or minimally manned operations.

Factory Integration

To solve the problems of scattered automation systems and low intelligence, a comprehensive power station solution has been developed. This solution integrates control, electrical, and intelligent systems, supports plant-wide information digitization and communication standardization, and enables data sharing across all systems, including core control and protection. It provides intelligent control of equipment and processes, smart maintenance, fault diagnosis, and helps optimize operations and improve efficiency.



Open access capabilities include but are not limited to the following:

- Supports Ethernet protocols such as OPC and Modbus TCP for system communication.
- Supports fieldbus protocols (ProfiBus, Modbus, HART, CAN) for connection with speed regulation, excitation, and smart instruments.
- Supports IEC61850 and IEC60870-5-101/104 for protection and telecontrol communication.
- Supports deep customization of electrical control integration.

Smart Monitoring

Digital-based intelligence runs through all scenarios of business operations and is a driver of management innovation and productivity improvement. Intelligent joint inspection and smart operation and maintenance with human intervention can help reduce the workload of operation and maintenance, highlight the abnormal conditions of key equipment, achieve precise and timely positioning and real-time push of scene image recognition, equipment status perception, etc., and enable operation and maintenance personnel to receive alarms quickly.

Smart Disk Monitoring

The integrated architecture provides an interface for the development of intelligent monitoring and intelligent early warning, supported by comprehensive data integration and three-dimensional scenario display, using intelligent algorithms and data-driven computing to gather operational information of various equipment for panoramic status monitoring of major power station equipment, early warning of equipment health status, and automatic alarm of hidden dangers. It helps to predict the condition of the equipment and display key indicators of the power station operation.

Intelligent Control

The participation of artificial intelligence in intelligent control is to combine data with intelligence, output the results of intelligent computing to the LCU controller, participate in logical control operations, achieve image condition control, safety lock control, optimization adjustment control, etc., thereby unearth hidden trends to optimize control decisions and improve system reliability.

Smart Inspection

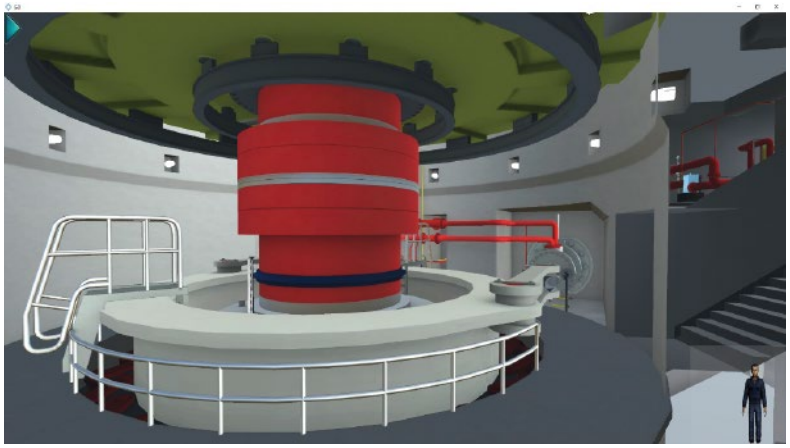
By using various means such as high-definition video inspection equipment and robots, and by means of image recognition, infrared temperature measurement, etc., formulate intelligent inspection strategies to achieve comprehensive monitoring of equipment operation status as well as video linkage, routine inspection, special inspection, etc. For critical equipment, achieve intelligent defect diagnosis, precise monitoring of abnormal points, and provide support such as fault analysis and alarm optimization. Combined with manual inspection to achieve joint inspection, thereby enhancing the system's ability to handle anomalies.

Fault Diagnosis

Through the intelligent sensing devices deployed on the main equipment within the station (such as water turbines, generators, main transformers, etc.), data on voltage, current, temperature, pressure, liquid level, etc. are comprehensively obtained, and past fault conditions and operation data are continuously recorded and analyzed to achieve fault early warning and fault location, and to clearly present the past, present and future status of the equipment. Ultimately, it will enable the equipment to shift from regular maintenance to condition-based maintenance and support unattended operation.

Digital Twin

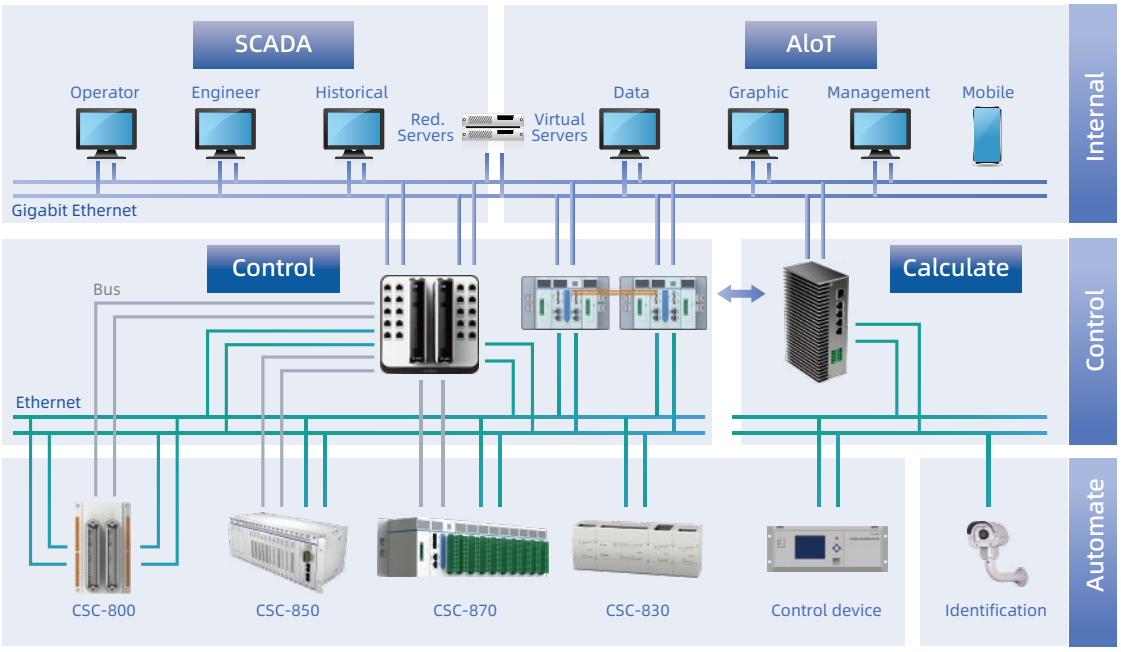
Mature hydropower simulation and digital twin application solutions have successfully assisted clients (groups/companies) in completing competitions (such as employee skills competition, shift leader skills competition, etc.) on multiple occasions. Among them, the 3D data visualization, video data visualization, and concealed data visualization models centered on hydropower equipment are easy to achieve the digital reproduction of all elements of various facilities within the station to help the monitoring system achieve standardized proactive risk warning, intelligent linkage, fault diagnosis, etc., in order to improve the operation and maintenance efficiency and the speed of talent training.



Product Introduction

Monitoring System

CSPA-2000 is a new generation of large-scale automated intelligent control system, mainly including CyberControl general configuration software, Nuclide logical configuration software, and CSC-800 series control system hardware, etc. It has a simple architecture, strong performance, and supports national standard trusted computing. It has achieved multi-level adaptation of software/hardware design, development and application as a whole. The system has passed the scientific and technological achievement appraisal of relevant institutions, and many of the achievements have reached the international leading level.

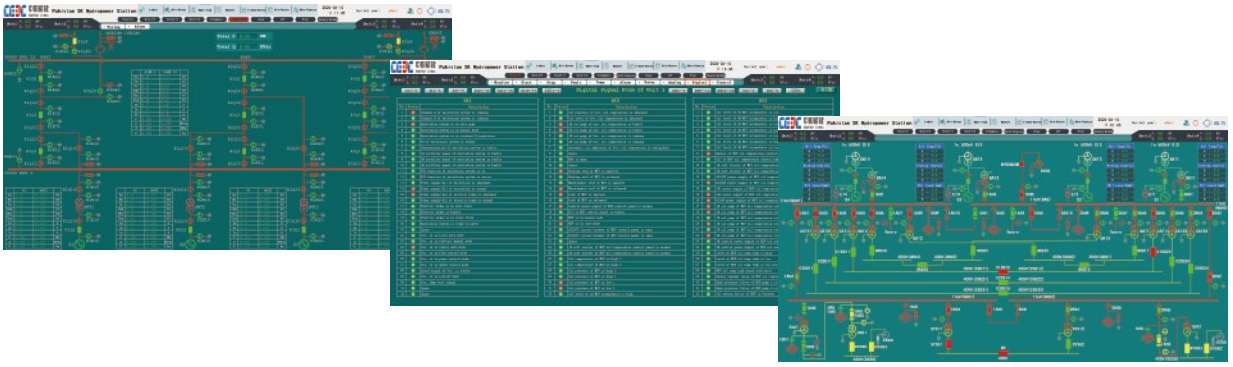


Architecture of Intelligent Control System

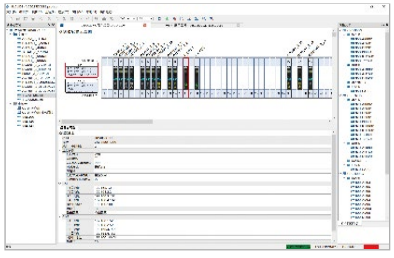
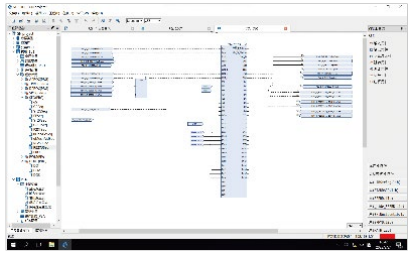
The vertical architecture of the monitoring system consists of the industrial Internet layer, the intelligent control layer and the industrial automation layer. Among them, the monitoring system layer adopts the industrial Internet framework and has the functions of SCADA and intelligent monitoring. The control layer adopts an intelligent control mode that combines non-real-time computing and real-time control. The controller is decoupled from I/O, and there are various types of I/O and extended networks to meet the needs of multiple scenarios.

Monitoring Software

CyberControl is an automation and intelligent integrated monitoring software with full independent intellectual property rights. It supports multiple platforms and systems, adopts a distributed database, and is compatible with operating systems and databases. This software can meet the monitoring requirements of single stations, centralized control, and ultra-large-scale intelligent monitoring. It supports industrial automation and power automation standard protocols, third-party equipment access/output, and cloud-edge integration deployment capabilities.



Nuclide is a fully independent intellectual property programmable controller logic configuration software designed for general-purpose systems, compliant with IEC61131-3 standards, and supports five standard languages: FBD, ST, LD, SFC, IL; Support for high-level language custom algorithms (e.g. C/C ++); Support for full download of programs, incremental download without disturbance, online debugging of parameter configuration, project upload, etc.


Intelligent Programmable Controller (PLC)

The intelligent programmable logic controller (PLC) mainly includes multiple control products such as CSC-800, CSC-850, and CSC-870, all of which are 100% independently controllable. It adopts advanced fieldbus and industrial Ethernet, high-performance multi-core embedded processor technology, and a fully redundant system architecture design. The products feature high reliability designs such as high protection, low power consumption, wide temperature operation, and full PCB coating.

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CSC-800 Type PLC

The CSC-800 distributed control system adopts an integrated structure design for the module and screen cabinet, is vertically installed, and has direct external connection lines. It supports two wiring methods: screw and direct plug. The overall installation and wiring of the screen cabinet are simple, the heat dissipation is uniform, it is easy to expand and maintain, and it is suitable for large-scale hydropower/pumped storage and other industrial applications.

Features

- Full redundancy: Controller redundancy, power redundancy, 1/0 expansion supports dual Ethernet ring network expansion, redundant DP bus expansion.
- A single pair of controllers supports 4 pairs of redundant DP parallel expansion for local I/O communication, while supporting 32 remote I/O communication nodes for dual Ethernet ring network expansion.
- The CPU has a maximum frequency of 4*1.2 GHz, consumes only 3.264W, has 1GB of memory, 8GB of storage, and supports battery-free power-off retention.
- The controller supports hot standby redundancy, no-disturbance switching, minimum control cycle 1ms, minimum data scan time 0.5ms Networking supports protocols such as Onet, Modbus, IEC61850, IEC104, ProfiBus, HART, CAN, OPC, etc.
- The controller supports up to 512 I/O boards, with distributed expansion between controllers, up to 64 pairs of controllers, and up to 32 domains in a single system.
- B code and SNTP time synchronization are supported, and the synchronization accuracy can be less than 1ms. All switch input modules support SOE function.
- High reliability intelligent I/O, line-isolated, analog accuracy less than 0.1%.
- Module hot-swappable, plug-and-play, multiple protections.
- All modules are three-proof, moisture-proof, salt spray-proof and mold-proof, suitable for harsh conditions.
- Operating temperature range: -40℃–70℃.

CSC-850 Type PLC

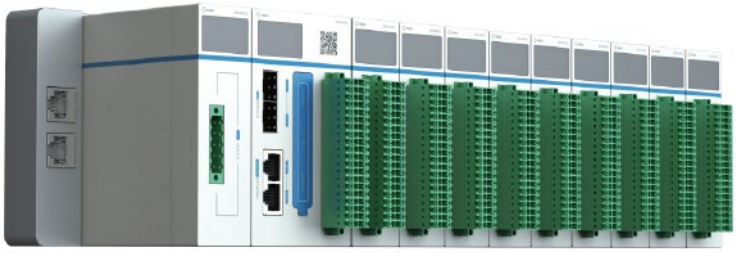
CSC-850 control product, metal chassis structure, high protection, high density design, 19" standard rack mounting, front indicator light, rear terminal output, suitable for dedicated PLC in rack scenarios such as hydropower/water conservancy.

Features

- Full redundancy: CPU hot standby redundancy, power redundancy, support for local bus expansion, remote Ethernet ring I/O expansion.
- High protection metal chassis, up to level 4 protection against strong energy electromagnetic interference.
- High integration design, up to 544 points for a single cage and 16,384 points for a single controller.
- High performance 4-core CPU, 1GB memory, minimum control cycle 1ms, minimum data scan time 0.5ms Networking supports protocols such as Onet, Modbus, IEC61850, IEC104, ProfiBus, HART, CAN, OPC, etc.
- The controller supports up to 512 I/O boards, and there is distributed expansion between controllers, supporting up to 64 pairs of controllers.
- It supports time synchronization for B-code and SNTP, etc. The synchronization accuracy can be less than 1ms, and all switch input modules support SOE function.
- High reliability intelligent I/O, line-isolated, analog accuracy less than 0.1%.
- Module hot-swappable, plug-and-play, multiple protections.
- All modules are three-proof, moisture-proof, salt spray-proof and mold-proof, suitable for harsh conditions.
- Operating temperature range: -40℃–70℃.

CSC-870 Type PLC

CSC-870 control product, universal PLC form, module + base plate structure, base plate supports slots such as 4/6/8/10/12/15, supports rail or screw mounting, front output line, compact size (height 112mm), suitable for various large/medium/small process control fields.



Features

- The controller supports 5 Ethernet ports (2* optical/electrical ports +2* electrical ports +1* backplane redundant electrical ports), 4 RS485 communication interfaces, and 4 CAN network communication interfaces.
- Supports single-rack, dual-rack redundancy, local bus expansion, and remote Ethernet ring I/O expansion.
- With single-rack redundancy, up to 4 I/O racks can be expanded locally, supporting dual DP
- With dual-rack redundancy, remote I/O can be extended via Ethernet ring network, with a maximum expansion of 32 nodes.
- DN35 rail mounting, compact size, front panel lead-out, flexible layout.
- High performance 4-core CPU, 1GB memory, minimum control cycle 1ms, minimum data scan time 0.5ms Networking supports protocols such as Onet, Modbus, IEC61850, IEC104, ProfiBus, HART, CAN, OPC, etc.
- The controller supports up to 512 I/O boards, and there is distributed expansion between controllers, supporting up to 64 pairs of controllers.
- It supports time synchronization for B-code and SNTP, etc. The synchronization accuracy can be less than 1ms, and all switch input modules support SOE function.
- High reliability intelligent I/O, line-isolated, analog accuracy less than 0.1%.
- Module hot-swappable, plug-and-play, multiple protections.
- All modules are three-proof, moisture-proof, salt spray-proof and mold-proof, suitable for harsh conditions.
- Operating temperature range: -40℃–70℃.

CSC-830 Type PLC

CSC-830 PLC, modular, scalable IO structure design, supports 35mm rail mounting, scale within 200 points; Supports RS-485 and industrial Ethernet communication, suitable for a variety of small and medium-sized control business scenarios.

Features

- Modular, scalable architecture: supports a variety of custom modules to meet specific requirements (such as power modules to meet precise metering requirements, etc.).
- Strong point-carrying capacity: Can scale up to 15 local I/O modules, or multiple slave units as needed.
- Strong communication capability: Can access standard protocols such as Modbus-RTU and Modbus-TCP.
- Support for SOE: Resolution up to 2ms.
- Operating temperature: -40℃–70℃.

Control Devices

Synchronization Device

The CSC-825 digital quasi-synchronization device can be used to complete the synchronous closing operation of generator grid connection and line circuit breaker, and can automatically identify the grid connection nature of the circuit breaker at the grid connection point. In differential frequency grid connection, it can precisely capture the timing of grid connection and achieve impact-free grid connection.

Features

- It has the functions of differential frequency grid connection, simultaneous frequency grid connection and no-voltage closing.
- Fast grid connection can be achieved, and reverse power connection can be realized.
- Phase Angle and amplitude compensation can be made for the voltage on both sides of the synchronization point.
- It can measure and record the action time of the closing circuit.
- It has a large capacity recording and event storage function.

Main Feature Configuration	Specification and Model		
	CSC-825A	CSC-825B	CSC-825X
Generator Grid-connecte	●	●	—
Lines Concurrent	●	●	—
Voltage, Frequency Adjustment	●	●	—
Automatic Corner	●	●	—
No Pressure Close the Switch	●	●	—
Measure the Circuit Breaker Closing Time	●	●	—
Ethernet Communication	●	●	—
Line Selection Control	●	—	—
Line Selection	—	—	●

Time Synchronization Device

The CSD-196 time synchronization device uses a core timing algorithm based on mutual backup timing of BDS and GPS. Each clock can be connected to up to 4 time reference signals, and the output time accuracy is better than 1 microsecond. It can provide different types of high-precision time signals for monitoring, protection, excitation, PMU, fault recording, etc.

Features

- It can output time synchronization pulses, IRIG-B code, serial port time message, Network Time message (SNTP), IEEE-1588 (PTP) time synchronization signals.
- It can receive external time reference signals in IRIG-B(DC) code.
- Supports fiber, open contact, TTL, RS-422/485, RS-232, and Ethernet signal interfaces.
- Support 104 protocol upload device status information, and support dual-network synchronization upload.
- Dual power supply is supported and power-off alerts are available.

Intelligent Communication Control Unit

The CSD-1321 series of intelligent communication control units, with a wide range of AC and DC power supply, can be used for access and transfer of monitoring information, protocol conversion, as well as for station-level intelligent telecontrol and data communication network shutdown. It can shut down unwanted device ports as needed, with high security.

Features

- Modular architecture for flexible configuration.
- Support advanced applications such as remote motion, fault information substations, online monitoring of primary equipment, as well as source-side maintenance and remote browsing.
- It has multiple functions such as historical data, recording files, and operation log storage.

AGC

The CSC-800G control sub-station can receive instructions issued by the AGC master station of the dispatching center in real time, allocate them to each unit of the power station according to the predetermined strategy, control the governor for automatic regulation, and realize the active power automatic control of multiple units in the entire station.

Features

- Automatic power generation control of power stations.
- The device is flexible to expand, reliable, high measurement accuracy, strong anti-interference ability, and fast computing speed.
- It supports multiple control modes, and the adjustment dead zone can be manually set.
- Historical data holographic storage, long time recording.
- The interface is flexible, allowing for convenient information exchange with other systems.

AVC

The CSC-800V control sub-station receives instructions from the dispatching center AVC master station in real time, distributes them to each unit of the power station according to the pre-determined strategy, controls the excitation system to perform automatic regulation, realizes automatic voltage/reactive power control throughout the station, and keeps the bus voltage within a reasonable range.

Features

- Automatic voltage control of the power station.
- The device can be expanded flexibly, is reliable, has high measurement accuracy, strong anti-interference ability and fast computing speed.
- It supports multiple control modes, and the adjustment dead zone can be manually set.
- Historical data holographic storage, long time recording.
- The interface is flexible, allowing for convenient information exchange with other systems.

Integrated Information Management of Power Stations

In addition to controlling, scheduling and protecting the production process equipment of hydropower, it can also provide design implementation, technical consultation, system integration and other services for the information management system related to the operation of the power station, mainly including plant ventilation system, industrial television system, main equipment status monitoring system, dam safety monitoring system, water situation and water regulation, etc. By digitizing information and standardizing communication throughout the station, data sharing and integration are carried out to enhance the intercommunication capabilities among various systems/equipment, achieve the automation and intelligence of power station operation equipment, meet the information application requirements such as intelligent early warning and smart operation and maintenance, thereby improving the level and efficiency of power station operation management and improving the customer experience.

Protection System

Since its establishment, Sifang Company has been actively involved in the innovative research and development of protection products, and has built an independent and controllable protection product R&D and production system. Currently, it can provide protection application solutions for numerous industries. Up to now, more than 1.5 million sets of protection and automation equipment have been put into operation, covering five continents around the world. Among them, the actual application of generator-transformer group protection products exceeds 1,000 sets. The largest application in thermal power is for 1,350MW units, in nuclear power for 1,000MW units, in hydropower for 650MW units, and in gas turbines for 480MW units.

Generator and Transformer Unit Protection

The CSD-300 series of self-controlled generator/transformer protection products, which use 100% self-controlled components including chips, operating systems, communication protocol stacks, etc., are fully self-controlled and can be applied to various capacity grades and types of turbine - generator/transformer protection scenarios.

Features

- Full range of electrical and non-electrical quantity protection solutions
- A time-tested differential protection scheme
- Flexible and reliable stator and rotor grounding protection
- Diversified communication interfaces and intelligent hardware self-check
- Humanized user interface and automated on-site debugging

Product Model	Product Name	Application Scenarios
CSD-300GT	Hair Change Group Protection	Conventional generator sets and in cases where the generator outlet does not have a circuit breaker
CSD-300GS	Generator Protection	Small and medium-sized generators
CSD-300G	Generator Protection	• A variety of large generators • Where there is a circuit breaker at the generator outlet or where panel design is required according to the protected object
CSD-300TMS	Main Transformer Protection	
CSD-300TAS	High Plant Transformer Protection	
CSD-300T	Activate Variable Protection	
CSD-300TB	Activate Variable Protection	Activate variable protection
CSD-300P/T	Hair Change Group Protection	Pumped storage transformer group

Line Protection

The CSC-100 series line protection products can be configured with functions like pilot protection, distance protection, zero-sequence protection, automatic reclosing, inverse-time overcurrent protection, three-phase inconsistency protection, and overcurrent/overload protection as needed. These products are suitable for lines at 220kV and above.

Features

- Master-backup integrated design, with a full-line rapid main protection.
- Differential protection with adaptive CT ratio on both sides.
- CT saturation discrimination.
- Primary device failure alarm and anti-misoperation locking function.
- Hardware self-check intelligent.

Plant Power Protection

The CSD-200 series of protection, measurement and control products, suitable for low-voltage power grids or plant power systems, have complete protection, measurement, control and monitoring functions, providing a guarantee for the safe and stable operation of plant power.

Features

- Integrate functions such as protection, measurement, control and communication.
- The software and hardware can be flexibly configured and expanded to meet the requirements of different applications.
- Support AC/DC operating power supply.

Product Model	Product Name	Scope of Application
CSD-211	Digital line protection measurement and control device	35kV and below voltage level non-directly grounded line protection and control
CSD-212	Digital line distance protection measurement and control device	Protection and measurement for non-directly grounded lines of 35kV and below voltage levels
CSD-213	Digital fiber longitudinal differential protection measurement and control device	Protection and measurement control for non-directly grounded lines of 35kV and below voltage levels
CSD-237	Digital motor protection measurement and control device	10kV and below voltage level asynchronous motor protection and measurement control
CSD-241	Digital transformer protection measurement and control device	Protection and measurement of substation transformers for 66kV and below voltage levels
CSD-246	Digital backup power automatic input device	Backup power sources of various voltage levels

Busbar Protection

The CSC-150 series of busbar protection products can be equipped with differential protection, circuit breaker failure protection, busbar (section) failure protection, busbar (section) dead zone protection, busbar (section) overcurrent protection and other functions as required, and applicable to busbar voltages at various voltage levels up to 1000 kV and below.

Main Features and Configurations	Specifications and Models		
	CSC-150A	CSC-150C	CSC-150D
Differential Protection	●	●	●
Circuit Breaker Malfunctioning Protection	●	●	●
Motherline (Segment) Malfunctioning Protection	●	—	●
Motherline (Segment) Dead Zone Protection	●	—	●
CT Disconnection Discrimination	●	●	●
PT Disconnection Discrimination	●	—	●

Features

- Adapt to various operating modes of the busbar.
- CT saturation automatic detection based on synchronization factor.
- Perfect voltage locking solution.
- Automatic branch position switching identification for double busbar segmented operation.
- Allow each branch to use a different ratio of CT.
- Hardware self-checking is intelligent.

Excitation System

The GEC-300 series of excitation control products can achieve excitation control for large/medium/small generator sets, supporting various types such as self-shunt excitation, three-unit, two-unit brushless, three-unit brushless, and DC exciter. Up to 1,200 sets of products have been put into operation so far, with a maximum capacity of 800 MW for a single hydropower unit and 660 MW for a single thermal power unit. In addition to meeting domestic market demands, the products have also been exported to Southeast Asia, South Asia and Africa.

Since its launch, the product has won the Science and Technology Progress Award of the Ministry of Electric Power Industry, the Science and Technology Progress Award of the Northeast Electric Power Administration Bureau, the Science and Technology Progress Award of the Central China Electric Power Administration Bureau, the First Prize of China Electric Power Science and Technology Progress Award, as well as four invention patents and more than ten software Copyrights.

Features

- Hierarchical multiprocessor architecture.
  - ECU: Fully graphical Windows, user-friendly interface, easy to operate.
  - AVR: Automatic voltage regulation unit, control cycle S 0.625ms.
  - IPU: Intelligent power unit that regulates the heating components of the rectifier cabinet itself, the start and stop of the sub-unit, etc.
  - CAN: A reliable field control bus network.
- Intelligent feedback current sharing technology, current sharing coefficient greater than 0.98.
- Complete quality system/hardware/supplier management/quality inspection/product certification.

SFC (Pumped Storage Only)

The SFC, or Static Frequency Converter, is a key device for starting a pumped storage power station in the pumping direction.

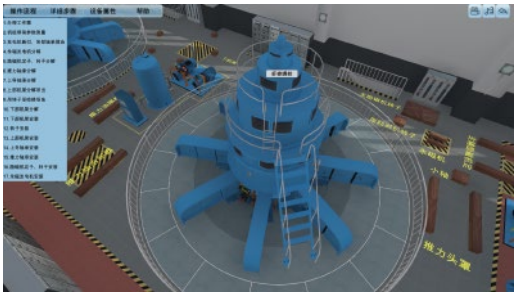
Sifang's SFC products are well-designed, such as trigger redundancy technology, which fully guarantees the reliability of the trigger board; The specially designed sampling loop ensures sampling accuracy throughout the startup process (from low-frequency small signals to power frequency rated signals). Since the development of the SFC product, it has been tested and verified on multiple sites, and the feedback has been good.

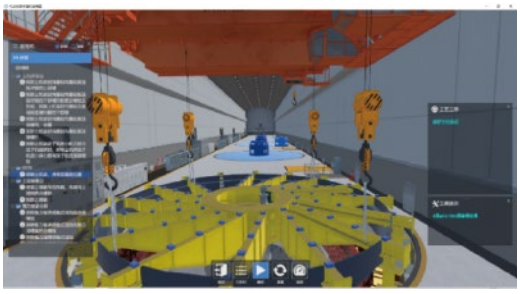
Features

- Superior control performance: Accurate determination of the rotor position of the unit, smooth and stable start-up process, fully capable of making the pumping direction of the pumped storage unit reliable for start-up.
- Good acceleration performance: A unique patented control algorithm that provides settable acceleration curves.
- Optimized grid connection strategy: Automatically calculate the excitation regulation value when connected to the grid, using a proprietary patent algorithm, active grid tracking, shortened grid connection time, and increased grid connection success rate.
- Modular design: Integrated design of thyristors, trigger units, heat sinks, etc. Compact cabinet, saving floor space costs.
- Flexible and reliable protection: Equipped with primary and backup protection such as differential, overcurrent, di/dt.

Simulation System

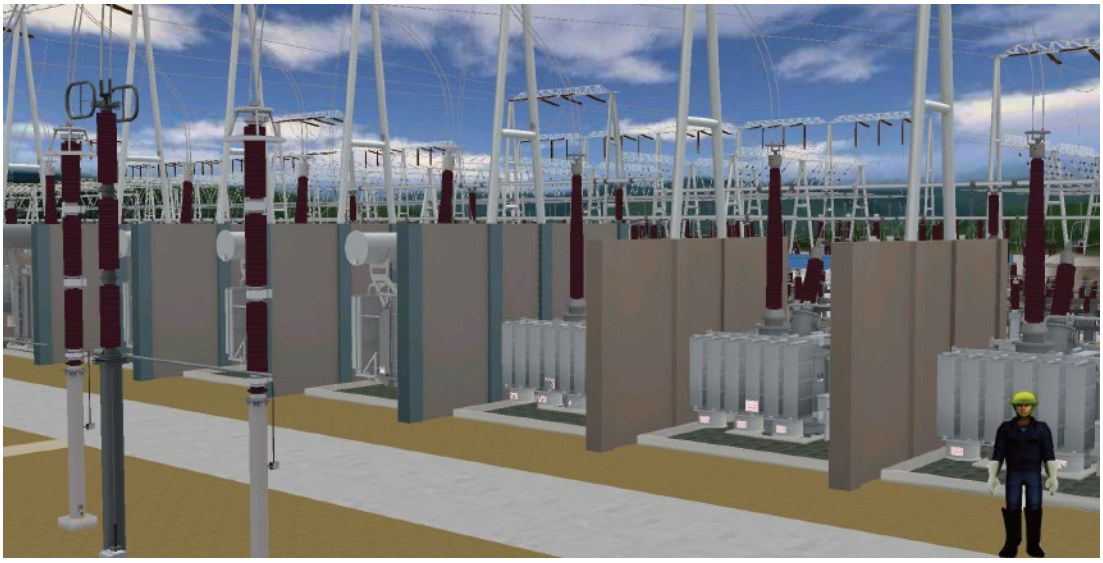
The simulation system has good controllability, no loop-breaking/safety, is not restricted by weather conditions and sites, has good economy, and can be repeated multiple times. Establishing a three-dimensional (3D) scene model centered on the generating units, primary equipment and plant equipment of the hydropower station, achieving three-dimensional data visualization, video data visualization and concealed data visualization of the equipment, with realistic effects, can fully restore the operation process and equipment failure phenomena, and can increase the speed of talent training in the power station and reduce the difficulty of operation and maintenance.





System Functions

- Device Operation Simulation
- Unit Condition Training, Production Information System Access
- 3D Visualization Simulation
- Equipment History and Maintenance, Disassembly
- Fault Simulation
- VR Virtual Reality
- Evaluation and Assessment System
- Operation Ticket



Testing and Certification (Part)

Monitoring System

Protection System

Excitation System


GEC300 型励磁控制系统入网
检测报告


检 验 报 告

样品型号 GEC-300SR
样品名称 励磁控制器
委托单位 北京四方继保自动化股份有限公司
制造商 北京四方继保自动化股份有限公司
代理商/经销商 /
签发日期 2013 年 6 月 13 日

SFC Products


检 测 报 告

委托单位：北京四方继保工程技术有限公司
样品名称：静止变频器
型号规格：SSF-800/1600-A
检测类别：委托试验

电力工业电气设备质量检验测试中心

Simulation System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Typical Applications (Part)

Table 1: Monitoring System Performance			
No.	Project Name	Unit Capacity	Type
1	Auxiliary equipment such as monitoring, protection and DC for the Nam Shen 1A hydropower station in Laos	50 MW (2 × 25 MW)	Hydropower
2	ong Chao 2*22MW hydropower station project in Vietnam	44 MW (2 × 25 MW)	Hydropower
3	Hydropower monitoring equipment for the restoration project of the beautiful hydropower station in Myanmar	40 MW (2 × 20 MW)	Hydropower
4	SK 4*221MW hydropower station in Pakistan	884 MW (4 × 221 MW)	Hydropower
5	Computer monitoring system at Long Chao Hydropower Station in Vietnam	44 MW (2 × 22 MW)	Hydropower
6	Computer monitoring system, relay protection at the Bousanga hydropower station in Congo	240 MW (4 × 60 MW)	Hydropower
7	Computer monitoring system of the Baihe (Jiahe) Hydropower Station on the Han River in Hubei Province	180 MW (4 × 45 MW)	Hydropower
8	Computer monitoring system of Xinji Hydropower Station on the Han River in Hubei Province	120 MW (4 × 30 MW)	Hydropower
9	The monitoring system of the unit in Eping, Hubei Province has been upgraded and connected to the centralized control center and the centralized control system	114 MW (3 × 38 MW)	Hydropower
10	Hubei Three Gorges Left Bank Power Station Main Transformer Cooler Control cabinet	14 × 700 MW	Hydropower
11	Hubei Gezhouba Power Station overhaul drainage pump control cabinet in the Da and Er Rivers	17 × 125 MW / 5 × 125 MW + 2 × 170 MW	Hydropower
12	Computer monitoring system of Xiaoyantou Hydropower Station in Zhaotong City, Yunnan Province	129.9 MW (3 × 43.3 MW)	Hydropower
13	Computer monitoring system of Wanjiakouzi Hydropower Station in Yunnan	198 MW (2 × 99 MW)	Hydropower
14	Computer monitoring system of Dapingtian Hydropower Station in Baoshan City, Yunnan Province	96 MW (3 × 32 MW)	Hydropower
15	The computer monitoring system and its affiliated equipment of each hydropower station in Mengjiang, Guizhou	90 MW (3 × 30 MW)	Hydropower
16	The computer monitoring system and its ancillary equipment of the Shangjianpo Hydropower Station on the Mengjiang River in Guizhou	60 MW (2 × 30 MW)	Hydropower
17	Computer monitoring system of Jia Cha Hydropower Station in Pingtang County, Guizhou Province	100 MW (2 × 50 MW)	Hydropower
18	The water and electricity monitoring and protection system of the Guizhou Duliujiang Great Integration and Congjiang Navigation and Power Hub Project	81 MW (2 × 18 MW + 2 × 22.5 MW)	Hydropower
19	Computer monitoring and relay protection at the Muni Hydropower Station in Lixian County, Sichuan Province	46 MW (2 × 23 MW)	Hydropower

Table 1 (continued): Monitoring System Performance			
No.	Project Name	Unit Capacity	Type
20	Sichuan Bridge Reservoir Hydropower Electromechanical Equipment Update and Remote Computer monitoring system	90 MW (4 × 22.5MW)	Hydropower
21	Renovation of the computer monitoring system at the Changbai Hydropower Station in Xichang, Sichuan	50 MW (2 × 25 MW)	Hydropower
22	Computer monitoring system for the entire plant of the Zhugeduo Hydropower Station on the Heishuihe River in Aba Prefecture, Sichuan Province	80 MW (2 × 40 MW)	Hydropower
23	The sand discharge tunnel and expansion project at the Liujiaxia Taohekou of the Yellow River in Gansu Province	300 MW (2 × 150 MW)	Hydropower
24	Guangxi Datang Guiguan Jinniuping Hydropower Plant Unit monitoring system	60 MW (3 × 20 MW)	Hydropower
25	The Wendegen Hydropower and Water Conservancy Project in Xing 'an League, eastern Inner Mongolia	36 MW (3 × 11.4+1.8 MW)	Hydropower
26	The integrated automation system and relay protection of the Luoyuan Huokou Reservoir Project in Fujian Province	60 MW (2 × 25 MW + 1 x 10 MW)	Hydropower
27	The LCU renovation project of Gangnan Power Station of Hebei Huadian Hybrid Energy Storage Hydropower Company	11 MW (1 × 11 MW)	Pumped Storage
28	Hunan Heimifeng Primary FM Active Online Test System Field sub-station equipment	1200 MW (4 × 300 MW)	Pumped Storage
29	Jiangxi Hongping Primary FM Active Online Test System Field sub-station equipment	1200 MW (4 × 300 MW)	Pumped Storage
30	Henan Huilong Pumped Storage Power Station Upper Reservoir Dam Rear Pumping Pump Self-controlled PLC project	120 MW (2 × 60 MW)	Pumped Storage

Table 2: Protection System performance			
No.	Project Name	Unit Capacity	Type
1	Research on protection technology for Large-capacity variable-speed Pumped Storage units	—	Pumped Storage
2	Dandong Pushihe Pumped Storage Power Station Generator and Transformer Group Protection Device Procurement Contract	4 × 300 MW	Pumped Storage
3	Relay protection renovation of State Grid Xinyuan Shanxi Xilongchi Pumped Storage Power Station	4 × 300 MW	Pumped Storage
4	Zhanghewan Energy Storage Power Generation Co., LTD. Unit 3 protection grid connection trial operation	1 × 250 MW	Pumped Storage
5	The protection systems for units 3 and 4 at the Huang-gou Pumped Storage Power Station in Mudanjiang are undergoing trial operation.	1 × 300 MW	Pumped Storage
6	Taishan Company's Generator Transformer Group Protection Upgrade Project (Units 1-4)	1 × 250 MW	Pumped Storage
7	Procurement of the Wuyue pumped storage relay protection system and its accessory equipment	4 × 250 MW	Pumped Storage
8	Heimifeng Company's 500kV main transformer B set protection upgrade and renovation	4 × 300 MW	Pumped Storage
9	Purchase of transformer protection equipment for Panjiakou Power Plant	3 × 90 MW	Pumped Storage
10	Huadian Hybrid Energy Storage Hydropower Company Gangnan-1 unit protection and renovation	1 × 11 MW	Pumped Storage
11	Research and application of Key technologies for independent control of Core Components of relay protection devices for Pumped Storage units	1 × 250 MW	Pumped Storage
12	Standardized design of pumped storage generator protection device and grid connection test run	1 × 300 MW	Pumped Storage
13	Relay protection renovation of State Grid Xinyuan Anhui Xin 'anjiang Hydropower Plant	8 × 95 MW + 1 × 90 MW	Hydropower
14	Ankang Hydropower Plant, Shaanxi Province	4 × 200 MW	Hydropower
15	The Menas hydropower Station in Ecuador	3 × 90 MW	Hydropower
16	SK Hydropower Station in Pakistan	4 × 221 MW	Hydropower
17	Daguo Hydropower Station in Shannan, Tibet	4 × 165 MW	Hydropower
18	Yalong River Lianghekou Hydropower Station	6 × 500 MW	Hydropower
19	Yangfanggou Hydropower Station on the Yalong River	4 × 375 MW	Hydropower
20	The Rubuge Hydropower Station	4 × 150 MW	Hydropower
21	State Grid Gansu Liujiaxia Hydropower Plant	5 × 230 MW	Hydropower
22	State Grid Xinyuan takes control of the Thirteen Tombs Power Plant	4 × 200 MW	Hydropower
23	Sanbanxi Hydropower Plant	4 × 250 MW	Hydropower
24	The Grafnaya hydropower Station in Tajikistan	240 MW	Hydropower
25	Datang Group Changheba Hydropower Station in Ganzi Prefecture, Sichuan Province	4 × 650 MW	Hydropower

Table 3: Excitation System performance			
No.	Project Name	Unit Capacity	Type
1	Unit 1 to Unit 8 of Xiangjiaba Hydropower Station	8 × 800 MW	Hydropower
2	No. 1 to No. 2 units of the Da 'aguo Hydropower Station in Yajiang County, Ganzi Prefecture, Sichuan Province	2 × 130 MW	Hydropower
3	hina Yangtze Power (Gezhouba 17F) Excitation system	1 × 125 MW	Hydropower
4	Unit 3 to Unit 4 of Changdian Power Station, Taipingwan Power Plant	2 × 120 MW	Hydropower
5	Unit 1 to Unit 2 of Hebei Yu County Power Plant	2 × 660 MW	Thermal Power
6	Unit 1 to Unit 2 of Panxian Power Plant, Guizhou Province	2 × 660 MW	Thermal Power
7	Yuanbaoshan Power Plant Unit 2 to Unit 4	3 × 600 MW	Thermal Power
8	No. 3 to No. 4 units of Harbin No.3 Power Plant	2 × 600 MW	Thermal Power
9	Datang International Shen Hair Power Plant No. 3 to No. 4	2 × 500 MW	Thermal Power
10	Unit 11 of Huaneng Beijing Thermal Power Plant	1 × 360 MW	Thermal Power
11	Beizhong (Guodian Power Chaoyang Thermal Power) Unit 1 to Unit 2	2 × 350 MW	Thermal Power
12	Unit 1 to Unit 2 of Hejin Power Generation Branch of Shanxi Zhangze Electric Power	2 × 350 MW	Thermal Power
13	No. 5 to No. 6 units of Xinjiang Huadian Kashgar Thermal Power Plant	2 × 350 MW	Thermal Power
14	Unit 1 to Unit 2 of Guodian Hainan Ledong Power Plant	2 × 350 MW	Thermal Power
15	Harbin Electric Works (Xingyi, Guizhou) No. 1 machine - No. 2 machine	2 × 350 MW	Thermal Power
16	No. 1 to No. 2 units of Harbin Electric (Datang Binzhou Thermal Power Plant)	2 × 350 MW	Thermal Power
17	Harbin Electric Works has ordered No. 1 to No. 2 units of Datang Suihua Thermal Power Plant	2 × 350 MW	Thermal Power
18	Unit 4 of Hohhot Thermal Power Plant	1 × 350 MW	Thermal Power
19	Adani Power Pvt. Ltd. No. 1 to No. 4	4 × 330 MW	Thermal Power
20	Wang Mi Thermal Power Plant, Vietnam	1 × 330 MW	Thermal Power

Table 4: SFC Product Performance			
No.	Project Name	Unit Capacity	Type
1	Huayuan Power Zhitu Wind Farm Synchronous condenser (Unit 1 to Unit 2)	2 × 10 MVar	Adjust the Camera
2	Huayuan Power Derun Wind Farm Synchronous condenser (Unit 1 to Unit 2)	2 × 10 MVar	Adjust the Camera
3	Vision Energy Fengning Wind Power Project Tuner	1 × 50 MVar	Adjust the Camera
4	Mengneng Tuquan 1 million Kilowatt Wind Storage Base Project Synchronous condenser (Unit 1 - Unit 2)	2 × 50 MVar	Adjust the Camera
5	Monengkeshketeng 1 million kilowatt wind storage base Project Condenser (Unit 1 - Unit 2)	2 × 50 MVar	Adjust the Camera
6	Aerospace Hongyuan project Synchronous camera	1 × 20 MVar	Adjust the Camera
7	Qiyuan Project (Hebei) Modulator	1 × 20 MVar	Adjust the Camera

Table 5: Simulation System Performance			
No.	Project Name	Unit Capacity	Type
1	Datang Guiguan Power 3D Intelligent Simulation Training System	7 × 700 MW, 4 × 300 MW	Hydropower
2	3D visualization intelligent simulation system for the Jinping-I Hydropower Station on the Yalong River	6 × 600 MW	Hydropower
3	3D visualization intelligent simulation system of the Yalong River Guandi Hydropower Plant	4 × 600 MW	Hydropower
4	Huaneng Sichuan Taipingyi Hydropower Simulation Training Base Project	4 × 650 MW	Hydropower
5	Chongqing Datang International Pengshui Hydropower Development Co., LTD. Simulation training system	5 × 350 MW	Hydropower
6	Datang Jialingjiang Tingzikou Hydropower's Production Training Simulation System	4 × 275 MW	Hydropower
7	Research and development of a 3D Modeling-Based Maintenance System for Mixed-Flow Hydroelectric Units at Yunfeng Power Plant	4 × 100 MW	Hydropower
8	Simulation of hydroelectric generating units for the Wendegen Hub project of the Water Diversion project from Chuo to Liao in Xing 'an League, eastern Inner Mongolia	36 MW	Hydropower
9	Computer simulation training at the training center of Gansu Electric Power Investment Jiudianxia Hydropower Development Company	3 × 100 MW	Hydropower
10	Chongqing Electric Power College Hydropower Station Hybrid Simulation Training System	5 × 350 MW	Hydropower
11	Digital-Physical Hybrid Simulation System for Teaching and Training Equipment of Hydroelectric Generator Sets in Guangxi Electric Power Vocational and Technical College	4 × 600 MW	Hydropower

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