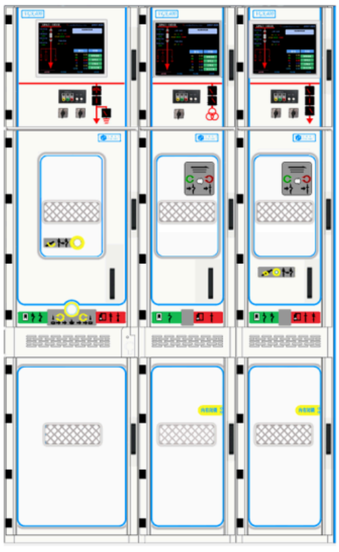
SHNF 上海能优 SHANGHAI NENGFU

# SUBSYSTEMS OF THE EXPERT DIAGNOSIS SYSTEM

## About us

Nengfu Electrical is a company specializing in providing efficient and reliable electrical system solutions and engineering services. We seize opportunities in the development of new power systems and drives digital transformation across the energy sector.

## PLATFORM SYSTEM



The platform system includes both a"Cloud Data Center" and"Client Terminals"
The Cloud Data Center supports both on-premises and cloud-based deployment (compatible with Alibaba Cloud, Tencent Cloud, Huawei Cloud, and the three major telecom operator clouds in China).

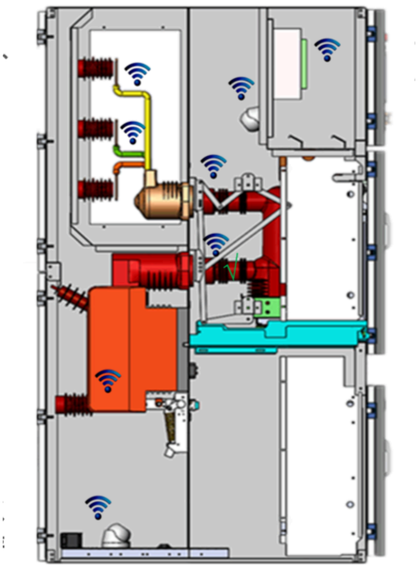
Typically, the cloud data center is configured with multiple servers, each assigned to different functions such as data load balancing, data acquisition, data storage, and web publishing, distributed across the servers as needed.

The Client Terminals support PCs, tablets (Pad), smartphones, and large display systems, and can present various data types including:

- Geographic location data of each functional module
- Analog data
- Digital (switch status) data
- Event data
- Report data
- Project management data

**Overview:**
The on-site large screen display system is based on touchscreen hardware and is installed locally on the instrument panel of high-voltage switchgear cabinets (intelligent cabinets). Depending on the cabinet type, a10.4-inch or8-inch touchscreen can be selected (other sizes are also customizable).

# ON-SITE LARGE DISPLAY SYSTEM



**The system can display:**

- Single-line diagram (for the specific cabinet)
- Analog data
- Digital (switch status) data
- Event data
- Report data

**Management/operator information**

It also provides local electric operation functionality for primary equipment.
The on-site display system can replace traditional operation and display devices, instrument meters, and protection relays (as protection is now handled by the digital protection system and no longer needs to be panel-mounted—see “Digital Protection System” for details).

This results in a clean, streamlined, and aesthetically pleasing instrument panel on the high-voltage switchgear cabinet, allowing clear and simple operation and data viewing.

**Digital Protection**

- Phase-to-phase three-stage overcurrent protection (with low-voltage directional blocking function)
- Inverse time overcurrent protection
- Three-stage zero-sequence overcurrent protection (with directional function)
- Zero-sequence inverse time protection
- Overvoltage/undervoltage protection
- Fuzzy zero-sequence overvoltage protection
- Auto reclosing
- Acceleration protection
- Under-frequency load shedding
- Low-voltage system separation
- Fault waveform recording
- The device is also equipped with control box functions, providing:
- Trip and close circuit holding
- Anti-pumping circuit
- Trip and close monitoring circuits

**One-touch Switching Operations**

- Electrically operated handcart (with interlock protection)
- Electrically operated grounding switch (with interlock protection)
- One-touch power on/off (with logic protection)

# SUBSYSTEMS OF THE EXPERT DIAGNOSIS SYSTEM


**Electrical Characteristics Monitoring**

Capable of monitoring:

- Three-phase voltage
- Three-phase current
- Zero-sequence voltage
- Zero-sequence current
- Power
- Power factor
- Also performs analysis and statistics on monitored electrical quantities.
- Monitors motor current for handcart, grounding switch, and energy storage unit.

**Mechanical Characteristics Monitoring**

Capable of monitoring:

- Breaker opening/closing time
- Opening/closing current
- Opening/closing acceleration
- Travel distance
- Overtravel
- Provides early warning in case of anomalies or potential hazards.

**Temperature Monitoring**

Capable of monitoring:

- Temperature of the six breaker contacts
- Busbar joint temperature (optional)
- Temperature in breaker compartment / busbar compartment
- Temperature at cable joint (optional)

**Ambient Temperature and Humidity Monitoring**

Monitors ambient temperature and humidity;

- Supports automatic heater control to regulate the internal environment and ensure proper operating conditions inside the cabinet.

**Partial Discharge (PD) Monitoring**

- Using UHF sensors to detect electromagnetic pulse signals caused by partial discharges.
- Capable of real-time detection, analysis, and continuous monitoring of PD signals in high-voltage switchgear.
- Applies professional algorithms to filter, analyze, and record PD pulse data and track discharge development trends.

**Voice Announcement**

Provides voice prompts for status changes in digital and analog signals, such as:

- Position changes
- Analog signal limit alarms
- Event notifications