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TELECOM TOWER SITE SOLUTION

Cataloge 2020

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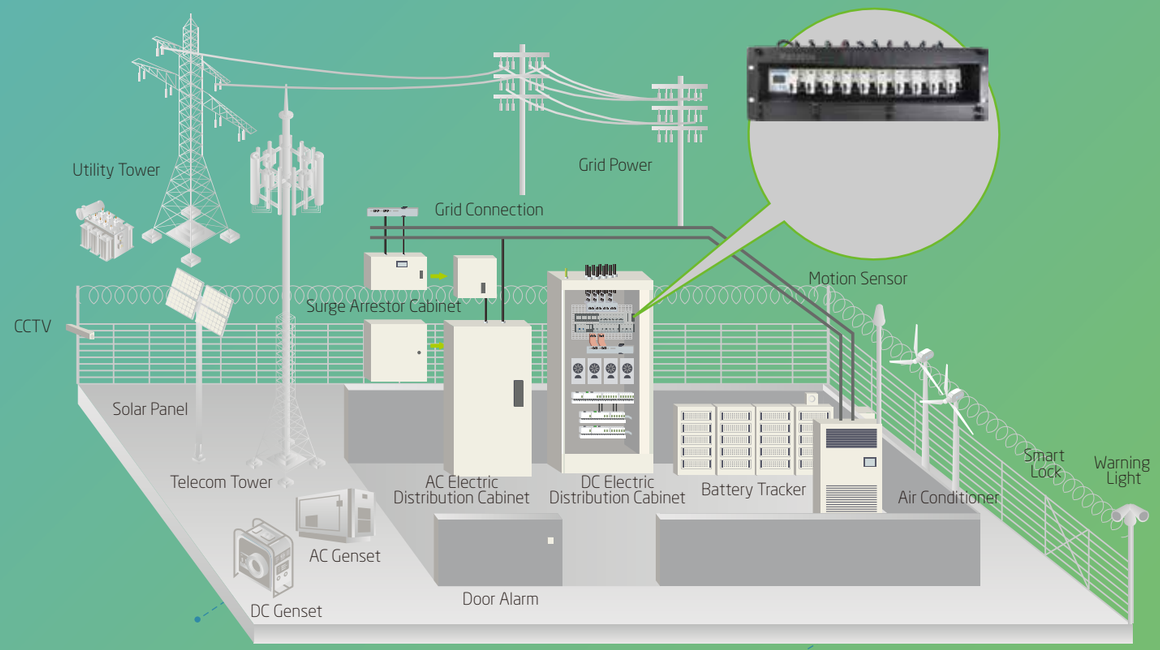

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Company Brief Introduction

FOCUS ON SMART IOT ELECTRICAL SOLUTIONS

Established in 2014, Shanghai Matis Electric Co., Ltd. (MATIS) focuses on innovated AI+IoT electrical solutions. Based on deep understanding of low voltage electric , we integrate the cutting-edge technology: AI, IoT, Big Data, and Cloud computing etc, and develop innovated electrical solutions. This solution makes the electricity safer and smarter and mainly used in the following applications: Telecom Tower, smart building, industrial automation (Industry 4.0), smart utility distribution system, smart electrical fire protection, public trasportation facility, municipal construction (traffic light,street light ,CCTV), ect.

OFFERING THE WHOLE SOLUTION WITH BOTH HARDWARES AND SOFTWARES

MATIS AIoT electrical product includes: 1)AIoT metering MCCB; 2)AIoT energy meter with protection; 3)AIoT metering MCB; 4)Smart Recloser; Supporting these AIoT electrical hardware, we also developed various of platforms of Smart energy cloud, Electricity safety supervision, Energy efficiency management platform, and corresponding APPs for each products.

Matis AIoT electrical solution integrate multi-functions in one: short circuit, overload, earth-leakage, over/under-voltage, phase loss, arc fault, phase imbalance, temperature, real-time monitoring of electrical parameters, power safety monitoring, energy management, remote control , scheduled control, electrical fault analysis, pre-larm & alarm, billing, event report, software etc.

MATIS electrical solutions include both the connected hardware and web software platforms & APPs. They are connected by the wired and wireless communications. The wired communication includes RS485, Ethernet RJ45 and wireless communication includes WiFi, GRPS 2G/3G/4G, NB-IoT, LoRa etc.

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Company Culture

MISSION

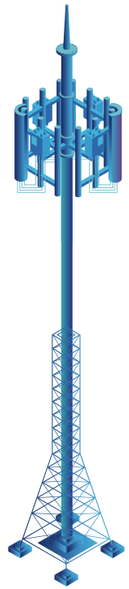
Creating safer and smarter electricity for human being

VISION

Committed to AIOT electricity solution expert

CORE VALUE

Sincere, Innovation, Teamwork, Concentration



MATIS Pays High Attention To Product Quality And Technology Innovation

By 2020, MATIS owns the followings patents:

8	6	25	28	5
Copyrights	Invention Patents	Utility Model Patents	Design Patents	Software Copyrights

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Matis Smart Power Solution gives you a complete solution approach to:
. Deliver more reliable and efficient power
. Protect your assets, processes and people
. Provided tailored, future-ready solutions for the new digital economy
. Offer smart safety supervision and power managment
. Creating new business opportunitis for your company.

Contents

Concept Introduction

From the connected device to edge control, device management software, APP and application solutions on following domains : Telecom, Grid, Buidling, Plant and industry, Matis offers the complete smart IoT electrical solution and delivers enhanced value around safety, reliability, operational efficiency, sustainability , and connectivity to our customers.

Smart Hardware Device

All the electrical device connected by RS485 and Modbus RTU protocol: Remote Control Device with Breaker, Multi-Channel Meter, Smart Breaker, Smart Recloser, Surge Protector.

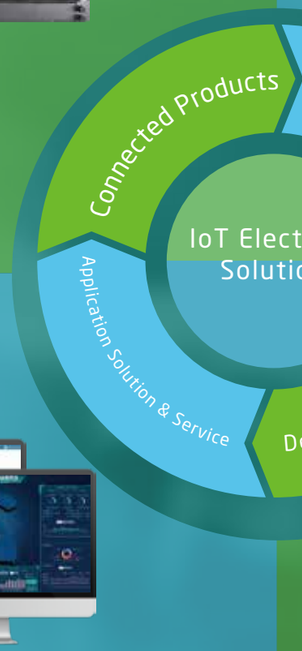
Data Acquisition Device

Data acquisition, edge control and electrical parameter computing.

Realize protocol conversion and Network interconnection.

Interface port: GSM/GPRS, Ethernet Lan(RJ45), WiFi, LoRa, RS485

Communication Protocol: Modbus RTU,MQTT, UDP



Application Solution

Customize software, solve practical problems, offer the whole solutions and service according to the customers's demand from different industries through data acquisition of device management platform and data analysis.

Device Management Software

Mornitor all the electrical parameter in real-time, make edge control, and realize remote device operation and maintaineance, electrical safety supervision and power consumption management of all the sites in APP or Web software.

Functions

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Metering & Measurement

The device integrates CT sensor to meter and measure each load precisely, then provide the accurate data for in device management software platform & APP and local display.

· Real-Time Monitoring
· Metering
· Billing and Online Payment

Electrical Protection

The device integrates full electrical protection in one and realize pre-alarm, alarm of electrical fault for electrical safety supervision through software and app. And the electrical parameter can be setup in through software and app

· Full Electrical Protection
· Pre-alarm & Alarm
· Electrical Parameter Setting

Smart Control

The device integrates remote control mechanism to realize the remote control function of device or the associated device through APP or software platform.

· Remote ON/OFF
· Remote Lock/Unlock
· Timer Control/Scheduled Control
· Other Scene Control

Efficient management

Based on the features of online & offline connection between device and software, Human-Device interaction, our Smart power solution can improve the operation & maintainence of electrical equipment and lower its cost as well. Base on data acquisition and edge control, the solution make the electrial safety supervision and power mangement

· Energy Efficiency Management
· Operation & Maintainence Management
· Event report

Smart Interconnection

All the devices integrate interface port RS485 and communication protocol of Modbus RTU. The smart gateway has both downlink communication to connect all the devices by RS485 and uplink communication to connect software platform through wireless communcaition and MQTT protocol.

· Wired communication: RS485, Ethernet
· Wireless communiction: GPRS 2G/3G/4G, NB-IoT, WiFi, LoRa
· Communication Protocol: Modbus RTU,MQTT

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Telecom Industry Introduction

Since 2019, 5G business emerge and expand sharply. More than 6 millions of 5G telecom tower sites will be built in China in the next 7 years and it initiates the new era of internet of Everything and 5G network of high speed and low delay.

6 MILLIONS
5G TOWER SITES

The energy consumption of 5G twice more than of the one of 2G,3G, and4G equipment and the telecom operators have big pressures on the electricity cost. Reducing electricity cost become the most important task. In order to realize this task, the telecom operator have the following requirement:

1. Power-up or power-down of new and indoor 5G tower sites at the scheduled time.
2. Making specific scenario to save energy based on the business coverage and business difference on time of telecom tower sites.
3. Power-up or power-down of the whole tower site or different tower cells on scheduled time and

Therefore, it is very important to realize smart management on the telecom tower site. In order to push the 5G business development, Matis is offering the smart electric distribution solutions of telecom tower site for Tower company or different telecom operators such as differentiated power backup solution , energy consumption management solution and on-site power distribution unit resource.

Telecom Tower Site Introduction

Telecom tower site is the most important infrastructure in the communication industry. A form of radio station refers to a radio receiving and transmitting station that transmits information with mobile phone terminals through mobile communication switching center in a certain radio coverage area. The telecom tower site is used to ensure that the mobile phone can keep the signal at any time and anywhere in the process of mobile, which can guarantee the demand of calling and sending and receiving information. At present, there are many 2G, 3G and 4G telecom tower sites everywhere and 5G tower sites are just under construction.

Telecom Tower Site Classification

There are various types of tower sites, which are basically divided into macro site, radio remote site, micro site, indoor sub-site.We provide different smart electrical distribution solutions for different types of telecom tower sites, and provide mart distribution solutions for Data centers and communication rooms in the communication industry

Telecom Tower Site Classification

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Challenge of 5G Tower Site Construction

The power consumption of 5G equipment is 2-3 times than the one of 2G,3G,4G.The traditional tower site only make the measurement on the different operators, so it can't accurately measure different equipment(2G,3G,3G,4G,5), so it can't make the energy efficiency management of the equipment. After the 5G business is undertaken, the original 2G, 3G and 4G backup power service of tower sharing station cannot be guaranteed, resulting in the shortage of backup power capacity of the base station,and shorten the life the old tower site. Therefore,it is vital important to make energy management on 5G equipment and the whole tower site.

For share tower sites,with the increasing demand for differentiated power generation services of various operators,there is a dispute of power generation among various telecom operators. Some operators would like to choose customized power generation and other special scenary requirement.

Some operators will delay the electricity bill payment, the telecom shared tower company can not stop the tower service and have no way to deal with the delay of electricity bill payment.

Some telecom operators will add the loads privately without permission the telecom tower company, which result in billing disputes among different operators, so it must be solved smart management system of telecom tower site.

For 5G tower site, the capacity of small oil engine is insufficient, and it is difficult to transport large oil engine as well.

The traditional tower site has no monitoring of electrical safety, real-time monitoring of electrical equipment, and no early warning and alarm for electrical fault. Therefore, the operation and maintenance is very high, but the efficiency is low.

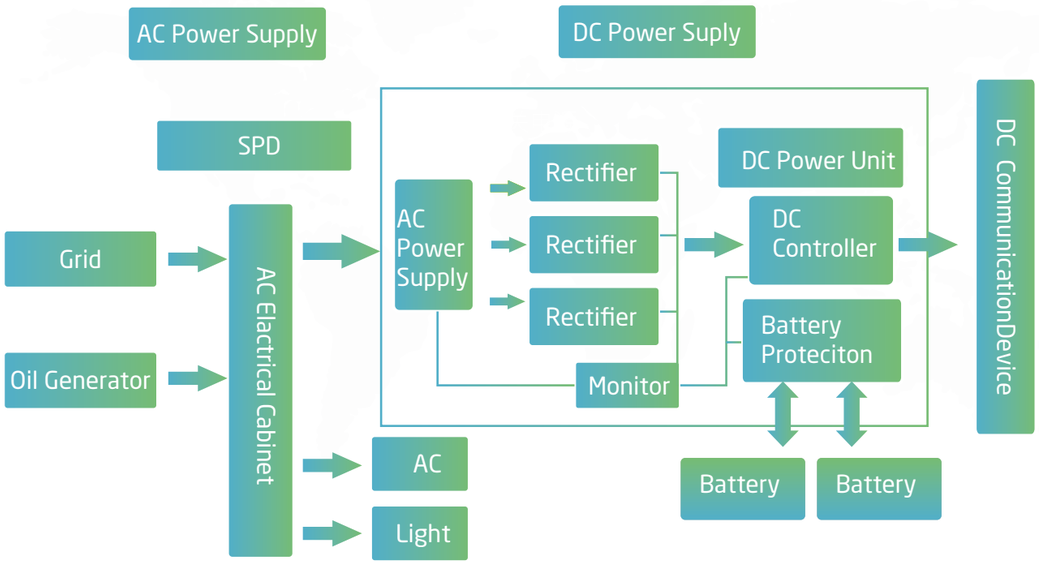
When lightning occurs, many telecom electrical equipment will trip and need long time and many labour cost to make maintenance, which will cause communication accidents.

If there is no local security lock in the device, there will be security risks in operation and maintenance.

Telecom Site Introduction

Electrical Distribution System Introduction of Telecom Tower

The power system of telecom tower site consists of AC electrical distribution, Switching Power supply, Battery and it includes AC power supply and DC power supply system. AC power supply consists of Grid Power, Generator Power, Arrester and AC electrical distribution Cabinet system. DC power supply consists of power set (including AC power unit, Monitor, rectifier and DC power Unit) and Battery.



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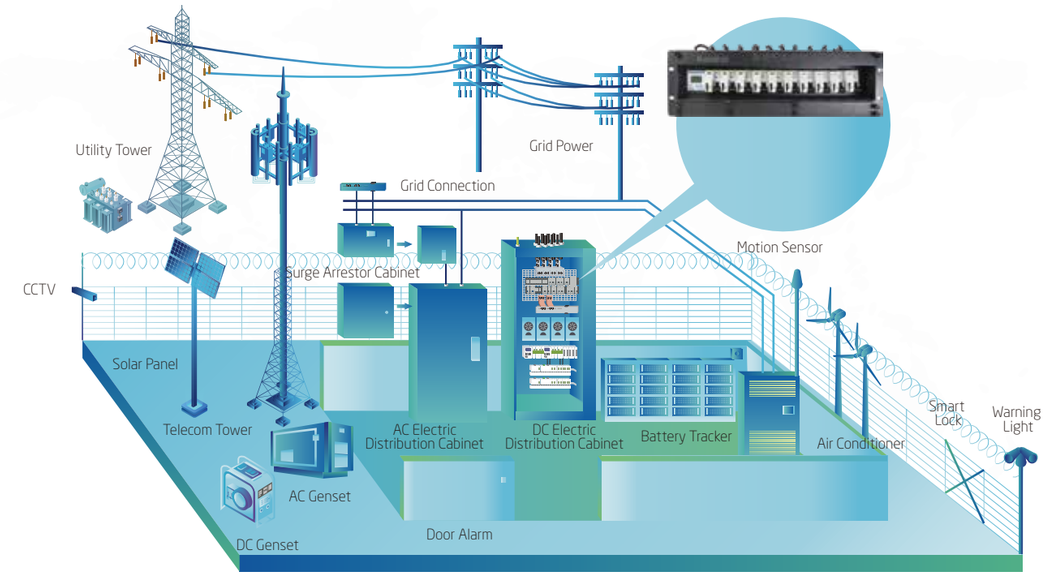
Telecom Site Solution

General Introduction

With the development of 5G business, the power consumption of tower site is increasing sharply. It is very important to realize smart electrical supervision and power energy management of telecom tower site. In order to support the development of 5G business,our telecom tower site solution can meet the demand of differentiated power backup and energy consumption management of different operators and different equipment of existing base stations, and the on-site resource management requirements of power unit.

Smart Electric Distribution System Solution includes

1.Multi-channel meter device can make accurate metering and precise management on the each load of AC electrical system and realize auto-transfer between grid power and generation power;
2.Remote controller with breaker can realize the smart and remote control of telecom equipment according to the power backup requirement of different telecom equipment and control requirement;
3.The DC metering module can measure the energy consumption of each equipment of different operators and realize energy management.
4. Our device can be connected to FSU of customers' and all the data can be transmitted to the software platform of customer . We also offer the development of the customized software platform and transfer all the data to customized software platform through the data acquisition



Advantages

High Safety,Reliability and Stability

Reliable and fast transfering management system of grid power and oil generation power;5G independent power generation management;Remote and local lock and unlock function of device to assure the safety of operation and maintenance;On-site maintenance, manual control mode,remote control mode all assure safe,stable and reliable operation of telecom tower site.

High Proformance

The solution realize independent control and metering on each load,which can make smart energy efficiency management and smart control management on telecom tower site.

Cloud Software Platform

We develop the special software platform to realize the smart electrical distribution management, power management and 5G differentiated power backup management for telecom operator or telecom tower company. THe software system can improve the safety and reliability of the operation and maintenance of telecom tower site and , reduce the operation cost by 30%. The distribution resource system planning, operation and maintenance realize the system process management, rapid fault response, and improve operation and maintenance management of telecom tower site

Modularization

The smart power unit can be customized according to requirment of different telecom site.

Macro site Solution 1:
LLVD & BLVD

Load type: comprehensive load 2G / 3G / 4G mixed type

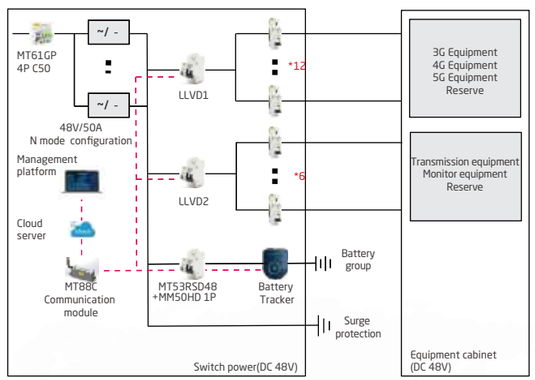
Number of users: 2-3

Power loads: ≥ 200A

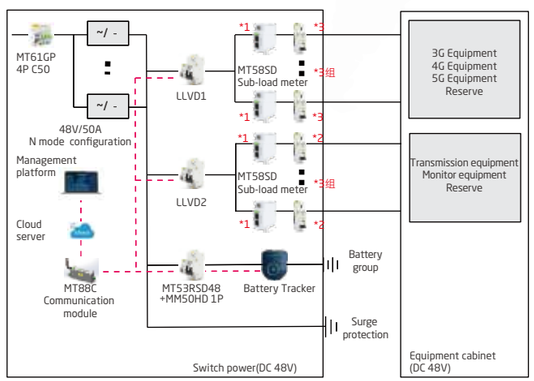
No.of LLVD sub-load loads :9

No.of BLVD sub-load loads : 6

When grid power is off, the battery pack begins to discharge and continues to power supply the main equipments of the station (BTS / NodeB / eNodeB), transmission equipment, etc., to make sure the station is powered under normal operation.
When the battery voltage drops set voltage value of LLVD, the control module will disconnect BTS / NodeB / eNodeB, data equipments and other power supply, the main equipments of the station are out of service, only power supply of transmission equipment is guaranteed.
Smart power distribution unit sets LLVD and BLVD according to the voltage and time.
Control module: MT53RS mechanical outer shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.



Macro site Solution 2:
LLVD and BLVD (with metering sub-load)



Load type: comprehensive load 2G / 3G / 4G mixed type

Number of users: 2-3

Power load: ≥ 200A

NNo.of LLVD sub-load loads :9

No.of BLVD sub-load loads : 6

When grid power is off, the battery pack begins to discharge and continues to power supply the main equipments of the station (BTS / NodeB / eNodeB), transmission equipment, etc., to make sure the station is powered under normal operation.
When the battery voltage drops to set voltage value of LLVD, the control module will disconnect BTS / NodeB / eNodeB, data equipments and other power supply, the main equipments of the station are out of service, only power supply of transmission equipment is guaranteed.
Smart power distribution unit sets LLVD and BLVD according to the voltage and time.
Control module: MT53RS mechanical outer shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.
Metering module: MT58 metering module, with voltage/current accuracy of 0.5%, power and energy accuracy of 1%, providing precise apportionment ratios for shared base stations.

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Macro site Solution 3:
Multi communication newtwork / multi operator

Load type: comprehensive & operator 1 / operator 2 / operator 3

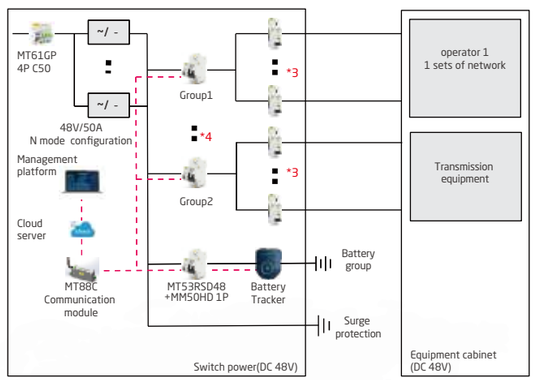
Number of networks / number of users: 2-3

Power load: ≥ 200A

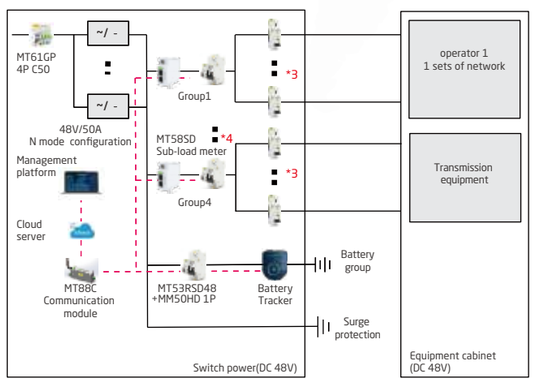
4 groups of distribution circuits: 3 groups of network / operator

load + 1 group of transmission equipment

According to voltage, time or active command, smart PDU can flexibly control, lock, and unlock different network devices(2G,3G,4G,5G)/the loads of different telecom operators.
When grid power is off, the battery pack begins to discharge and continue to supply the main equipments and transmission equipment, etc., to make sure the station is powered under normal operation.
When the battery voltage drops to a set value of control module, which is divided into essential and multiple classification electrical load. Sequentially to cut power supply of data equipments, the master station service, and ensure power supply only to transmission equipments.
Smart power distribution unit can set backup power according to the voltage and time.
Control module: MT53RS mechanical outer shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.



Macro site Solution 4:
Multi communication newtwork / multi operator (with metering sub-load)



Load type: comprehensive Load type:2G/3G/4G

Load type: 2G / 3G / 4G & operator 1 / operator 2 / operator 3

Number of networks / number of users: 2-3

Power load: ≥ 200A

4 groups of distribution circuits: 3 groups of network / operator

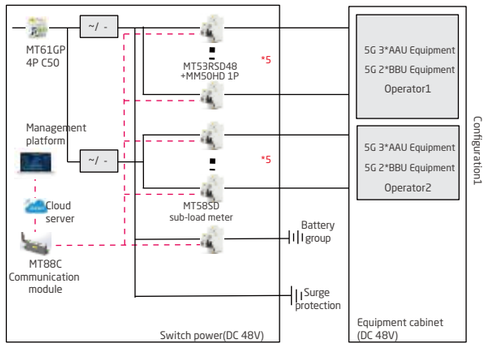
load + 1 group of transmission equipment

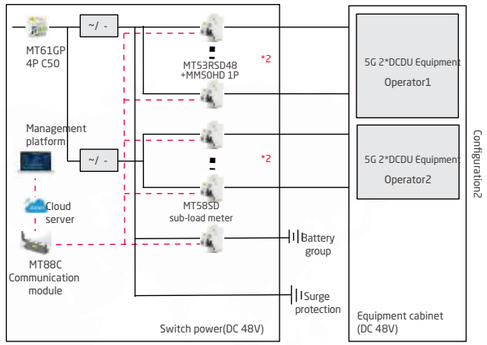
According to voltage, time or active command, smart PDU can flexibly control, lock, and unlock different network devices(2G,3G,4G,5G) / the loads of different telecom operators.
When grid power is off, the battery pack begins to discharge and continue to supply the main equipments and transmission equipment, etc., to make sure the station is powered under normal operation.
When the battery voltage drops to a set value of control module, which is divided intoessential and unessential with multiple classification electrical load. Sequentially to cut power supply of data equipments, the master station service, and ensure power supply only to transmission equipments.
Smart power distribution unit can set backup power according to the voltage and time.
Control module: MT53RS mechanical outer shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.
Metering module: MT58 metering module, with voltage/current accuracy of 0.5%, power and energy accuracy of 1%, providing precise apportionment ratios for shared base stations.

Macro site Solution 5:
5G tower site Solution

Load type: 5G 3 * AAU + 2 * BBU & 5G DCDU
Number of networks / operators: 2
Power load: ≥ 200A
2 sets of distribution circuits: 2 sets of 5G network / 2 sets of BBU

According to voltage, time, or active command, smart PDU can flexibly control different operators / different load, to open and close, lock and unlock load.
The smart PDU can set backup power according to its voltage and time.
Control module: MT53RS mechanical external shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.

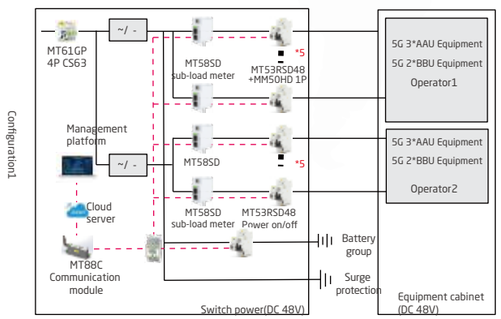


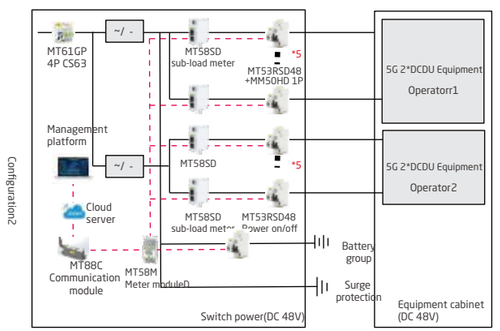


Macro site Solution 6: 5G telecom site solution (with metering sub-load)

Number of networks / operators: 2 power load: ≥ 200A
2 sets of distribution circuits: 2 sets of 5g network / 2 sets of BBU

According to voltage, time, or active command, smart PDU can flexibly control different operators / different load, to open and close, lock and unlock load.
The smart PDU can set backup power according to its voltage and time.
Control module: MT53RS mechanical external shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.
Metering module: MT58 metering module, with voltage/current accuracy of 0.5%, power and energy accuracy of 1%, providing precise apportionment ratios for shared base stations.





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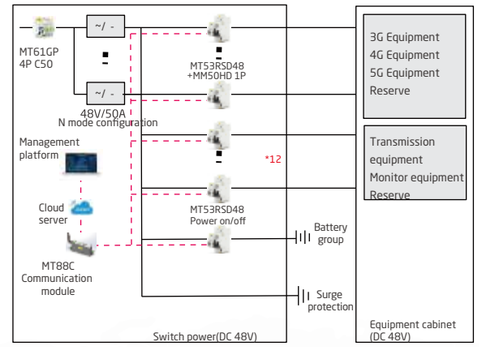
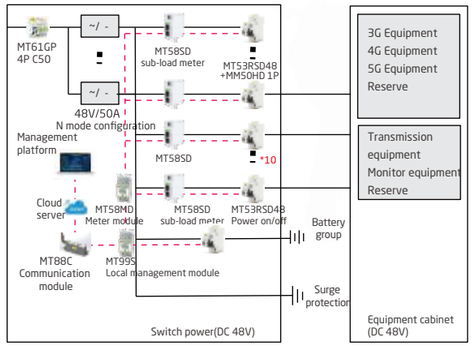
Macro site Solution 7: Multi communication newtwork (5G) / operators

Load type: 2G / 3G / 4G / 5G & operator 1 / operator 2 / operator 3
Number of networks / number of operators: 2-3
Power load: ≥ 200A
4 groups of distribution circuits: 3 sets of network / operator
load + 1 set of transmission equipment

"According to voltage, time, or active command, smart PDU can flexibly control different operators / different load, to open and close, lock and unlock load.
The smart PDU can set backup power according to its voltage and time."
Control module: MT53RS mechanical external shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.





Macro site Solution 8:
Multi communication newtwork (5G) / multi operator (with metering sub-load)

Load type: 2G / 3G / 4G / 5G & operator 1 / operator 2 / operator 3
Number of networks / number of operators: 2-3
Power load: ≥ 200A
4 groups of distribution circuits: 3 sets of network / operator
load + 1 set of transmission equipment

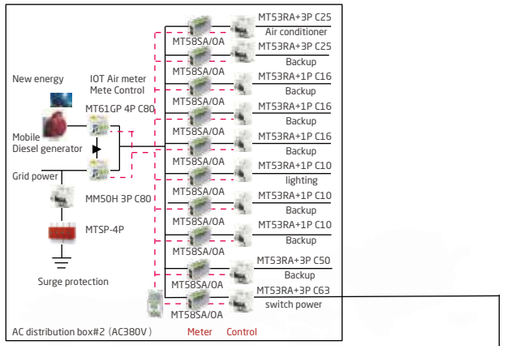
According to voltage, time or active command, smart PDU can flexibly control, lock, and unlock different network elements / different operations.
When grid power is off, the battery pack begins to discharge and continue to supply the main equipments of 2G /3G /4G to make sure the station is powered under normal operation.
When the battery voltage drops to a set value of control module, which is divided into essential or secondary importance with multiple classification electrical load. Sequentially to cut power supply of data equipments, the master station service, and ensure power supply only to transmission equipments.
Smart power distribution unit can set backup power according to the voltage and time.
Control module: MT53RS mechanical outer shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life. When the 5G network element is idle, it can be shut down regularly or set according to various scenarios.
Metering module: MT58 metering module, with voltage/current accuracy of 0.5%, power and energy accuracy of 1%, providing precise apportionment ratios for shared base stations.

AC electrica distribution solution

AC main input: grid power/ generator
Capacity: 63A / 80A
AC sub-load output: switch power/ air conditioner / lighting / socket / others

AC power distribution unit:
Input grid power or generator power, will distribute the AC power to the switching power supply rectifier module.
It contains a surge protector as the secondary lightning protection of the station power system.

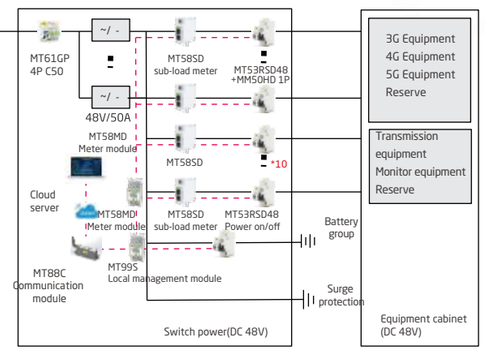
AC power supply system operation mode:
1. When the grid power is normal, the grid power supply;
2. After the grid power outage, when the mobile generator does not arrive at the station, the communication equipment in the station is powered by the battery discharge;
3. The mobile diesel generator arrives at the station and waits for the generator to start. The generator power the station;
4. The station is powered by grid, when it recovers.



Functions and features

1. When grid power outage, PDU provides AI output to DC backup power system;
2. When diesel generator starts, PDU provides AI output to DC backup power system ;
3. Realize the statistics of the diesel generator power record, time, and kWH;
4 .4 sets of tariff settings inside the meter circuit breaker, which can be used to cut peaks and fill valleys and cooperate with the battery backup system to achieve different power supply strategies and reduce base station electricity costs.
5. Meter circuit breakers will trip when voltage loss and ensure the safe operation of grid power and diesel generators;
6. Internal tripping and safety lock to ensure safe operation on site and prevent misoperation;
7. Analysis of data statistics and electricity theft events;

Smart circuit breaker module:
MT61GP has a voltage/current accuracy of 0.5% and a power and energy accuracy of 1%, providing a precise sharing ratio for shared base stations .



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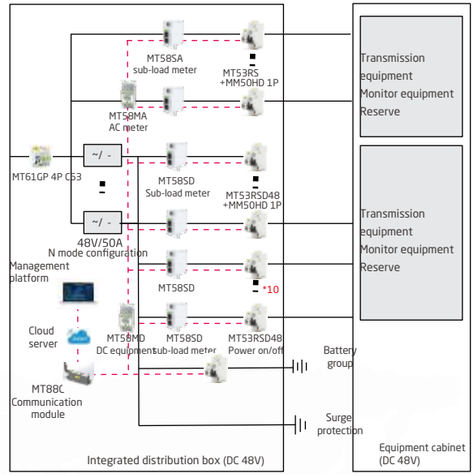
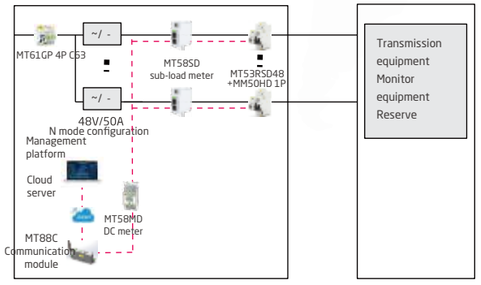
Radio remote site solution

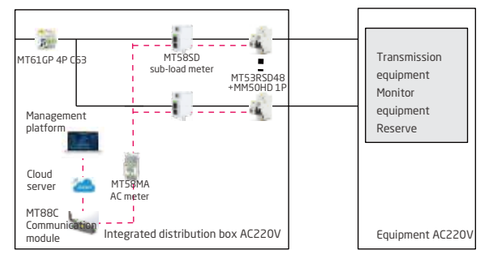
Load type: 2G / 3G / 4G / 5G & operator 1 / operator 2 / operator 3
Number of networks / number of operators: 2-3
Power load: ≥ 200A
4 groups of distribution circuits: 3 sets of network / operator load + 1 set of transmission equipment
Remote station has both DC and AC loads, and different types of metering and control equipments are used according to the actual site to meet the needs of remote monitoring.

Control module:
MT53RS mechanical external shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.
Metering module: MT58 metering module, voltage / current accuracy 0.5%, power and energy accuracy 1% to provide accurate allocation ratio for shared base stations.
AC meter
Integrated distribution box
DC equipment





Configuration1



Configuration2

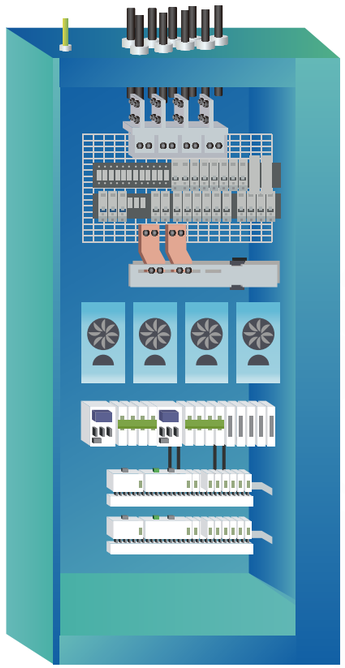
Indoor sub-site solution

LOAD TYPE: OMB HARDWARE

Select different power configurations (AC / DC) depending on the type of field device
According to the load equipment of different power supply types of different operators, the electric energy situation of equipment load can be counted and the energy consumption analysis can be provided.
According to the voltage, time or active command, it can flexibly control the power on and off control, lock and unlock control of each load of different operators / different network elements.
When the neT is idle, it can be turned off at a fixed time or set in a scenario.
The distribution unit sets the standby power according to the voltage and time.

Control module:
MT53RS mechanical external shaft control module, equipped with high breaking circuit breaker, 8000 times electrical life.
Metering module:
MT58 metering module, voltage / current accuracy 0.5%, power and energy accuracy 1% to provide accurate allocation ratio for shared base stations.
AC equipment
Configuration

Functions of site solution



Remote management of equipments

- Support remote power on/off, lock and unlock of independent users and independent loads;
- support to set operators business models through customized software or FSU system;
- help customers to efficiently manage equipment, greatly save electricity bill and cut labor cost;

Auto transfer between grid power and diesel generator

- Support the control and management of grid power and diesel generators ;
- Support the metering of grid power and diesel generator.

Local maintenance mode

- Local maintenance mode, the equipment is automatically locked to ensure maintenance personnel safety;
- local maintenance mode, the platform monitors the operation mode and status of the equipment through the local gateway module and FSU.

The accurate metering of each loads and seperate operators

- Support measurement and metering multi-user, multi-device, multi-load;
- The measurement accuracy is 0.5%, and the metering accuracy is 1%;
- The platform may monitor the measurement parameters and energy consumption equipments through local gateway module and FSU;
- Independent metering module can be easily added or reduced according to the loads on site.

Differentiated backup power

- It supports to achieve differentiated power backup by variables such as timer, time duration, voltage, kWh, and duty free time, for multiple users or multiple equipments;
- It supports parameter settings through local LCD screen, remote platform and FSU;
- It supports up to 14 loads of differentiated power backup settings.

The independent power generation of 5G equipments

- It supports independent power generation for multiple users or multiple 5G equipments;
- It solves the problem of insufficient capacity of small oil machines and difficult to move large diesel generator;
- optional power generation available and flexible configuration supportive.

Functions and Features of Site Solution

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Features of site solution

Instantaneous fault automatic reset

- The main line and sub lines have auto reclosing function, that can be automatically reset when instantaneous fault trip caused by lightning;
- Reclosing program can be set on deman.

Pre-warning and alarm of faults

- It supports pre-warning and alarm of over-voltage, under-voltage, over-current, or even over-temperature, phase loss, phase imbalance, etc., to ensure safe electricity;
- The parameters of pre-warning and alarm can be set either locally or remotely by platform.

Smart interconnection

- It supports the access of analog signal mains and diesel generators to provide supportive signals for differentiated backup power system;
- The system reserves RS485 terminals, which can be connected to FSU, or wireless gateway communication module;
- Standard B terminal protocol.

Efficient management

- Local management, or platform may monitor equipments, whenever and wherever, through communication gateway or FSU;
- Interactive experience and e-workflow, will improve the efficiency of operation and maintenance, and reduce the cost of operation and maintenance;
- Based on daily data analysis of the tower business, to improve the company management.

Site Solution Value

Value of telecom site solution

Equipment operation and maintenance management

1 Lean management of equipment assets to facilitate operation and maintenance;
2 System safety assessment, providing preventive maintenance guidance and methods;
3 Timely and professional fault recovery guidance, reducing the technical level requirements of operation and maintenance personnel;
4 Providing sustainable services to ensure sustainable power supply, and safety.

Energy efficiency management

1 Design energy consumption data by each load, analyze the type and trend of energy consumption, and output reports;
2 According to business features, to make energy saving plans, and combine the intelligent control procedures of equipments to finalize a complete set of energy efficiency management plan.

Safety supervision

1 Real-time monitoring of equipment status and timely access to equipment failure alarm information;
2 Full-featured electrical protection: overload, short circuit, overvoltage, undervoltage, phase loss, phase imbalance, and overtemperature;
3 According to safety level notification, Operation and maintenance personnel MAY handle failure warning and alarm accordingly, to ensure equipment safe operation.

Site Solution Benefits

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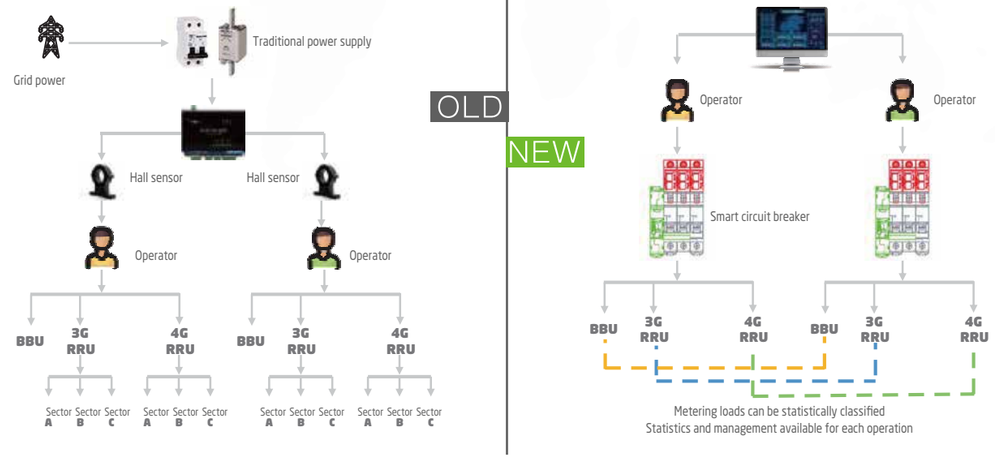
Accurate metering and efficient management of equipments in each load

Traditional solution

- Household meatering;
- Hall transformer is greatly affected by installation and site eviroment, and the metering is inaccurate;
- Equipment controllable;

Smart power distribution soltuion

- independent load, household metering
- applying metering solution of manganese copper, which won't be affected by installation and enviroment, with high meterig accuracy.
- independent load, remote control and management of seperate loads
- Statistics Management can be classified according to different loads or users.
- Equipments can be easily and flexibly managed or controlled, to improve management efficiency, largely save electricity bill and operation cost.



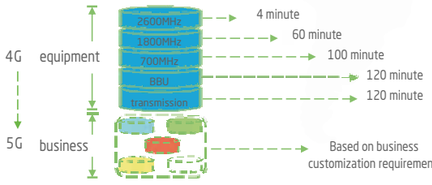
Differentiated backup power to improve battery efficiency

Primary and secondary power backup scheme (LLVD/BLVD)

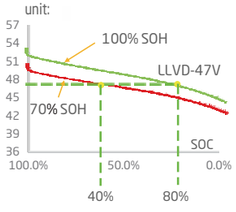
- According to different voltages, the device execute Load Low Voltage Disconnect (LLVD) and Battery Low Voltage Disconnect (BLVD);
- Load Low Voltage Disconnect (LLVD) all unessential loads. Battery Low Voltage Disconnect (BLVD) all loads;
- Battery State of Health (SOH) changes over time. The backup time duration is different against the same LLVD;
- To ensure the backup time of essential equipments, operators need to go to the site, every period of time (six months or a year), to check Load Low Voltage Disconnect (LLVD).

OLD

Sites evolving available, as backup power requirements are more complicated day by day



Traditional solution: Battery State of Health (SOH) changes
The backup time duration is different against the same LLVD



the same LLVD-47V

	100% SOH	70 %SOH
DOD	80%	50%
Backup time	2h	1.5h

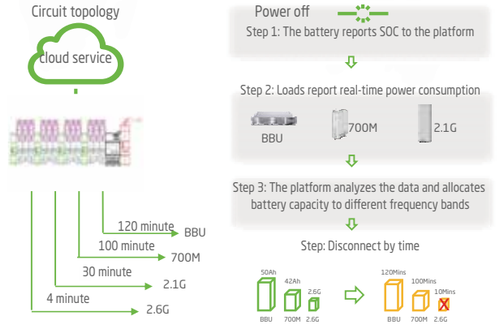
The operator changes the power voltage every year on site to ensure 700M 2 hours backup power

Differentiated backup power scheme

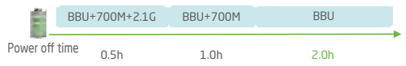
- Platform will monitor the battery key information, SOH (State of Health), SOC (State of Charge), voltage, in real time;
- Collect all loads power consumption in real time;
- From platform edge computing, users may distribute different backup power time for different equipments, according to its importance;
- Flatform may further differentiate backup power time, according to voltage, needed time duration, duty-free time period, and make it smarter;
- Differentiated backup power may greatly improves battery efficiency and maximize battery capacity on key equipments, meanwhile, to achieve accurate metering;
- Differentiated backup power may avoid changing voltage on site, and greatly reduce maintenance cost.

NEW

No routine site adjustments



Primary power on based on sub-band, BBU backup time can reach *2 hours



BBU power consumption 900w, 100Ah battery

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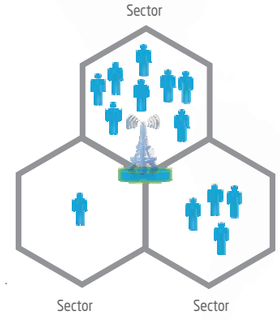
Power on and off according to business characteristics greatly save electricity and maintenance cost

Base station business features

- Different sites have different backup power priority, as different business required in different tim;
- Different sectors in same site, have different backup power priority, as business requirements are also different;
- 5G equipments requires huge power consumption, thus, energy saving is especially important, However, traditional solution can't control each equipments, and thus can't control equipments according to sites and sectors.

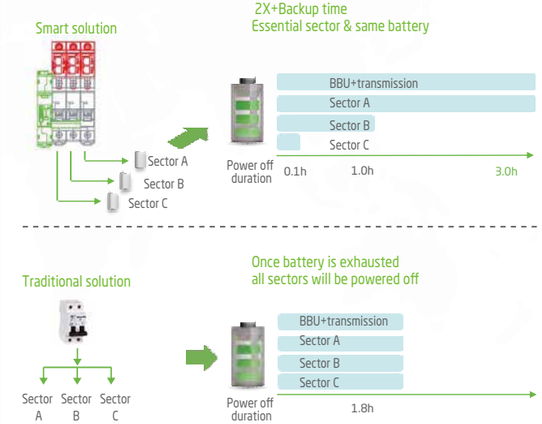
OLD



NEW

Smart solution

- According to different business requirments in sectors, trying to extend backup power time duration in essential sectors, as per power on in sectors;
- To power on/off different sites and sector, accordingly to different business quirements in different time, will greatly save electricty bill;
- Power on/off 5G each equipment independently.



5G solution application case

Case location
Customer needs

Case location

China Tower Shanghai Branch

Cutomer requirement

As texts description on the right picture.
Shanghai Tower wants real time review, on web, the capacity and status of device. It can remotely control each load, and regularly analyze the energy consumption of the operator and output electricity billing.

Specific requirements

- Differentiated backup power services to different equipments in the base station, 5G on power in time,
- different backup power demands in different operators,
- independent metering
- independent electricity generation based on user's equipments
- independent control management and timely faults handling

Differentiated Power Backup Solution of 5G Site

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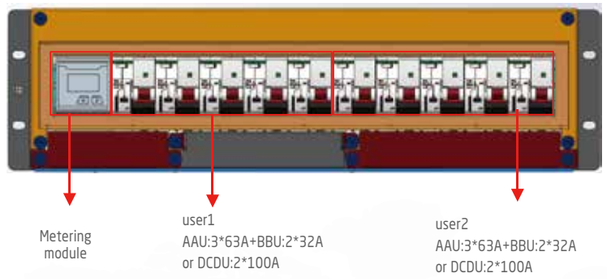
Smart PDU introduction



- 3U high-density design, space saving, easy to install;
- support equipment-level energy metering for 5G of two users;
- support 5G of two users to power on according to time duration;
- support 5G of two users to generate electricity on demand;
- maximum output power 200A@53.5V

Case characteristics

Support differentiated backup power for 5G users

1. Support two 5G users to power on according to time duration, and the time can be set through FSU/platform;
2. Each user supports 10 loads to meet the power distribution requirements of AAU and BBU

Support 5G user to meter energy by kWH

1. Support two 5G users the independent measurements of current, kWH and metering of all devices, and upload all data through the FSU or gateway;
2. High metering accuracy of 1%;
3. Use modular metering, it can add or reduce loads on demand, with simple wiring.

Support 5G equipments power generation on demand

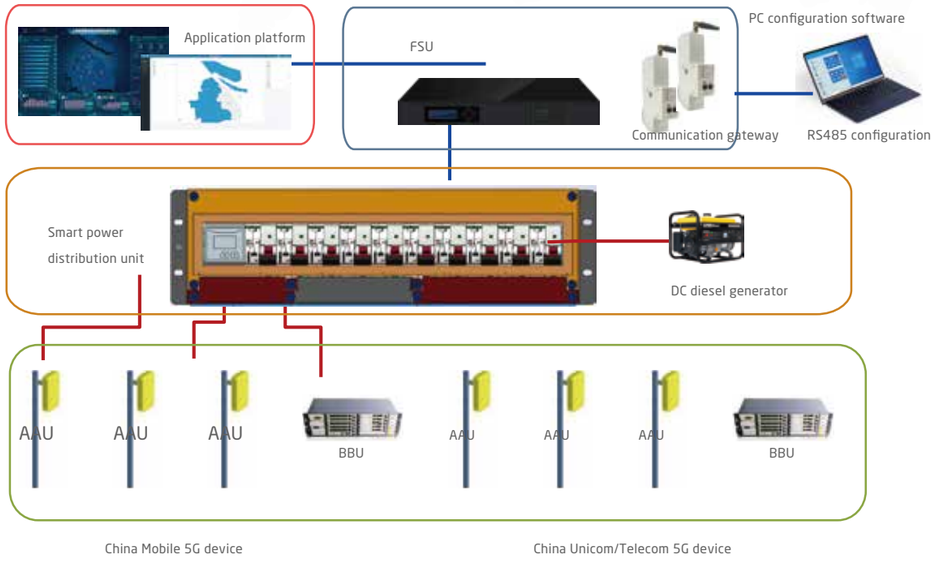
1. Support two 5G users to generate power on demand;
2. Solve the problem of insufficient capacity of small diesel generator and difficult to move big diesel generator.
3. Optional power generation and support flexible configuration.

Support 5G equipments independent power-on/off control and automatic fault reset

1. Support power-on/off, lock and unlock of 5G quipments of each load;
2. Instantaneous fault automatic reset to ensure the continuity of power supply;

Application solution 1

Application solution 2



Differentiated Power Backup Solution of 5G Site

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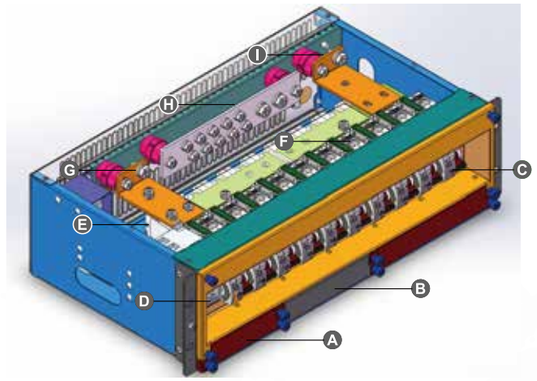
Introduction of smart power distribution unit

Overview of smart PDU



Type	Application
A AI diesel generator analog signal input	Signal input of grid power, diesel generator status
B Central processing unit	The local logic control and parameter setting management
C Control module	It executes power on/off, lock and unlock function of each sub-load.
D Local metering module	Local measurement data statistics storage module
E Measurement acquisition module	Current acquisition module
F Load output terminal	User 2 Input negative busbar
G 1st group negative busbar	user public Input positive busbar
H Public negative busbar	user 1 Input negative busbar
I 2nd group negative busbar	user 1 Input busbar

Product Features

Control function
- timer on-off,
- time duration of backup power,
- voltage of backup power,
- power of backup power,
- duty-free period of time

Meter function
- PDU owns various users metering and statistics
- PDU owns sub-load metering and statistics

Resource management
- System of power distribution load, remote capacity monitoring
- Connect PMS system, remotely organize power distribution resources

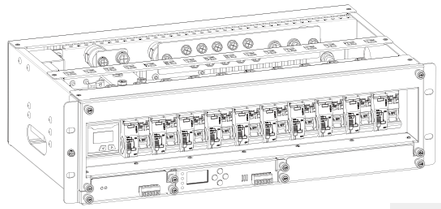
Auxiliary function
- PDU owns sensor of power on/off, diesel generator, and real time status of grid power or diesel generator
- DC generator optional
- RS485 / FSU / independent communication gateway, multi-mode management

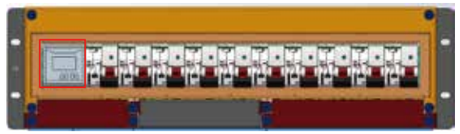
Main components

Control module	Metering Module	Current Sensor	IO terminal module	Central control module	Communication
					
achieve power-on/off control remote lock and unlock	achieve the measurement, metering and statistics of each load	data acquisition module of current and voltage	digital or analogue ports of input and output	user management module of local logic processing center	Communication Management Module

Main technical parameters of smart power distribution unit

Functional module





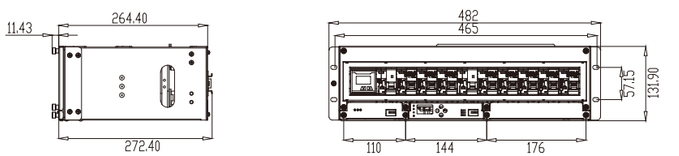
Technical parameter of smart PDU	
Input voltage	8V-60V dc
Output voltage	42.3V-57.6V dc
Input current	≤200A
Output current	20A / 32A / 63A / 100A optional
Central control module	local monitoring management unit
IO port module	optional, Support state grid, and generator monitoring

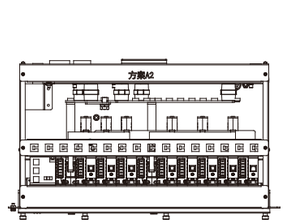
Components in smart PDU			
user 1	Load control	5*63A + 5*32A	Multi-device management
user2		user1：3*63A + 2*32A / user2：3*63A + 2*32A	2 users, multi-device management
		user1：2*100A / user2：2*100A	2 users, DCDU management,
user 1	Load control Load metering	5*63A + 5*32A	Multi-device management measurement
user2	User	user1：3*63A + 2*32A / user2：3*63A + 2*32A	2 users, multi-device management and measurement
		user1：2*100A / user2：2*100A	2 users, DCDU management and measurement

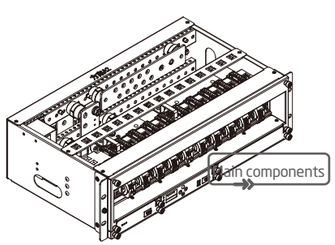
Control Load	
Control voltage	48VDC
Power	≤1W
Mechanical / Electrical life	10,000
Control	open, close, lock, unlock
Local operation	open, close, mode change, safety padlock

Metering load	Range	Accuracy
Voltage	-38--58V	0.5%
Current	1-120A	0.5%
Energy	0~99999999.9	1.0%
Power	load 0~5KW	1.0%

Installation Dimension







Input specification	Output specification1	Output specification2
200A 50~70mm²	32A 4mm²	100A 35mm²
	63A 4mm²	
Power distribution Power	Low current load（AAU / BBU）	High current load（DCDU）

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Smart PDU installation

Installation materials

Serial number	Category	Name	Description
1	Equipment	5 G Differentiated backup power module	Differentiated backup power equipment
2	Power cable	25mm2-35mm2 DC power cable	Equipment DC input cable
3	Ground cable	16mm2 Yellow-green ground cable	Equipment ground cable
4	Communication cable 1	Communication cable	Data cable of equipment and FSU
5	WEB configuring software		Interface software, Display equipment monitoring parameters, parameter delivery, etc.
6	configuring computer	laptop	Commissioning software bearing equipment
7	installation accessories	Terminals, cable ties, insulating tape, etc.	

Equipment installation

› Standard 19-inch subrack installation

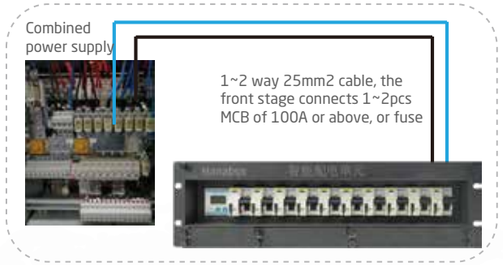
Note: By default, materials will be shipped in a 19-inch rack scenario

› Non-standard 19-inch installation, such as stock tripartite cabinet

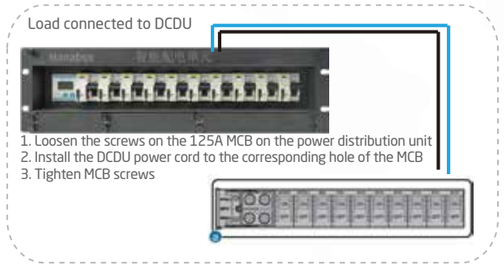
Note: For non-19-inch subrack, you need to prepare a 19-inch bracket or a pallet on site. Place the device on the pallet and fix the two sides with self-tapping screws to ensure that the device is stable and not loose.

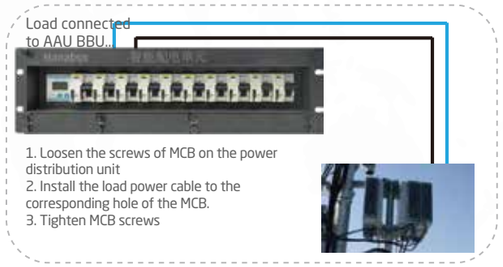
Cable installation

Step 1: DC input power cord installation

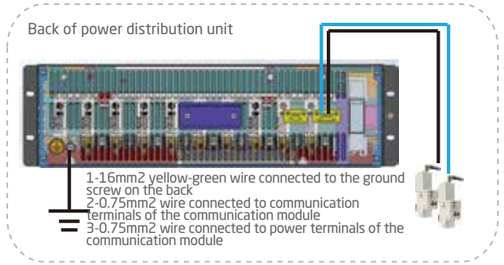


Step 2: DC output power cord installation





Step 3: Ground wire & communication module installation

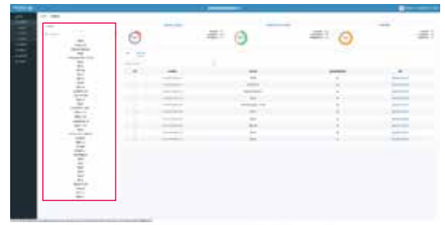


Step 4: Debug the platform

Software configuration of smart PDU

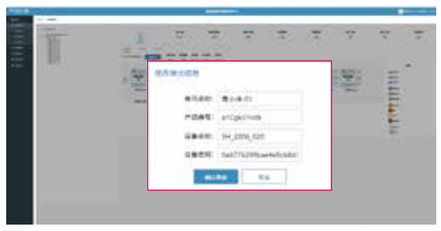
Step 1: Login project account in platform

Step 2: Choose the site



Step 3: Add a cabinet

Step 4: Bind the power distribution unit



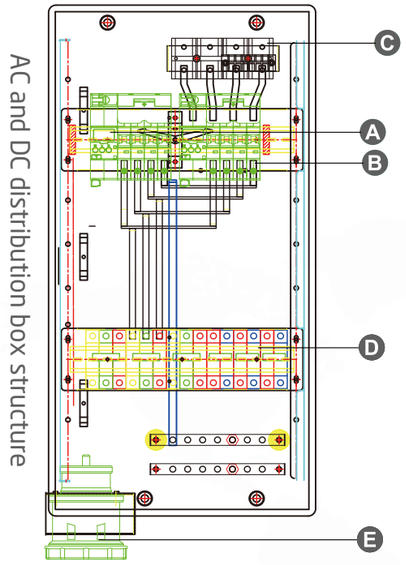
Step 5: Load configuration

Step 6: Device control & data review

Realize power on/off control remote lock, unlock	Realize power on/off control remote lock, unlock	Realize power on/off control remote lock, unlock
measurement, meter grid power, real-time power consumption of generators	measurement, meter grid power, real-time power consumption of generators	circuit breakers status

Realize power on/off control remote lock, unlock	realize the metering of each load and statistical data acquisition	data collect module of current and voltage

Smart AC electrical distribution box



Introduction

Input to grid power or the generators, the AC power distribution to the switching power rectifier module, air conditioner, or load of sockets, etc.; surge protector device included, a base station power supply system as a second stage lightning protection.

Functions of incomer side

Protection and Control:
- Remote control
- Auto Recloser
- Short Circuit
- Overload(100A default, threhold settable)
- Over voltage
- Under Voltage
- Phase Unbalance

Monitoring and Display:
- Voltage
- Current
- Active Power
- Reactive Power
- Power Factor
- Frequency
- Temperature

Metering :
- Total Energy
- Reactive Energy
- New Active Energy
- Net Reactive Energy
- Consumption of Active Energy
- Consumption of Reactive Energy
- Tariff Settable

Functions of outlet

Remote Control:
- Remote Control
- Remote Lock/Unlock
- Auto Recloser
- Surge Protector

Monitoring and Display:
- Voltage
- Current
- Active Power

Metering :
- Total Energy
- Energy of sub-load

Type	Application of
A Smart IoT metering circuit breaker	Grid power remote supervision, metering, control, protection
B Input line terminal	Generator remote supervision, metering, control, protection
C Output circuit breaker	Grid power input power line
D Generator quick plug-in	Optional smart circuit breaker, switching power supply, air conditioner, lighting, etc.
E Smart IoT metering circuit breaker	Generator input power line

AIOT Metering Breaker	AIOT Metering Breaker	Auto Reclosed MCB/RCCB	Control module	Metering Module	Current Sensor
					
.AC input . Single phase, Max.80A .Monitoring and Measurement . Metering grid power and diesel generator . Auto Transfer between grid power and generator . Remote On/OFF, Remote Lock/Unlock, Schedule Control	.AC input . Three phase, Max.80A .Monitoring and Measurement . Metering grid power and diesel generator . Auto Transfer between grid power and generator . Remote On/OFF, Remote Lock/Unlock, Schedule Control	.AC input .Auto-reclose the associated device after untimely trip of breakers . 3 times of auto-reclosing program fixed in the device . Local operation mode by hand for safety	. AC input . Monitoring and Measuring current, voltage of each load . Metering energy of each load	.AC input . Monitoring and Measuring current, voltage of each load . Metering energy of each load	.AC input . Data acquisition of current and voltage of each load

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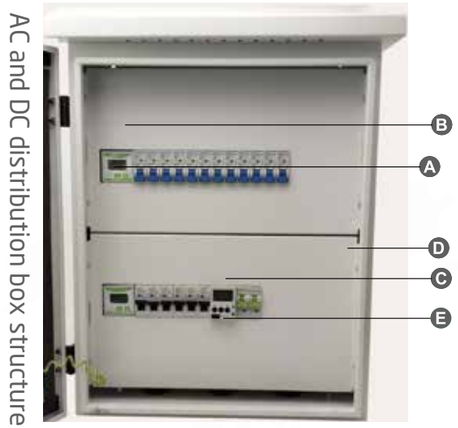
Smart AC & DC mixed electrical distribution box



The product function

Grid power input to one of the AC power is allocated to the external switching power supply rectifier module-then connected to the DC power distribution system; the other line is allocated to the AC power distribution system; to achieve the metering of power consumption in the complex power use site of AC and DC mixing .

Functions of incomer

Protection and Control:
- remote control
- fault reclosing
- short circuit
- overload(overcurrent value: default (overcurrent value: default 100A, parameters can be set)
- overvoltage
- undervoltage phase phase imbalance

Monitoring and Display:
- voltage
- current
- active power
- reactive power
- power factor
- frequency
- equipment temperature monitoring

Metering :
- total active
- reactive power
- net active
- reactive power
- consumption active
- reactive energy
- rate can be set

Functions of outlet

Remote Control:
- remote control of load
- fault reclosing, surge protection and surge protection remote control
- automatic reclosing

Monitoring and Display:
- a voltage
- current
- power

Metering :
- total energy kWH
- sub-load energy kWH

Type	Application of
A AC load metering module	AC load measurement statistics analysis
B DC load metering module	AC load signal acquisition
C DC load acquisition module	AC load measurement statistics analysis
D Smart circuit breaker of total AC input line	AC load signal acquisition
E AC load acquisition module	input line power measurement, metering, protection, control

AIOT Metering Breaker	AIOT Metering Breaker	Auto Reclosed MCB/RCCB	DC Contol Module	DC Metering Module	DC Current Sensor
					
.AC input . Single phase, Max.80A .Monitoring and Measurement . Metering grid power and diesel generator . Auto Transfer between grid power and generator . Remote On/OFF, Remote Lock/Unlock, Schedule Control	.AC input . Three phase, Max.80A .Monitoring and Measurement . Metering grid power and diesel generator . Auto Transfer between grid power and generator . Remote On/OFF, Remote Lock/Unlock, Schedule Control	.AC input .Auto-reclose the associated device after untimely trip of breakers . 3 times of auto-reclosing program fixed in the device . Local operation mode by hand for safety	.DC 48V .Remote On/OFF by RS485 .Remote Lock/Unlock .Auto Recloser .Scheduled On/OFF	. DC 48V . Monitoring and Measuring current, voltage of each load . Metering energy of each load	. DC 48V . Data acquisition of current and voltage of each load

Key components

AC system

MT88M/MT88C

Smart Metering MCCB

- Main switch of AC incomer and remote control;
- Metering grid power and generator power
- Auto-transfer between grid power and generator power
- Detecting the status of grid power and generator power
- Max.current 630A
- RS485,Ethernet, 4G

MT61GP 2P MT61GP 4P

AIOT Metering Breaker

- Main switch of AC incomer and remote control;
- Metering grid power and generator power
- Auto-transfer between grid power and generator power
- Detecting the status of grid power and generator power
- Max.current 80A
- RS485,Ethernet, 4G, 2G,3G,WIFI

MT61SR 2P MT61SR 4P

Smart Recloser

- Main switch of AC incomer and remote control;
- Auto-reclose the device after lightning happened in telecom sites
- Over/under voltage protection
- Leakage protection and auto-reclose after leakage fault disappeared
- Electrical alarm
- Max.current 125A
- RS485 and Modbus RTU

MT53-RS220 + MCB/RCBO

Remote Control Breaker

- Remote On/OFF by RS485
- Remote Lock/Unlock by RS485
- On/off status feedback of the associated breaker
- Scheduled On/OFF
- RS485 and Modbus RTU

MT53RA-ML50 2P MT53RA-ML50 4P

Auto Reclosed RCCB

- Auto-reclose the device after lightning happened in telecom sites
- Leakage protection and auto-reclose after leakage fault disappeared
- Auto recloser fault alarm
- Reclosing sequence adjustable

MT51RA-ML50 2P MT51RA-ML50 4P

Auto Reclosed RCCB

- Auto-reclose the device after lightning happened in telecom sites
- Leakage protection and auto-reclose after leakage fault disappeared
- Auto recloser fault alarm
- Reclosing sequence adjustable

MT58MA

Multi-channel meter device

- Metering energy and power consumption of multi-loads
- Monitoring the voltage of all the loads
- Over/under voltage threshold setting
- Over current threhold setting

MT58SA-S63

Solid-core current sensor

- Data acquistion of current and voltage
- Solid-core type with hole
- Active energy accuracy: class 1
- Max. current 63A

MT58SA-050

Open-core current sensor

- Data acquistion of current and voltage
- Open-core type with hole
- Active energy accuracy: class 2
- Max. current 50A

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DC System

MT53-RSD48

Remote Control Breaker

- Remote On/OFF by RS485
- Remote Lock/Unlock by RS485
- On/off status feedback of the associated breaker
- Scheduled On/OFF
- RS485 and Modbus RTU
- DC 48V

MT58SA-P63/125

Solid-core current sensor

- Data acquistion of current and voltage
- Plug-in type
- Active energy accuracy: class 1
- Max. current 125A
- DC 48V

MT58MD

Multi-channel meter device

- Metering energy and power consumption of multi-loads
- Monitoring the voltage of all the loads
- Over/under voltage threshold setting
- Over current threhold setting
- DC 48V

Monitoring Device

MT20-ST

Air conditioner smart socket

MT99BT

Battery Monitoring Device

- Monitor battery string voltage, charge and discharge current
- Calculate battery string SOC
- Auto-balancing
- Auto-sensing for the battery sensor's ID address
- Setpoint alarming (upper limit/lower limit)
- Data collecting
- RS485 (Modbus-RTU) & Ethernet (TCP or SNMP)
- Check battery string status: equalizing, discharging, floating charge, stand by and abnormal status

Smart Gateway

MT88C

Communication Module

- Downlink communicatio: RS485, Modbus RTU
- Uplink communication: GPRS 4G, GPS positioning, Ethernet RJ45 port
- Uplink communication protocol: MQTT
- AC/DC both available

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Case 1: Shanghai Tower Indoor Telecom Tower Station (China Mobile Qingxiaolai Station)

Site information

The power supply adopts Emerson R48-2900U communication power supply module, equipped with 150A power module, actual load 100A, and sufficient power supply capacity;

China Unicom and China Mobile share stations, China Mobile has 3pcs 4G RRUs, 3pcs 3G RRUs, China Unicom 3pcs 4G RRUs, and 3pcs 5G AAU, plus 1 transmission device;

DC metering module has been connected, using Hall acquisition module.

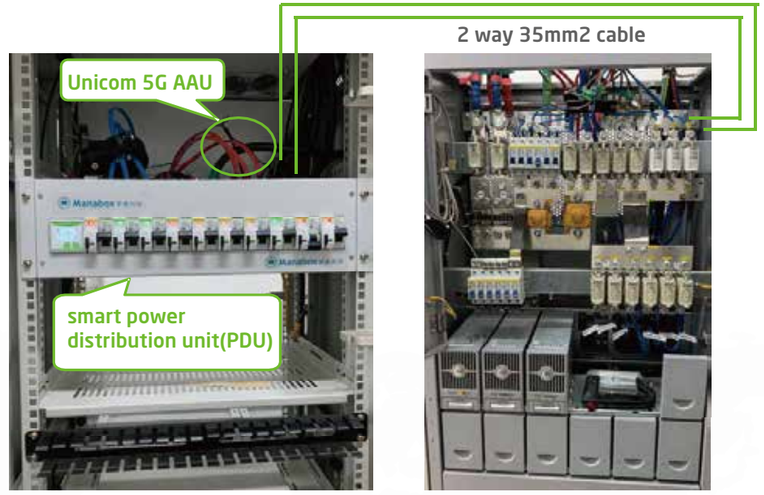
Before the site reconstruction

Customer demand

Now Unicom's 5G equipment has high power consumption,
accurate measurement and Hall measurement for data comparison;

4G and 5G equipment remotely control, open, close, lock, unlock.

After the site reconstruction



Reconstruction plan

1. Reuse the original power distribution and add a new smart PDU.
2. Smart power distribution unit for 5G main equipment users, was replaced with power on.
3. System parameters are set according to user.

Achieved results

1. Control: 10 outputs, all have open and close control, lock and unlock functions.
2. Metering: 10 outputs, all of which have measurement and measurement functions. The accuracy is 1%.
3. Independent control: independent control of sector equipment.

Case 2: China Tower Shanghai Outdoor Tower Station (China Unicom Qingshenxi)

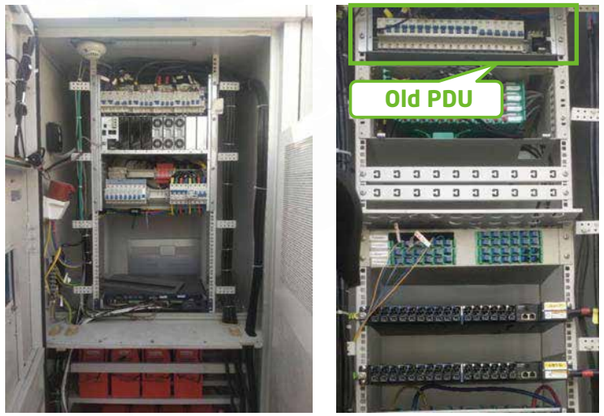
Site information

Combined switching power supply, equipped with a 300A power module, the actual load is 200A, and the power capacity is sufficient;

Telecom and China Unicom share stations. Telecom has 3pcs 4G RRUs, 3pcs 3G RRUs, China Unicom 3pcs 4G RRUs, and 3pcs 3G RRU devices;

already connected with a DC metering module and a Hall acquisition module.

Before the site reconstruction



Customer demand

1. Realize remote management and control (open, close, lock, unlock) of existing equipments, and metering of operator equipments
2. Hope to be able to remotely manage power distribution resources and allocate power distribution switches on/off reasonably;
3. Miscellaneous cable routing, The on-site reconstruction is highly complex, and it is easy to cause flashing due to loosen cable connection;
4. It is difficult to route the power cabinet to the integrated cabinet;
5. The cables are not marked with the main equipment information and need to be confirmed one by one

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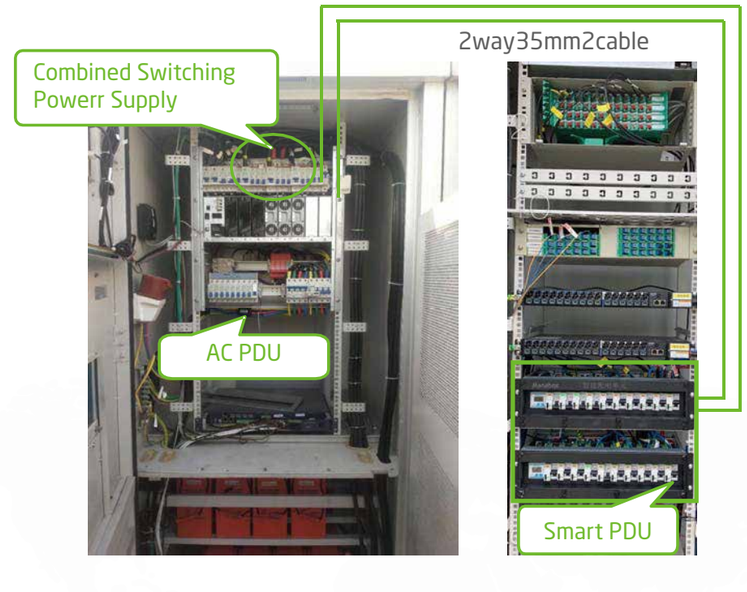
After the site reconstruction



Reconstruction plan

1. Reuse the original power distribution and add a new smart power distribution unit.
2. Telecom and China Unicom equipment are replaced with live electricity by users.
3. System parameters are set according to users

Achieved results

1. Control: 10 outputs, all have opening and closing control, and locking and unlocking functions.
2. Meter: 10 outputs, all of which have measurement and measurement functions. The accuracy is 1%
3. Independent control: independent control of sector equipments