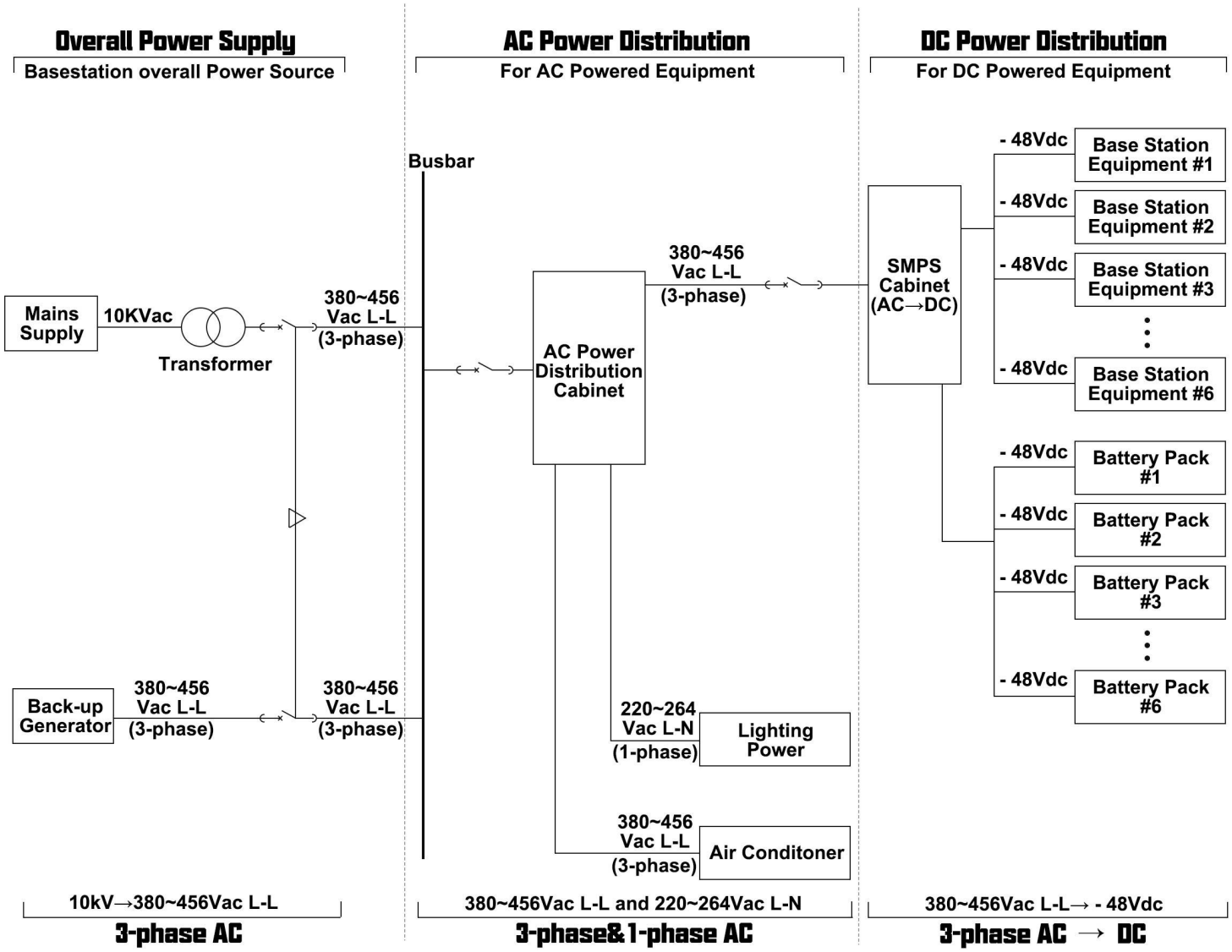
1. Base Station Power System Overview

The overall power system of a common telecommunications tower's base station could be devided into 3 basic parts.

(1) 2 major incoming circuits came from "Mains Supply" and "Back-up Generator". Normal they were carried by 2 different 3-phsae circuits. [Overall Power Supply]

(2) Multiple AC sub circuits mainly used for AC power supply of 3-phase loads like "Lighting Power" and 1-phase loads like "Air Conditioner" in base station [AC Power Distribution]

(3) Multiple DC sub circuits mainly used for DC power supply of DC loads like "Base Station Equipment" in base station [DC Power Distribution]



Author: Aaron Shi
E-mail: aaron@acrel.cn

2. Scenario Preset

According to the power system of base station. We can actually calculate that how many circuits we need to monitoring and set a compatbile model selection plan for metering devices like AC or DC energy meters and paired AC current transformer or DC current transducer.

So, let's first suppose we have following circuits in a certain base station that require monitoring:

(1) 5 circuits AC need to be monitored in total:

1 AC circuit 3-phase for "Mains Supply" [Rated voltage 400/230Vac, rated current 100A AC]

1 AC circuit 3-phase for "Back-up generator" [Rated voltage 400/230Vac, rated current 100A AC]

1 AC circuit 3-phase for "AC Distribution Cabinet" [Rated voltage 400/230Vac, rated current 100A AC]

1 AC circuit 3-phase for "Air Conditioner" [Rated voltage 400/230Vac, rated current 32A AC]

1 AC circuit 1-phase for "Lighting Power" [Rated voltage 230Vac L-N, rated current 16A AC]

(2) 5 circuits DC needed to be monitored in total:

4 DC circuits for 4 "Base Station Equipments" [Rated voltage: -48Vdc, rated current 50A DC, Each]

1 DC circuit for "Overall DC Power Input" [Rated voltage: -48Vdc, rated current 200A DC]

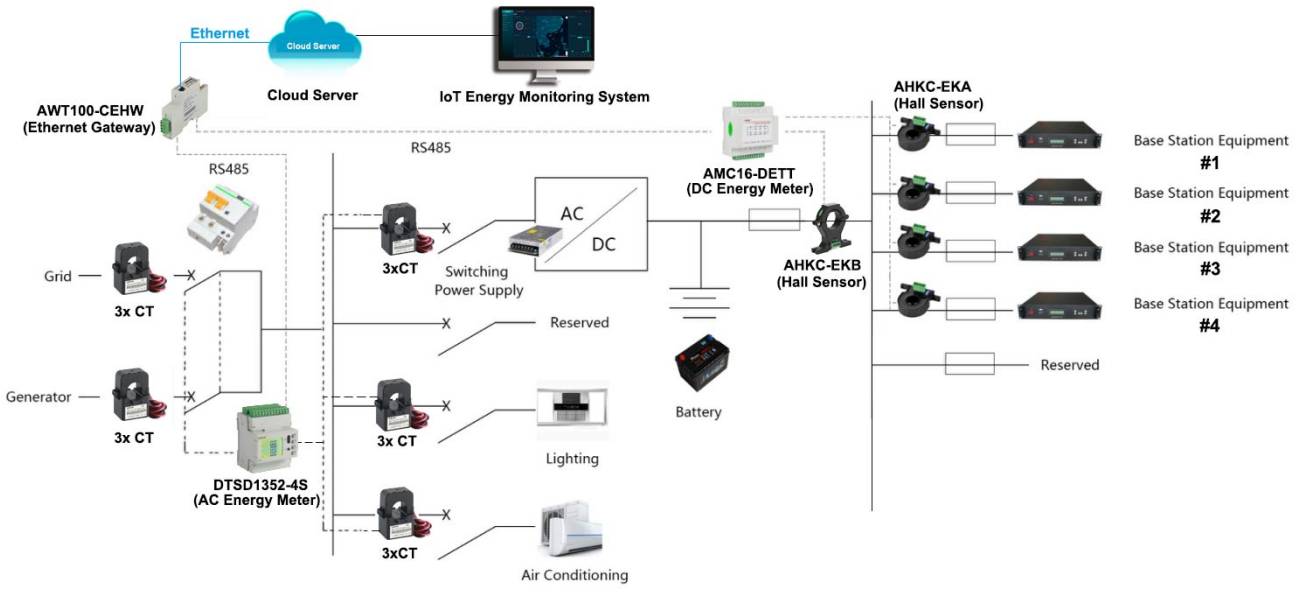
3. Device Deployment

For AC Power Metering - "Mains Supply", "Back-up Generator", "AC DB Cabinet", "Air Conditioner":
- 1* DTST1352-4S Multi-circuit AC Energy Meter
- 4* AKH-0.66/K-Φ16N 100A/50mA Split-core Current Transformer (1 set contain 3 CTs)

For AC Power Metering - "Lighting Power":
- 1* DTST1352-4S Multi-circuit AC Energy Meter
- 1* AKH-0.66/K-Φ16N 100A/50mA Split-core Current Transformer (1 set contain 3 CTs)

For DC Power Metering - "Base Station Equipments" & "Overall DC Power Input":
- 1* AMC16-DETT Multi-circuit DC Energy Meter
- 4* AHKC-EKA (50A/5V) Split-core Hall Effect DC Current Transducer
- 1* AHKC-EKB (100A/5V) Split-core Hall Effect DC Current Transducer

For Ethernet Upstream Communication:
- 2* AWT100-CEHW IoT Gateway
- 2* AWT100-POW Power Supply Module



Author: Aaron Shi
E-mail: aaron@acrel.cn

4. Hardware Devices Overview [Energy Meter & Ethernet Gateway]

DC Metering | Multi-circuit | 6-channel | RS485 (MODBUS)

Model 1: AMC16-DETT Multi-circuit DC Energy Meter

- Monitoring: Up to 6 circuits [DC Metering]
- Rated Voltage: -48Vdc
- Rated Current: 5Vdc (via -A/5Vdc hall sensor)
- Communicaiton: RS485 Interface, MODBUS-RTU Protocol
- Auxiliary Power Supply: -40~-60Vdc
- Certificate&Standard: IEC; CE

1-phase&3-phase | Multi-circuit | 4-channel | RS485 (MODBUS)

Model 2: DTSD1352-4S Multi-circuit AC Energy Meter

- Monitoring: Up to 4 circuits 3-phase or 12 circuits 1-phase or mixed [AC Metering]
- Rated Voltage: 380~456Vac L-N & 220~264Vac L-N
- Rated Current: 50mA (via -A/50mA CT)
- Communicaiton: RS485 Interface, MODBUS-RTU Protocol
- Auxiliary Power Supply: 85~265Vac/Vdc
- Certificate&Standard: CE

IoT Gateway | Ethernet | MQTT&MODBUS | RS485&RJ45

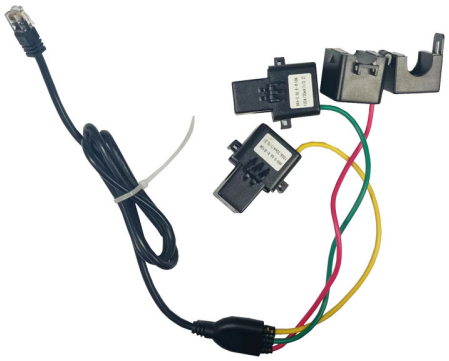
Model 3: AWT100-CEHW IoT Ethernet Gateway

- Upstream Methods: Ethernet (MQTT, MODBUS-TCP)
- Downsteam Methods: RS485 (MODBUS-RTU)
- Support: Up to 25 Energy Meters with RS485 Interface
- Auxiliary Power Supply: 85~265Vac L-N (via POW module) or 24Vdc (default)
- Certificate&Standard: CE-RED

Author: Aaron Shi
E-mail: aaron@acrel.cn

4. Hardware Devices Overview [Paired Current Sensor for Energy Meter]

AC Current | 3 CTs in 1 Set
16mm Aperture | 100A/50mA AC



Model 1: AKH-0.66/K-Φ16N 100A/50mA Split-core CT

- Current Ratio: 100A/50mA AC
- Accuracy: Class 0.5
- Aperture: 16mm
- Application: Paired with DTSD1352-4S AC energy meter for current intput
- Noted: 1 set include 3 CTs

Hall Effect | AC&DC Transducer
0~500A AC/DC In. | 0~±5/±4Vdc Out.

Model 2: AHKC-EKA Split-core Hall Sensor

- Current Input Range: 0~50A DC
- Current Output Range: 0~±5Vdc
- Aperture: φ20mm
- Auxiliary Power Supply: ±12Vdc (Supplied by AMC16-DETT)
- Application: Paired with AMC16-DETT DC energy meter for current intput

Hall Effect | AC&DC Transducer
0~1000A AC/DC In. | 0~±5/±4Vdc Out.

Model 2: AHKC-EKB Split-core Hall Sensor

- Current Input Range: 0~100A DC
- Current Output Range: 0~±5Vdc
- Aperture: φ40mm
- Auxiliary Power Supply: ±12Vdc (Supplied by AMC16-DETT)
- Application: Paired with AMC16-DETT DC energy meter for current intput

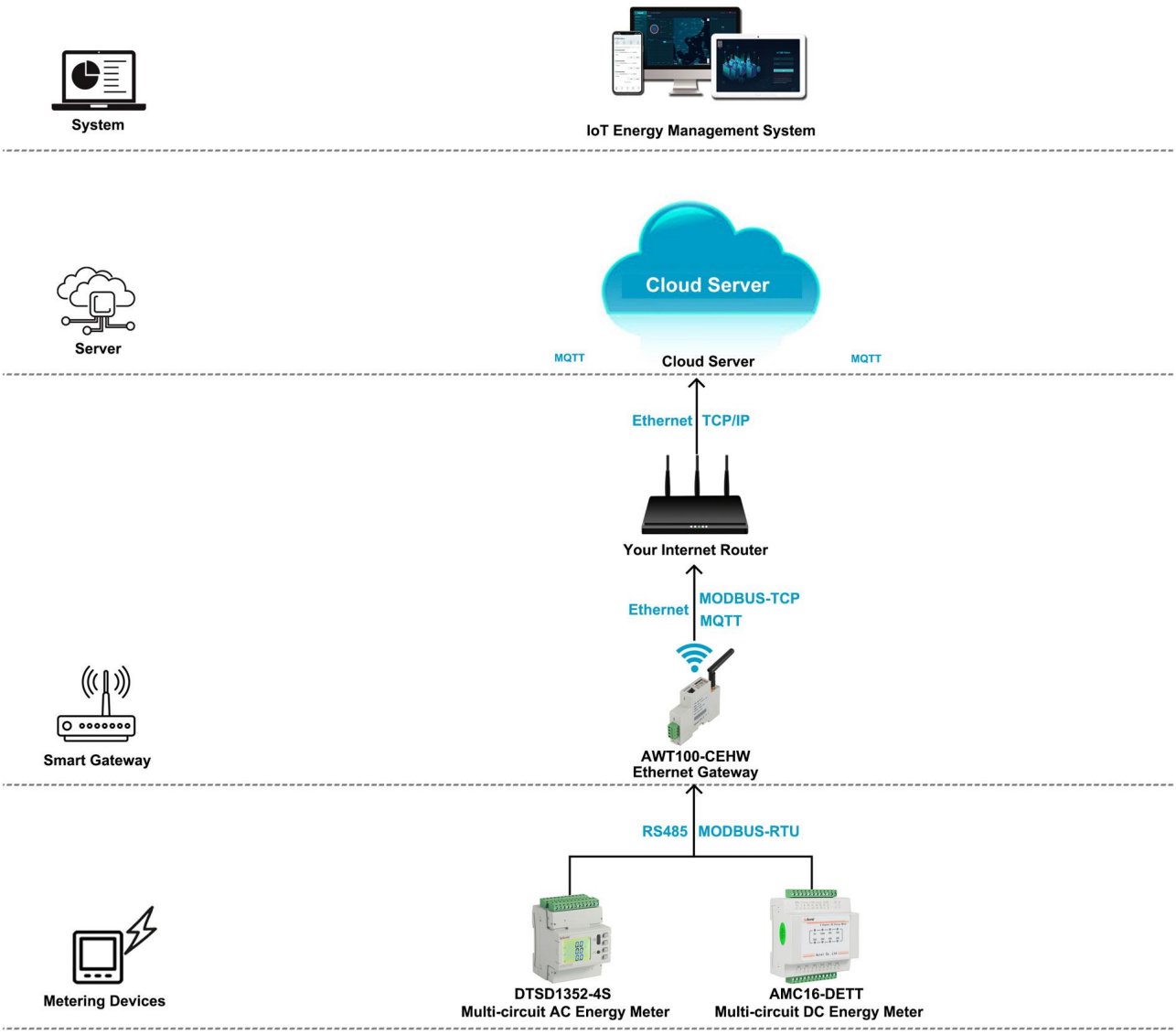
Author: Aaron Shi
E-mail: aaron@acrel.cn

5. Communication Structure&Logic

(1) Ethernet Communication could be served as one of the final data upstream methods by sending the data to cloud server deployed in Internet so that Acrel IoT System could be interact with these data collected by bottom metering devices like Energy Meter

(2) AWT100-CEHW gateway support upstream of Ethernet communication with MQTT and MODBUS-protocol and downstream of RS485 communication based on MODBUS-RTU protocol. Also, devices like AMC16-DETT, DTSD1352-4S support upstream communication of RS485 communication based on MODBUS-RTU protocol.

(3) Based on the communication described in item (2), Acrel AWT100-CEHW gateway could receive the data from AMC16-DETT and DTSD1352-4S energy meter using RS485 communication while sending the data further to cloud server using Ethernet upstream communication. Thus accomplish a complete communication from bottom metering devices to top system software.



Author: Aaron Shi
E-mail: aaron@acrel.cn

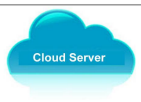
4. Overall Model Selection&Quoation

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot projtect)	3-month Free Trail (Users don't need to rent a cloud server))
		$140/Year (For 10 Points) (Price for Host Service Only, recommended in pilot projtect)	$14 to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$8000/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late projtect)	1-time charging of $8000 for Buy-out Service of permanent use (Support OEM and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Smart Gateway

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Ethernet Smart Gateway **AWT100-CEHW**	**Upstream:** Ethernet (DHCP, MQTT, MODBUS-TCP) **Downstream:** RS485 (MODBUS-RTU) **Support:** up to **20~25** Energy Meters within 400m using RS485 communication **Power Supply:** 85~265Vac/Vdc (via AWT100-POW Module); 24Vdc (Default)	1 pcs		
	Power Supply Module **AWT100-POW**	**Input:** 85~265Vac/Vdc **Output:** 24Vdc **Application:** paired with AWT100 Series gateway for 85~265Vac/Vdc power supply input	1 pcs		

AC Metering Devices Set

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	AC Multi-circuit Energy Meter **DTSD1352-4S**	**Monitoring:** Up to 12 circuits 1-phase or 4 circuits 3-phase or mixed [AC Metering] **Communication:** RS485 (MODBUS-RTU) **Rated Voltage:** 380~456Vac L-L & 220~264Vac L-N **Rated Current:** 50mA (via -A/50mA CTs) **Auxiliary Power Supply:** 85~265Vac/Vdc	2 pcs		
	Split-core Current Trasnformer **AKH-0.66/K K-φ16N**	**Current Ratio:** 100A/50mA AC **Aperture:** φ16mm (diameter) **Accuracy:** Class 0.5 **Application:** Paired with DTSD1352-4S for current input **Noted:** 1 set include 3 CTs	5 pcs		

DC Metering Devices Set

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	DC Multi-circuit Energy Meter **AMC16-DETT**	**Monitoring:** Up to 6 circuits [DC Metering] **Communication:** RS485 (MODBUS-RTU) **Rated Voltage:** -48Vdc **Rated Current:** 5Vdc (via -A/5Vdc Hall Sensor) **Auxiliary Power Supply:** -40~-60Vdc	1 pcs		
	Hall Sensor **AHKC-EKA**	**Current Input Range:** 0~50A DC **Current Output Range:** 0~±5Vdc **Aperture:** φ20mm **Auxiliary Power Supply:** ±12Vdc Application: Paired with AMC16-DETT for current input	4 pcs		
	Hall Sensor **AHKC-EKB**	**Current Input Range:** 0~100A DC **Current Output Range:** 0~±5Vdc **Aperture:** φ40mm **Auxiliary Power Supply:** ±12Vdc Application: Paired with AMC16-DETT for current input	1 pcs		

Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

Acrel IoT Energy Monitoring System could be access in 2 different ways:

(1) Access through WEB on your computer.

Access port: https://iot.acrel-eem.com/

(2) Access through APP on your mobile phone

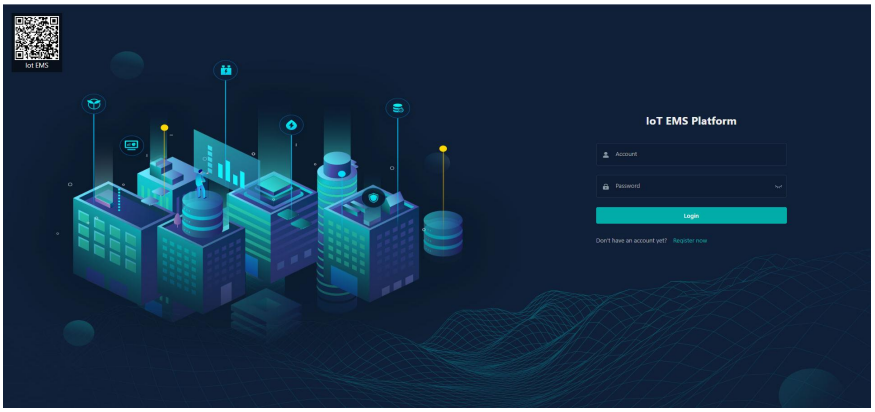
Download Link: https://play.google.com/store/apps/details?id=com.acrel.iotems

(1) WEB Accesss (Computer):

Access Port: https://iot.acrel-eem.com/

Test Account Name: acrel

Test Account Password: 123456

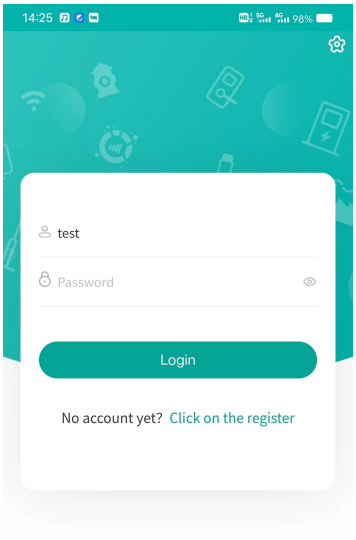


(2) APP Accesss (Mobile):

Download Link: https://play.google.com/store/apps/details?id=com.acrel.iotems

Test Account Name: acrel

Test Account Password: 123456



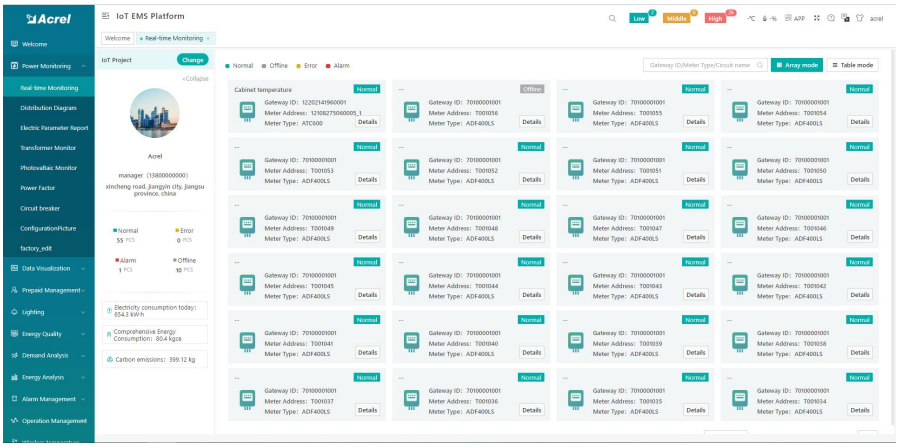
Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

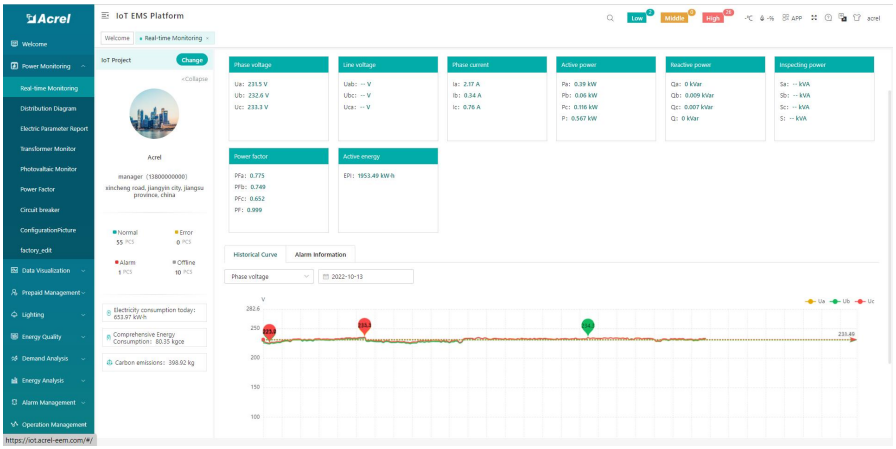
Main Function of WEB side System:

(1) Devices List (2) History Curve (3) Electricity Parameters Report (4) Energy Consumption Report (Daily, Monthly, Yearly) (5) User Report

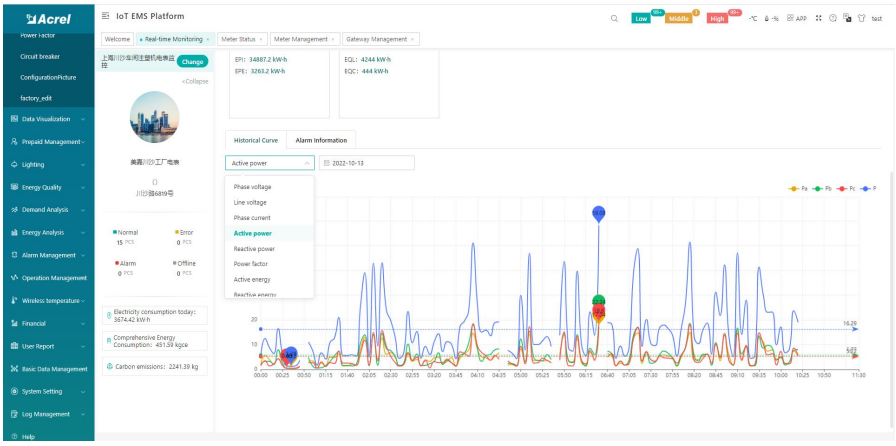
(1) Devices List: Showing the overall devices connected to Acrel System and were bond to certain project. SN code, Online-Offline status, devices model and other necessary information will be shown here.



(2) History Curve: Showing the daily history data curve of all the data that could be collected and upload by energy meter or other basic metering devices.



(2) History Curve: By selecting the items of "data" and "electricity parameter", platform can show the history curve of different data and date.



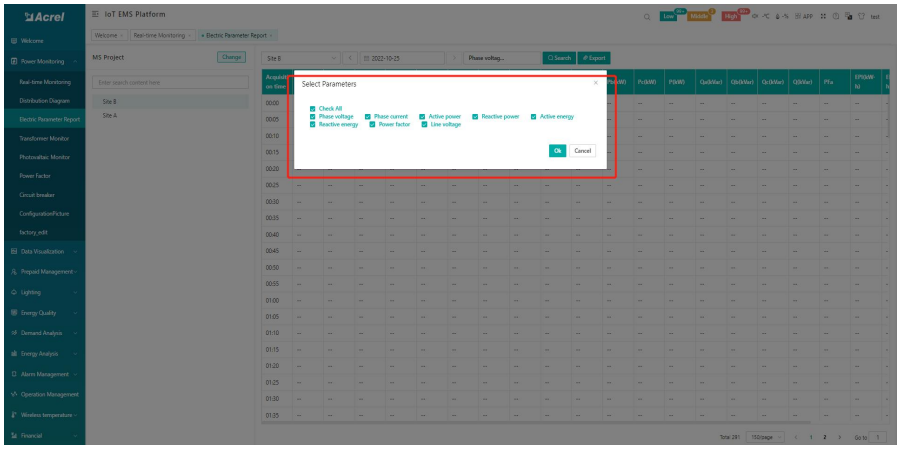
Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

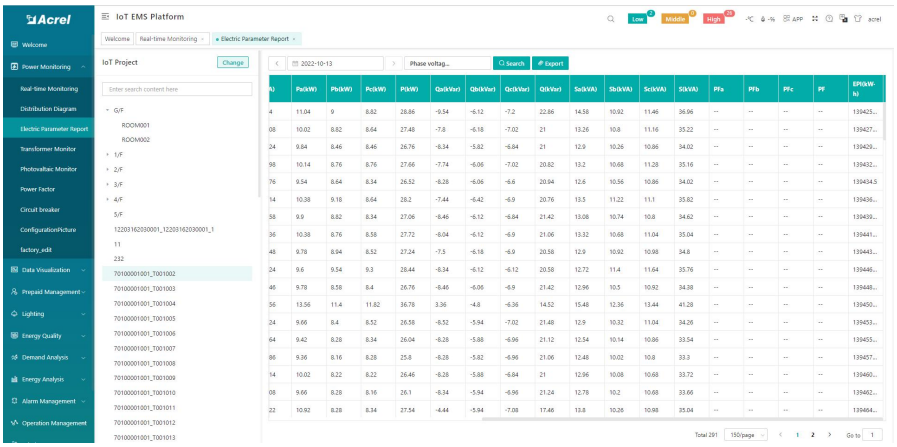
Main Function of WEB side System:

(1) Devices List (2) History Curve (3) Electricity Parameters Report (4) Energy Consumption Report (Daily, Monthly, Yearly) (5) User Report

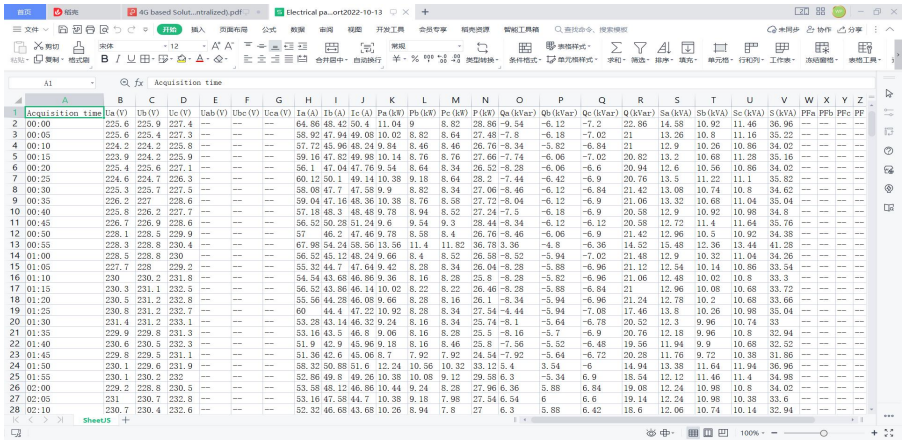
(3) Electricity Parameters Report: Select the "electricity parameters" that you want to show in this report .



(3) Electricity Parameters Report: All the electricity parameters that could be collected by certain energy meter will showed as a report here.



(3) Electricity Parameters Report: Report on platform could be exported in "Excel" format to your computer for a brief storage when accessing the IoT EMS WEB platform.



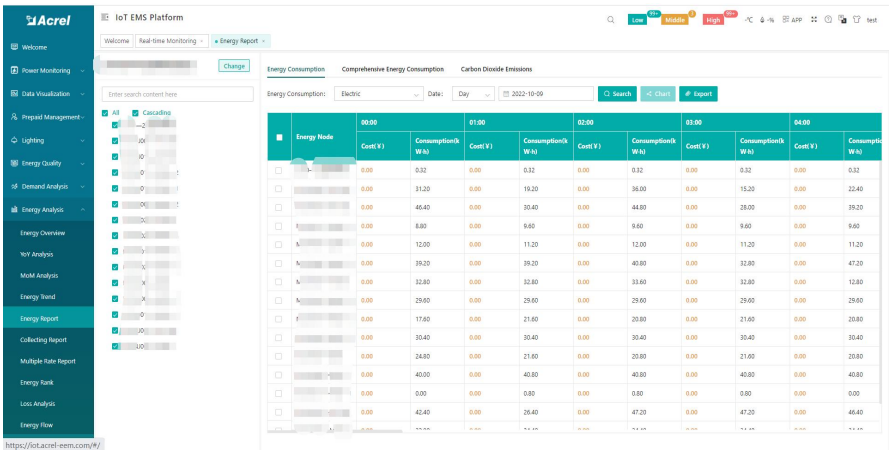
Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

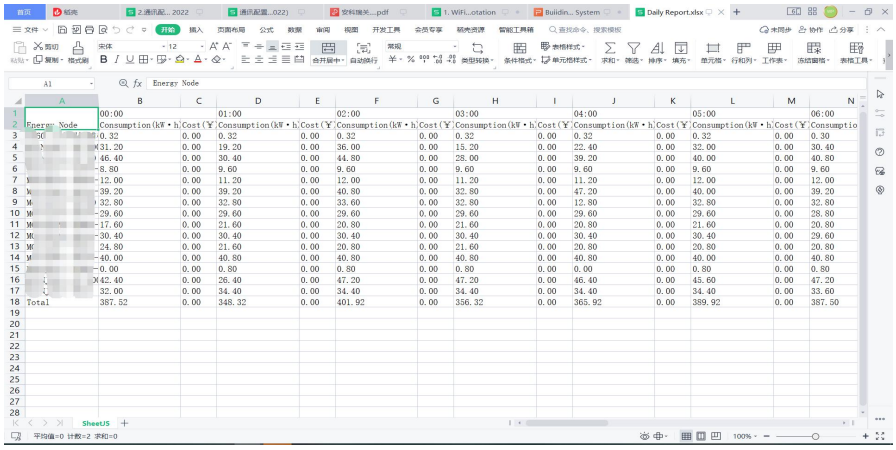
Main Function of WEB side System:

(1) Devices List (2) History Curve (3) Electricity Parameters Report (4) Energy Consumption Report (Daily, Monthly, Yearly) (5) User Report

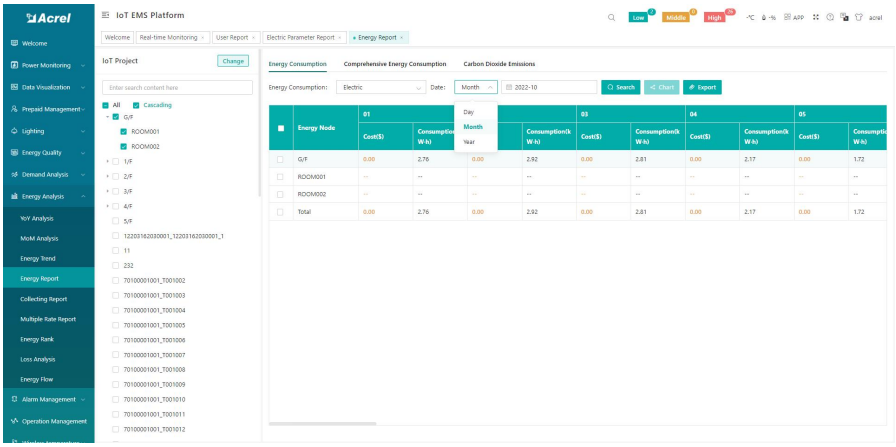
(4) Energy Report (Daily): This Interface show the daily energy consumtion report (calculated by forward active energy)



(4) Energy Report (Daily): This daily energy report could be also export to computer in "Excel" format



(4) Energy Report (Monthly& Yearly): Same as daily energy report, monthly and yearly energy report could be also checked on platform and exported in "Excel" format.



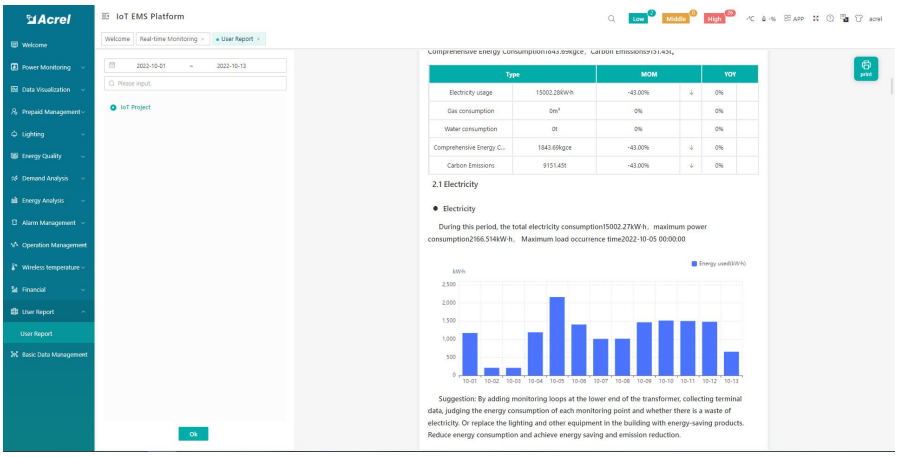
Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

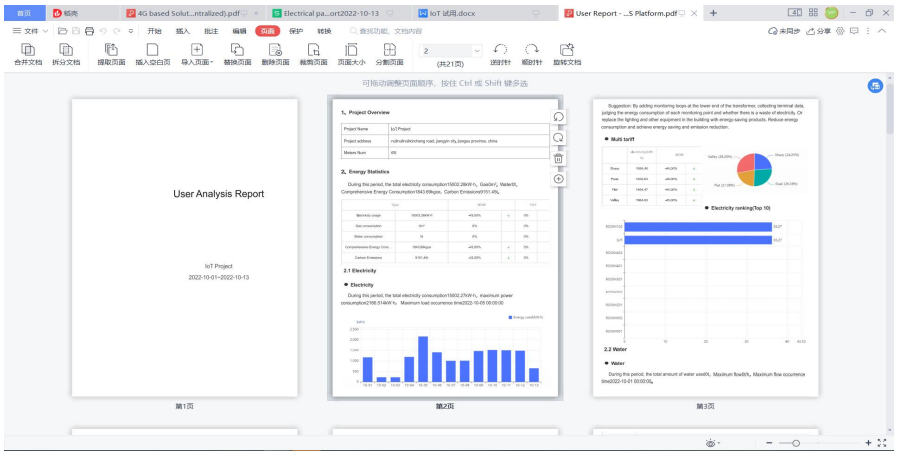
Main Function of WEB side System:

(1) Devices List (2) History Curve (3) Electricity Parameters Report (4) Energy Consumption Report (Daily, Monthly, Yearly) (5) User Report

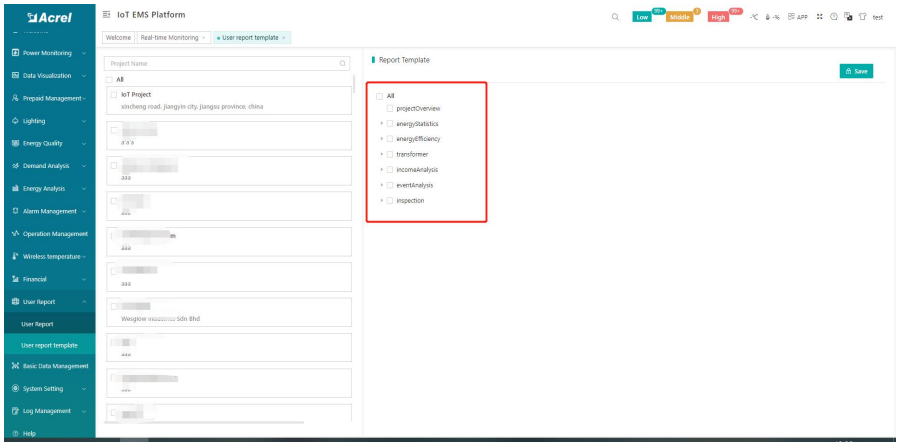
(5) User Report: A comprehensive user report including project overview, energy report, energy analysis and etc could be check on platform



(5) User Report: User report could be exported in "PDF" format into your PC for convenient check and storage.



(5) User Report: User report support template customization in buy-out service of Acrel IoT Energy Monitoirng System.



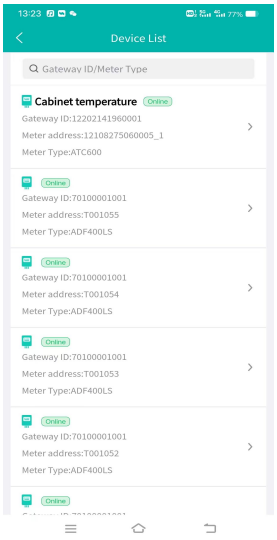
Author: Aaron Shi
E-mail: aaron@acrel.cn

6. Acrel IoT Energy Monitoring System (Partail Introduction)

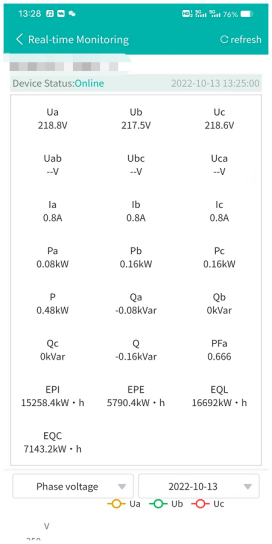
Main Function of APP side System:

(1) Devices List (2) History Curve (3) Electricity Parameters Report (4) Energy Trend (5) Energy Consumption Report (Daily, Monthly, Yearly)

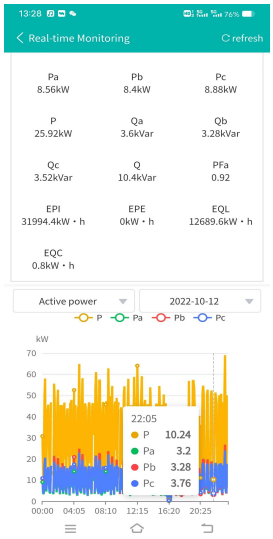
Noted: Since APP side and WEB side of Acrel IoT Energy Monitoring System share the same data, normally recommend our user to add the devices to their account using APP and check the data using WEB platform.



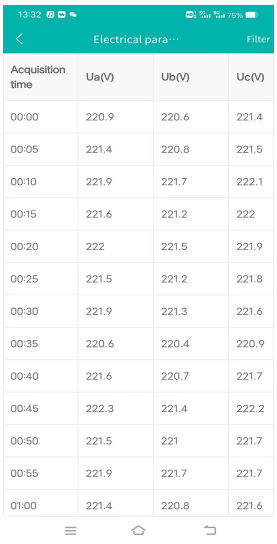
(1) Device List



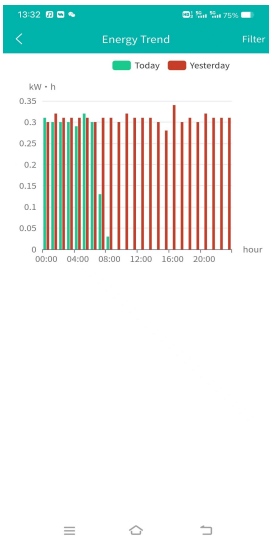
(2) History Curve



(2) History Curve



(3) Parameter Report



(4) Energy Trend

(5) Energy Report