TIANWU- AIO- L (BESS) Introduction

Overseas Pre-Sales Technical Support Department
Jiangsu Weiheng Intelligent Technology Co., Ltd.

About WEIHENG

OUR COMPANY

WEIHENG 为恒智能科技

WEIHENG's SHAREHOLDERS

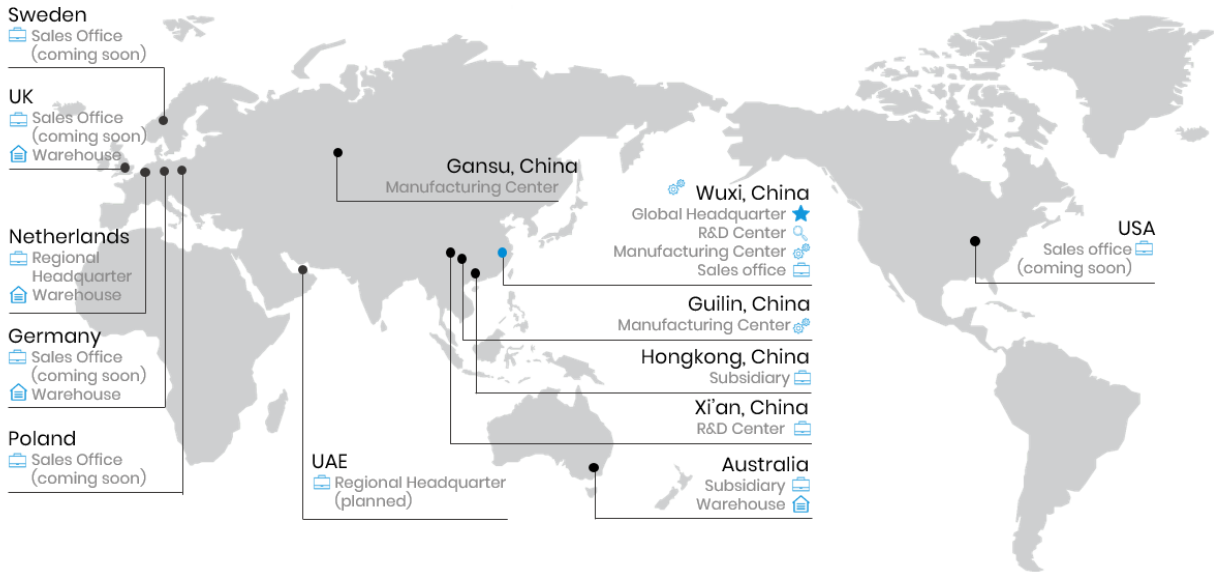
Global Leader Tech Co.	CATL, INOVANCE
Prestigious university	復容投資 FURONG CAPITAL, 水木 Waterwood
Leading investment Co.	瑞東 REORIENT, CD Capital 晨道资本, 锡创投 WUXI CAPITAL GROUP, 兴业国信资管 CIIT ASSET MANAGEMENT

4 Manufacturing Facilities

5GWh Capacity

Global Footprint

- 2 R&D Centers
- 4 Manufacturing Centers
- 5 Oversea Subsidiary
- 5 Oversea Sales Offices
- 4 Warehouses
- 5 China Sales Regional Teams

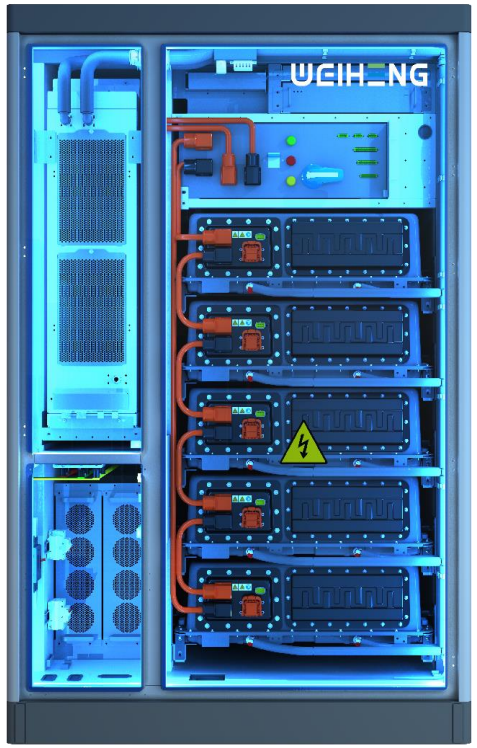


Products

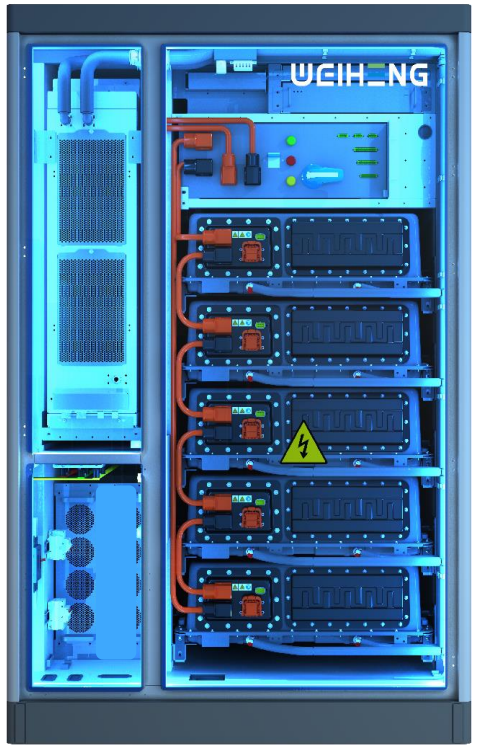
Utility ESS	• Main & grid side • Off-grid & microgrid	3-5MWh	
Commercial & Industrial ESS	• Commercial & Industrial • Charging stations	50-690kW 230-466kWh	
Residential ESS	• Incremental Market, All-in-One • New installations & retrofit	3-13kW 5-40.96kWh	
SaaS Services	• Utility energy storage & power • Supplier & consumer modules • Residential market		

What's TIANWU

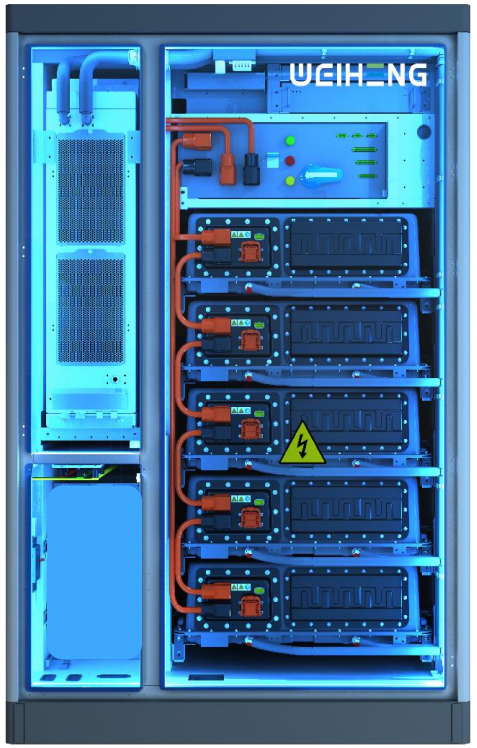
C&I Product



TIANWU-B (0.5C)
Standard Product
100kW/233kWh(0.5C Cell)



TIANWU-B (0.25C)
1 PCS
50kW/233kWh(0.5C Cell)

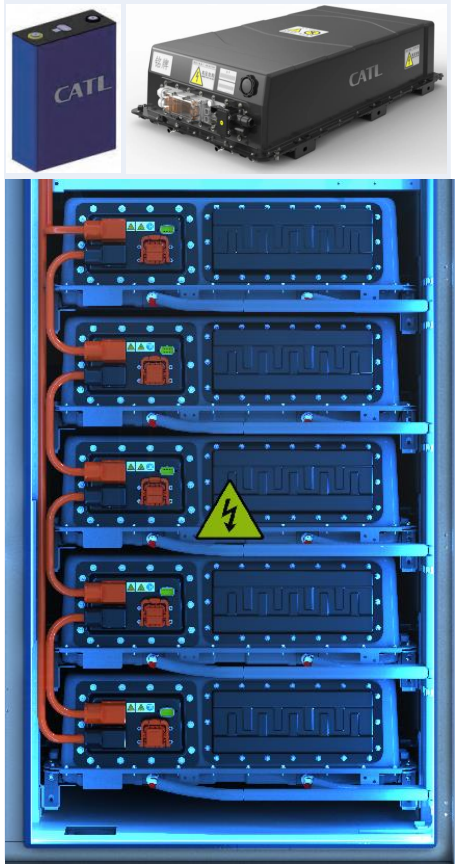


TIANWU-P (1C)
TIANWU + 250kW-A Cabinet
250kW/233kWh(1C Cell)

All In One

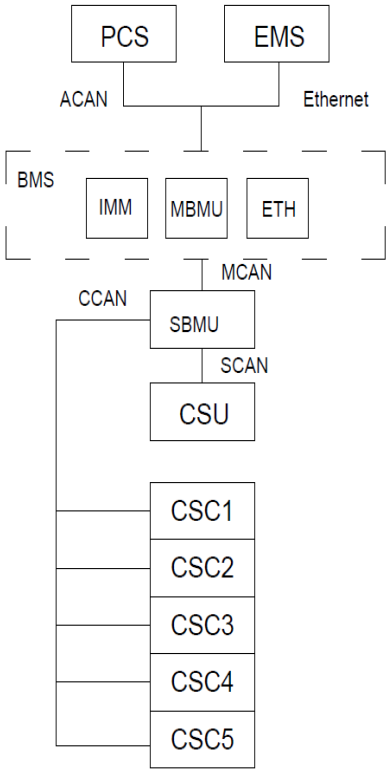
Battery

52S Cell= 1Pack
5S Pack=1Rack



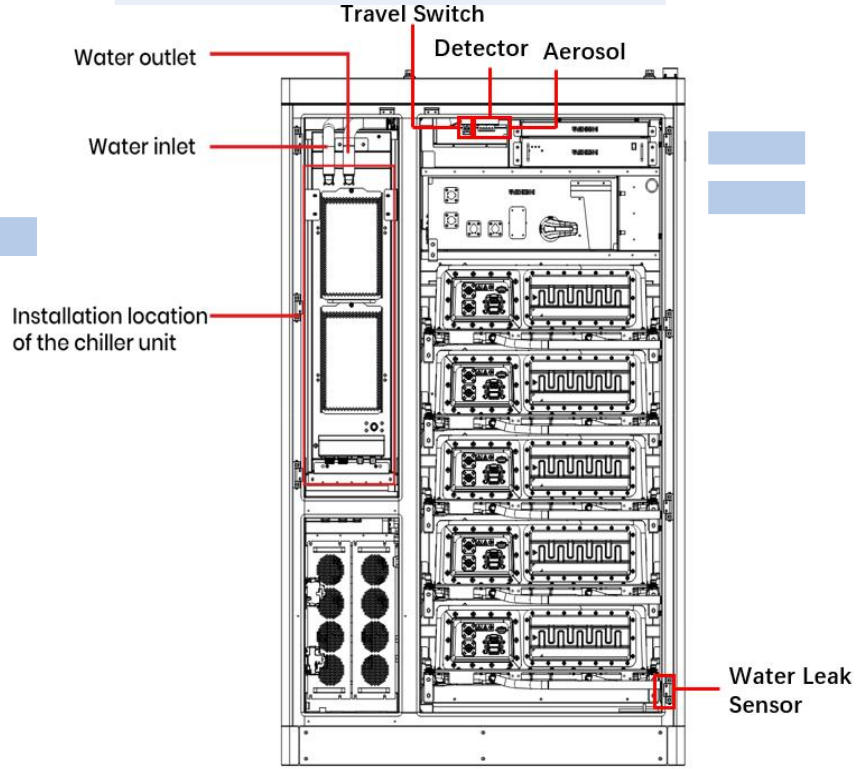
Manage System

- BMS(Data Collect)
- PCS(Charge/Discharge)
- EMS(Data Process)



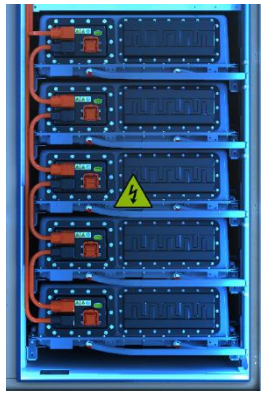
Control System

- TMS(Liquid Cooling)
- FSS(Fire Suppression)
- Environment Control



Energy Storage System(DC Side)

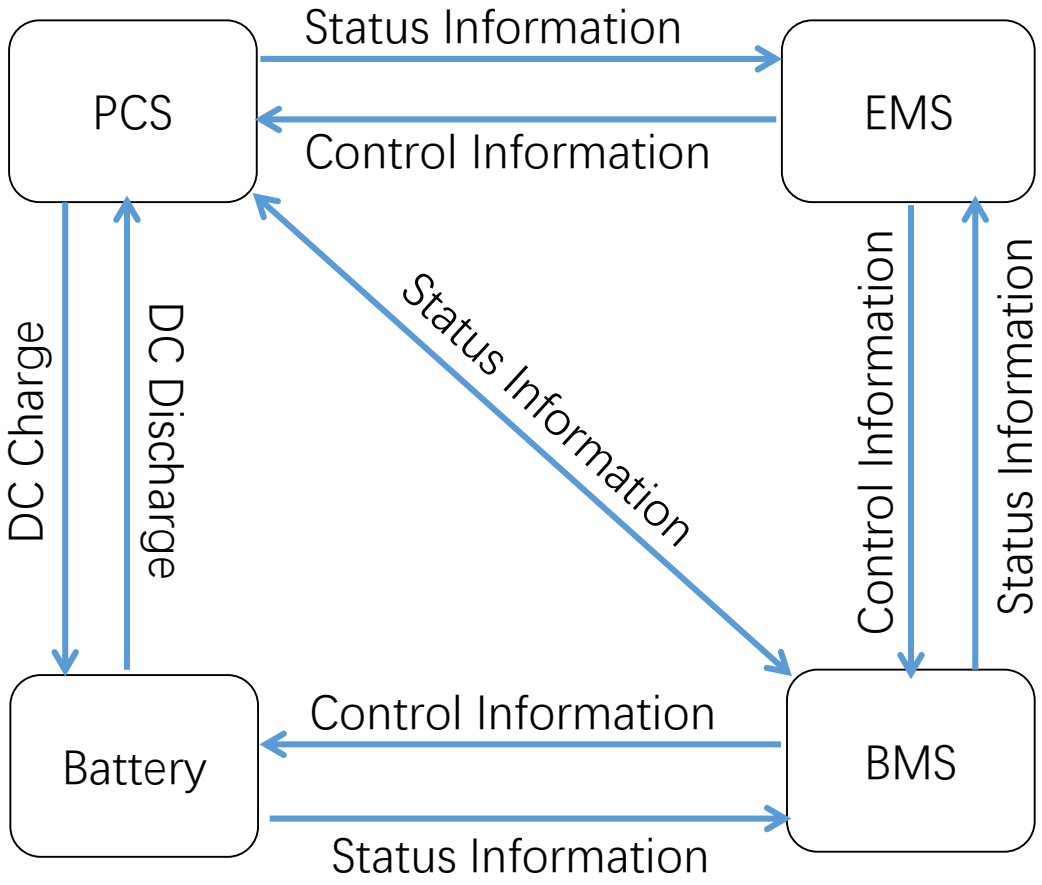
Cell	PACK	Rack
• CATL LFP Battery • 6000 - 8000 Cycle Life (0.5C 25°C, @80% SOH, @70% SOH) • 5000 - 6000 Cycle Life (1C 25°C, @80% SOH, @70% SOH) • 3.2VDC/280Ah • 0.5C(TIANWU-B)/1C(TIANWU-P) • Charge(0~60°C) • Discharge(-20~60°C)	• 52 Cells in series • 166.4VDC/280Ah, 46.59kWh • Liquid Cooling • CAN Communication • 21±3°C, Average 21°C	• 5 Packs in series • 832VDC/280Ah, 232.96kWh • Liquid Cooling • 25±3°C

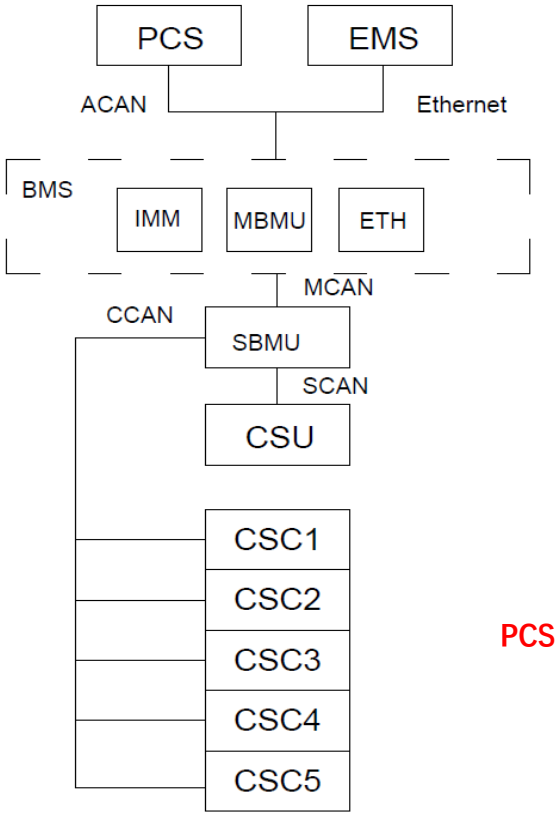


TIANWU BESS Specification

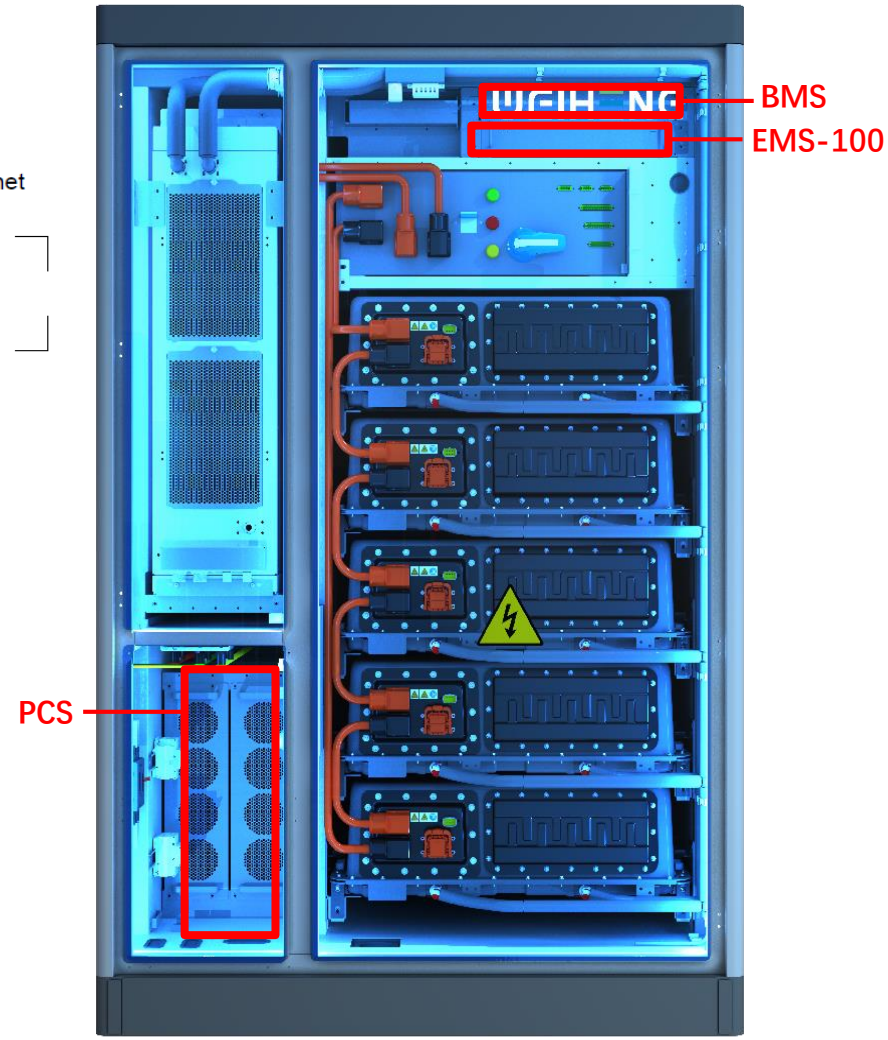
System Information	
Rated Capacity	233kWh
Rated DC Voltage	832V
Battery Type	LFP from CATL
Cell Specification	3.2V, 280Ah
System Battery Configuration	1P*52S*5S
Protection Level	IP55 C5
Inverter Topology	Non Isolated
Operating Temp. Range	-20~55°C (derating @>45°C)
Altitude	2000m
Dimensions (W*D*H)	1400*1350*2100mm
Cooling Method	Liquid Cooling Battery
Thermal Management System	Envicool Chiller (Smart Refrigeration & Electric Heating),Operating ambient temperature range, -30°C ~ +55°C
Environment Control System	Travel Switch, Water Leak Sensor & Transducer
Fire Control System	Detector, Aerosol,
Communication Protocol	Modbus, TCP/IP
Weight	~2700 kg

Manage System(EMS,BMS,PCS)



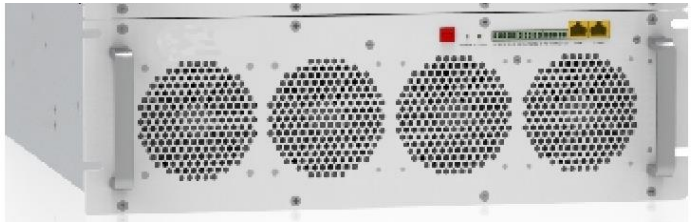


Topology diagram

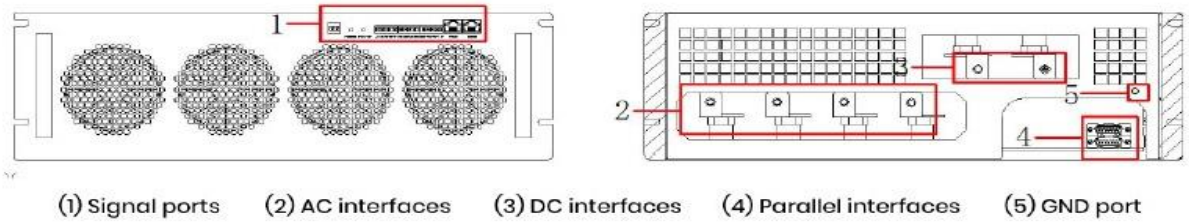


TIANWU Power Conversion System (PCS)

Technical Specification of AC side	
Rated Power/ Maximum Power	50kW
DC operating/ Full load voltage Range	680V ~ 950V
Max. DC Current	110A
Rated Ac voltage	400Vac, 3W+PE
Rated Frequency	50/60 Hz (±5Hz)
Rated Alternating Current	72A
Power factor adjusting range	-1 lead to +1 lag
Rated Voltage	400Vac
THD	<3% (Linear Load)
Maximum Conversion Efficiency	≥98.5%
General DATA	
Inverter Topology	Non Isolation
Operating Humidity Range	0-95% (non-condensing)
Noise Level	<70 dB
Operating Temperature Range	-25 ºC~60 ºC (Derating at >45ºC)
Cooling Method	Air Cooling
Altitude	2000m
Communication Protocol	RS485/CAN/Ethernet



Front View of PCS (Only for Reference)

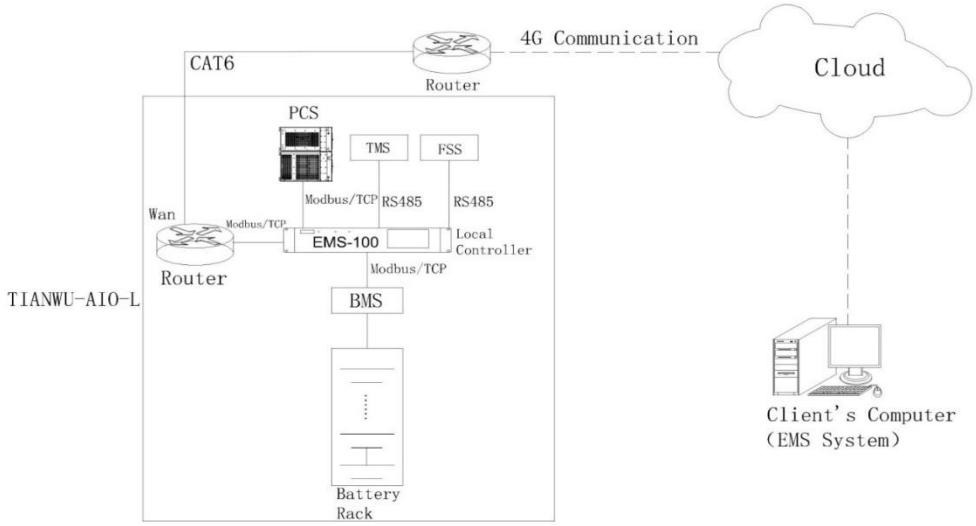


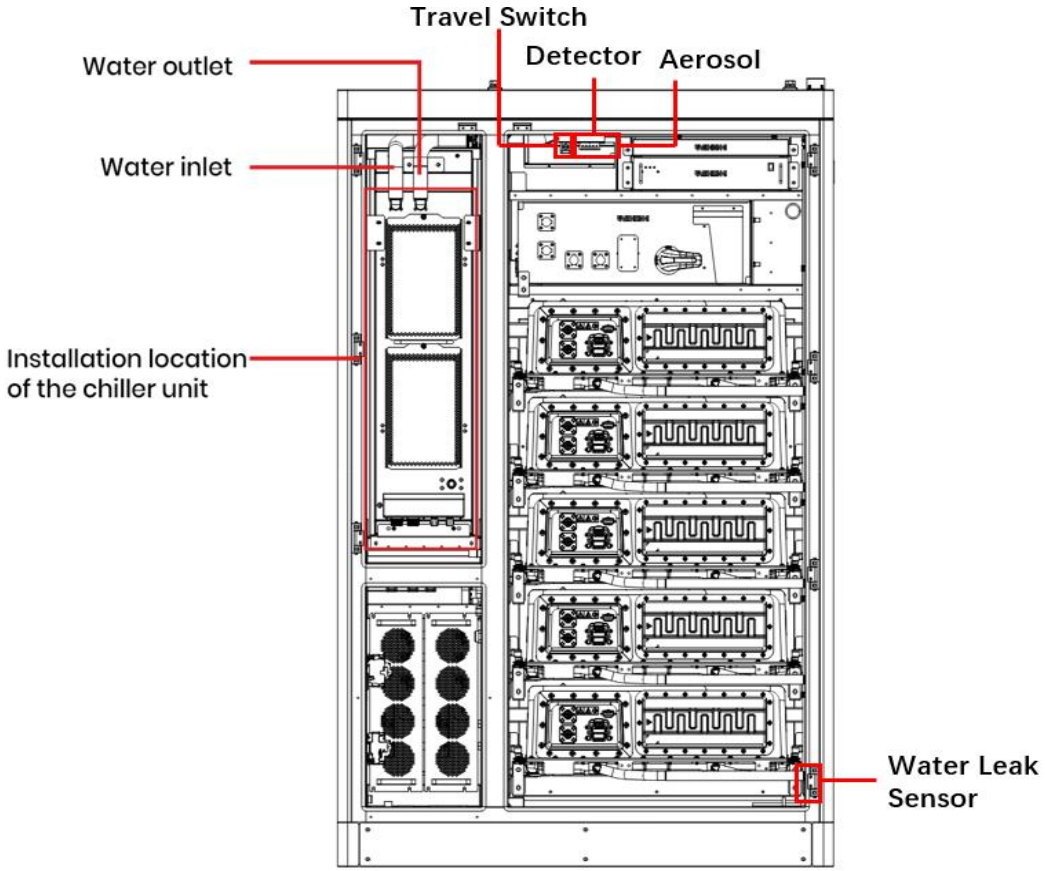
(1) Signal ports (2) AC interfaces (3) DC interfaces (4) Parallel interfaces (5) GND port

Front & Back View of PCS with Interfaces and Ports

Control System(TMS,FSS,ECS)

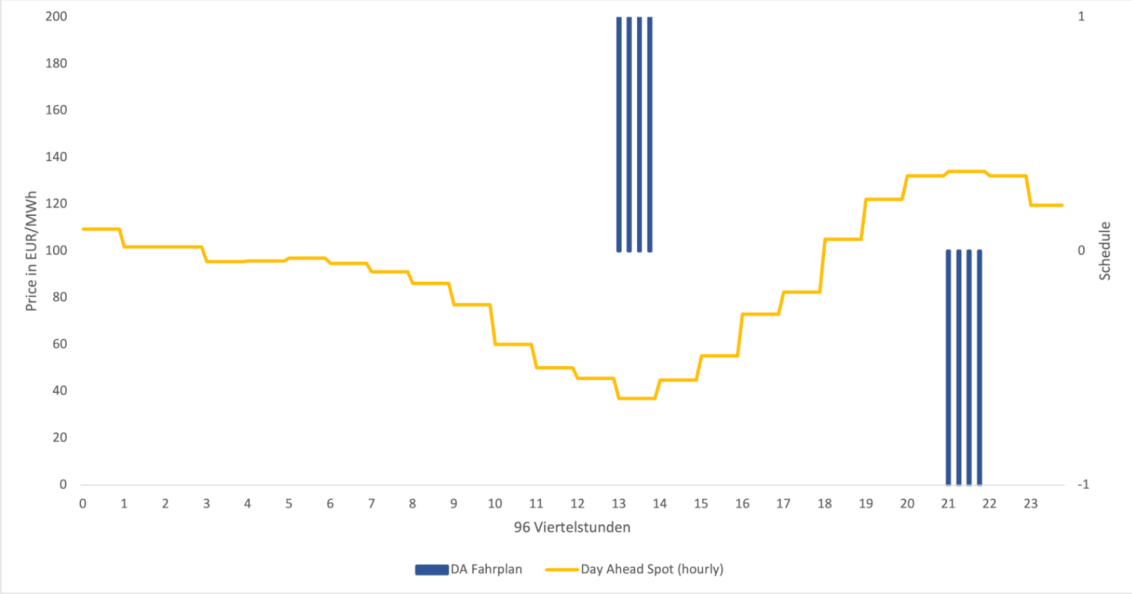
TMS	FSS	ECS
• Smart Refrigeration • Electric Heating • Remote Monitoring • Replenishment Easily • Extend Battery Life • Highly Efficiency	• Detector • Aerosol • Emergency start-stop Switch	• Travel Switch • Water Leak Sensor • Water Leak Transducer



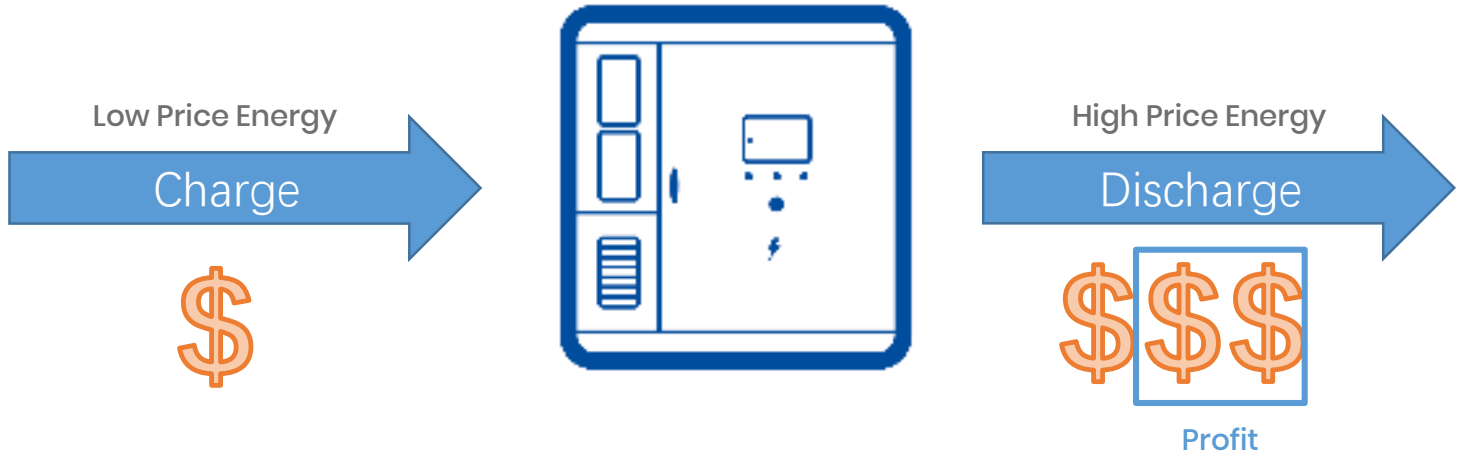


Application

Arbitrage & Spot Marketing Trading

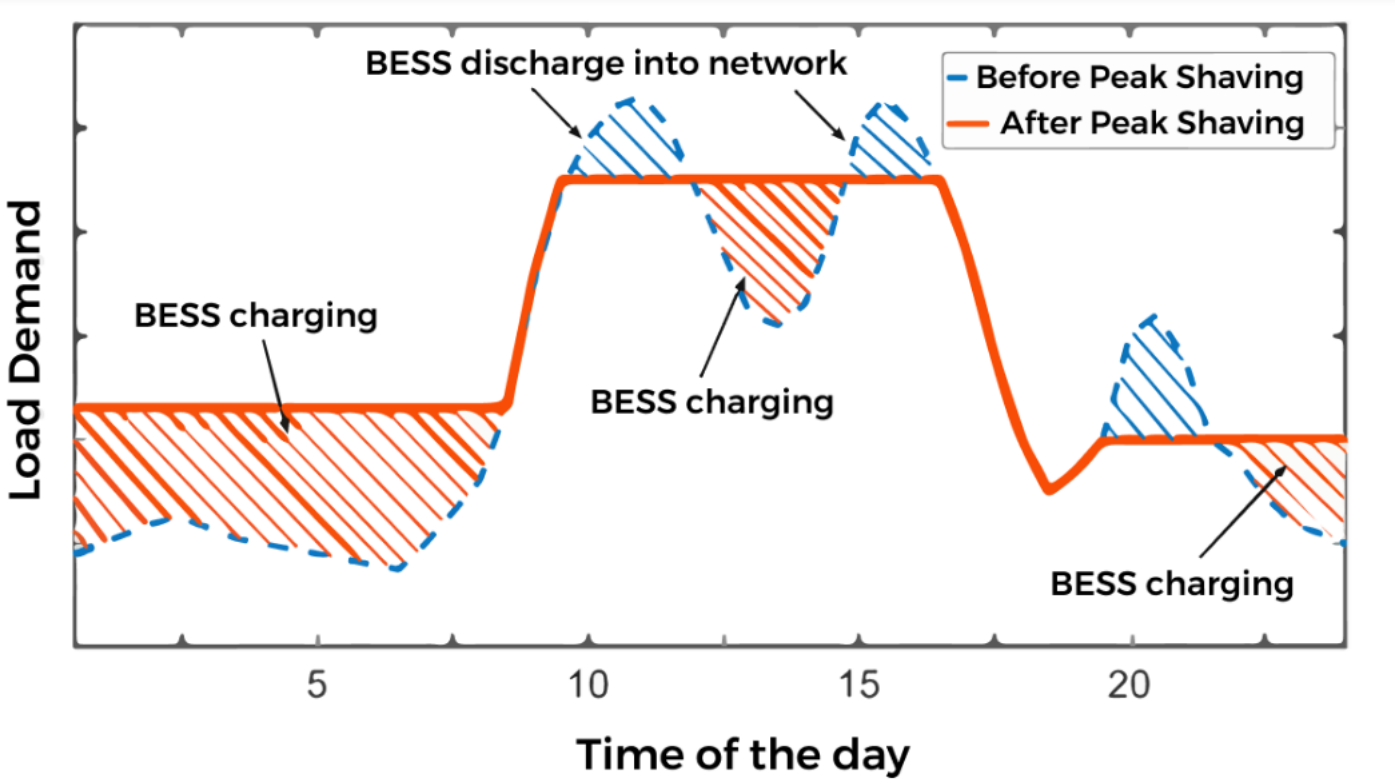


BESS arbitrage refers to the practice of using Battery Energy Storage Systems (BESS) to take advantage of price fluctuations in the energy market. The goal is to buy or store electricity when prices are low and sell or discharge it when prices are high, creating profit from the price differences. This is particularly effective in markets with volatile electricity prices, where peak and off-peak price gaps are significant.



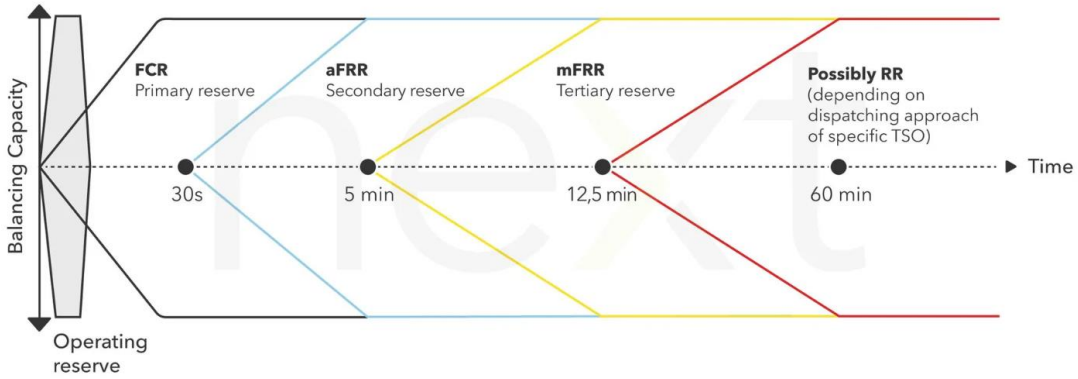
Peak Shaving & Renewable Energy Integration

At its core, **peak shaving is a strategic approach that allows consumers to optimize their energy usage by minimizing electricity consumption during peak demand periods**. These periods are typically characterized by a surge in energy requirements, resulting in higher costs and potential strain on the power grid. Energy storage systems play a crucial role in this process, acting as a buffer by storing excess electricity during off-peak hours and releasing it during peak periods, thereby reducing reliance on the grid



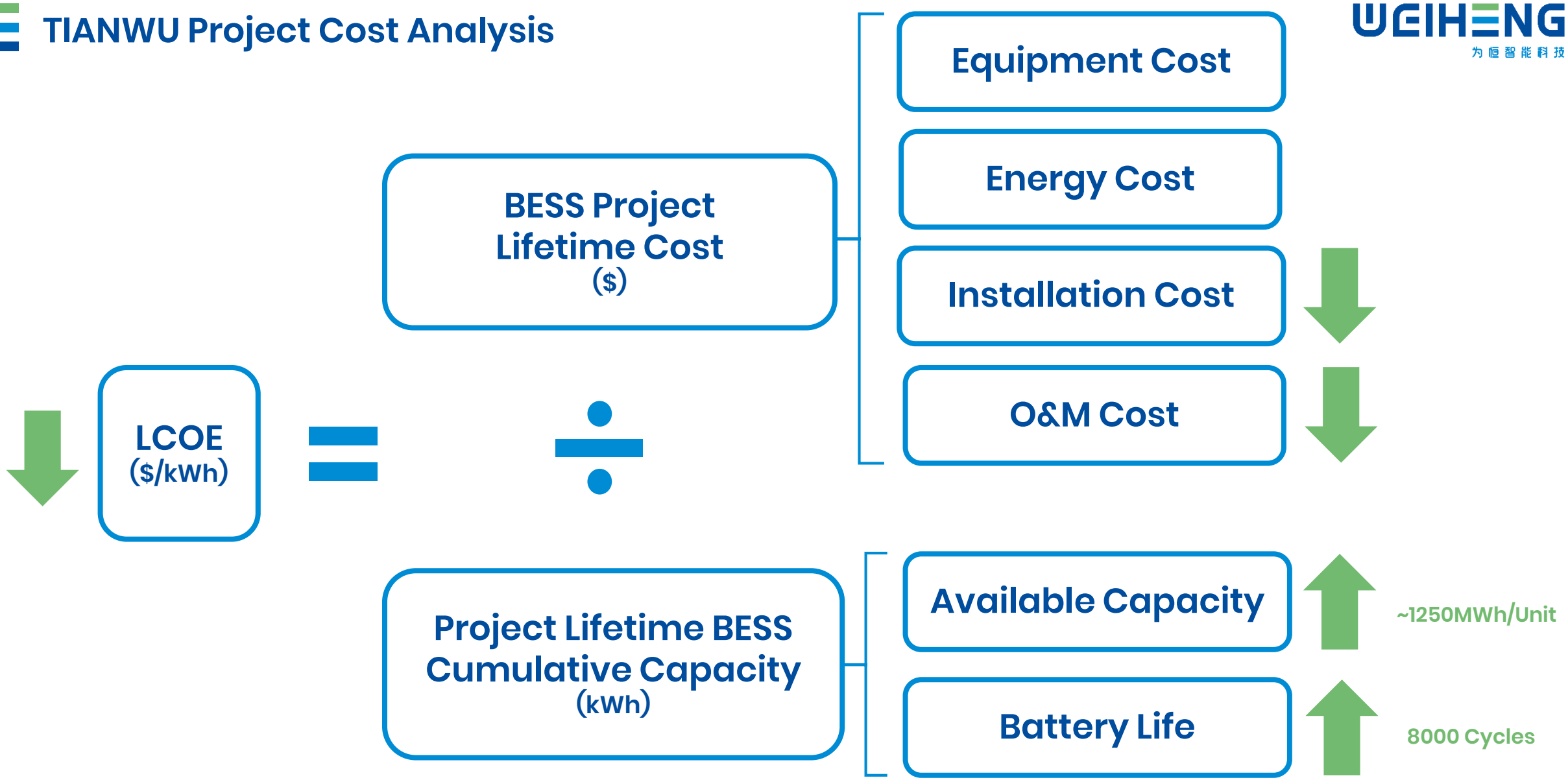
Application Introduction (Frequency Regulation)

Frequency Regulation					
Type	Response time	Duration	Frequency Deviation Range	Definition	Activation Sequence
FCR Frequency Containment Reserve	< 30s	A few min	49.8~50.2Hz	FCR is used to stabilize frequency deviations immediately after they occur by automatically adjusting power output.	First
aFRR Automatic Frequency Restoration Reserve	30s~Few min	Few min~ 15min	49.9~50.1Hz	aFRR restores system frequency to its nominal value by gradually adjusting power output through automated controls.	After FCR
mFRR Manual Frequency Restoration Reserve	< 15min	Longer to Hours	Long term & Large deviation	mFRR is manually activated to restore frequency and balance the grid when automatic reserves are insufficient.	After aFRR
FFR Fast Frequency Reserve	1~2s	Few seconds	>50.5 or <49.5Hz	FFR is a service that provides rapid adjustments to power output or consumption to counteract sudden frequency deviations in the grid	Before FCR



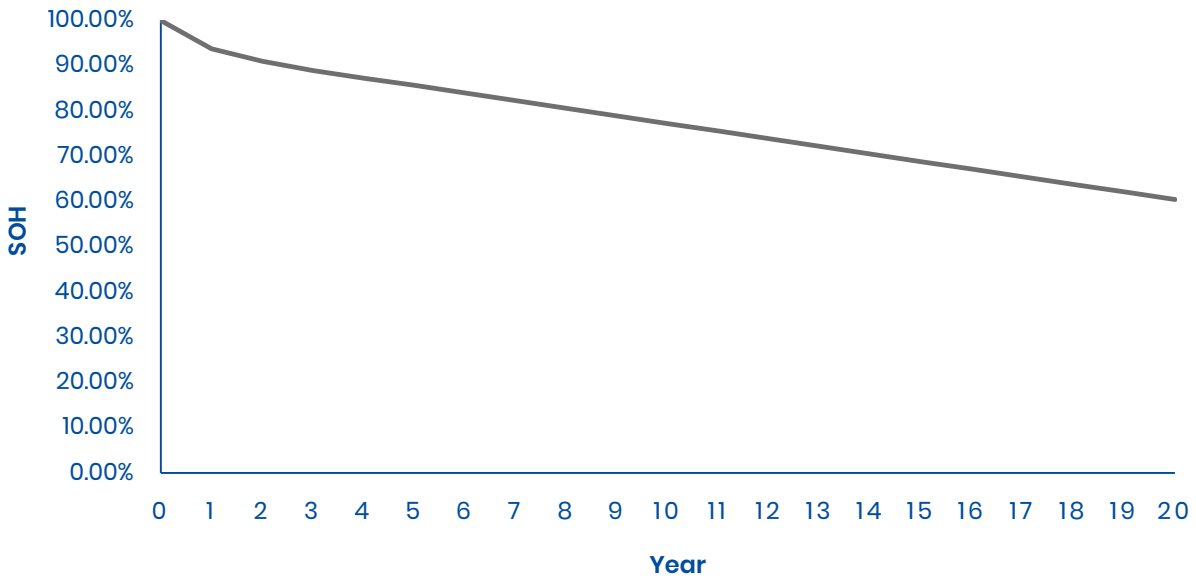
Why TIANWU

TIANWU Project Cost Analysis



TIANWU Battery (CATL Pack)

SYSTEM CAPACITY DEGRADATION CURVE



Working Condition (300 Cycles/Year)					
Cell	Cooling	Max Charging & Discharging C-Rate	DOD	Cycles/Day	Ambient Temperature
CATL 280Ah	Liquid	0.5C	90%	1	25~45°C

System Capacity Degradation Table	
Year	SOH of the system
0	100.00%
1	93.78%
2	90.99%
3	88.96%
4	87.25%
5	85.68%
6	83.97%
7	82.29%
8	80.62%
9	78.92%
10	77.22%

Cycle Life of 280Ah Cell			
Liquid Cooling ; 0.5C; DOD 90%; 25°C ; EOL 65%			
Cell	PACK	System Life Cycle	Defect Rate
CATL	CATL	8000~12000	1/1,000,000,000
CATL	Others	6000~8000	/

Operating more Cycle Earn more

Safety First Principle

266 PCS control points
48 Battery control points
34 auxiliary control points

IP55
C5
UN 38.3

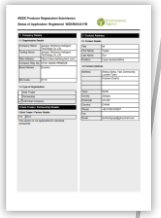
HV Box
(Circuit Breaker & Fuse)

Power Electronics

Digital Tech.

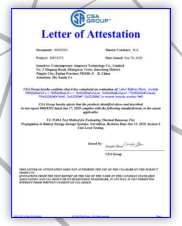
Mechanics

Free Recycle



WEEE

Recycle



UL 9540A

Electrochemistry

Electric Engineering

Modularized quick plugs and connectors components

IEC61000

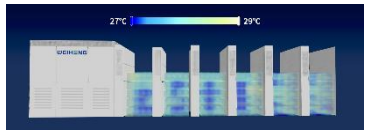
Firefighting

Thermal Control

Smoke Detector

Tem Detector

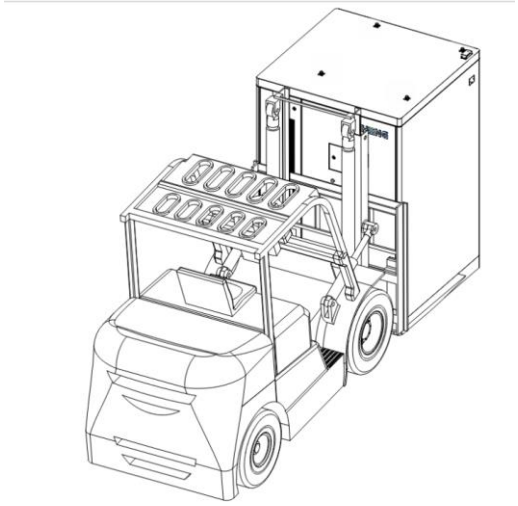
Aerosol

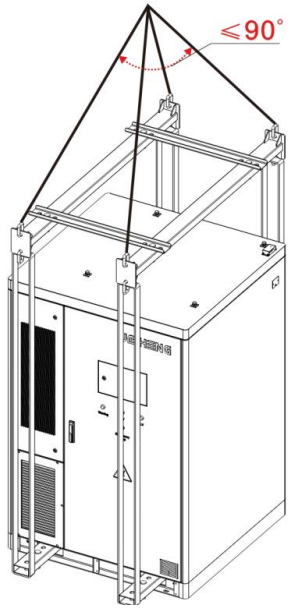


BMS Cell Level Thermal Control

TIANWU Advantage For Installation

TIANWU	Other Product
• All in one shipment • Forklift / Crane move whole cabinet easily • Less wiring job • Plug and Play	• Shipped separately • Battery side hard to move by lift & crane • A lot of labor need • Need to wiring inside wires





No Extra Labor No Indoor Wiring
Two hours One Unit

TIANWU Europe Footprint (Netherlands Warehouse)

Europe Installation Report	
Area	Quantity (Units)
Netherlands	66
Norway	18
Slovakia	9
Sweden	17
UK	4
Bulgaria	3

WEIHENG

Europe Delivery Faster !

PANGU OS (Self-developed Cloud EMS)

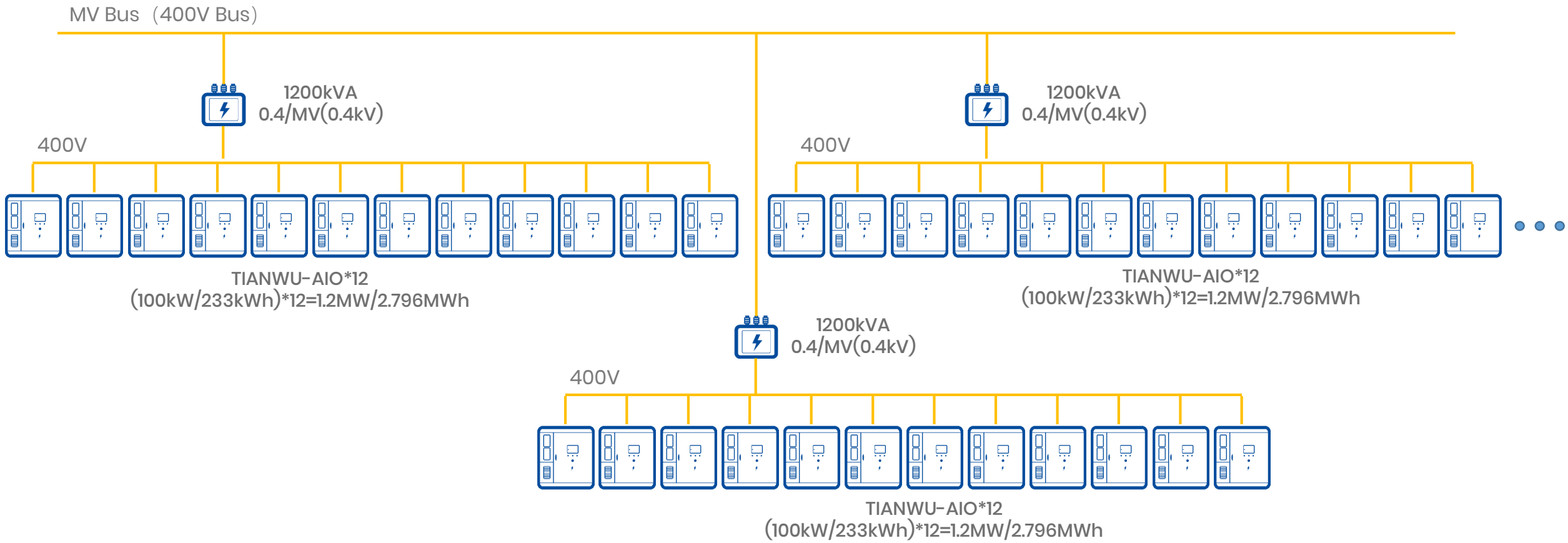
Control	Monitor	Report
• Anti back feeding • Charge/Discharge Period • Power Factor • SOC • Demand power control	• Battery Status (Cell Level) • PCS status • System Status (Grid, BESS, PV, Load) • TMS, FSS	• Revenue • Running history • Curve • Carbon Reduction • Alarm History

- Customizable operational strategy
- Keeping up with market demands and updating software systems in real time
- Support third-party EMS

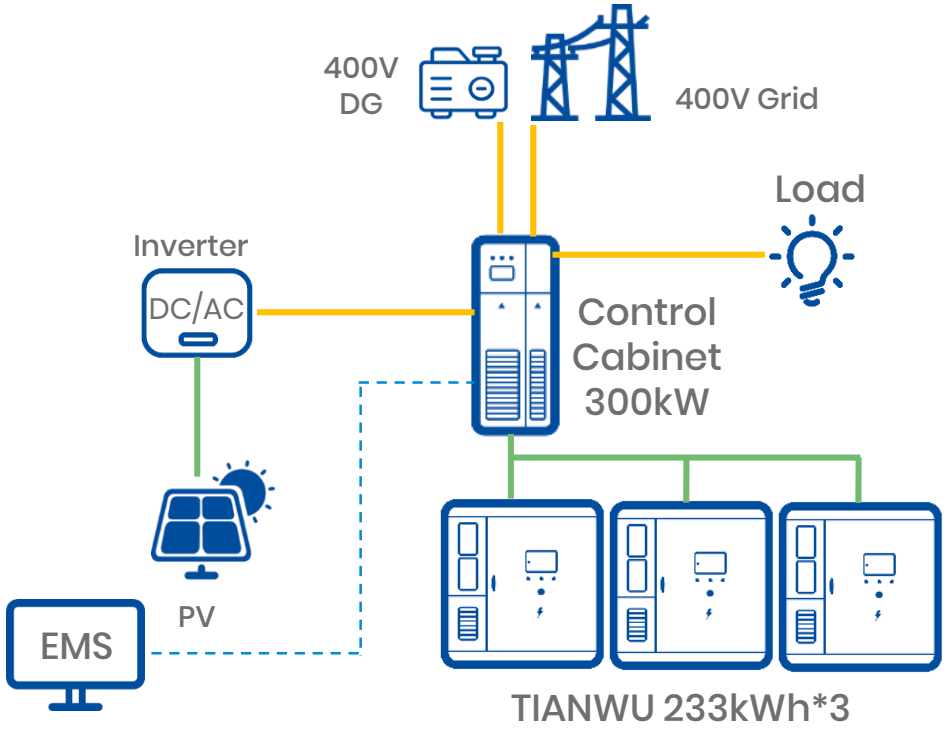
- Higher Adaptability to Third-Party EMS
- Self-developed, Protocols shareable
- Software Tech Support 24h/7 days
- Equipment operation faster

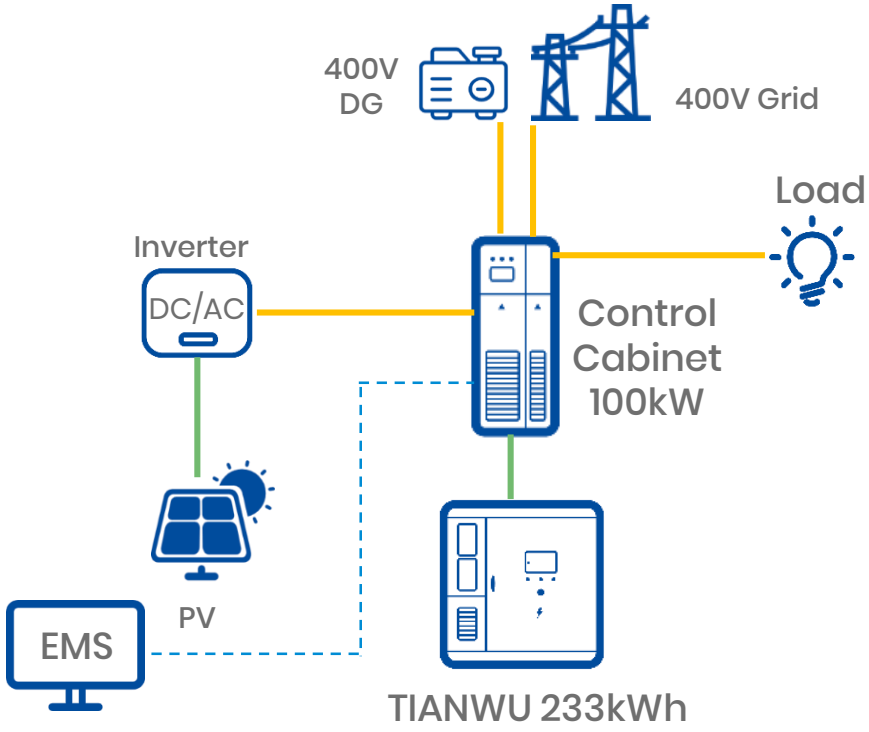
24-hour after-sale services

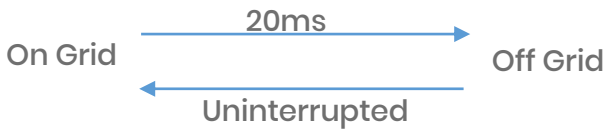
Unlimited multi-machine parallel connection
(MV Interconnect optional)



Backup-solution
(With Control Cabinet)

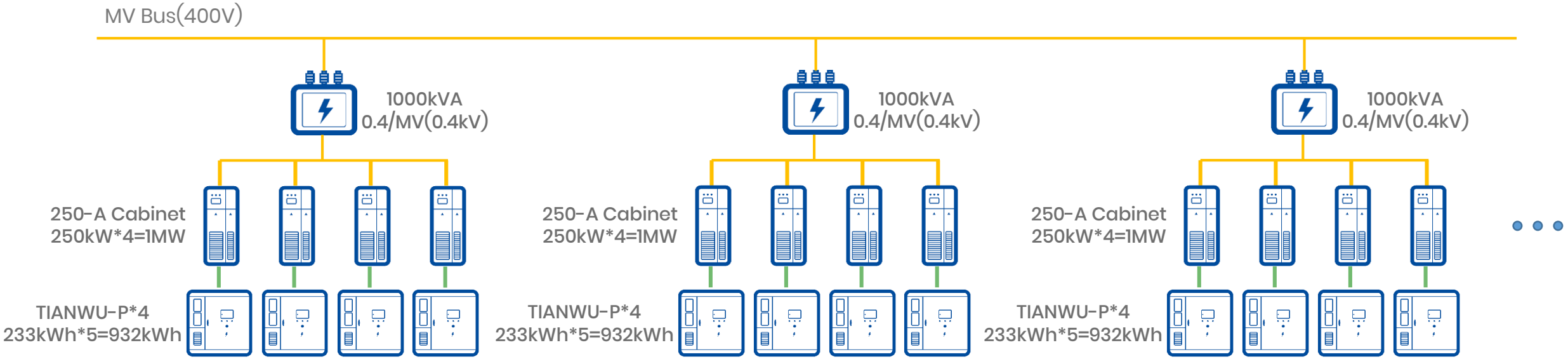






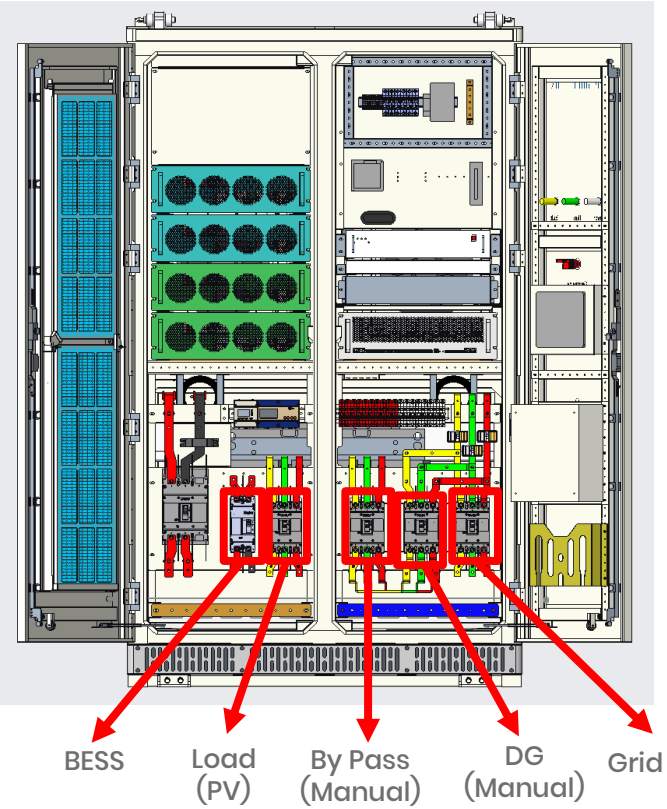
1C System-solution

(Multi-machine parallel connection & MV Interconnect optional)

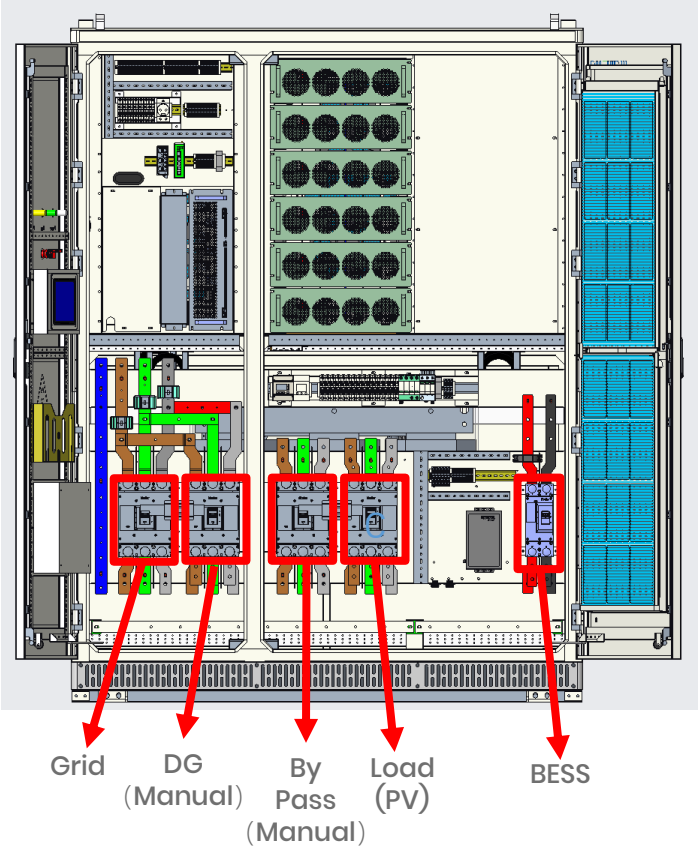


Control Cabinet (AC Side)

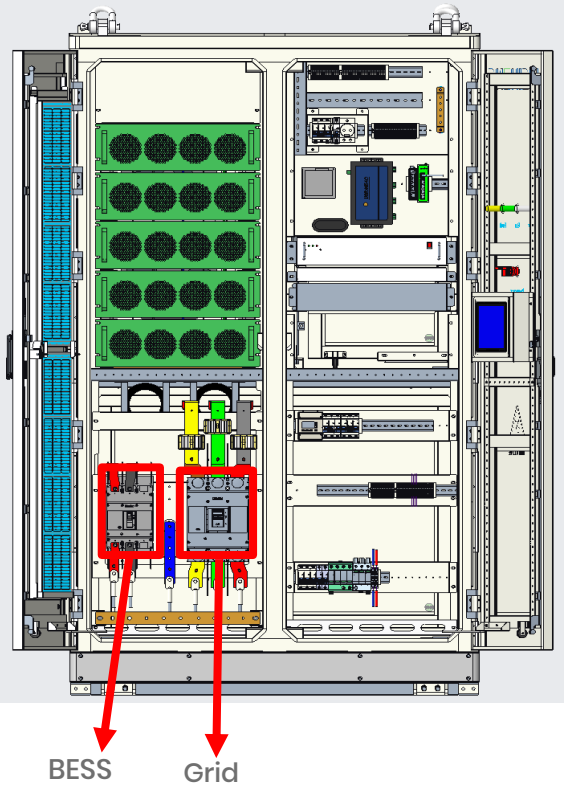
100kW Control Cabinet
1200*1350*2109 (W*D*H)



300kW Control Cabinet
1750*1350*2309 (W*D*H)



250kW-A 1C Cabinet
1200*1350*2109 (W*D*H)



Item	1C TIANWU	On/Off Grid Module
PCS	YES (50kW*5)	YES (100kW=50kW*2 / 300kW=50kW*6)
STS	No	YES
Transformer	No	YES
UPS	YES	YES
BMS	YES	YES
EMS	YES	YES

TIANWU Certification

Certification & Standards
UN38.3
UL1973
IEC62619
IEC 62477
IEC 61000-6-2/4
IEC 63056
G99
EN 50549-1
IEC 61683
IEC 60068-2-1, -2, -14, -30
CEI 0-21/0-16
AS/NZS4777.2
TR 3.3.1:2024
IEC 61727:2004
IEC 62116:2014
NC RfG PSE,2018-12-18 PTPIREE
VDE-AR-N 4105:2018-11

Certified Quality, Trusted Choice, Buy Now, Install Now, Operate Now!

IEC 61000

EN 50549

IEC 63056

IEC 61727

UL 9540A

G99

VDE-4105

IEC 60068

Installation

Machine Installation

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Remove the crate and foam	Remove the pallet and sealing plates	Move and hoist	Fix the energy storage cabinet	Connect cables	Inspect after Installation

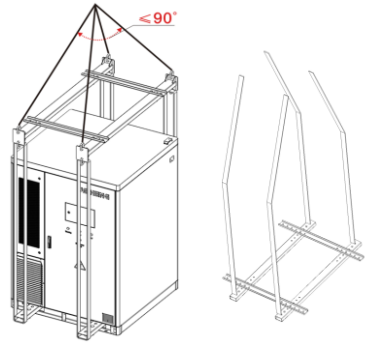
Unload crate

Move to site

Remove crate & Front & Rear base panel

Find Fork holes

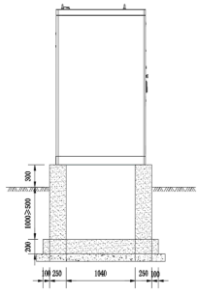
Use Forklift move to installation position



Use Lifting frame lifting to installation position

Solid Base: WEIHENG will provide design details (Drawing)

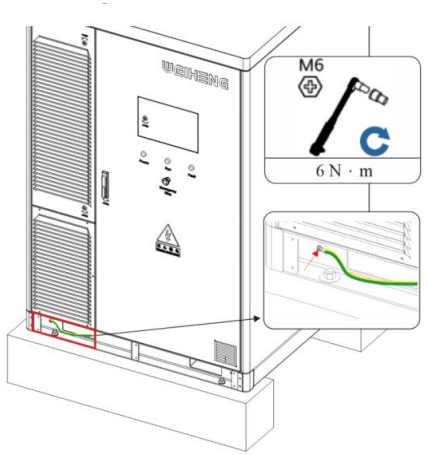
Steel Base:
28# B – Steel Groove



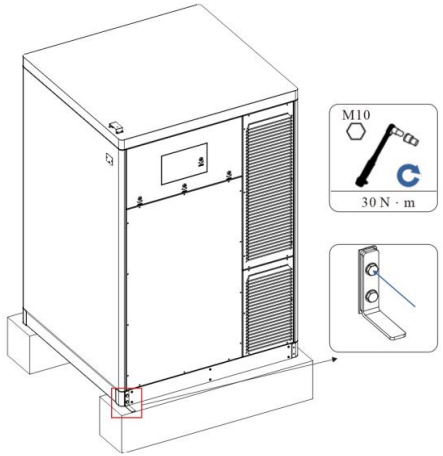
Concrete Base

Wiring

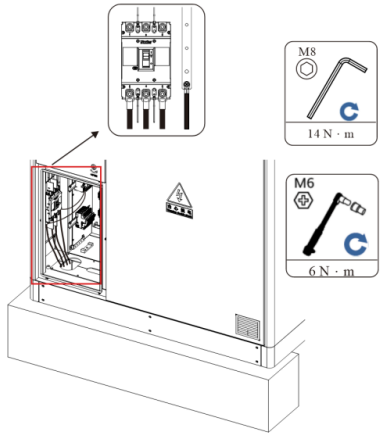
TIANWU Cable Requirements			
Name	Type	Cable Size	Description
AC Incoming Line	3-conductor copper core/copper-clad aluminum /aluminum alloy cable for outdoor	≥70mm^2	User-supplied
PE Cable	Single-conductor copper core/copper-clad aluminum/aluminum alloy cable for outdoor	25~50mm^2	User-supplied
Auxiliary Power Cable(N)	2-conductor (L, N) copper core/copper-clad aluminum/aluminum alloy cable for outdoor use	≥6mm^2	User-supplied



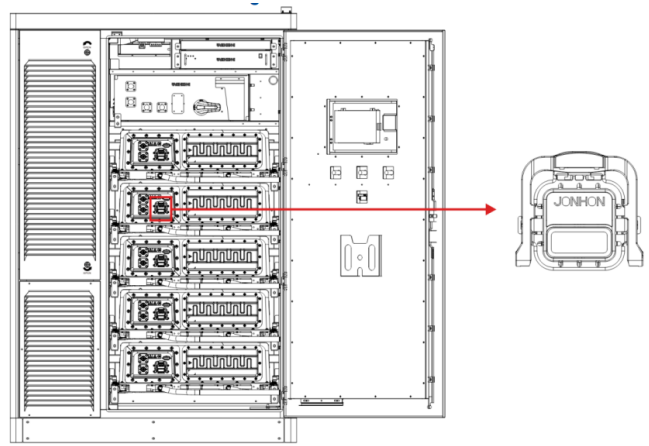
1. PE Cable



2. Grounding Bar



3. AC Incoming Cable



4. MSD

Commissioning

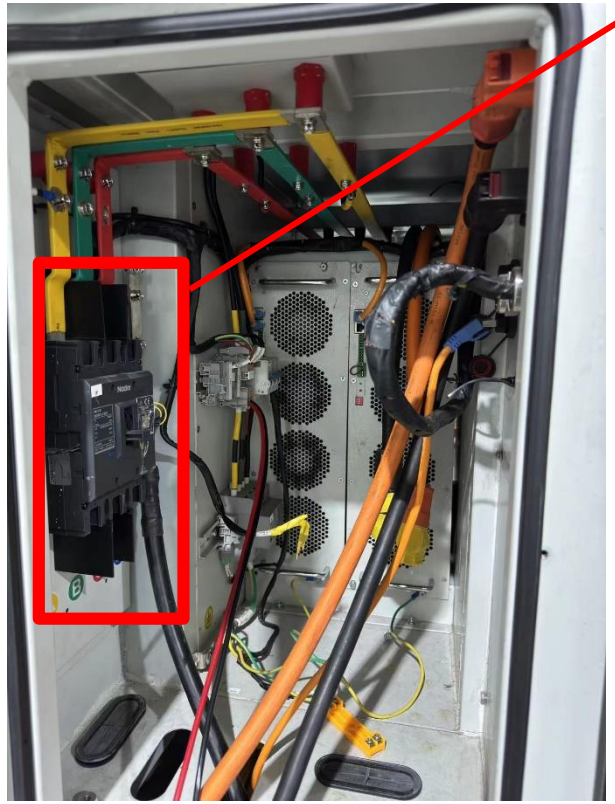
Commission Step	
Operation	**Item**
Power On	• AC Main Power • Aux Power • UPS • HV Box
PANGU Lite	• Language • Time Zone
Communication	• Meter (Over 2 Meters connect with N540) • Local Router connect with customer Router (Fiber, Internet, IP) • Local EMS Setting (Trouble shooting, Update)
Power Off	• PANGU Lite • UPS • Aux Power • AC Main Power

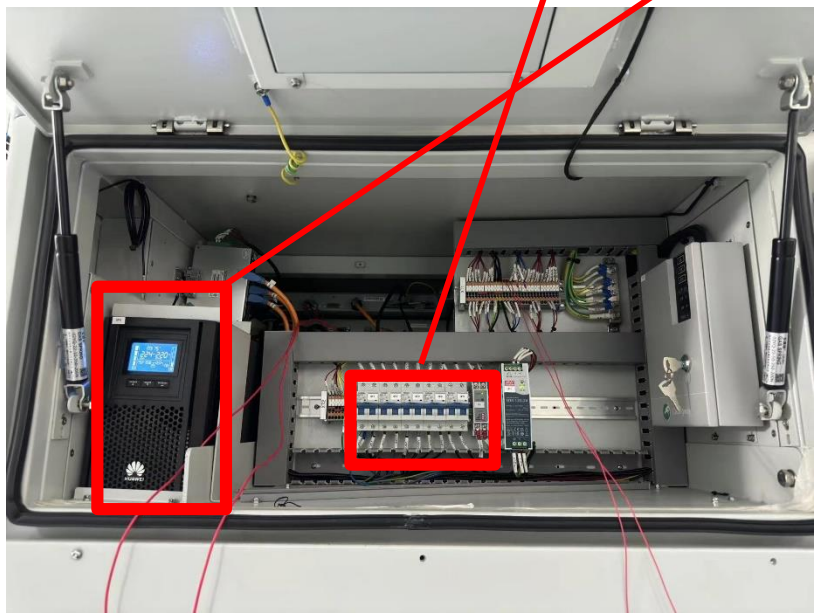
Please refer to Commissioning manual

Power On

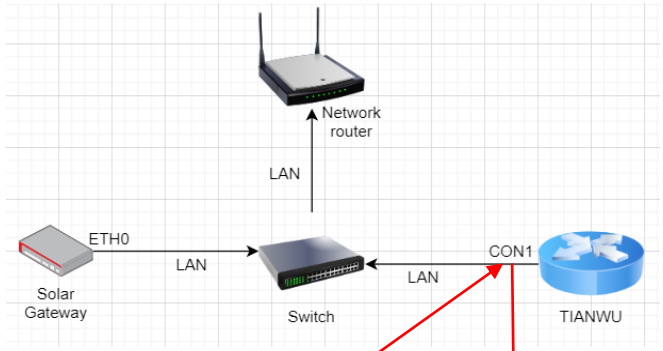
Check → Main Breaker → BESS AC Breaker → Aux Breaker → UPS → HV Box

Cable & PCS
(Follow User Manual checklist)



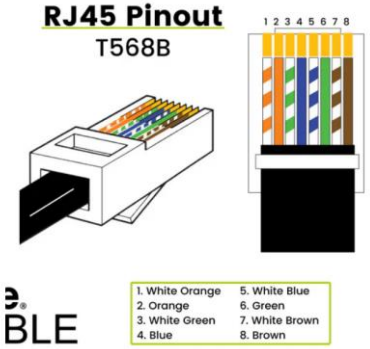


Internet Setting



RJ45

RJ45 Pinout
T568B



BLE

1. White Orange	5. White Blue
2. Orange	6. Green
3. White Green	7. White Brown
4. Blue	8. Brown

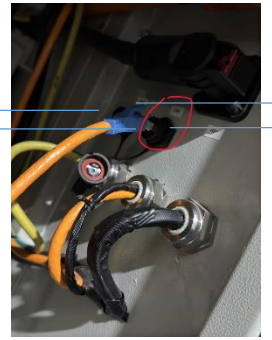
TP Link Inside Back of TIANWU

WAN

EMS-100

CON 1

CON2



CON 2

CON 1

Inside TIANWU

Meter #1

Meter #2

N540

Switch Box

3rd Party EMS

Router

Internet

3rd Party EMS

Maintain

Maintenance Plan	
Quarterly	• Cabinet (visual inspection) • Air-Cooled chiller (Clean filter) • Adapter (indicator steady green) • Power distribution area • Window filters
Semi-annual	• Air- cooled chiller (visual inspection) • Filters • Smoke, temperature detector (System off) • Fire Suppression module (System off) • UPS
Annual	• Battery Pack visual inspection • Adapter (indicator steady green)

Please refer to maintenance manual

Case

TIANWU Cases

Netherlands Farm PV+TIANWU case

HUAWEI 600kW fast EV Charger case

Thailand Factory Energy storage case

Malaysia PV+BESS +DG Off Grid case

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