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CHINT

CHINT GLOBAL

TYPICAL SOLUTIONS FOR COMMERCIAL& INDUSTRIAL PV STORAGE & CHARGING

ABOUT CHINT

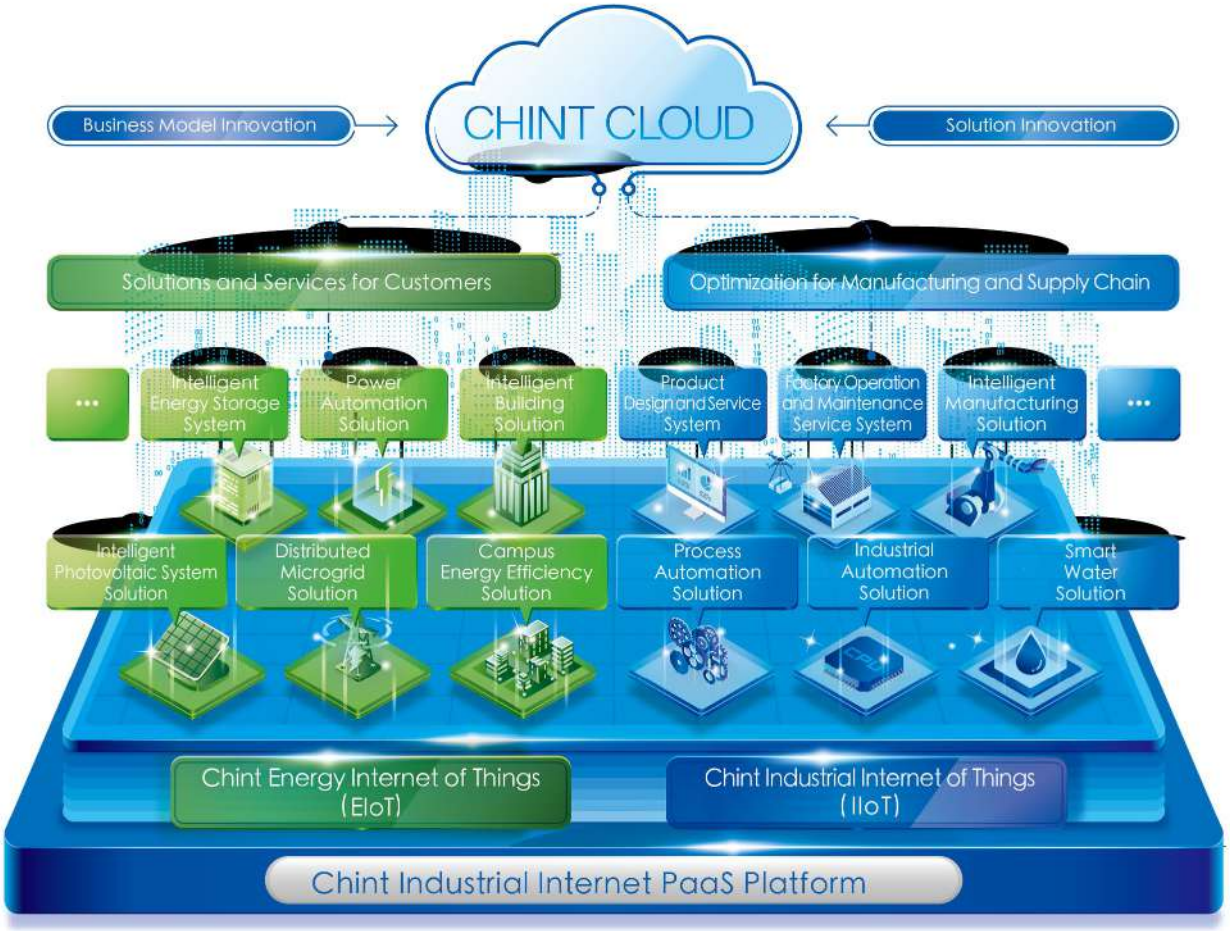
CHINT A leading global provider of smart energy solutions

Founded in 1984, CHINT is a leading global provider of smart energy solutions. It is actively deploying "4+1" industrial sectors including smart electrics, green energy, industrial control and automation, smart home and incubator, forming an integrated whole industry chain of "power generation, storage, transmission, substation, distribution, sales and consumption". And it boasts an extensive business network across over 140 countries and regions as well as more than 30,000 employees and an annual sales revenue of over USD 11.4 billion. CHINT has been ranking among China's Top 500 companies for 18 consecutive years. Its subsidiary, CHINT Electrics is the first company in China with low-voltage electrics as its main business getting listed on the A-share market as one of the Top 50 Asian listed companies.

To comply with the trend of integrated development of modern energy, intelligent manufacturing and digital technology, CHINT has adopted "One Cloud & Two Nets" as the business strategy. CHINT Cloud fulfills digital application and services in both internal and external as the platform of intelligent technology and data application. Based on the Industrial Internet of Things (IIoT), CHINT built an intelligent manufacturing system and realizes intelligent application in electrical industry. Relying on the Energy Internet of Things (EIoT), CHINT built its smart energy system and develops the regional EIoT mode.

Focusing on energy system of supply, storage, transmission, distribution and consumption, CHINT has core businesses of clean energy, energy distribution, big data and energy value-added services. Furthermore, CHINT pillar businesses include photovoltaic equipment, energy storage, power transmission & distribution, low-voltage apparatuses, intelligent terminals, software development and control automation. With developing into a platform-based enterprise, CHINT provides a package of energy solutions for public institutions, industrial & commercial users and end users, by building a regional smart energy operation ecosphere.

ONE CLOUD & TWO NETS STRATEGY



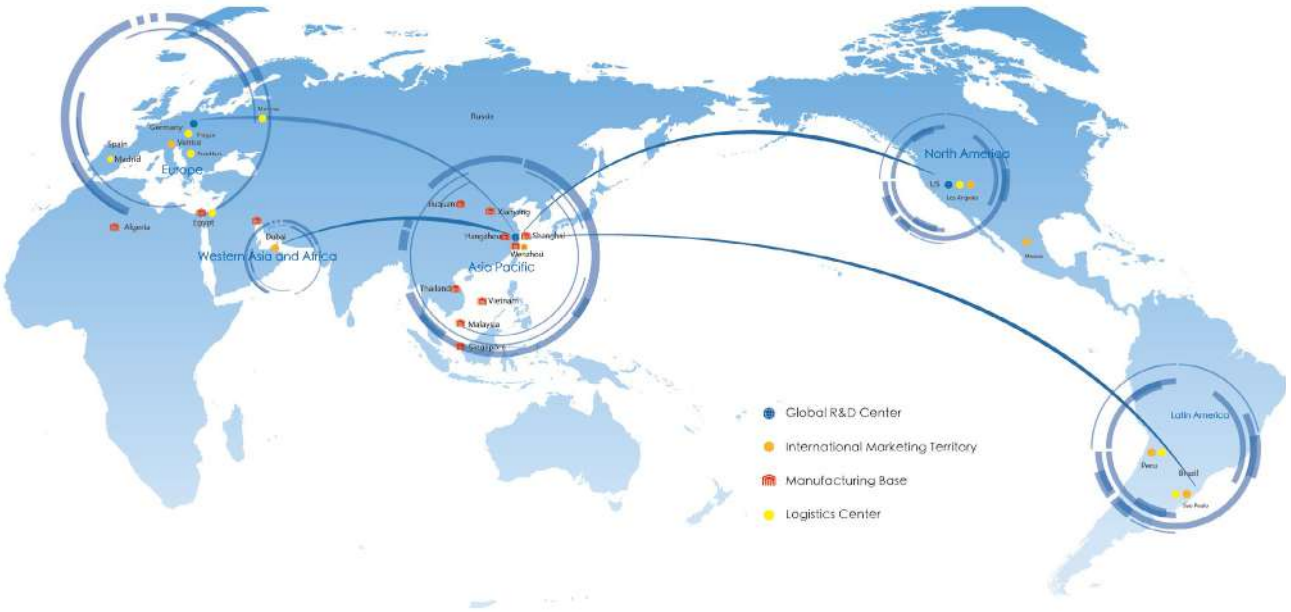
Energy system optimization is an inevitable trend against the background of resource shortage, environmental pollution and climate change – three challenges faced by global energy development. To keep in line with the trend, CHINT actively implements the business strategy of One Cloud & Two Nets, continuously promotes the deep integration of big data, IoT, AI and manufacturing industry in stages to become a platform-based enterprise, and leads the new direction of industry development.

As a medium of smart technology and data applications, CHINT Cloud connects corporate in-house manufacturing with operation and management data, realizing digital applications and services both internally and externally.

As a user-centric multi-energy complementary smart energy system, CHINT EIoT provides a package of energy solutions for governments, industrial & commercial users and end users. Its business includes Smart Energy Efficiency, Smart Power, Smart Home and Smart Clean Energy, etc.

As a smart manufacturing system based on corporate digital transformation, CHINT IIoT constitutes a flexible, high-efficiency and intelligent industrial system. Its business includes Intelligent Manufacturing, Intelligent Industry, Smart Water, Smart Heating, etc.

GLOBAL FOOTPRINT



4 International R&D Centers:
North America, Europe, Asia Pacific, North Africa

6 International Marketing Territories:
Asia Pacific, Western Asia and Africa, EuroPe, Latin America, North America, China

12 Manufacturing Bases:
China (Wenzhou, Hangzhou, Shanghai, Jiaxing, Xianyang, Ji'nan), Thailand, Singapore, Vietnam, Malaysia, Egypt and Algeria

20+ International Logistics Centers

21 Global Subsidiaries

2000+ Sales Companies

GLOBAL CAPACITY LAYOUT

The industrial manufacturing bases are mainly located in Wenzhou, Hangzhou, Shanghai, Jiaxing and Xianyang. Additionally, CHINIT has set up factories in Thailand, Egypt, Singapore, Vietnam, Malaysia, etc.

Egypt Production BaseV

ietnam Production BaseM

alaysia Production BaseT

hailand Solar Power Production Base

Singapore Complete Electric Equipment Production Base

Shanghai Production Base

Hangzhou Production BaseW

enzhou Production Base

Jiaxing Production BaseX

ianyang Production Base

R&D, QUALITY, SALES, LOGISTICS

By providing reliable products and service for clients, CHINT puts forward the concept "Great Quality." Quality control and upgrade is divided into four systems: scientific research, quality control, marketing service and logistics distribution. These methods and strategies make a comprehensive upgrade to product quality and services. Emphasis on "prevention first, continuous improvement" is the basis of an effective quality inspection system. Leading the management process of "Great Quality" in the production process controls each link of production accurately and realizes the institutional operation of quality improvement.

"Great Quality" is not just a slogan, but a belief rooted in each employee's work. High-quality and accuracy are the basic requirement. Starting from a routine operation by each staff to implementing a high-quality of production and service, CHINT is your most reliable partner.

Service Concept

Sincerely care for customers, quality creates value

Service Purpose

Innovative and progressive, satisfying the customers

Integrated Vertical R&D

By gathering the global industry elites to Provide safe and stable energy-saving green and advanced electric products.

5% At least 5% of revenue is invested in research and development

Great Quality System

Ensuring flaw-free and trouble-free products, the multi-dimensional and multilevel control is conducted through procurement, inspection, quality control and certification.

One-stop Services

CHINT's concept is that it is not difficult to fulfill a high-quality logistics distribution at one time, while it is difficult to stay as accurate and prompt as the first-time. High-efficiency and high-precision accuracy are our requirement.

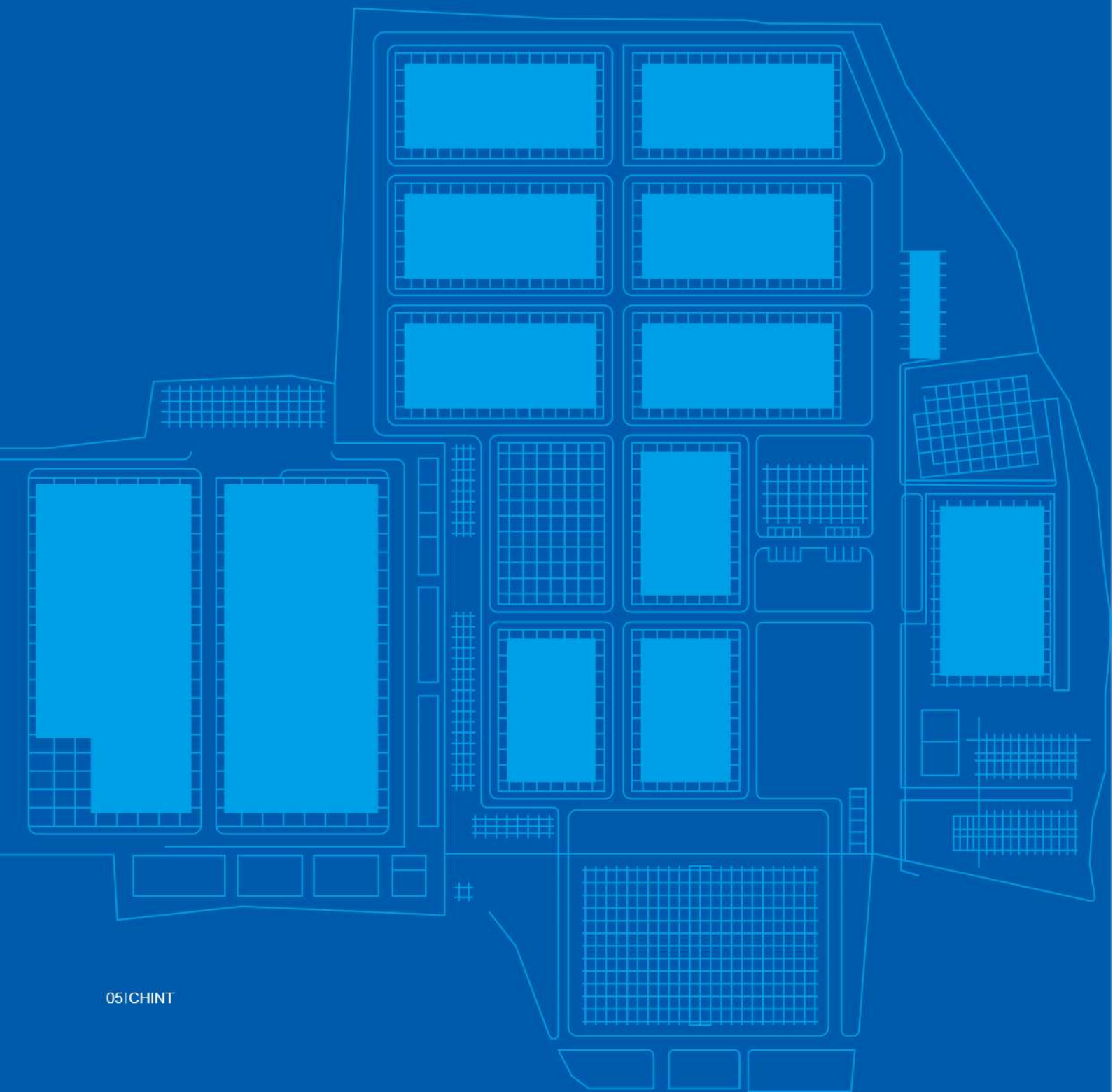
48-Hour Response

Providing end-to-end one-stop services for customers with complaints, business consulting and technical support by solving problems immediately and including any possible problems in advance.

48 hour Global Services

PROJECT INTRODUCTION

01



PROJECT INTRODUCTION

1.1 SYSTEM INTRODUCTION

1.2 DESIGN PRINCIPLES

1.3 PROJECT BACKGROUND

1.1 SYSTEM INTRODUCTION

The commercial and industrial (C&I) photovoltaic intelligent storage & charging solution is "photovoltaic + energy storage + electric vehicle charging". It integrates various technologies such as photovoltaic power generation, energy storage and pile charging, providing green power for the electrical equipment of industrial and commercial users. It can also provide charging services for electric vehicles. At the same time, the built-in energy storage unit can not only provide supplementary power, but also provide other auxiliary functions, such as peak shaving, valley filling, etc., which effectively improves the system operating efficiency and increases the revenue.

It is a typical application of micro-grid, and it is also a new business model in the context of vigorously promoting electric vehicles in various countries, expanding the charging pile market, and rapidly developing energy storage. With the popularization of electric vehicles in the future, the electricity load of major cities will far exceed the existing power supply capacity. At present, the difficulty of urban power expansion has become a reality, and the growth of electric vehicles in the future will lead to urban power shortages. The introduction of photovoltaic and energy storage systems can not only solve the problem of power expansion, but also provide backup power for various industrial and commercial customers to avoid sudden power outages during peak hour power consumption.

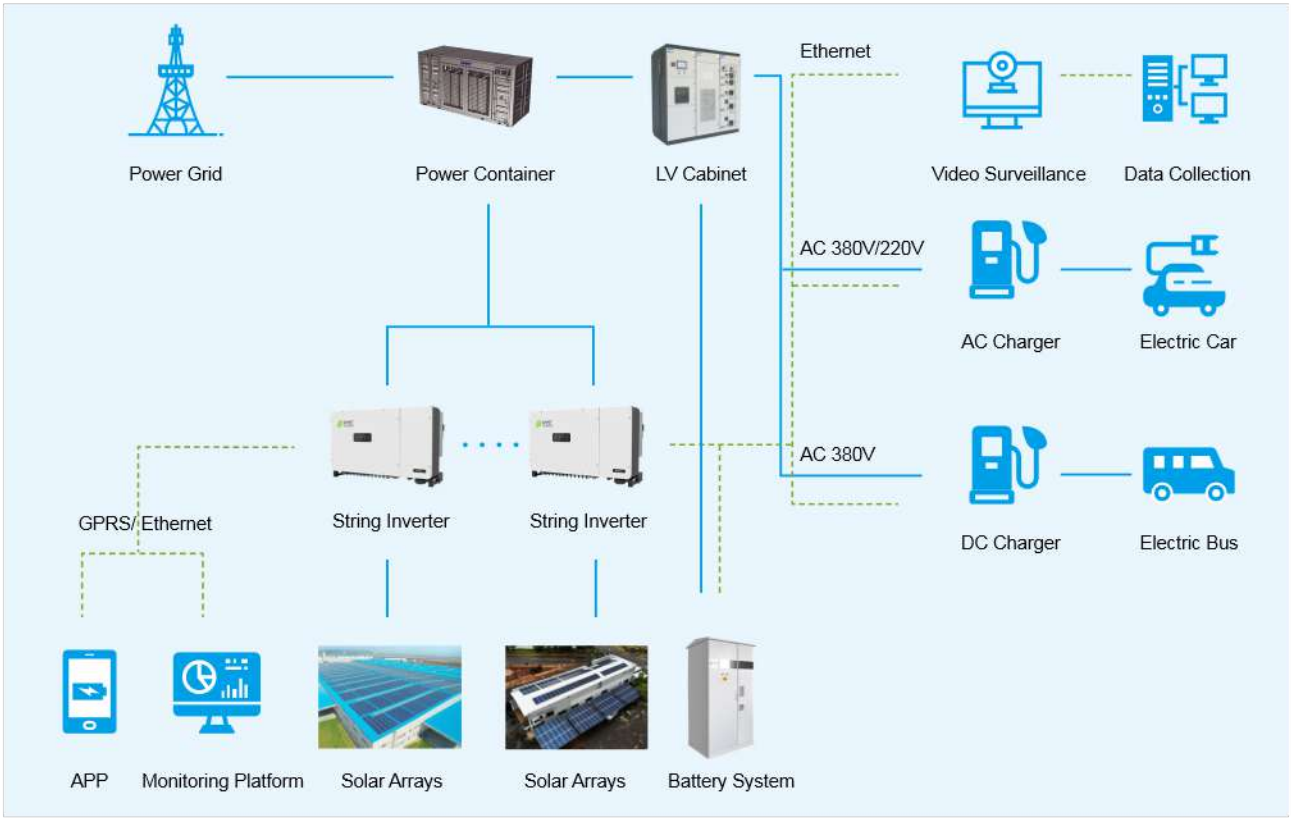


Figure 1 System Composition of the Solution

1.2

DESIGN PRINCIPLES

- Comply with the principle: The design must implement the relevant national laws, regulations, energy-saving and environmental protection technology policies, and meet the requirements of urban planning and environmental protection;

- Coordination principle: The implementation of the project should ensure that the original production and operation activities are not affected by the construction of the project, and the coordination and unity with the surrounding environment.

- The principle of improving user economic efficiency: Adhere to customer-oriented, strengthen energy monitoring capabilities, strengthen user energy use characteristics analysis, provide targeted services, meet customers' deep-level and diversified energy service needs, and reduce customer energy costs;

- The principle of cost saving: Strive to achieve a compact site layout, save raw materials and space, and save costs as much as possible without affecting the implementation effect;

- The principle of safe and reliable power supply: Comprehensively understand and analyze the status quo of the distribution network, combined with short-term and long-term planning, to meet the requirements of the power supply capacity of the grid and the principle of power supply reliability;

- The principle of energy conservation and environmental protection: The project design should actively adopt new technologies, new designs, and new materials that are energy-saving, environmentally friendly, maintenance-free and meet the requirements of fire protection and safety, health and environmental protection.

1.3

PROJECT BACKGROUND

The project is based on existing idle resources (such as existing factory roofs and carports), making full use of existing relatively mature clean energy technologies to power the equipment in the factory area. At the same time, it provides charging services for the electric vehicles of factory staff, realizing the popularization of green energy in the factory, reducing excessive dependence on urban electricity, and promoting the electricity revenue of the factory.

The photovoltaic intelligent storage & charging system integrates distributed solar power system, energy storage system and electric vehicle charging system. Through the energy management system, the application of each energy can be effectively adjusted to meet the application needs of customers and conform to the current carbon neutral development plan, which is of positive significance.

- Distributed solar power system: Install solar modules on the roof of building or carport to generate electricity. Green power is given priority to all electrical equipment in the charging station, including lighting, air conditioning and electric vehicle charging, so as to achieve self-generation, self-sufficiency, and surplus electricity to gain extra income;

- Energy storage system: Store the excess electricity generated by solar system, and store the electricity during the low electricity price at night, and release electricity during the peak hour consumption of the day to realize the income of peak and valley difference in electricity prices;

- Electric vehicle charging system: Built charging parking spaces on existing open spaces, all equipped with DC charger or AC charger, to meet various charging needs of users;

- Energy management system: It can realize real-time monitoring, dispatching, load restraint and other functions of solar system, energy storage, electric vehicle charging, and power distribution.

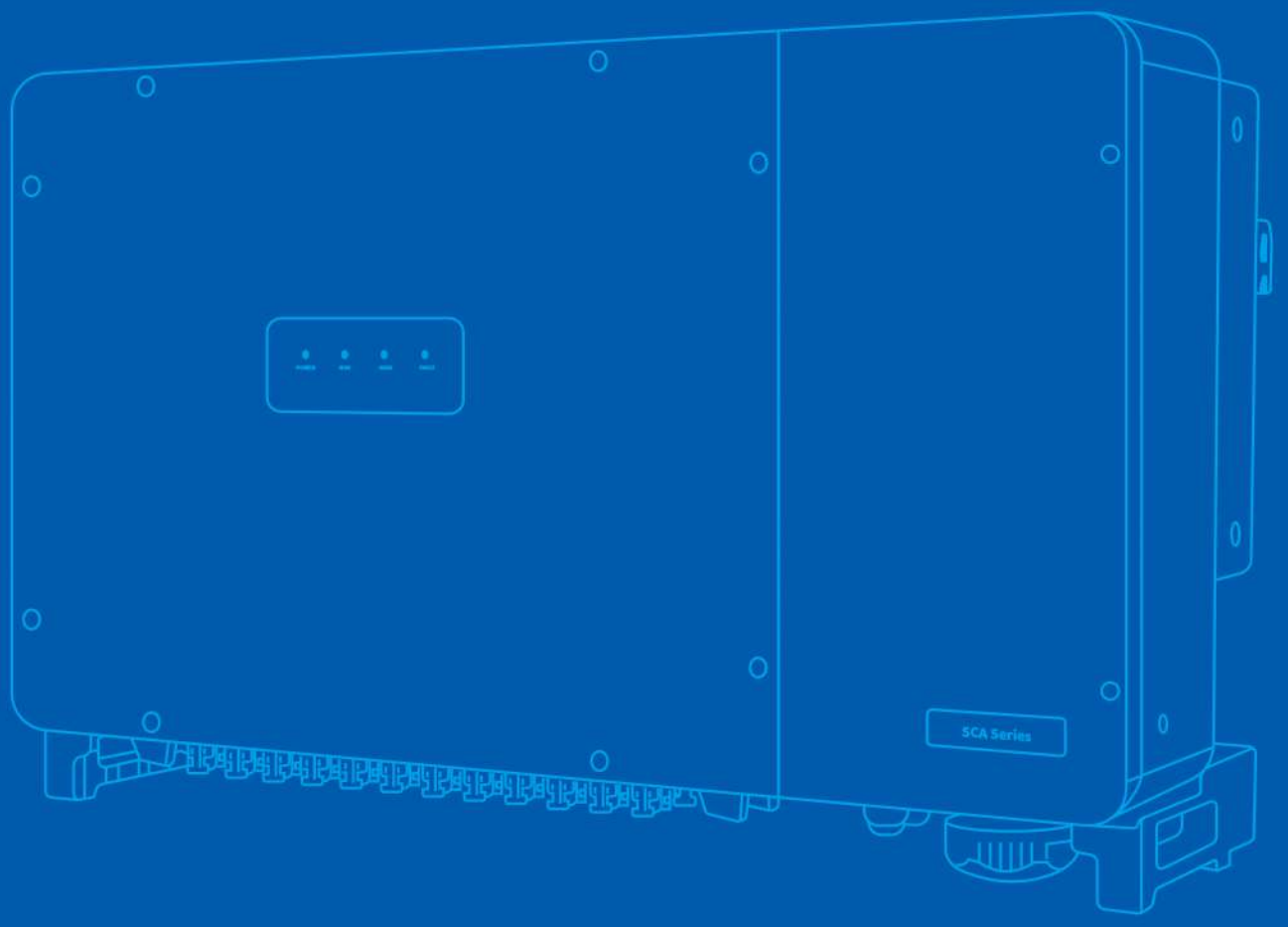
1.3

PROJECT BACKGROUND

Figure 2 Industrial and Commercial Roof Installation Renderings

TYPICAL SOLUTION

02



TYPICAL SOLUTION

2.1 APPLICATION SCENARIOS

2.2 SYSTEM DESIGN

2.3 EQUIPMENT SELECTION

2.1

APPLICATION SCENARIOS

The C&I photovoltaic intelligent storage & charging solution integrate distributed solar systems, energy storage systems, charging systems, and monitoring platform. This solution makes full use of the roof and carport of the building to construct a solar system. The generated electric energy firstly supplies electric vehicles and other loads in the factory, and the excess electric energy will be stored in the energy storage system to supplement when the solar energy system is insufficient. Through the coordination between solar energy and energy storage systems, it can minimize the amount of electricity obtained from the grid and increase customer profits.

Application scenarios:

- During the day, when the solar radiation is sufficient, the solar system directly supplies power to the charger and the factory load, and the excess power will be stored in the energy storage system.
- During the peak electricity consumption period, the energy storage system meets the load's electricity demand through discharge and achieves peak-to-valley income.
- When the power generated by the solar system cannot meet the power demand of the load, the energy storage system will provide supplement.
- When the energy storage system is not fully charged, it can be charged at night when the electricity price is low, and discharged during the peak hours of the next day to obtain electricity income between peaks and valleys.
- The system is dispatched and adjusted according to power demand, so that the solar system, energy storage system and charging system are perfectly coordinated, thereby increasing customer revenue.

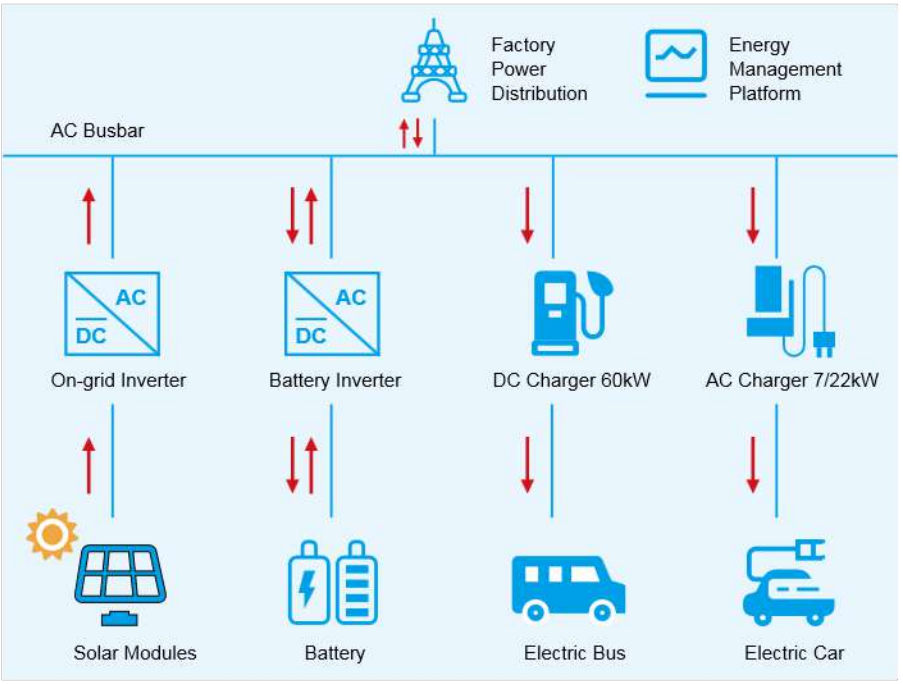


Figure 3 System Schematic Diagram

2.2

SYSTEM DESIGN

The power station uses the factory roof and carport roof to install solar power system, with a total installed capacity of about 351kWp. The usable area of the factory roof is about 2400m^2, and 234kWp solar modules can be installed. The factory has 40 parking spaces and a carport area is about 500m^2, and a total installed capacity of solar modules is 117kWp.

The energy storage system adopts a modular design with an installed capacity of 100kW / 256kWh. The charging system uses one 60kW dual-gun DC charger and six sets of 7kW AC chargers, with a total of 8 charging parking spaces, the total installed power is 102kW.

Figure 4 Project Site Installation Renderings

2.3

EQUIPMENT SELECTION

2.3.1 | Solar Module

Solar modules are the core components of solar power generation systems, and their photoelectric conversion efficiency and the advantages and disadvantages of various parameters directly represent the power generation performance of the entire system. Currently, there are many types of solar modules on the market, most of which are monocrystalline, and the power of the modules is increasing. The greater the power of the module, the fewer the number of modules used in a project of the same capacity, and the fewer corresponding DC-side cables. The overall loss of the system is reduced, and the workload of later operation and maintenance is reduced too.

Figure 5 The Main Solar Modules of CHINT Energy

Table 1 The Main Solar Modules of CHINT Energy

AstroSemi Mono PV Panels					
NO.	Model	Max. System Voltage	Power Range	Main Power	Module Efficiency
ASTRO 3 -- 158.75mm Half Cell+9BB+PERC					
1	CHSM72M-HC	1500Vdc	405-420	410Wp 415Wp	20.30% 20.50%
ASTRO 4 -- 166mm Half Cell+9BB+PERC					
2	CHSM60M-HC	1500Vdc	370-380	375Wp	20.60%
3	CHSM60M(BL)-HC	1000Vdc	355-365	365Wp	20.00%
4	CHSM72M-HC	1500Vdc	445-455	450Wp	20.70%
ASTRO 5 -- 182mm Half Cell+11BB+PERC					
5	CHSM72M-HC	1500Vdc	530-545	535Wp	20.90%

2.3

EQUIPMENT SELECTION

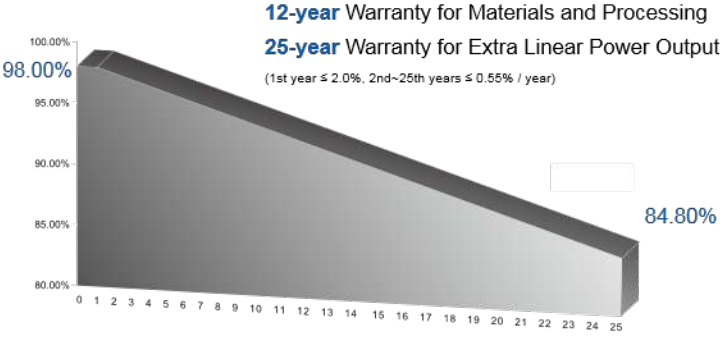
2.3.1 | Solar Module

AstroTwins Mono PV Panels						
NO.	Model	Max. System Voltage	Power Range	Main Power	Module Efficiency	
ASTRO 3 -- 158.75mm Half Cell+Bifacial+9BB+PERC						
1	CHSM72M(DG)/F-BH	1500Vdc	400-415	405Wp 410Wp	19.70% 19.90%	13.80% 14.00%
ASTRO 4 -- 166mm Half Cell+Bifacial+9BB+PERC						
2	CHSM60M(DG)/F-BH	1500Vdc	365-380	370Wp 375Wp	20.30% 20.60%	14.20% 14.40%
3	CHSM72M(DG)/F-BH	1500Vdc	435-450	445Wp	20.50%	14.30%
ASTRO 5 -- 182mm Half Cell+Bifacial+11BB+PERC						
4	CHSM72M(DG)/F-BH	1500Vdc	525-540	530Wp	20.70%	14.50%

Considering comprehensively, this scheme selects high-efficiency monocrystalline solar panel with a power of 450Wp.

Astro 4 Semi

Create Sustainable and Efficient Green Energy
440W~455W
Monocrystalline PV Module
CHSM72M-HC Series (166)



2.3

EQUIPMENT SELECTION

2.3.1 | Solar Module

KEY FEATURES

OUTPUT POSITIVE TOLERANCE
GUARANTEED 0~+5W POSITIVE TOLERANCE TO ENSURE POWER OUTPUT.

INNOVATIONAL HALF-CUT TECHNOLOGY
BETTER SHADING TOLERANCE, HIGHER RELIABILITY.

INNOVATIONAL MULTI-BUSBAR TECHNOLOGY
HIGHER LIGHT ABSORPTION, LOWER RISK OF MICROCRACK.

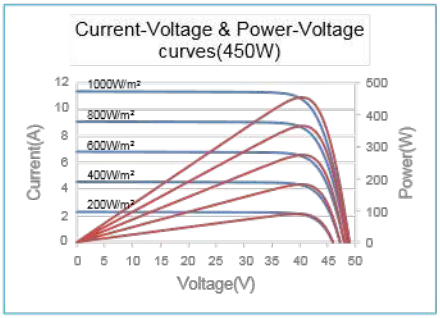
SUPER PERC+ CELL TECHNOLOGY
HIGHER MODULE POWER AND MODULE EFFICIENCY, LOWER POWER DEGRADATION.

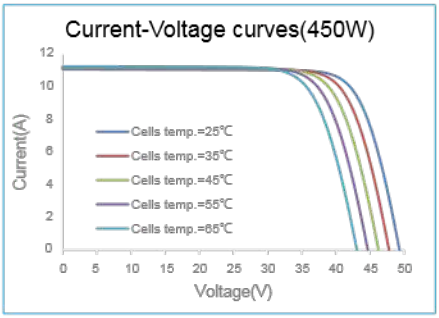
PID RESISTANCE
EXCELLENT PID RESISTANCE.

COMPREHENSIVE CERTIFICATES

The first solar company which passed the TUV Nord IEC/TS 62941 certification audit.

CURVE





2.3

EQUIPMENT SELECTION

2.3.1 | Solar Module

Table 2 Electrical Parameters of Solar Modules

ELECTRICAL SPECIFICATIONS				
STC rated output (Pmpp)	440 Wp	445 Wp	450 Wp	455 Wp
Rated voltage (Vmpp) at STC	40.85 V	41.05 V	41.32 V	41.51 V
Rated current (Impp) at STC	10.77 A	10.84 A	10.89 A	10.96 A
Open circuit voltage (Voc) at STC	48.50 V	48.80 V	49.05 V	49.35 V
Short circuit current (Isc) at STC	11.24 A	11.30 A	11.37 A	11.44 A
Module efficiency	20.2%	20.5%	20.7%	20.9%
Rated output (Pmpp) at NMOT	327.1 Wp	330.8 Wp	334.5 Wp	338.2 Wp
Rated voltage (Vmpp) at NMOT	37.93 V	38.12 V	38.37 V	38.55 V
Rated current (Impp) at NMOT	8.62 A	8.68 A	8.72 A	8.78 A
Open circuit voltage (Voc) at NMOT	45.42 V	45.70 V	45.94 V	46.22 V
Short circuit current (Isc) at NMOT	9.06 A	9.10 A	9.16 A	9.22 A
Temperature coefficient (Pmpp)	- 0.35%/°C			
Temperature coefficient (Isc)	+0.035%/°C			
Temperature coefficient (Voc)	- 0.28%/°C			
Nominal module operating temperature (NMOT)	41±2°C			
Maximum system voltage (IEC/UL)	1500VDC			
Number of diodes	3			
Junction box IP rating	IP 68			
Maximum series fuse rating	20 A			

STC: Irradiance 1000W/m², Cell Temperature 25°C, AM=1.5
NMOT: Irradiance 800W/m², Ambient Temperature 20°C, AM=1.5, Wind Speed 1m/s

2.3 EQUIPMENT SELECTION

2.3.1 | Solar Module

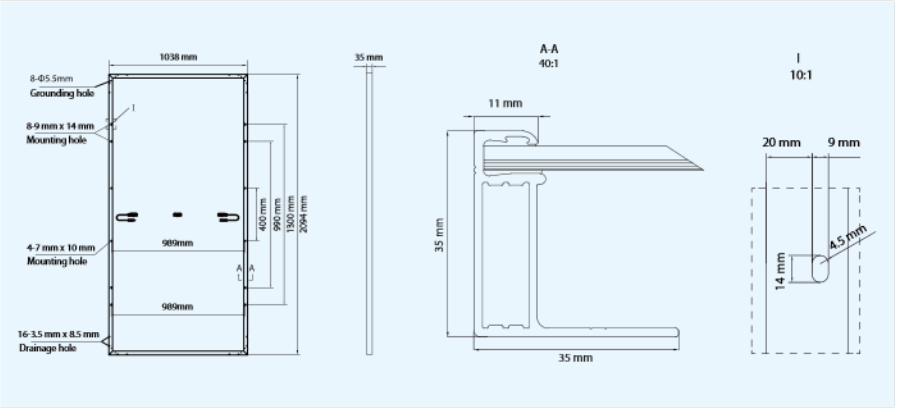
MECHANICAL SPECIFICATIONS	
Outer dimensions (L x W x H)	2094 x 1038 x 35 mm
Frame technology	Aluminum, silver anodized
Front glass thickness	3.2 mm
Cable length (IEC/UL)	Portrait: 300 mm Landscape: 1300 mm
Cable length (IEC/UL)	4 mm² / 12 AWG
① Maximum mechanical test load	5400 Pa (front) / 2400 Pa (back)
Fire performance (IEC/UL)	Class C (IEC) or Type 4 (UL)
Connector type (IEC/UL)	HCB40 / MC4-EVO2

- Refer to Astronergy crystalline installation manual or contact technical department.
  Maximum Mechanical Test Load=1.5×Maximum Mechanical Design Load.

PACKING SPECIFICATIONS	
① Module Weight	23.5 kg
② Packing unit	31 pcs / box
Weight of packing unit (for 40'HQ container)	772 kg
Number of modules per 40'HQ container	682 pcs

① Tolerance +/- 1.0kg ② Subject to sales contract

MODULE DIMENSION DETAILS



2.3

EQUIPMENT SELECTION

2.3.2 | Grid-connected Inverter

The grid-connected inverter converts direct current (DC) into alternating current (AC) suitable for injection into the grid. Generally, there are three types of grid-connected inverters: micro inverters, string inverters and centralized inverters. The comparative analysis is shown in the table below.

Table 3 The Comparative Analysis of Grid-connected Inverters

Item	Micro-Inverter	String Inverter	Centralized Inverter
Centralized large power station	Not applicable	Applicable	Applicable
Large-scale distributed industrial and commercial rooftop power station	Not applicable	Applicable	Applicable
Small and medium-sized distributed C&I rooftop power station	Applicable	Applicable	Not applicable
Distributed residential rooftop power station	Applicable	Applicable	Not applicable
Number of solar modules corresponding to a single MPPT	Single string	1-4 strings	Large number of strings
MPPT voltage range	Wide	Wide	Narrow
Power generation efficiency	Highest	High	General
Installation area	No need	No need	Need a separate room
Outdoor installation	Allowed	Allowed	Not allowed
Maintainability	Difficult to maintain	Easy to maintain	General
Inverter cost	Micro Inverter > String Inverter > Centralized Inverter		
System cost	Micro Inverter > String Inverter / Centralized Inverter (the two are similar)		

As a well-known inverter supplier at home and abroad, Chint Power Company not only provides 1KW-3.125MW grid-connected PV inverters, but also provides battery modules, ESS cabinets, PCS and energy storage systems and overall solutions.

2.3

EQUIPMENT SELECTION

2.3.2 | Grid-connected Inverter

After comprehensively considering the system capacity, grid-connected voltage and system cost, the project chose a 110kW string inverter.

CPS SCA110KTL-DO/EU
CHINT Power 1500V String Inverter

- Low Investment: Three-phase string inverters products provide standard configuration DC switch, integrated DC combiner box, standard class II lightning protection, optional PLC/RS 485 communication, which can match the requirements of different customers.
- High Profits: Three-phase string inverters can provide 99% maximum efficiency, 98.5% Euro efficiency, 99.5% MPPT efficiency, advanced topology design and international known device options, which can guarantee the profits of the whole life cycle.
- Maintenance Warranty: String inverter can support remote monitoring, fault diagnosis and software upgrade,7*24H after-sales service can guarantee the maintenance of the whole life cycle.

Table 4 Electrical Parameter of 110kW String Inverters

Item	CPS SCA110KTL-DO/EU	CPS SCA110KTL-DO/EU2
DC Input		
Max. DC voltage	1100Vdc	
MPPT Voltage Range(full load)	500 - 870Vdc	
Start voltage	300Vdc / 100W	
Rated DC voltage	600Vdc	
Number of MPPT	9	12
Number of strings per MPPT	2	1
Max. DC current	9*26A	12*26A
Max. Current for input connector	30A	
DC switch	Integrated switch	

2.3

EQUIPMENT SELECTION

2.3.2 | Grid-connected Inverter

AC Output	
Rated AC power	100kW
Max. AC power	110kVA
Rated AC voltage	400Vac
Rated AC voltage range	322Vac - 528Vac
Grid Connection Type	3Φ / PE
Max AC Output Current	160A
Grid frequency	50Hz / 60Hz
Rated frequency range	45-55Hz / 55-65Hz
Power factor(cos Φ)	±0.8 (adjustable)
Current THD	< 3%
AC disconnection type	
System Data	
Topology	Transformerless
Max. efficiency	98.80%
Euro efficiency	98.40%
Consumption at night/ standby	< 30W / < 6 W
Environment Data	
Ingress Protection	IP66
Cooling method	Cooling Fans
Operating Temperature	- 30°C to + 60°C
Ambient humidity	0-100%
Altitude	4000 m
Display and Communication	
Display	LED + APP (Bluetooth + Wi-Fi)
Communication	RS485 (standard) /PLC (Optional)
Mechanical Data	
Dimensions (W*H*D)	1050*660*340 mm
Weight	86 kg
Safety	
Certifications	LVD, IEC 61727, IEC 62116, EN 50549

2.3

EQUIPMENT SELECTION

2.3.3 | Storage System (PCS+Battery)

CHINT ESS is committed to the convenient, efficient and stable energy, to create a safer and sustainable operating environment. The electricity cost is different in most areas in the whole day. And it is more expensive in the daytime. The promotion purpose of the energy storage system is to encourage users to develop smart power plans. To keep the safety and stability for the grid supplier, to avoid more loss at the generation side. Charging at low price and discharging at high price, to reduce the electricity cost.

Energy storage converter, also known as two-way energy storage inverter, English name PCS (Power Conversion System), used in AC coupled energy storage systems, it is a device that realizes two-way conversion of electric energy, such as convert the battery's DC current into AC current, and then send it to the grid or AC loads, or convert the AC current into DC current to in charge the battery.

PCS has two working modes: on-grid and off-grid. The grid-connected mode realizes the two-way energy conversion between the battery pack and the grid. It has the characteristics of grid-connected inverters, such as anti-islanding, automatic tracking of grid voltage phase and frequency, low voltage ride-through, etc. It can be dispatched according to the grid or local control. Off-grid mode, also known as isolated grid operation, is to disconnect from the main grid when the set requirements are met, and to provide partial loads with AC power that meets the power quality requirements of the grid.

The project uses lithium iron phosphate batteries, which have the advantages of high power density, high cycle times, high depth of discharge, high safety, and wide operating temperature range. They are currently widely used in energy storage carriers. The parameter is shown in the figure below. It consists of a battery cabinet and an electrical cabinet. The battery cabinet is equipped with battery modules, a set of BMS, and a high-voltage cabinet.

PCS Cabinet

Battery Cabinet

2.3

EQUIPMENT SELECTION

2.3.3 | Storage System (PCS+Battery)

Table 5 Electrical Parameter of ESS Cabinet

Model Name	ESS-100/256
DC Input	
Max. DC voltage	1000Vdc
DC voltage range	500Vdc ~ 900Vdc
Max. DC current	228A
Auto buffering function	yes
Grid-tied AC Output	
Rated AC output power	100kW
Max. output power	110kVA
Rated grid voltage	400Vac
Grid voltage range	-15% ~ +15% (settable)
Rated grid frequency	50Hz (45Hz ~ 55Hz settable) / 60Hz ((55Hz ~ 65Hz settable)
Max. output current	159A
Grid connection type	3 phase/ PE/N (neutral optional)
Total harmonic distortion	< 3%
Off-grid AC Output	
Rated AC output voltage	400Vac
Output voltage precision	1%
Max. output current	159A
Overloading capability	110% overload
General Data	
Max. efficiency	96.40%
Isolation transformer	yes
IP grade	IP54
Operation temperature	- 30°C ~ +65°C (> 45° derating)
Relative humidity	0-95%, No condensation
Cooling type	Intelligent forced air cooling
Dimension(W*H*D)	800*1800*800 mm
Altitude	4000m (> 3000m derating)
Display	Touch screen
Communication	BMS: CAN/RS485 EMS: Ethernet/RS485 WIFI (optional)
Battery Information	
Battery capacity (kWh)	256
Rated voltage (Vdc)	518
Operating voltage range (Vdc)	420-588
Battery chemistry	LFP

2.3

EQUIPMENT SELECTION

2.3.4 | AC/DC Charger

Electric vehicles have no tailpipe emissions. Replacing conventional vehicles with EVs can help improve roadside air quality and reduce greenhouse gas emissions. In view of the rapid development of EV technology, electric private cars may become the main stream vehicles in the foreseeable future. To support the wider use of electric private cars, governments of various countries have been sparing no efforts in enhancing the EV charging infrastructure and network.

The input end of the charger is directly connected to the AC grid, and the output end is equipped with a charging plug for charging electric vehicles. According to different charging methods, chargers can be divided into AC chargers and DC chargers. The AC charger is slow charging, and the DC charger is fast charging. The parameters are as follows:

Table 6 Electrical Parameter of AC Charger

Name	Smart AC Charger	
Model Order Code	AC230/ 7kW B/C	AC400/ 22kW B/C
Power	7kW	22kW
Charging mode	MODE 3 CASE B/C	
Dimensions (W * H * D)	350*150*650 mm	
Weight	9.08 kg	9.48 kg
Input voltage	230 V±15%	400VAC±15%
Input frequency	50/60Hz	
Input Current	Current adjust	
Efficiency	> 99%	
Output charging interface	Socket/ Plug	
Leakage current protection	TYPE B RCCD	
Charging protocol	IEC 61851-1	
Start method	RFID Card / Via OCPP	
LED indicator	LED Light belt with red, blue, green	
Meter	Power meter with MID certificate	
Communication method	Wi-Fi	
Protocol	OCPP1.6J	
Background function	Build-in background via browser / WIFI system upgrade	
Broken record	Charge records / Fault records	
Protective function	Overcurrent protection; B-type leakage protection; Overvoltage protection; Under voltage protection; Relay over-temperature protection; Socket or plug over temperature protection; CP fault protection; Relay adhesion protection	
IP rating	IP54	
Operating temperature	-25°C to +50°C	
Working humidity	≤ 95% RH	
Certification	CE	

2.3

EQUIPMENT SELECTION

2.3.4 | AC/DC Charger

Table 7 Electrical Parameter of DC Charger

Model	60kW DC Charger	
Input Data		
Input voltage	380/400AC ±10%	
Input Hz	50/60Hz ± 5hZ	
Input current	Max 104A	
supply system	3P+N+PE	
Power factor	≥ 0.99	
THD	≤ 5 %	
Output Data		
Charging model	Mode 4 CASE C	
Connector type	CCS2	CHAdeMO
cable length	4.5m	
Output voltage	200V-750VDC	200V-500VDC
Output current	0-150A	0-125A
Charging protocol	DIN70121	CHAdeMO 2.0
Electronic lock	NA	Yes
Features		
Startup mode	Local startup by card	
Card reader	Support MF1 card meet ISO14443 Type	
Card type	M1 card	
Interface	Touch screen, 8 Inches	
Payment system	no	
power metering	Meet GB/T29318-2012	
Communication methods/ protocol	need docking	
Ingress protection	IP54	
Electrical protection	Over current protection, residual current protection, ground protection, surge protection, over/ under voltage protection, over/ under frequency protection, over/under temperature protection	
Noise	≤ 70 dB	
Efficiency	≥ 94%	

2.3

EQUIPMENT SELECTION

2.2.4 | AC/DC Charger

Operating temperature	—25°C+50°C
Working humidity	5% ~ 95%
Standards	
Certification Standards	IEC 61851-1, IEC 61851-23, IEC 61851-24
EMC level	Support IEC61000 EMC class B, IEC 61851-21-2
Certification	TUV SUD certificated
Basic Information	
Name	60kW DC charger on Euro standard
Model	TCDZ-DC0.75/60
Power	60 kW
Charging model	Mode 4 CASE C
Dimensions (L*W*H)	700*500*1700 mm
Weight	≤ 320 kg

AC Charger

DC Charger

2.3 EQUIPMENT SELECTION

2.3.5 | Energy Management System

The energy management system (EMS) can monitor the power supply, power load, energy storage system, chargers and other devices in the system in real time, and can interact with the charging cloud platform and the energy cloud platform remotely to maximize the use of the distributed solar system and ensure the best power quality and the highest economic benefits. It provides auxiliary response and coordinated dispatch services for the distribution network.

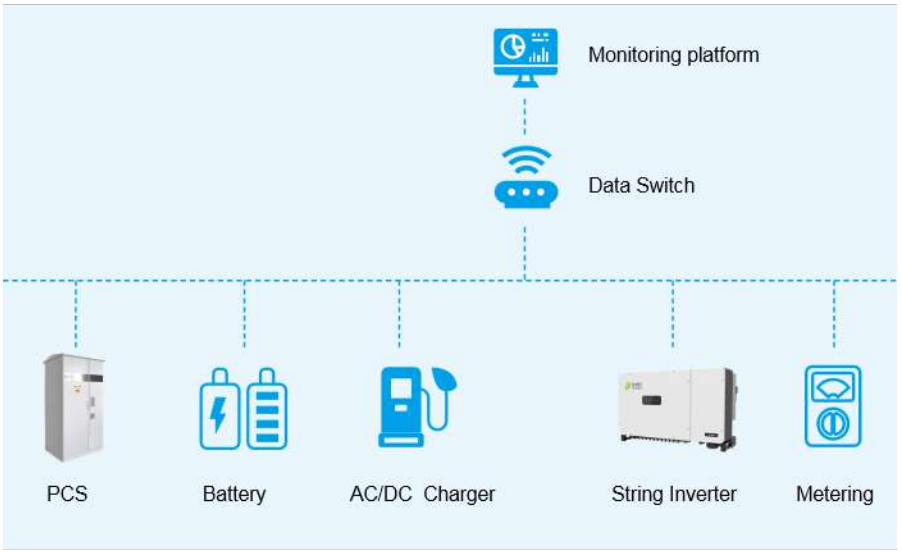


Figure 6 System Network Structure

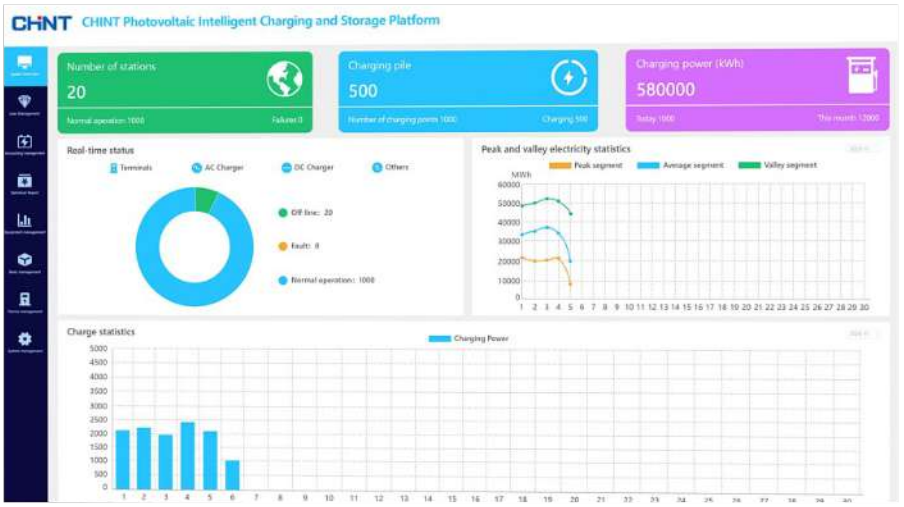
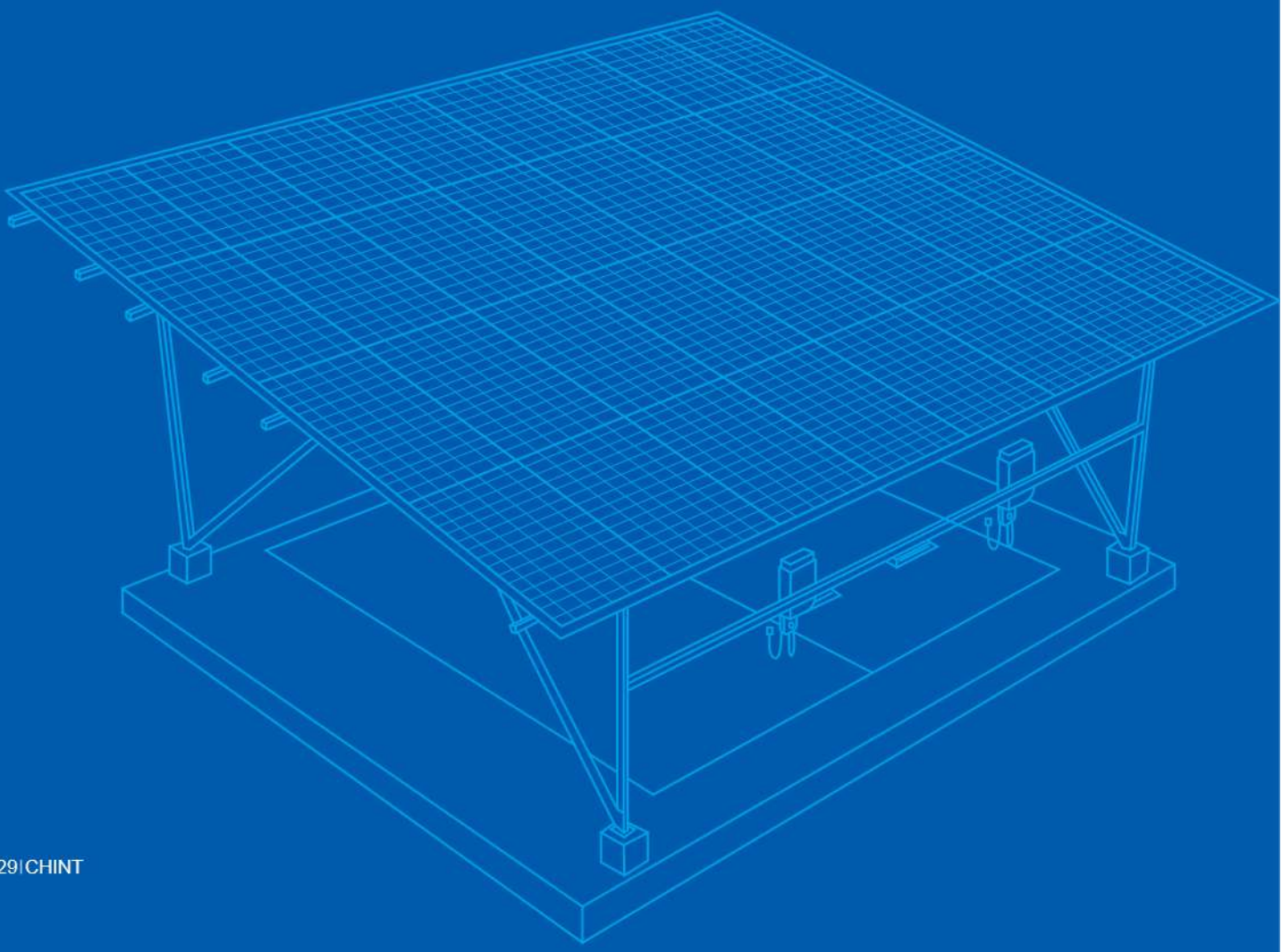


Figure 7 Photovoltaic Intelligent Charging & Storage Monitoring Platform

SYSTEM SCHEME

03



SYSTEM SCHEME

3.1 CONFIGURATION

3.2 CONCLUSION

3.1

CONFIGURATION

The project is designed to install 780 monocrystalline silicon solar panels with a standard power of 450Wp and a total capacity of 351kWp. The system adopted a 110kW string inverter, 20 solar panels connect to one string, and 13 strings connect to one inverter. The energy storage system adopts an independent outdoor cabinet design. PCS, battery modules, EMS, fire alarm system and HVAC are all concentrated in the cabinet. The system is mainly used in new energy integration systems, and can also achieve special functions such as peak-to-valley power adjustment and demand adjustment. Among them, the PCS capacity is 100KW, and the battery module capacity is 256kWh. The entire power station has three string inverters and an energy storage system, which are connected to the customer's side through one 4in-1out AC combiner box. At the same time, according to customer needs, a 60kW DC charger and six sets of 7kW AC chargers are also equipped to supply power to the electric vehicles of the employees in the factory.

According to the above system analysis and product selection, the configuration list of the system is as follows:

Table 8 Configuration List of the Project

Item	Product Name	Technical Parameter	Unit	QTY
Solar System	Solar Modules	CHSM72M-HC-450Wp (166), Mono	pcs	780
	Mounting System	Tile roof, flat installation, aluminum alloy	set	1
	String Inverter	110kW, three phase 400Vac, IP65	set	3
	AC Combiner Box	4 IN-1 Out (4*200A, 1*800), 400Vac	set	1
	Cables	DC/AC Cables	set	1
Storage System	PCS Cabinet	100kW, three phase 400Vac, IP65	set	1
	Battery Cabinet	256kWh, Lithium battery, IP65	set	1
	Cables	AC Cables	set	1
Charging System	AC Charger	7kW AC Charger, Mode 3 case C, Input voltage 230Vac, 50/60Hz, IP54	set	6
	DC Charger	60kW DC Charger, Mode 4 case C, Input voltage 400Vac, 50/60Hz, IP54	set	1
	Cables	AC Cables	set	1
EMS	Control Cabinet	Collect the information and upload to the platform	set	1
	EMS Software		set	1
	Cables	Communication Cables	set	1

3.2

CONCLUSION

According to the calculation of the solar radiation 4.5kWh/m².day, the power generation of the 351kWp solar power station in the first year is about 440MWh. The electricity price of the factory during the day is about US$0.104/kWh, so it can be seen that the power station can save at least US$45,830 in electricity bills every year. In addition, the annual income of chargers is nearly US$15,000, so the investment payback period of the entire project is about 5 years, which is extremely valuable for investment.

At the same time, industrial and commercial photovoltaic charging and storage projects are clean energy projects. According to the annual power generation capacity of the solar power system, it is estimated that at least 30 tons of CO_2, 0.12 tons of SO_2 and 0.12 tons of NOx can be saved each year. With the increasing development of the international carbon emission trading market, the energy saving and emission reduction will also be one of the main sources of customer benefits in the future.

The development and application of photovoltaic intelligent charging & storage solution will play an active role in the development of power supply and clean energy in the future.

- It uses clean energy to supply power and uses battery system to store electrical energy. Photovoltaic, energy storage and charging facilities constitute a microgrid. The microgrid can interact intelligently with the public grid according to demand, and can achieve two different operating modes: grid-connected and off-grid. The application of energy storage system can also reduce the impact of charging piles on the regional power grid during high-current charging.

- It can not only provide green electricity for electric vehicles, but also can realize auxiliary service functions such as peak shaving and valley filling, which can effectively improve the operating efficiency of the system.

- It will be able to build a system integrating generation, construction, transformation, distribution, and sales in the limited land resources, and achieve a basic balance between local energy production and load consumption through energy storage and optimized configuration.

  In addition, in many energy storage systems of photovoltaic intelligent charging & storage solution, some batteries that have been eliminated in electric vehicles are also used, thereby realizing echelon utilization of power batteries. If the echelon utilization of batteries can be popularized, this will greatly solve the problem of battery recycling in new energy vehicles.

  The photovoltaic intelligent charging & storage solution is a bold innovation attempt in the use of renewable energy, energy storage applications and the construction of new energy vehicle charging stations. In recent years, with the support of governments and policies of various countries and regions, the energy storage industry has cooperated with manufacturers, user units, and investment and financing institutions to jointly explore industrial models covering upper, middle and lower reaches. The entire industrial chain of the energy industry accelerates the commercialization of the market process. The photovoltaic intelligent charging & storage solution have gradually become a new focus in the global photovoltaic field.