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V2.0.0 | 2025.10 | EN



Haitai Solar

BROCHURE OF HAITAI SOLAR

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Tangshan Haitai New Energy Technology Co., Ltd.

Quality creates value
Value builds brand

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01

LIGHT OF ORIGIN:
ESTABLISHMENT AND EVOLUTION



COMPANY PROFILE

A comprehensive energy enterprise based in China and going global

Establishment of Haitai Solar

2006

Listing on Beijing Stock Exchange

2022

Global Renewable Energy Enterprises

TOP 500

Stock Code: 920985

Founded in 2006, Haitai Solar started with photovoltaic (PV) module manufacturing. Leveraging its deep industry experience and technical expertise, the Company gradually expanded into the broader energy sector. Its business covers nine sectors: **PV modules, PV power stations, PV mounting, PV cells, graphite electrodes/carbon electrodes, energy storage, battery swapping, hydrogen energy, and wind energy**, thus forming a diversified and comprehensive new energy industry ecosystem.










On August 8, 2022, the Company was successfully listed on the Beijing Stock Exchange, marking a new phase of development for Haitai Solar. Today, Haitai Solar has achieved a strategic transformation from a single photovoltaic business to a diversified development involving wind, solar, hydrogen, and energy storage.

The Company adheres to the principle that quality builds value, winning market trust through product quality and service. Through continuous technological innovation and product optimization, it is committed to providing clean and efficient green energy products and solutions to global customers, contributing to global energy transition and sustainable development.

BUSINESS SECTORS

Development strategy of integrating wind, solar, hydrogen, and energy storage

9 Business Sectors

-  PV Modules
-  PV Power Stations
-  PV Mounting
-  PV Cells
-  Graphite Electrode/
Carbon Electrode
-  Energy Storage
-  Battery Swapping
-  Hydrogen Energy
-  Wind Energy

DEVELOPMENT HISTORY

Strategic transformation leap

2006-2012

>>>

2013-2016

>>>

2017-2020

>>>

2021-Now

Laying foundation for and
rise of PV module manufacturing

Deep engagement in and
expansion of photovoltaic industry

Leap and enhancement
of PV industry

Diversification and development
of green energy

2006

Haitai Solar was established

2008

Mature R&D and technical strength
Large-scale development of PV industry

2011

The 600 MW solar module production line
was officially launched

2013

Be shortlisted in the Ministry of Industry and Information
Technology's list of approved photovoltaic manufacturers
fully expand into the Japanese market

2016

Obtained the "Pioneer" power degradation
certification in the first year.
Establish a production base in Vietnam

2017

Entered the PV power station sector

2020

Rated as the Tier 1 PV module manufacturer

2021

Entered the sectors of PV mounting, energy
storage and hydrogen energy

2022

Listed on Beijing Stock Exchange, entering the sector
of wind energy

2023

Entered the sectors of PV cells, battery swapping and
graphite electrodes/carbon electrodes

2024

Global marketing network

BUSINESS MAP

To become a more valuable and intelligent producer of green energy

6 Global production bases

Yutian Base in Hebei,Caofeidian Base in Hebei,and Zhangjiakou Base in Hebei
Xinghe Base in Inner Mongolia Autonomous Region,
Xilingol League Base in Inner Mongolia Autonomous Region,Shuozhou Base in Shanxi

100+ Global sales territories

Asia: China, the Republic of Korea, Japan, Philippines, Cambodia, Thailand, Myanmar, India,Pakistan and Mongolia
Europe: France, Germany, Netherlands, Lithuania, Austria, Hungary, Switzerland, Spain, Portugal and Russia
Americas: Canada, the United States of America, Argentina and Brazil
Africa: South Africa, Chad, Zimbabwe and Ethiopia
Oceania: Australia



GLOBAL PARTNERS

Haitai Solar has made joint efforts with global partners in working for environmental protection, expecting to promote the optimization and upgrading of the global energy structure, implement the concept of sustainable development via practical actions, and create a more green and friendly homeland for mankind.

200+

国家电投
SPIC

中国电建
POWERCHINA

中国铁建

国家能源集团
CHN ENERGY

国家电网
STATE GRID

中核集团
CNNC

中国能建
ENERGY CHINA

广东能源集团
GUANGDONG ENERGY GROUP

中国华电
CHINA HUADIAN

中国华能
CHINA HUANENG

中国五矿

PINGTAI

DUPONT

BG北控

大唐集团公司
CHINA DATANG

中国葛洲坝集团

TATA

浙商中拓
ZHEJIANG DEVELOPMENT

CHNT
正泰新能源

HUAWEI

锦浪科技
GINLONG

湖南建投

Marubeni
丸紅株式会社

...

02

DIVERSIFIED LAYOUT:
INTEGRATION OF WIND, SOLAR, HYDROGEN,
AND STORAGE SYSTEM SOLUTION

PV MODULES

Efficient PV module products

Since its establishment in 2006, Haitai Solar has been committed to the business of PV modules. With its high-quality products and services, it has garnered preference from both domestic and international clients and expanded its marketing network globally. Its global production capacity of PV modules has reached 10 GW. With nearly two decades of expertise driven by innovation in the PV industry, Haitai Solar is prepared to tackle new challenges and seize new opportunities in this new era. It is committed to providing customers with professional green products, comprehensive green energy solutions, and efficient & excellent services.

Deeply engaged in PV sector for nearly

20 YEARS

Production capacity of efficient modules

10 GW

ALL SERIES

PERC single-glass module – Haitai-Taiji
182、210
PERC double-glass module – Haitai-Taihe
182、210
TOPCon single-glass module – Haitai-Taiji 2.0
182、210、210R
TOPCon double-glass module – Haitai-Taihe 2.0
182、210、210R

MAIN PRODUCTS

TOPCon double-glass module – Haitai-Taihe 2.0		
Product model	Maximum power	Efficiency
182-54NT	450W	23.04%
182-72NT	600W	23.23%
182-78NT	650W	23.25%
210-60NT	650W	22.97%
210-66NT	720W	23.18%
210R-48NT	455W	22.77%
210R-66NT	635W	23.51%

TOPCon single-glass module – Haitai-Taiji 2.0		
Product model	Maximum power	Efficiency
182-54NT	455W	23.30%
182-72NT	605W	23.42%
182-78NT	655W	23.43%
210-60NT	655W	23.14%
210-66NT	720W	23.18%
210R-66NT	625W	23.14%

PERSONALIZED PRODUCTS

Product name	Product model
OBB	HTM590~610DMH5-72NT
OBB	HTM620~640DMH5-78 NT
Flexible module	HTM380~400MH5-54NT
Sound barrier	HTM290~310MH5-40


SYSTEMATIC PRODUCTS

Product name	Product model
Balcony PV system	HTM420~440DMH5-54 NT

KEY ADVANTAGES >>


■ ADVANTAGES OF DOUBLE-GLASS MODULE

Haitai Solar's double-glass modules by the double-glass packaging process have better performance in mechanical strength, acid/alkali corrosion resistance, sandstorm resistance, and salt spray resistance. In addition, double-glass modules, with lower water permeability, feature higher efficiency in preventing water vapor ingress, thus reducing the aging rate and PID.




Backside gain

Rear-side power generation contributes to different gains across environments and design methods




Weather resistance

Glass on both sides contributes to better resistance to acid/alkali corrosion, salt spray, ammonia gas, wind, and sand and higher adaptability to harsh environments



Anti-PID

Better water vapor isolation and POE encapsulation reduce attenuation caused by the PID effect



Mechanical strength

Compared with composite materials, tempered glass backsheets can improve the mechanical performance of modules resisting wind and snow pressures

■ ADVANTAGES OF TOPCON MODULES

Guarantee of Lower Attenuation

The advanced N-type TOPCon technology provides an attenuation warranty: within 1% in the first year and within 0.4% in the 2nd-30th year

Gain **1.70%**

High bifaciality

N-type modules have a higher bifaciality: The bifaciality of 70% (P-type) is increased to 80% (N type), greatly optimizing the power generation capacity

Gain **1.30%**

Lower operating temperature

N-type cells feature a longer minority carrier lifetime, higher efficiency, contributing to the lower operating temperature & smaller heat loss of modules

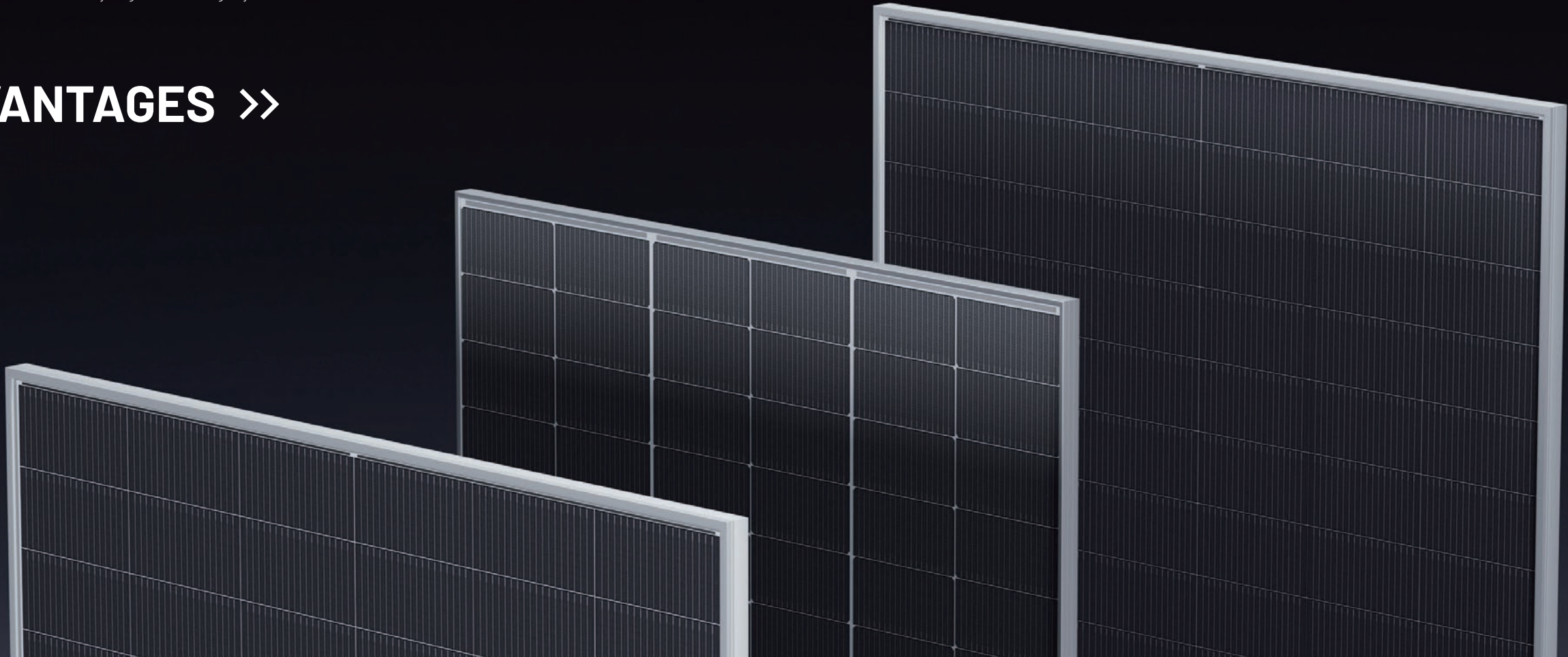
Gain **0.60%**

Better temperature coefficient


The advanced N-type TOPCon technology brings a better temperature coefficient: from -0.34% (P-type) to -0.30% (N-type)


Gain **0.34%**


KEY ADVANTAGES >>



■ MBB MODULE STRENGTHS

- 

Reduction in electrical loss
The transmission path of current on the cell is shortened to reduce internal loss
- 

Reduction in optical loss
The multi-busbar round solder strip can reduce the shading area, effectively reflect light to the cell, and improve the short-circuit current of the module. The optical utilization rate of the solder strip area is increased from below 5% to above 40%
- 

Stronger resistance to subfissure and grid fracture
The denser the arrangement of main grid lines is, the greater the mechanical strength of cells will be, and the smaller the failure area will be when penetrating subfissures occur

■ ADVANTAGES OF HALF-CUT MODULE

- High package power**
The gap between cells of half-cut modules is increased, and the gap reflection increases the light absorption of the cells
- Strong anti-shading ability**
When the array in a fully horizontal arrangement is shaded at the bottom, the unshaded upper parts output normally
- Low hotspot temperature**
A decrease in the working current of cell strings leads to a hotspot temperature decrease. Compared with the whole-piece module, the hotspot temperature can be reduced by 10-20°C
- Reducing rear-side mismatch of bifacial modules**
Mismatch caused by uneven light reception on the upper and lower parts of the rear side can be reduced by the half-cell structure
- Low operating temperature**
Current halving leads to decreases in the internal heat loss power, self-heating power, and operating temperature of the module

OBB MODULE >>

■ ADVANTAGES OF OBB MODULE

Saving silver paste

Silver paste is the raw material with the highest cost in the cell link. The OBB technology requires only fine busbar and eliminates main busbar, so the consumption of silver paste for cells will be reduced by about 20%-40%

20%~40%

Improvement in conversion efficiency

The main busbar of cells is eliminated to reduce the shading area. At the same time, the current transmission distance is shorter and the series resistance is lower, thus the power loss is reduced. With the same type of cells, the power of modules packaged with OBB technology is increased by about 0.7%-1%







0.7%~1.0%

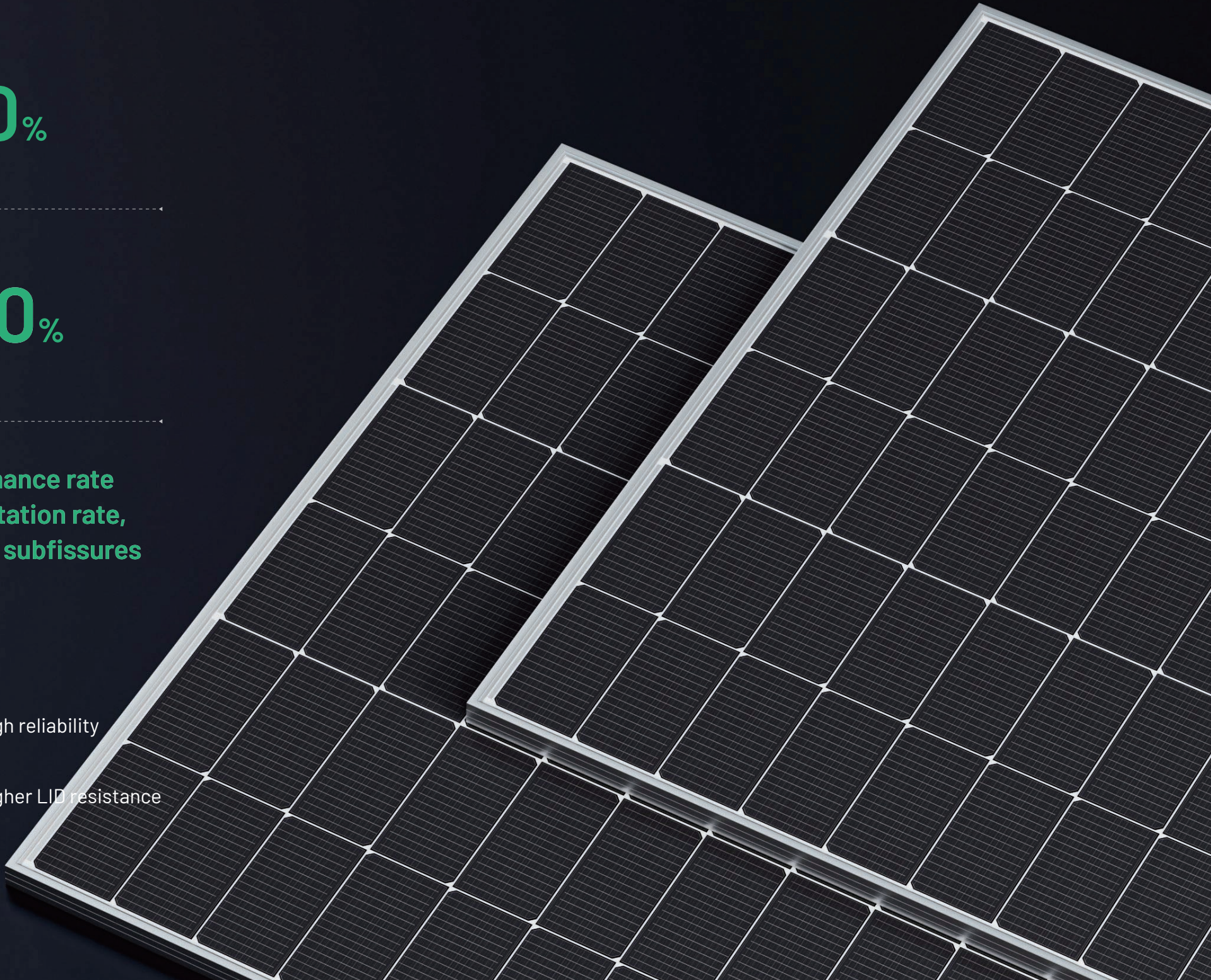
Improving conformance rate

OBB modules adopt the design of densely distributed multiple welding wires. At the contact point between a thin grid line and welding wire, the stress distribution on the cell is more uniform, reducing the fragmentation rate, grid fractures, and subfissures

Improving conformance rate
Reducing fragmentation rate,
grid fractures, and subfissures

■ Module characteristics

-  High power
-  Low attenuation
-  High reliability
-  Low temperature coefficient
-  Nice appearance
-  Higher LID resistance



FLEXIBLE MODULE >>

■ ADVANTAGES OF FLEXIBLE MODULES

More lighter
The weight is 3.5 kg/m2, 70%light-
er than conventional glass modules

More stronger
The enhanced support design con-
tributes to excellent hail impact
resistance

More thinner
The thickness is 2.8 mm (excluding
junction box), 50% of conventional
module thickness

More convenient
The system needs no brackets and
is directly attached to the original
mounting surface with structural
adhesive, which facilitates quick
installation

More flexible
The minimum bending radius can
reach 0.3 m, and no subfissures
and power attenuation occur to the
cells

More beautiful
Surface colors and patterns can be
customized to meet architectural
aesthetic requirements

■ MODULE APPLICATION SCENARIOS

- Distributed PV power stations:** on roofs, walls or other building surfaces of various shapes
Building integrated photovoltaics (BIPV): as part of a building facade, roof or window
Mobile power supply: for outdoor adventure, camping or disaster rescue
Vehicles: surfaces of vehicles such as automobiles, ships and aircraft



SOUND BARRIER MODULE >>

■ ADVANTAGES OF SOUND BARRIER MODULE

Micro-bending capacity

The special short frame design of sound barrier modules allows a certain degree of transverse and longitudinal bending, making the modules more fitting for the installation surface with slight bending

Sound and heat insulation

The sound barrier modules are packaged with 3.2mm fully tempered glass and reinforced adhesive film, insulating sound above 35dB and insulating heat simultaneously

Reducing floor area of PV modules

Renovating existing sound barriers or setting new ones requires no additional road space and new land area

Providing clean energy

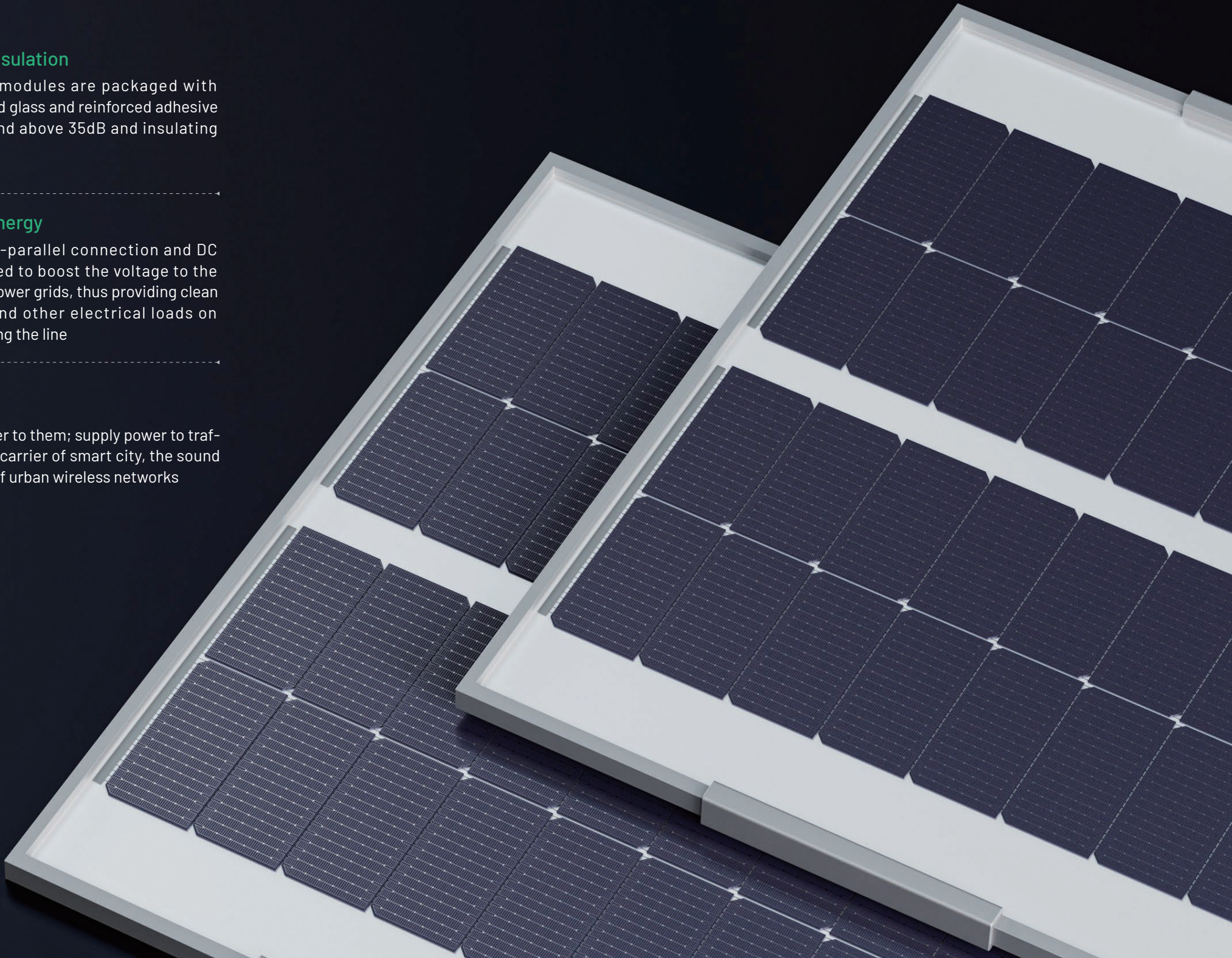
PV panels in series-parallel connection and DC inverters can be used to boost the voltage to the nominal level of AC power grids, thus providing clean energy for lamps and other electrical loads on nearby roads and along the line

Diversified application scenarios

PV sound barriers installed on urban roadside can carry billboards or supply power to them; supply power to traffic auxiliaries such as street lamps, signs and communication equipment. As a carrier of smart city, the sound barrier system can be equipped with signal transmitters to realize full coverage of urban wireless networks

■ Module characteristics

-  Economic benefits
-  High reliability
-  Convenient installation
-  Sound and heat insulation



BALCONY PV SYSTEM >>

■ ADVANTAGES OF BALCONY PV SYSTEM

Increasing renewable energy

Providing renewable energy for residential or commercial buildings and reducing the consumption of conventional energies

Utilization of space

Maximize the use of balcony space to generate clean energy

Convenient installation

Installation operation is simple and convenient, and only two people are required to complete the installation and disassembly

Flexibility

Compared with roof or ground PV systems, it is more flexible and easier to install and maintain

Energy cost savings

Reduce the dependence on conventional power, reduce energy costs, and lower household or commercial electricity bills

Plug-and-play

Matching with MC4 compatible plugs, plug-and-play, convenient, and quick

Flexible installation

Suitable for a variety of installation scenarios, including the ground, roof, and wall

Remote monitoring and control

The APP can be used to directly connect to the Bluetooth of the device for local monitoring, or log into the account for remote monitoring

The balcony PV system mainly consists of the following parts:

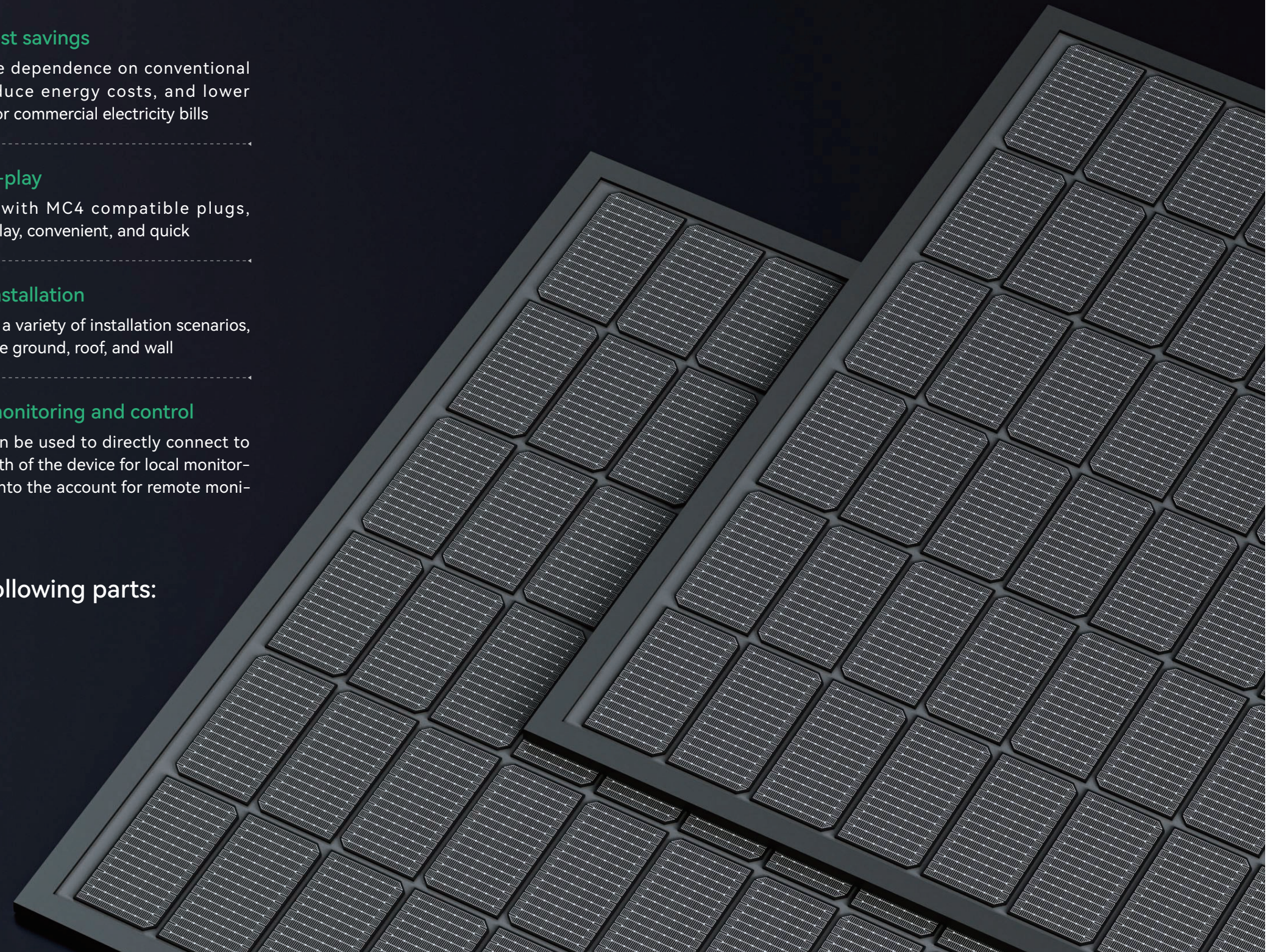
Photovoltaic panel (all black module)

Mounting bracket

Microinverter

Connecting cables

APP for monitoring and control



PV POWER STATIONS

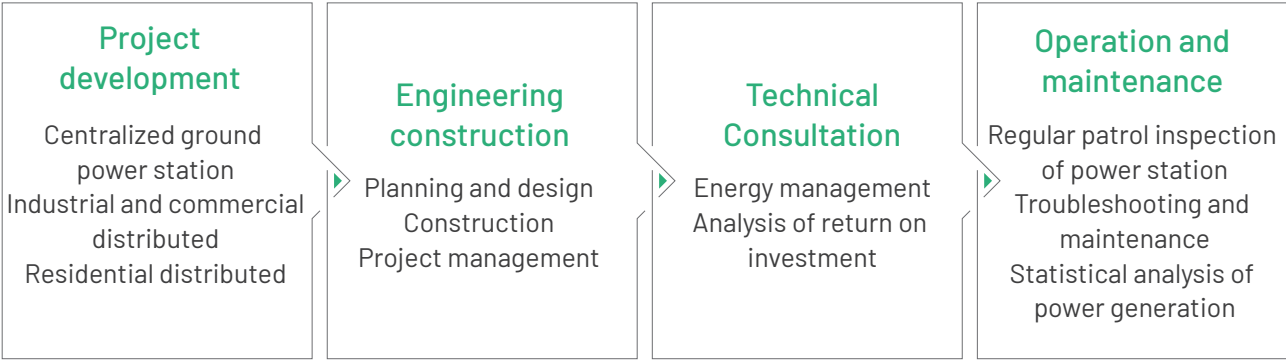
One-stop solution for PV power station



BUSINESS OVERVIEW


Haitai Solar entered the PV power station sector in 2017 and holds a Grade 2 qualification for general contracting of power construction and a Grade 3 qualification for the installation, repair and test of power facilities. As a comprehensive power engineering company, Haitai Power can provide allaround services covering new energy project development, engineering construction, operation and maintenance, technical consultation, and other links, providing customers with one-stop solutions. "Tailaidian" is a cooperatively cobuilt product launched by Haitai.


ONE-STOP SOLUTION FOR PV POWER STATION





ADVANTAGES


- Reliable product assurance**


 A nearly-20-year-old module and mount manufacturer capable of product delivery with just one-click request
- Flexible financial leverage**

 According to the agent evaluation system, provide stable financial leverage
- Quick settlement support**

 Improve the efficiency of capital operation, allowing settlement of only one account
- Comprehensive product solution**

 Various product portfolios such as the products for the roof, courtyard, sunlight room, doublesided slope, etc
- Professional business support team**

 Provide professional technical services for 1-to-1 business support
- Rich user experience**

 9 years of experience in residential photovoltaic construction, operation, and maintenance

PV MOUNTING

A provider of “PV module + PV mounting” solutions



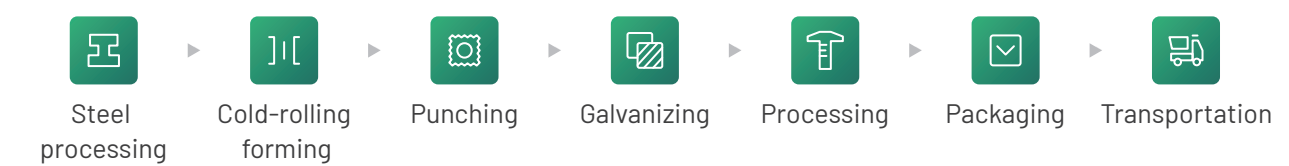
BUSINESS OVERVIEW

Haitai Solar entered the PV mounting sector in 2021, specializing in the R&D, design, manufacturing, and sales of PV mounting systems. With an annual production capacity of 100,000 tons and the capability to install 4GW modules, the Company relies on its industrial diversification to provide its customers with the most professional solutions. It offers specialized PV mounting solutions such as "PV modules + PV carports" and "PV modules + PV agriculture," making it a leading integrated solution provider in China that combines PV modules with various mounting systems.



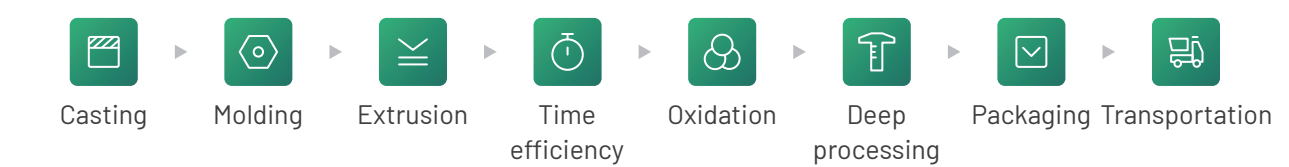
Carbon steel bracket

Roof mounting system, Zn-Al-Mg coating steel mounting system, carpark mounting system, farmland mounting system, and Fishery-PV complementary mounting system



Aluminum alloy bracket

Carpark mounting system, farmland mounting system, roof mounting system, and aluminum alloy ground mounting system



■ MAIN PRODUCTS

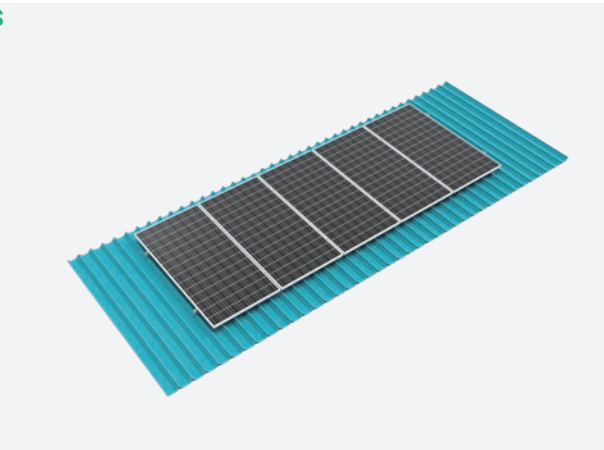
Industrial and commercial roof mounting systems

HTRM Series

Designed based on local conditions; convenient installation mode; suitable for various color steel tiles. It can provide a rail-free solution to directly lay PV modules, which is convenient and efficient.

Main features

- 1. Various products, which can be used on different roofs
- 2. Lightweight, conveniently-installed, time-saving, and efficient
- 3. High-quality aluminum alloy material, with high strength and corrosion resistance



Utility Model Patents

HTRM Series

It is a residential tile roof PV mounting solution. The system has a simply-structured stainless steel hook form, a few accessories, and good waterproof performance, and can ensure convenient installation.

Main features

- 1. Full range of hooks, suitable for various roofs
- 2. Few system accessories, ensuring easy installation
- 3. Made of stainless steel and aluminum alloy, with high strength and corrosion resistance



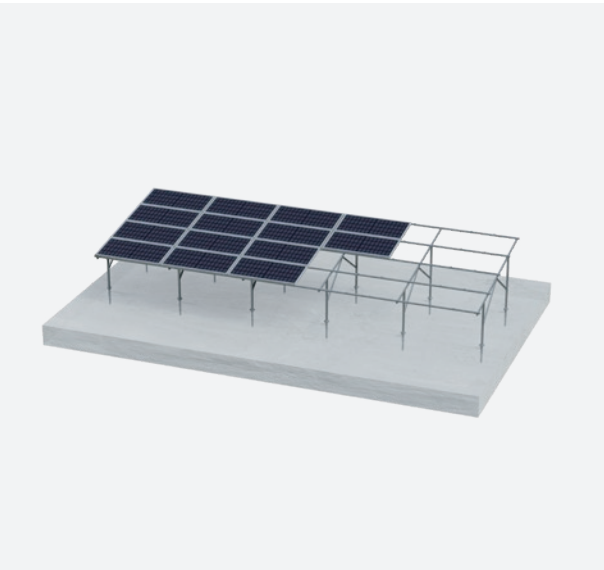
Aluminum alloy ground mounting system

HTGM Series

It is a ground mounting solution suitable for flat ground, mountainous areas, and highly corrosive environments. Haitai aluminum alloy ground mounting system is a traditional and popular mounting system suitable for highly corrosive environments such as coastal areas.

Main features

- 1. Aluminum alloy material providing strong corrosion resistance and high self-repairing capability
- 2. Highly pre-assembled main beam and legs, greatly reducing construction and labor costs
- 3. Recyclable and usable even after 25-year use
- 4. Structural components being adjustable with actual conditions of project sites, meeting requirements of sloping mountainous areas, etc



Zn-Mg-Al Coating Steel Mounting Systems

HTGM Series

It is a ground mounting solution suitable for flat ground, mountainous areas, and highly corrosive environments. Haitai Zn-Al-Mg coating steel mounting system is a new material PV mounting system, which is suitable for highly corrosive environments such as coastal areas.

Main features

- 1. Brand-new highly-corrosion-resistant materials suitable against highly corrosive environments
- 2. With strong self-repairing capability, reducing later maintenance costs
- 3. The product features low cost and high quality.
- 4. Available customization based on customer needs and actual project conditions



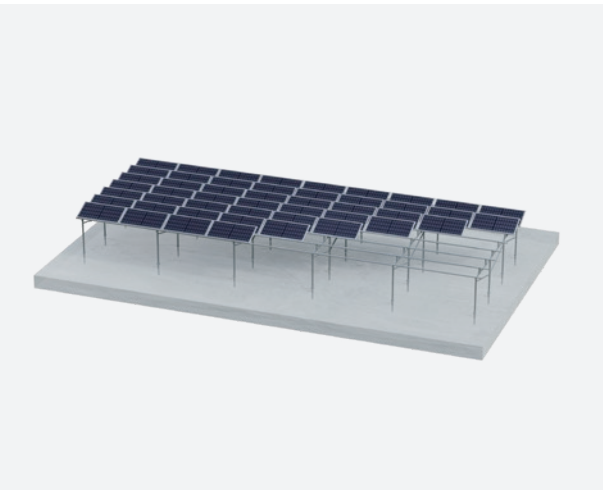
Farmland mounting system

HTFarmland Series

It is suitable for agriculture, fishery, and other agricultural-PV complementary mounting solutions. The Haitai farmland mounting system is a mounting system that combines agriculture and photovoltaic systems.

Main features

- 1. Agriculture-solar complementary, realizing PV power generation without affecting agricultural operations
- 2. Suitable for areas with scarce land resources, effectively improving land utilization
- 3. Available customization based on customer needs and actual project conditions



PV carpark mounting system

HTCarport Series

The PV carpark system is a new type of waterproof carpark mounting system integrated with PV buildings.

Main features

- 1. Structural waterproofing, with greatly improved waterproof performance
- 2. Reasonable location-based design, effectively improving space utilization
- 3. Various forms, meeting different customer needs
- 4. Strong system stability and high-strength protection against heavy snow



PV CELLS

Supplier of TOPCon-N high-efficiency battery products

BUSINESS OVERVIEW

Haitai Solar entered the PV cell sector in 2023 and is dedicated to the integration of R&D, manufacturing, and sales of efficient solar cells. The Company is committed to providing customers with high-performance high-reliability TOPCon-N-type efficient cell products. Currently, the designed total production capacity is 10 GW, which aligns closely with the group's development direction and exhibits a high degree of complementarity.



GRAPHITE ELECTRODE/CARBON ELECTRODE

High-quality graphite electrode/carbon electrode



Customers First



Stable quality



Independent factory



Continuous innovation

BUSINESS OVERVIEW

Founded in 2023 and located in Xinghe County, Inner Mongolia Autonomous Region, Haitai New Energy (Xinghe) New Materials Co., Ltd is a subsidiary of Tangshan Haitai New Energy Technology Co., Ltd. (stock code: 835985.BJ).

The Company has achieved complete independence and control in technology, production, processes, and quality. It has built a fullprocess production line with an annual output of 120,000 tons of largesize graphite electrodes and carbon electrodes, primarily producing largesize 1272 and 1320 graphite electrodes and carbon electrodes. These products are mainly used in industrial silicon smelting electric furnaces. The production line uses petroleum coke as the main raw material and coal tar pitch as a binder. The products are meticulously refined through processes such as calcination, batching, kneading, forming, roasting, graphitization, and machining to ensure excellent performance and meet market demands.

Large-size graphite electrode/carbon electrode

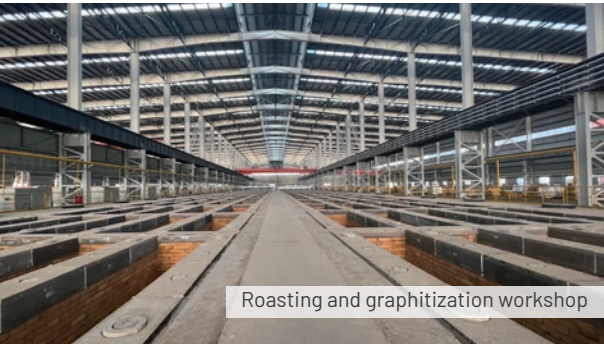
1272/1320
Specification

Large-scale production line

120,000
tons



Workshop Exterior



Roasting and graphitization workshop



Calcination workshop

ENERGY STORAGE

A global provider of energy storage products and system solutions



BUSINESS OVERVIEW

Haitai Solar entered the energy storage sector in 2021 and is a provider of global energy storage integrated products and system solutions under Haitai Solar. It has a fully automatic, intelligent and efficient lithium battery module and PACK production line with a single-line capacity of 2GWh.

The products provided by Haitai Digital Energy include:

- Large container energy storage system**
(5MWh, 6.25MWh)
- Commercial and Industrial Energy Storage System**
(215kWh, 233kWh, 261kWh, 372kWh, 418kWh)
- Residential energy storage system**
(single-phase 3-6 kW, three-phase 8-15 kW, 5-30 kWh)



BUSINESS ADVANTAGE

Quality Control

Provide customers with one-on-one, customized and professional system solutions and O&M management solutions, including on-grid/off-grid microgrids, user-side, grid-side, and power source-side solutions.

Product advantages

Long service life, high safety, high efficiency/intelligent and digitalized/multi-level software and hardware protection/modular design for easy expansion, installation, and maintenance.

Equipment Advantages

Fully automated production equipment such as fully automatic KUKA robot, high-precision OCV/IR and EOL testing equipment, advanced plasma cleaning machine, nondestructive laser welding machine, full-automatic assembly line, intelligent AGV robot and high feedback charging and discharging test equipment. By strictly controlling 256 quality control points across various stages including insulation, voltage difference, adhesive application, and welding inspection of cells, modules, and PACK, as well as enclosure airtightness testing and capacity testing, product quality is ensured.

CONTAINER ENERGY STORAGE SYSTEM >>

Haitai-Blue Shield HTDESS 1725/3420-LC



PRODUCT INTRODUCTION

- LFP

High-quality LFP batteries, long cycling life-time (> 6000 times)
- BMS

Intelligent BMS enables 3-level monitoring, guaranteeing high performance and security
- Large storage capacity, high conversion efficiency, comprehensive efficiency > 85%
- Prefabricated containers can be applied in various scenarios, and also reduce installation costs
- Modular design, flexible to adapt to various kinds of voltage platforms and systems with various capacities
- All-round and multi-level cell protection strategy and fault isolation measures to ensure the safety and stability of the energy storage system
- With fire protection, thermal management system, access control, monitoring, leakage protection and other features, this system runs safely and stably
- Easy operation and maintenance and low maintenance costs

COMMERCIAL AND INDUSTRIAL ENERGY STORAGE SYSTEM >>

Haitai-Blue Star HTDESS-100TS(DC100)

PRODUCT INTRODUCTION

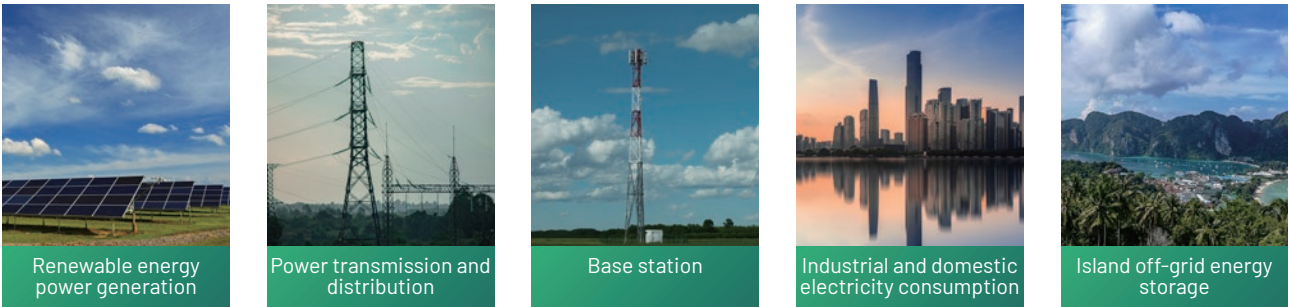
1. Integrated liquid-cooled battery PACK, high-precision BMS system, intelligent EMS system, PCS and fire prevention system;
2. The system can improve the power quality of the grid, such as voltage deviation, three-phase imbalance and harmonics;
3. It has the functions of load tracking, standby power supply and peak shaving;
4. Adopt modular design for flexible application in various occasions;
5. It can help industrial and commercial owners reduce electricity expenses, increase green power consumption, and maintain the safe and stable operation of the system.



PRODUCT FEATURES

- High-efficiency liquid cooling technology, cell temperature difference < 3°C
- Intelligent monitoring system, integrated with BMS and EMS intelligent safety system
- Integrated design, convenient transportation and plug-and-play
- Built-in independent fire fighting system

APPLICATION SCENARIOS



RESIDENTIAL ENERGY >>
STORAGE BATTERY PACK



HTDESS 2.56kWh 51.2V/50AH



HTDESS 5.12kWh 51.2V/100AH

■ PRODUCT INTRODUCTION

The 2.56kWh and 5.12kWh modular batteries feature compact and lightweight individual modules, requiring only simple and easy installation steps. You can easily customize the battery combinations to meet your energy storage needs. With a reliable BMS system and high-performance balancing technology, the entire system achieves intelligence and flexibility, providing you with a more stable discharge platform.

■ PRODUCT ADVANTAGES

Higher conversion efficiency	Greater flexibility	Energy can be saved
Reduced reliance on the grid	Faster charging and discharging	Better suitable for peaking applications
Lower cost, larger system		

RESIDENTIAL ENERGY >>
STORAGE INVERTER



Single-phase hybrid inverter
3-6kW HTDESS S3.0K-6.0K G2



Three-phase hybrid inverter
6-15kW HTDESS T6.0K-15k G1

■ PRODUCT INTRODUCTION

- 1. Support multi-machine parallel connection, support 5-40kWh battery, and support 1.5 times module expansion at the input end to meet various needs of customers as much as possible;
- 2.PV string 16A, supporting 182/210 high-power PV module access;
- 3. The power grid and battery are switched between on-grid and off-grid in zero time, so that the electricity consumption is guaranteed.

■ PRODUCT ADVANTAGES

Economical and Efficient
Maximum efficiency ≥ 97.5%, small volume saves installation space

Intelligent management
Home smart energy management terminal, power dispatching and demand-side response management node, distributed virtual power station management node

Safe and reliable
Compatible with anti-reverse current function and battery reverse connection protection

Friendly and flexible
Support multi-machine parallel connection, compatible with access of multiple batteries such as lead-acid batteries and lithium-ion batteries

COMMUNICATION POWER >> SUPPLY SYSTEM



OUTDOOR CABINET-TYPE INTEGRATED >> PV-STORAGE SYSTEM



■ PRODUCT INTRODUCTION

Special new energy hybrid power supply system for communication base stations, with different power supply system equipment configured according to the requirements of different base stations.

PV MPPT controller and mains rectifier modular installation, PV module support 5kW-30kW, mains rectifier module support 5-15kW expansion design.	Outdoor IP54 protection grade, multiple safety control and lightning protection design, suitable for harsh environments such as high altitude and extreme low temperatures.
The product has multiple protections for overvoltage, overcurrent, overtemperature, undervoltage and short circuit.	Integrated battery management function, with battery reverse connection, overcharge and over-discharge protection functions.
It has various communication interfaces such as RS232, RS485 and CAN.	It can manage multiple energies such as solar energy, wind energy, mains supply, fuel generator and battery at the same time.

■ PRODUCT HIGHLIGHTS

- Support the flexible expansion of PV power generation capacity
- Integrated EMS function, safe and stable
- Support battery capacity and discharge time prediction
- Support simultaneous access to load, battery, grid, DG, and PV
- Built-in isolation transformer with strong load adaptability and strong adaptability

BATTERY SWAPPING

Free battery swapping operation platform and mature battery swapping software and hardware solutions



BUSINESS OVERVIEW

Haitai Solar entered the battery swapping sector in 2023, offering battery swap solutions for electric vehicles, as well as operational solutions for battery swapping. The main reason for the rise of battery swapping is the government's consistently strict regulation on vehicles that meet new national standards and residential charging, along with the rapid development of e-commerce and instant delivery services. The time for electric vehicles to charge has changed from 3 hours to 5 seconds for a battery swap, and the initial cost has decreased from over 3,000 yuan to 600 yuan.



Battery swapping for two-wheel vehicle
Takeaway/delivery industry



Battery swapping for three-wheel vehicle
Express/Electric Tricycle



Battery swapping for four-wheel vehicle
Express/rural goods and passenger transport vehicle



Independent energy station
Photovoltaic + battery swapping + energy storage

ADVANTAGES



Software platforms

Can truly support refined operation

1. Battery swapping user APP
2. Battery swapping operation and maintenance APP
3. SaaS Platform of battery swapping merchants
4. Battery swapping and vehicle rental platforms
5. Battery swapping big data platform



Hardware products

Verified by the huge market

1. Haitai smart battery swapping cabinet
2. Haitai power battery
3. Haitai battery swapping vehicle



User traffic

Massive high-quality data on battery swapping for riders

1. Rider information
2. Battery swapping data of riders
3. Covering major cities in the country



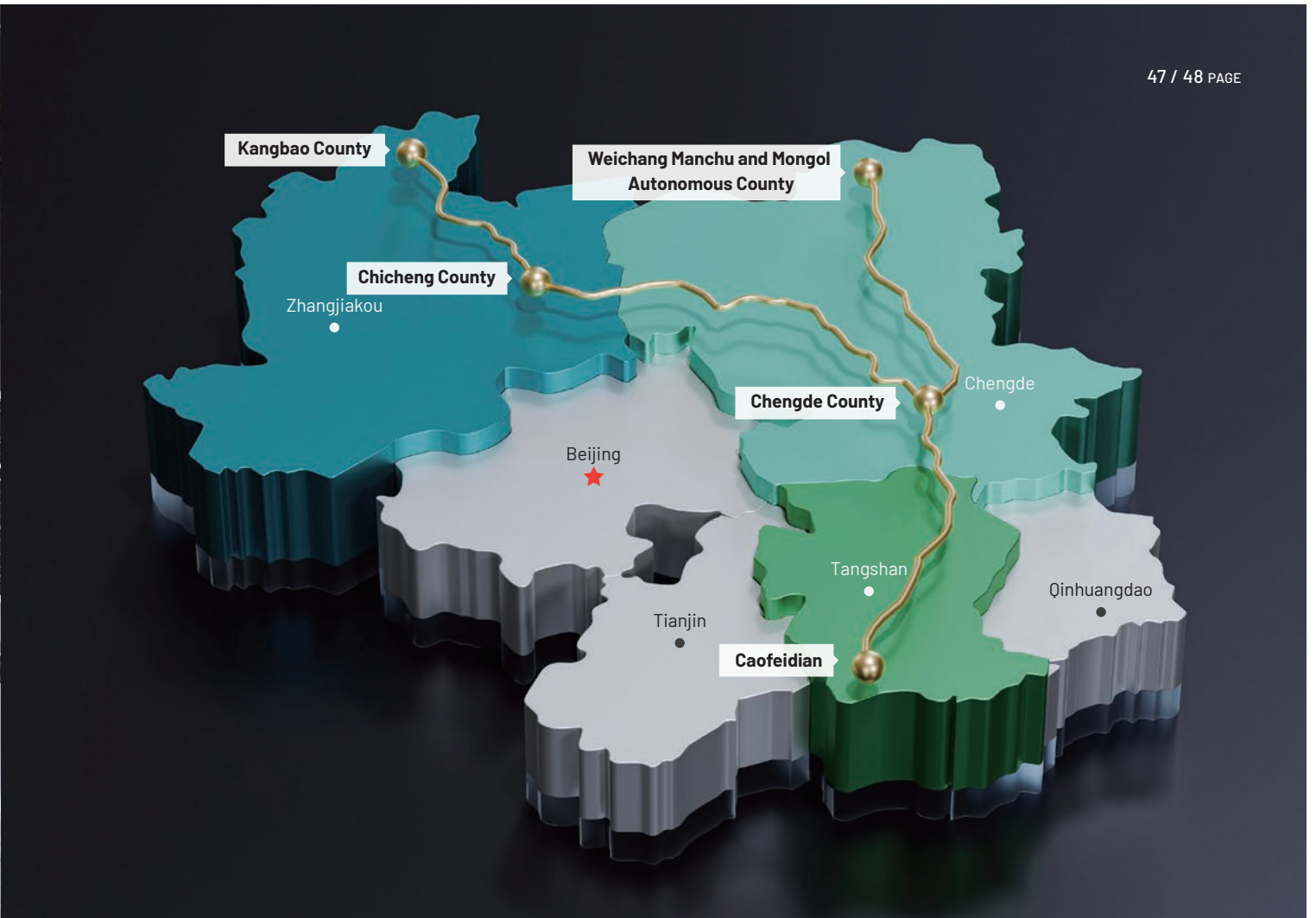
Urban resources

Promote faster implementation of business

1. Vehicle channel resources
2. Local agent service provider resources
3. Site/key customer resources
4. Property resources at point locations of battery swapping cabinet

HYDROGEN ENERGY

Hydrogen production · hydrogen use · hydrogen transportation



BUSINESS OVERVIEW

Conduct in-depth research and exploration on the implementation of long-distance hydrogen pipeline projects, collaborate with multiple safety and economic professional institutions, and promote breakthrough implementation of the projects. Focusing on the needs of hydrogen energy scenarios, we provide complete green hydrogen energy solutions for wind power, photovoltaic hydrogen production, chemical, metallurgical, transportation and other fields.



INTRODUCTION TO HAITAI KANGBAO (ZHANGJIAKOU)-CAOFEIDIAN (TANGSHAN) LONG-DISTANCE HYDROGEN PIPELINE PROJECT

The starting point of the mainline project pipeline is located at Kangbao Station next to Kangbao Hydrogen Plant in Zhangjiakou City, and the end point is located at Caofeidian Station in Tangshan City. The full throughput is equivalent to 4.81 million tons of standard coal, which can reduce carbon dioxide emissions by 9.16 million tons.

Transmitted medium	High-purity hydrogen
Outer diameter of steel pipe	813mm
Design transmission pressure	7.2MPa
Design transmission temperature	0~40℃
Extreme ambient temperature	-24.6℃/39.2℃
Total line length	1037.82km

Total line length
1037.82km

Equivalent to saving standard coal
4.81million tons

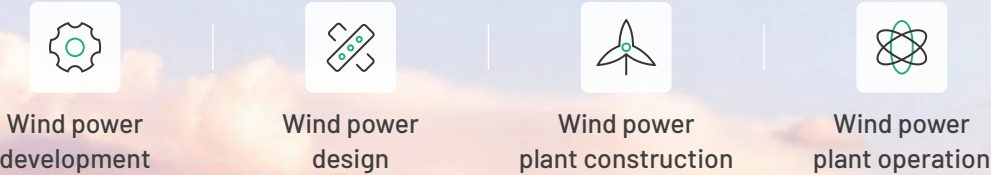
Equivalent to reducing carbon dioxide emissions
9.16million tons

WIND ENERGY

Haitai Solar's professional platform for wind power investment

BUSINESS OVERVIEW

Haitai Solar entered the wind energy sector in 2022, and Haitai Wind Energy carries the strategic mission of expanding the Group's wind power business. Relying on Haitai Solar's strong manufacturing background and strong economic strength, as well as years of new energy equipment manufacturing and service practice such as PV modules, Haitai Wind Energy is committed to building a professional platform in the field of wind power investment of Haitai Solar, aiming to create a new profit growth center for Haitai Solar.



WIND POWER PROJECTS DEVELOPED

Sijiaoshan Wind Power Project Phase I and II in Yutian County

180_{MW}

Yutian County Southern Wind Power Project Phase I and II

350_{MW}

Qinhuangdao Haigang District Central-ized Wind Power Project

200_{MW}

Xinghe Self-generated and Consumed Distributed Wind Power Generation Project

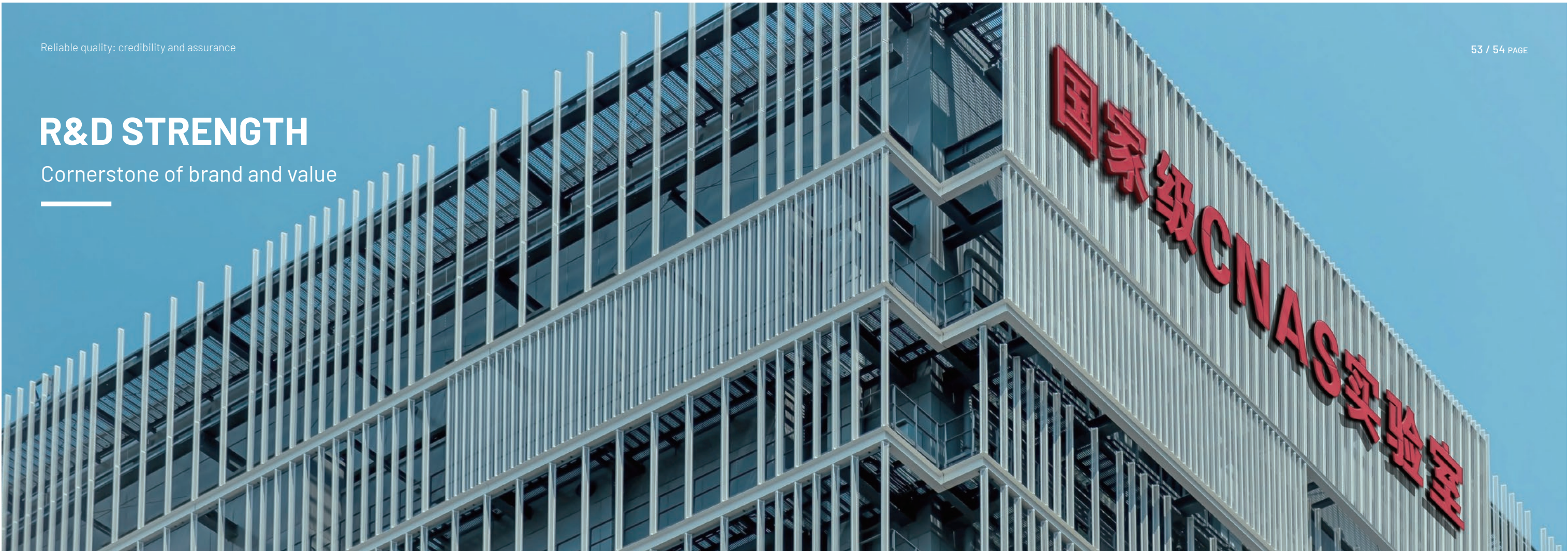
40_{MW}

03

RELIABLE QUALITY:
CREDIBILITY AND ASSURANCE

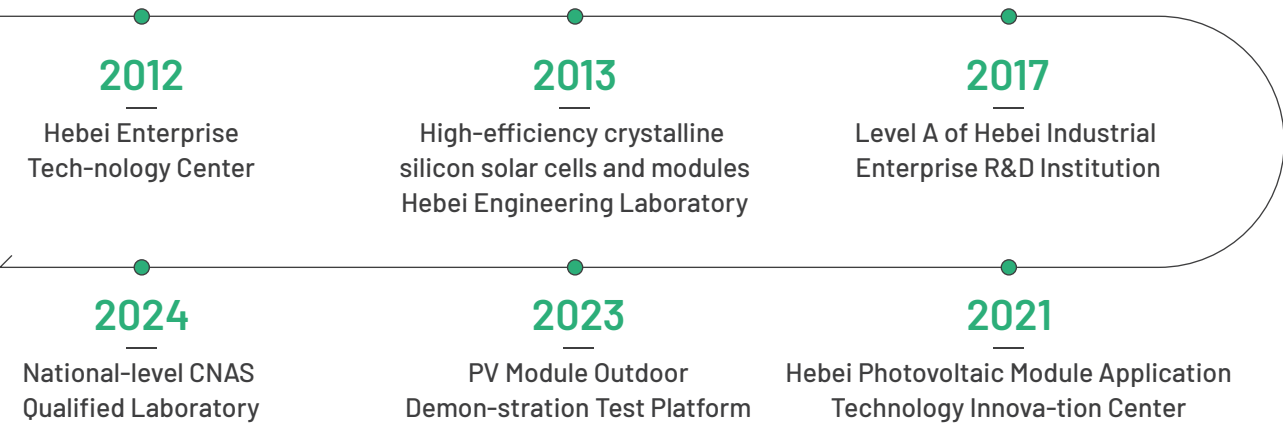
R&D STRENGTH

Cornerstone of brand and value



Haitai Solar is committed to advancing the reform of the energy structure and places great emphasis on independent innovation capabilities. It has established national-level CNAS laboratories, provincial engineering laboratories, enterprise technology centers, technology innovation centers, and outdoor practice bases. The Company actively engages in joint research and development with research institutions and major universities. Currently, it has established long-term scientific research partnerships with institutions like Tsinghua University, Shanghai Jiao Tong University, and the Chinese Academy of Sciences.

R&D PLATFORMS



CNAS QUALIFIED LABORATORY

Haitai Solar's Photovoltaic Test Center has been recognized as a national-level CNAS laboratory, equipped with advanced experimental and testing facilities. It is capable of conducting various critical performance tests such as UV, salt spray, dynamic load, static load, hail impact, and electrical performance testing. The center provides testing services according to ISO/IEC 17025 standards, offering test reports that are recognized both nationally and internationally. Upholding high CNAS standards, the center continuously enhances its testing capabilities, expands its scope, and provides customers with more reliable products and higher-quality services.

PRACTICE BASE

Haitai Solar's "PV Module Outdoor Demonstration Test Platform" is developed based on the key R&D program of Hebei Province-new PV cell and module performance testing and outdoor demonstration key technology research and development project, focusing on the key issues in the construction of public platform for performance testing and demonstration test of new crystalline silicon PV modules. It has the ability to analyze the impact of environmental parameters on energy efficiency test of PV modules and real-time monitoring of outdoor power generation and IV data of modules.

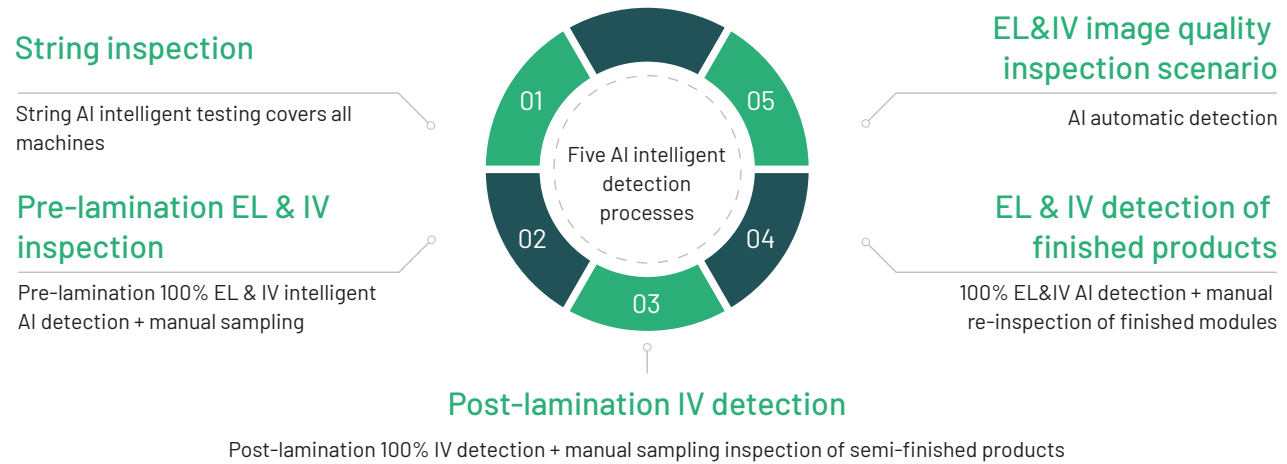


LEAN PRODUCTION

Quality builds value

PV MODULES

Haitai Solar has entered the stage of digital transformation, implementing multi-scenario AI intelligent testing projects (such as string inspection, pre-lamination EL inspection, post-lamination IV detection, finished product EL&IV detection, etc.), achieving full automation of quality inspection, defect type statistics, multidimensional quality management analysis, and other functions. This significantly enhances the efficiency and quality of inspections, meets customer requirements, and helps maximize customer profits.



ENERGY STORAGE

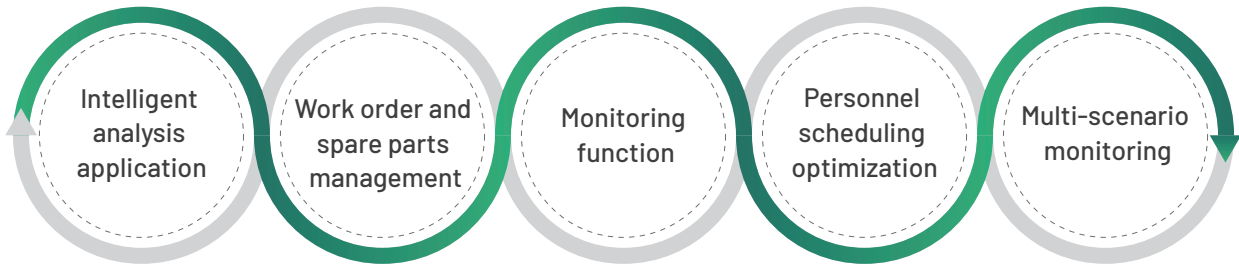


INTELLIGENT O&M

Quality builds value

PV POWER STATIONS

The O&M of PV power station covers many aspects such as intelligent analysis application, work order and spare parts management, monitoring function, personnel scheduling optimization and multi-scenario monitoring by realizing the whole process closed-loop management.



HONORS AND QUALIFICATIONS

Value creates the brand

Certificates of Honor
300+

Various Certifications
60+

Invention Patent
20+

Utility Model Patents
200+

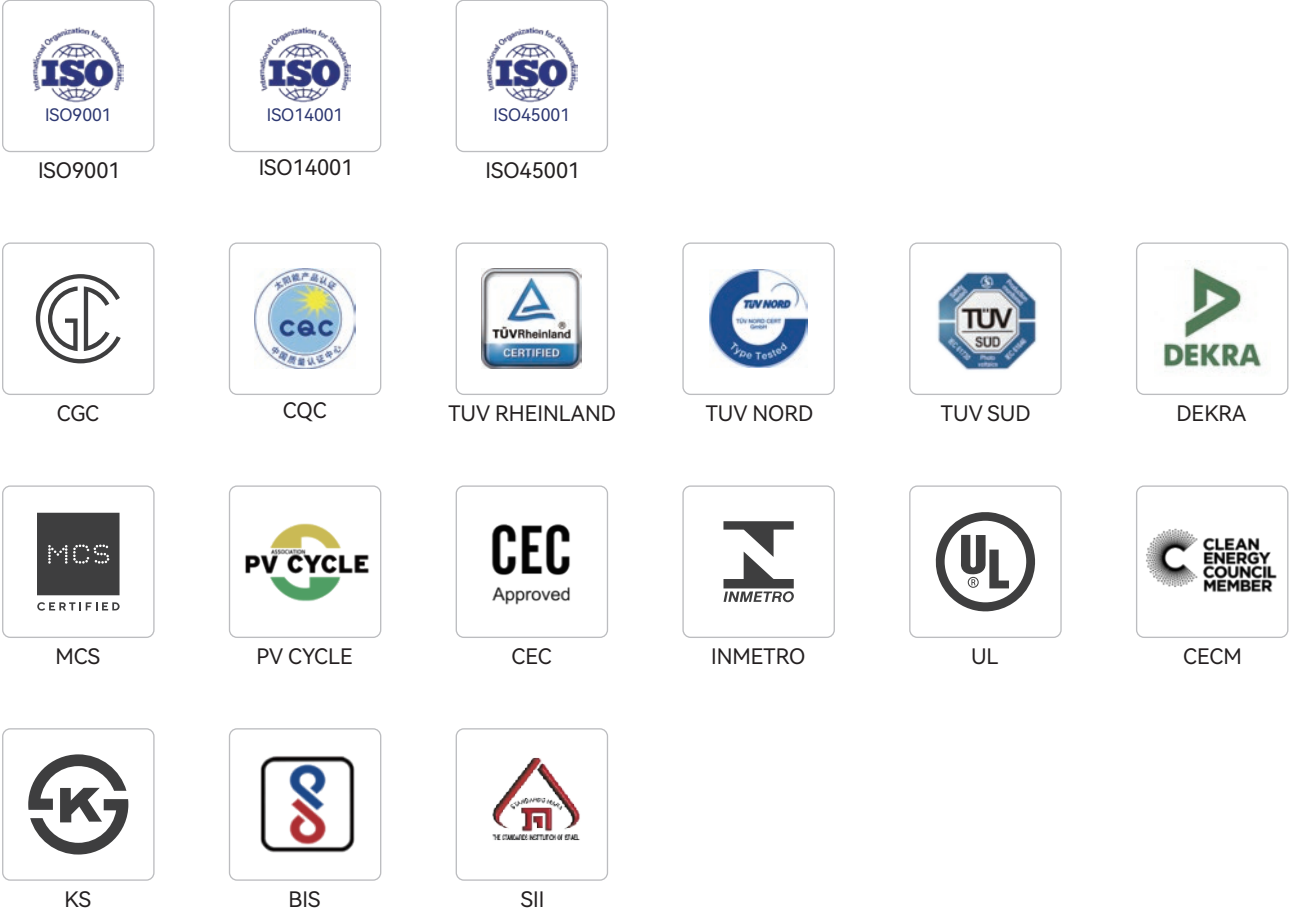
- Global Top 500 Renewable Energy Enterprises
- National High-Tech Enterprise
- High-quality residential PV module brand in China
- The Most Influential Module Enterprise in PV Industry
- National Green Factory
- Leading Photovoltaic Technology Enterprise in China
- Provincial individual champion in manufacturing industry
- Hebei Provincial Leading Enterprise in Science and Technology
- List of Enterprises that Meet Photovoltaic Standard Conditions
- The fourth batch of Intelligent PV Pilot Demonstration Enterprise
- Grade A Certificate of R&D Institution
- Green Supply Chain Management Enterprise

...



PV MODULES

It has passed the certification of ISO9001, ISO14001 and ISO45001. The whole series of products have been included in the list of enterprises that meet the Standard Conditions for Photovoltaic Manufacturing Industry by the Ministry of Industry and Information Technology. Its products have been certified by key global market standards such as TUV, CQC, UL, CSA, CEC, BIS, KS, INMETRO, SI1, and MCS.



PV MOUNTING



ENERGY STORAGE



04

SUCCESSFUL PROFILE:
GLOBAL CLASSIC CASES

GLOBAL CLASSIC CASES

Promoting global sustainable development

■ LARGE GROUND-BASED POWER PLANT PROJECTS



13MW / Spain



9.9MW / Kyoto, Japan



30MW / Netherlands



GLOBAL CLASSIC CASES

Promoting global sustainable development

■ COMMERCIAL AND INDUSTRIAL DISTRIBUTED PROJECTS







GLOBAL CLASSIC CASES

Promoting global sustainable development

RESIDENTIAL DISTRIBUTED PROJECTS



GLOBAL CLASSIC CASES

Promoting global sustainable development

■ PV MOUNTING PROJECTS



GLOBAL CLASSIC CASES

Promoting global sustainable development

ENERGY STORAGE PROJECTS



05

A GREEN FUTURE:
THE PATH TO SUSTAINABLE
DEVELOPMENT

SUSTAINABLE DEVELOPMENT STRATEGY

Environment, society, and governance



■ SCIENTIFIC GOVERNANCE

Haitai Solar adheres to the principles of scientific regulations and efficient operations, establishing a specialized corporate management system. The company's board of directors serves as the main decision-making body. In the company's daily operational management and reform development, all directors of the board fully support the work of the company's management team, promoting the compliant, sustainable, and stable development of various company operations. The Company has set up operation and management organizations such as the Investment Management Committee, Audit Committee, Compensation Committee, Safety Management Committee, Office of the Board of Directors and President's Office, with clear powers and responsibilities and smooth processes to ensure the efficient and orderly operation of the Company and effectively protect the rights and interests of shareholders, employees and customers.

■ TECHNOLOGICAL INNOVATION

Driven by innovation, Haitai Solar focuses on technological innovation and product innovation as well as technology research and development. Through industry technology exchanges and university cooperation, it has broken through the technical bottleneck of the industry. From technical theory to product design and manufacturing processes, with a core focus on user needs, Haitai Solar continuously enhances product performance and reliability, driving industry development. The Company consistently strengthens its R&D team, improves the support mechanisms for R&D personnel, and optimizes management processes from both R&D and production perspectives. This involves standardizing the design principles and standards for product development and quality control to ensure a smooth R&D process.

■ LOW CARBON AND ENVIRONMENTAL PROTECTION

The natural environment is the most valuable resource for all of humanity. Haitai Solar takes the ISO14001 environmental management system as its basic system management, actively adopts advanced energysaving and environment-friendly production technology, and creates a low-carbon, energysaving and environment-friendly green intelligent manufacturing system from the whole production cycle of products. Upholding the philosophy of mutual benefit for nature, society, customers, employees, and partners, the Company promotes the coordinated, harmonious, and sustainable development of the enterprise with the ecological and social environment.

■ PEOPLE-ORIENTED

Haitai Solar ensures that employees enjoy the rights and obligations granted by law, adhering to the principles of fairness, justice, and transparency. The Company resolutely eliminates all forms of discrimination in gender, age, ethnicity, race, religious beliefs, health status, and other factors. It guarantees full compliance with relevant national laws and regulations, as well as respect for employees' personal wishes, in all aspects such as recruitment, employment, training, promotion, and compensation. Additionally, it prohibits forced labor and the use of child labor. At the same time, the Company pays attention to protecting the rights and interests of part-time workers, temporary workers and interns under various employment conditions.

■ SOCIAL CHARITY

Haitai Solar strictly implements the central, provincial, and municipal requirements for targeted poverty alleviation and the eradication of poverty, actively participating in photovoltaic poverty alleviation projects to support their development. The Company has established a "Haitai Fund", aimed at providing assistance to special employees in unexpected situations, helping employees to overcome difficulties. Haitai Solar has donated over 1 million yuan to the community in a united effort against the pandemic. Additionally, the Company has assisted national poverty alleviation efforts by donating a total of 200,000 yuan to Linxi Town's Huangshikan Village, Jilizhuang Village, Guotun Xiaohuang Village, and the Hebei Zhongji Poverty Alleviation Foundation.

SUSTAINABLE DEVELOPMENT STRATEGY

Environment, society, and governance



CALCULATED BASED ON THE ANNUAL PRODUCTION CAPACITY OF 10GW EFFICIENT MODULES PRODUCED BY HAITAI SOLAR

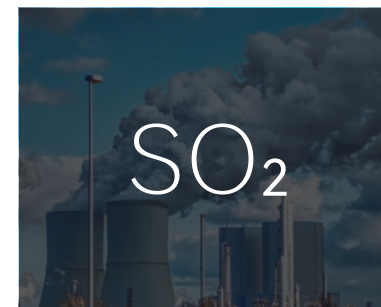


Equivalent to planting trees of about

91.05 million

Equivalent to saving stand coal by about

4,181,500 tons



Equivalent to reducing sulfur dioxide emissions by about

14 million tons

Equivalent to producing clean energy electricity of about

13.87 billion kWh



CO₂

Equivalent to reducing carbon dioxide emissions by about

91 million tons

