# 100MW component production base in Nigeria



# **I. Company Qualifications and Honors**



**Business License** 



of Hunan Province



Photovoltaic "Front-runner"



Enterprise Publicized as "Abiding by Contracts and Valuing Credit" in Hunan Province (2017)



Work Safety Permit



Awarded the Title of Famousbrand Product of Hunan Province



Won the Most Influential Award in Hunan New Energy Engineering Industry

## **Qualification Certificate**



Environmental Management System Certification Certificate



Quality Management System Certificate



**Occupational Health Management System Certificate** 





**HSE Health, Safety and Environment Management System Certification Certificate** 

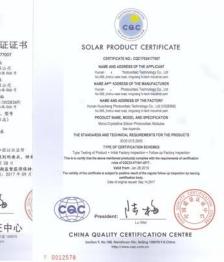


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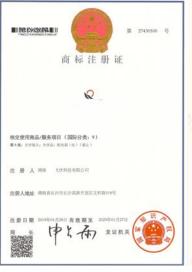
CQC Certificate

弘祖模式

# **Invention patent certificate**

























## **II. Plant Construction Scale**

The plant of this project (Nigeria Photovoltaic Module Factory) will include a production workshop and warehouses to meet the process requirements in the production of photovoltaic modules and the work needs of employees, with a building area of no less than 4,000 square meters. The main construction contents and scale are as follows:

Engineering Category	Section Name	Estimated Number of Floors	Floor Area (m²)	Building Area (m²)	Building Type
	Production Workshop	1	2,000	2,000	Light Steel / Brick - Concrete
Main Production System	Finished Product Warehouse	1	1,200	1,200	Light Steel / Brick - Concrete
	Raw Material Warehouse	1	800	800	Light Steel / Brick - Concrete
	Total			4,000	

Note: The owner will carry out supporting construction to add other buildings locally according to the local construction situation.

The project construction is designed in full compliance with the construction requirements of modern enterprises. It is constructed using light steel, frame structures, and brick - concrete structures. The entire plant is equipped with skylights for daylighting and natural ventilation. The buildings of the production plant have good overall structural performance, are convenient for construction, and save costs.

## Structural Form of the Plant

- 1. The principle of the general layout is rational arrangement, land conservation, and appropriate reservation of development space. The buildings in the plant area adopt a light steel and brick concrete structure layout with smooth flow directions, and the connections of roads, water, electricity, and gas pipelines are smooth.
- 2. Install and weld the steel structure in accordance with the plant area design plan, and ensure the light transmittance of the roof to make use of natural lighting.
- 3. Requirements for the construction of the production plant:
- 3.1 Overall flatness of the plant: ±10mm. A flat ground can not only improve the overall quality of the building but also effectively reduce the later stage maintenance cost. An uneven ground may lead to problems such as damage to ground materials, equipment failures, and even affect people's safety. During the construction process, first, use professional measuring tools, such as laser levels, spirit levels, etc., to monitor the flatness of the ground in real time. Second, the materials should be evenly distributed during the construction process to avoid local over thickness or under thickness. For the discovered flatness problems, adjustments should be made in a timely manner to ensure the construction quality. Height of the plant: at least 4 meters. The height of the maintenance space is related to the height of the plant.
- 3.2 Load bearing capacity: at least 0.5T / m². Before pouring concrete, the base layer must be compacted by vibration, and a compaction test should be carried out. Concrete can be poured only after passing the test. (For areas with insufficient load bearing capacity, steel plates are used for paving and reinforcement)
- 3.3 Nigeria has a tropical savanna climate, generally high temperature and rainy. The building waterproof layer must be built on a base surface with a drainage slope. Loose materials with high water absorption are strictly prohibited under the waterproof layer of the building. During the rainy season, frequently check the sky ditch and open ditch to avoid blockage.
- 3.4 Except for special requirements, the lighting intensity, temperature, humidity, atmospheric pressure, and ventilation and emission facilities in the plant should meet the requirements of the component product plant.
- 3.5 The overall environment of the production workshop has good ventilation and remains clean.
- 3.6 The room temperature of the component testing station is 25°C ± 5°C, and it is a constant humidity workshop.

# **Supporting Facilities of the Plant**

To ensure the normal operation of the component production plant, we recommend configuring the following supporting facilities:

- 1. Power Supply System: According to the electricity and lighting needs of the production workshop and warehouse, it is recommended to equip a stable power supply system, and consider the installation of grid connected power generation and energy storage equipment to meet the needs of photovoltaic power generation.
- 2. Water Supply System: It is recommended to configure a stable and reliable water supply system and drainage system.
- 3. Gas Supply System: (Situation of air compression station, protective gas supply, etc.) Air pressure requirement: 0.6 0.8 MPa ----- One 75KW air compressor is selected for the production line.
- 4. Fire fighting System: It is recommended to configure a complete fire fighting system, including fire alarms, fire hydrants, and fire fighting equipment, etc., to ensure the safety of the plant.
- 5. Monitoring System: It is recommended that the production plant area be equipped with a monitoring and network system.
- 6. According to the planning and design requirements, the water supply and drainage design should comply with local policies and design specifications;
- 6.1 Water Supply Design: Supplied according to the local tap water pipeline network.
- 6.2 Power Supply: Incoming main power supply: three phase 380V, 50Hz, three phase 5 wire. The maximum peak value of the production line equipment is: 【750KW】, so a transformer with a total capacity of 800kVA can be selected, or a power distribution combination can be selected according to the local actual situation.



## **III. Production Line Configuration and Production Capacity**

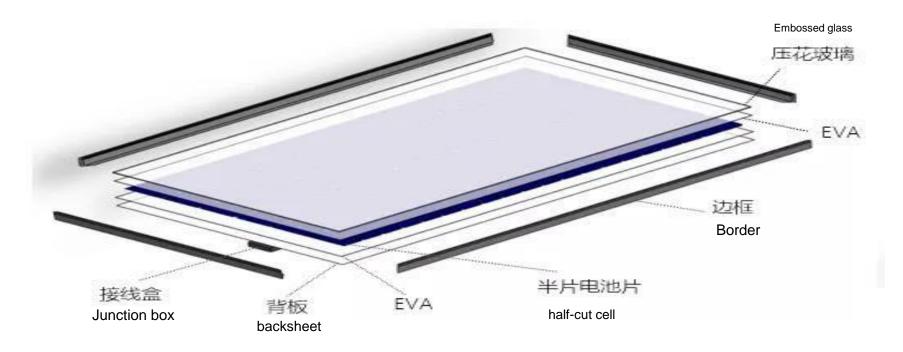
The entire production line is staffed with 36 people (including production technology management, procurement, warehouse, equipment, etc.). Based on an annual production capacity of 100MW and single - shift production capacity, calculated by the 28 - day production of conventional 182 - 580W components, the daily production capacity is 0.3MW, the monthly production capacity is

8.4MW, and the annual production capacity is 100.8MW.

Staffing for the Production of 100 - MW Components							
Process	Position	Staffing	Proce ss	Position	Staffing		
Production Management Position	Production Management	2	Pre - process Position	Sorting and Slicing	2		
	Technical Management	2		String Welding Machine	2		
	Warehouse	2		Layout, String Rework	5		
	Market Procurement	1		Pre - EL Mirror Inspection	1		
	Equipment	2		Lamination	2		
Total		9	Post - process Position	Trimming, Flipping Inspection	1		
				Framing	2		
				Gluing	1		
				Junction Box Installation	1		
				Welding and Potting	2		
				Cleaning	4		
				IV/EL Testing	2		
				Cutting Inspection	2		
				Total	27		

## IV. Composition of Component Raw Materials

The main material composition of solar cell components: (Eight major raw and auxiliary materials) Backsheet, EVA, welding strip, cell, glass, silicone, aluminum profile, junction box. Benchmarking against first - tier brands



Schematic Diagram of Photovoltaic Module Structure

## Raw and Auxiliary Materials Required for Component Production

## BOM (Bill of Materials) for Components

Material Name	Specification Model	Unit	Quantity to Purchase	Material Name	Specification Model
Cell	1/2 Half-cut 182	Piece		/	
Coated Glass	2272*1128*3.2	Block	01	/	
Backsheet	2278* <i>1130*</i> 0.35mm	Sheet		/	
EVA	2089* <i>1030*</i> 0.45mm	m²	02	/	
Interconnect Strip	0.38*0.17mm	KG	\multirow{12}{*}{Pur chase materials	/	\multirow{12}{*}{En sure customer
Bus Bar	0.35*6.0mm	KG	according to production plan	/	product needs according to the production
	0.35*4.0mm	KG	orders}	1	completion cycle}
Junction Box	Three-way line box with 35cm wire	Set		1	
Adhesive	400ml/Tube	Tube		1	
Flux	25L/Barrel	L		1	
Aluminum Frame	2278* <i>1134*</i> 30mm	Set		/ -	

Auxiliary materials are uniformly purchased in the market according to production plan requirements, and component delivery periods are completed as planned.

## **Composition of Component Raw Materials - Battery Cells**



**Battery Cells Classified by Screen Pattern and Color** 



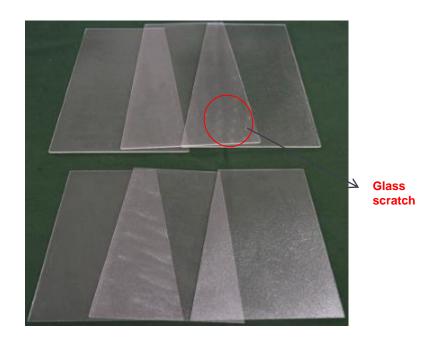
**Cutting Battery Cells into 1/2 Pieces** 

Sort battery cells of different specifications and sizes into grades according to their power and color, and cut them into half pieces.

Battery cell: A solar cell is a device that directly converts light energy into electrical energy. It is made of semiconductor materials. When irradiated by sunlight, electron - hole pairs are excited. The electrostatic field in the P - N junction barrier region is used to separate the electron - hole pairs. The separated electrons and holes



## **Composition of Component Raw Materials - Tempered Glass**



Low-iron tempered textured glass (also known as tempered glass) is used. The thickness is  $3.2\text{mm} \pm 0.2\text{mm}$ , and the tempering performance complies with the national standard: GB9963-88. Within the wavelength range (320 - 1100nm) of the spectral response of solar cells, the light transmittance reaches more than 91%, and it has a relatively high reflectivity for infrared light with a wavelength greater than 1200 nm. This glass can also withstand the radiation of solar ultraviolet rays without a decrease in light transmittance. It is used to support the structure of photovoltaic modules, enhance the load-bearing capacity and load of photovoltaic modules, and has the functions of light transmission, anti-reflective light transmission, water resistance, gas resistance, and corrosion resistance.

For tempered glass used as the packaging material of photovoltaic modules, there are relatively high requirements for the following properties:

- a). Resistance to mechanical impact strength
- b). Surface light transmittance
- c). Glass appearance



Check the impact strength of the glass. Free fall from a height of 1 meter for three times without damage

## **Composition of Component Raw Materials - EVA and Backsheet**

#### **EVA**

EVA (Ethylene-Vinyl Acetate Copolymer) is a hot-melt adhesive. It is used to encapsulate battery cells, preventing the external environment from affecting the electrical performance of the cells. It enhances the light transmittance of photovoltaic modules, bonds battery cells, tempered glass, and the backsheet together, and has a certain bonding strength. Meanwhile, it has a beneficial effect on the electrical performance output of photovoltaic battery components.

#### **Backsheet**

It serves as a back protection and encapsulation material. Commonly used types include TPT, TPE, and PET, with a polyethylene structure. It is used to enhance the aging resistance and corrosion resistance of photovoltaic modules, prolonging their service life. The white backsheet scatters the light incident inside the photovoltaic module, improving the light absorption efficiency of the module. Additionally, due to its relatively high infrared emissivity, it can also reduce the operating temperature of the photovoltaic module. At the same time, it improves the insulation performance of the photovoltaic module.



Inspect the gram weight, thickness of EVA and backsheet, and check for no mechanical damage.



## **Composition of Component Raw Materials - Aluminum Frame and Junction Box**

## **Aluminum Frame**

The aluminum frame is an aluminum alloy frame installed along the extension of the glass. It serves to protect the glass edges, enhance the sealing performance of the photovoltaic module, and improve the overall mechanical strength of the photovoltaic module, facilitating the installation and transportation of the photovoltaic module. The surface of the aluminum alloy must undergo passivation treatment - anodic oxidation, and the thickness of the surface oxide layer should be greater than 12  $\mu$ m. The frame used for encapsulation should be free from deformation and scratches on the surface. Currently, the average oxide layer treatment thickness of aluminum frames by component manufacturers is 15  $\mu$ m  $\pm$  2  $\mu$ m.

## **Junction Box**

It is an electrical connection device for photovoltaic modules. It functions to seal and waterproof the outgoing wires of the photovoltaic module, protecting the safety of the photovoltaic module system during operation. The protection class is IP85. The external wires of the junction box use standard insulated copper wires to meet the requirements of current - carrying capacity, voltage loss, and wire strength. The diode prevents the "hot - spot effect". The technical parameters are: maximum reverse peak voltage of 1500V, and maximum forward current of 15A - 25A.





Weight measurement and wall thickness inspection of the frame



Three - part junction box



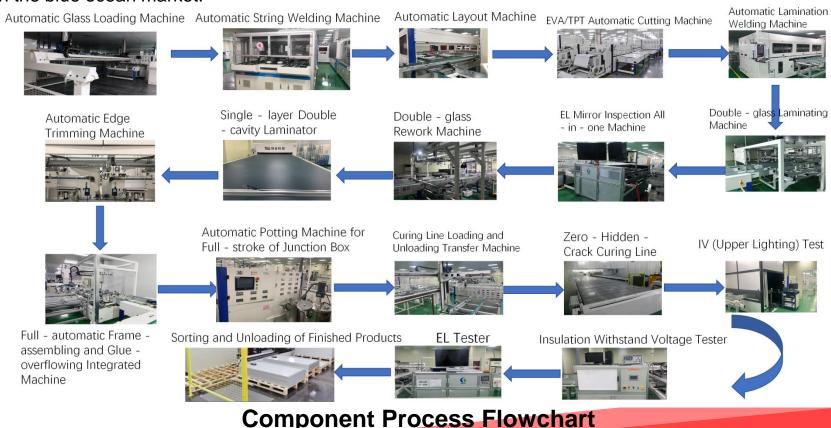
# **Equipment Production Process Flow**

## **Equipment Configuration List**

Equipment Configuration List for 100MW Component Production						
Serial Number	Name	Quantity	Unit	Remarks		
1	Scribing Machine	1	Set			
2	String Welding Machine	2	Sets			
3	Bus Bar Welding Machine	1	Set			
4	Laminator	2	Sets	Single - layer double - cavity laminator		
5	Layout Machine	1	Set			
6	Cutting Machine	2	Sets			
7	EL Integrated Machine	3	Sets			
8	Manual Edge Trimming Station	1	Set			
9	Appearance Flip Inspection Machine	1	Set			
10	Frame Gluing Machine	1	Set			
11	Framing Machine	1	Set			
12	A - B Potting Machine	1	Set			
13	Curing Line	1	Set	Robot automatic loading and unloading		
14	180 - degree Flip Station	2	Sets			
15	IV Tester	1	Set			
16	Stacker	2	Sets			
17	Assembly Line	1	Strip			
	Air Compressor (Peripheral Equipment)	1	Set			
	Dryer (Peripheral Equipment)	1	Set			
	Cooling System (Peripheral Equipment)	1	Set			
	Plant Power Distribution System (Peripheral Equipment)	1	Set	Secondary power distribution is the owner's responsibility		
Other	Construction Cost	4000	m²	Determined according to local civil construction actual costs		

## **Production Process Flow**

This project selects high-efficiency automated production equipment and mainly focuses on N-type TOPCon high-efficiency solar cells as the flagship product. This product has advantages such as great potential for efficiency improvement, a high domestic production rate of equipment, low attenuation, and a high bifacial rate, and is a mainstream product conforming to the market development trend. As an emerging field in the photovoltaic industry, the current concentration of the TOPCon high-efficiency module industry is relatively low. It requires developers to have a sufficient understanding of photovoltaic product manufacturing and building structures. At present, the partner already has years of project implementation experience in relevant fields. This cooperation with them is more conducive to achieving rapid layout in the field of TOPCon high-efficiency modules and seizing the first opportunity in the blue ocean market.



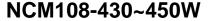
## V. Technical Specifications of Component Products and After-sales Service





NCM72-280~320W

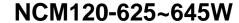
Component dimensions: 172576530mm



Component dimensions: 1725 113430mm

NCM144-570~590W

Component dimensions: 2278 113430mm



Component dimensions: 2172\*1303\*35mm

NCM132-690 ~ 710W

Component dimensions: 2384\*1303\*30mm











## **Advanced Production Technology**

Adopts optimized MBB design Cell efficiency > 23.0%

## **Excellent Quality Control**

Fully automated production line, 100% of products undergo three EL and appearance inspections MES and ERP information-based logistics and information management

# Outstanding Power Generation Performance

0~+5W positive power tolerance Low attenuation rate and excellent weak light performance increase additional power output

#### **Stable Mechanical Performance**

Passes rigorous hail tests
Can withstand wind pressure of
2400Pa and snow pressure of
5400Pa

## **Long-term Weather Resistance**

Excellent resistance to potentialinduced degradation (PID) Obtained fire protection certification to ensure safety during component use

## Component Product Introduction







Size 尺寸: 2384\*1303\*35mm



## Component Parameter table

Component Name	Component Power (W)	Specification (mm)	Weight (kg)		Peak Current (Imp) (A)	Open - Circuit Voltage	Short - Circuit Current (A)	40 - inch Cabinet Packing
	(W)	(mm)	(kg)	Vmp(V)	Imp(A)	Voc (V)	Isc(A)	(Pcs)
72 half - cell monocrystall ine silicon	280W		15. 5	23. 70V	11.82A	24. 22V	13. 97A	1260
	285W			24. 01V	11.87A	24. 56V	14. 02A	
	290W	1722*765*30m		24. 32V	11.92A	24. 90V	14. 07A	
component- 182	295W			24. 64V	11.97V	25. 30V	14. 09V	
	300W			24. 96V	12.02A	25. 69V	14. 11A	
100 b-16	430W			32. 72V	13. 15A	38. 62V	13. 90A	806
108 half - cell	435W			32. 96V	13. 21A	38.86V	13. 96A	
monocrystall ine silicon	440W	1724*1134*30m m	21	33. 20V	13. 27A	39.10V	14. 02A	
component-	445W	<b>]</b> ""		33. 44V	13. 33A	39. 34V	14. 08A	
182	450W			33. 68V	12. 39A	39. 58V	14. 14A	
144 1-16	570W	2278*1134*30m	27. 5	42. 99V	13. 26A	51.99V	13. 89A	620
144 half - cell	575W			43. 17V	13. 32A	52. 15V	13. 95A	
monocrystall ine silicon	580W			43.35V	13. 38A	52. 31V	14. 01A	
component- 182	585W			43. 53V	13. 44A	52. 47V	14. 07A	
182	590W			43. 71V	13.50A	52. 63V	14. 13A	
120 half -	625W	2172*1303*35m m	34. 5	39. 90V	17. 41A	43.10V	18. 36A	682
cell	630W			36. 10V	17. 46A	43.30V	18. 41A	
monocrystall ine silicon	635W			36. 30V	17.50A	43.50V	18. 46A	
component-	640W			36. 50V	17.54A	43.70V	18. 51A	
210	645W			36. 70V	17. 58A	43.90V	18. 58A	
132 <b>half</b> -	690W	2384*1303*30m m	38. 4	39. 15V	17.63A	46.87V	18. 45A	620
cell	695W			39. 32V	17.68A	47. 04V	18. 50A	
monocrystall ine silicon	700W			39. 49V	17. 73A	47. 21V	18. 55A	
component-	705W			39.66V	17. 78A	47. 40V	18. 60A	
410	710W			39. 83V	17.83A	47. 59V	18. 65A	

## **Training and After-sales Service**

Under normal application, installation, use, and operation conditions, there will be no defects in materials and processes. Regarding the power and electrical performance characteristics of solar photovoltaic modules, if the output power of any module under standard test conditions is lower than 90% of that stated in the product specification sheet provided by the company, the option to compensate for the power loss by providing additional modules to the customer or to replace the defective module is available.

- 1. Limited Product Quality Guarantee
- 2. Limited Peak Power Quality Guarantee
- 3. Exclusions and Limitations
- 4. Remote Video Guidance

The product is accompanied by a product qualification certificate and a product warranty card.

The company has high-quality products, a team of professional engineering designers, experienced on-site installation engineers, and first-class maintenance personnel. We provide customers with prompt problem-solving solutions.

#### **Warranty Service Commitments**

1. If there are product quality issues with the modules during the warranty period, our company provides a three-guarantee service of return, replacement, and repair.

2. After the warranty period, our company will continue to provide technical support for the use of the goods, including fault removal and supply of parts, and will charge fees at a reasonable price.

## **Equipment Warranty Terms**

The warranty terms for component production equipment are usually formulated around three core elements: warranty period, coverage scope, and liability exclusion, aiming to clarify the rights and obligations of the manufacturer and the user.

- 1. Warranty Period: The mainstream period is 1 3 years, usually calculated from the date when the equipment is accepted as qualified or the date when installation and commissioning are completed. It only covers quality defects (such as component failures, performance non compliance) that occur under normal use and compliant operation of the equipment. The manufacturer usually provides free repair and replacement of components services.
- **2. Liability Exclusion**: The following situations are not within the warranty scope:
  - Damage caused by human operation errors, violent use, or unauthorized disassembly and modification of the equipment;
  - Damage caused by force majeure (such as earthquakes, floods) or environmental factors (such as unstable voltage, excessive dust);
  - Normal wear and tear of consumable components (such as filters, conveyor belts);
- **3.Warranty Vouchers**: Documents such as the purchase contract, invoice, and equipment acceptance form need to be provided to enjoy the service. Some manufacturers require equipment information registration.
  - **.Special Agreements**: If the equipment is used for commercial production, some terms will restrict the warranty for failures caused by "abnormal continuous operation"; second hand equipment usually does not enjoy the original factory warranty.

# **Production Process of Component Manufacturing**



**String Welder**: Welds and connects battery cells in series to form cell



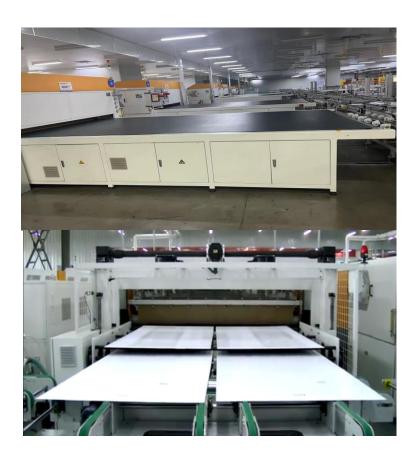
Automatic Lamination and Welding Machine: Welds cell strings using bus bars.



Layout Machine: Arranges and stringwelds battery cells on photovoltaic glass.



**EL (Electroluminescence)**: Inspects the appearance and internal quality of cell strings.



**Laminator**: Bonds battery cells with glass, EVA, and backsheet through vacuuming and high temperature.

# **Production Process of Component Manufacturing**



**Gluing and Framing**: Applies glue and assembles the frame.



**Curing Line**: Cures the silicone by maintaining constant temperature and humidity.



**IV Tester**: Tests the power and electrical performance of components.



**Final Inspection**: Reflects the internal quality of components through the screen.

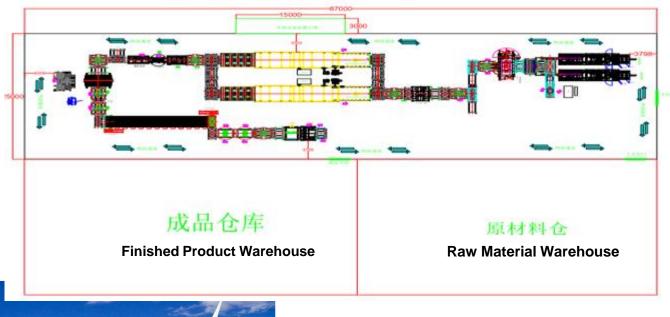


Component Finished Product Classification and Palletizing: Classifies and palletizes the finished components.

## **VI. Factory Layout Plan**

The equipment selection for this project comprehensively considers the subsequent technology development direction and technical compatibility. The entire production line is compatible with the transmission and production of single - glass and double - glass components, single - sided and double - sided components, and 182 battery products. The entire workshop has a high degree of automation, adopting MES (Manufacturing Execution System) integration technology to achieve real, reliable, and analyzable data, and realize intelligent information management of the entire factory area.

# 100MW Component Production Workshop





# **Looking Forward to In-depth Communication and Cooperation with You!**



## **Sunshine Business, Lighting Up the World**

Photovoltaic new energy is committed to the promotion, innovation and application of green and low-carbon photovoltaic energy. We are willing to work with friends from all walks of life to strive for creating a beautiful living environment for mankind!



