

N TYPE

SAME SUNSHINE MORE VALUE



Mission:

Less Consumption, More Power Generation

Core Value:

Customer First, Creation First, Cooperation First, Commitment First.

Vision:

Green Energy Cultivator

Way of Development:

Strive, Innovation, Focus



GROUP INTRODUCTION



125 GW Accumulated 125GW solar backsheet shipped

4.1 GW Accumulated 4.1GW n-type bifacial cell & module shipped

50,000 Household Power Station Provide 50,000+ householders with the green energy service

600 MW Owns total 600MW power stations and reduces carbon emissions by 450,000 tons per year

Jolywood (Suzhou) Sunwatt Co., Ltd. was established in March, 2008 and successfully became a public company in September, 2014. The stock code is SZ300393 and located in Shajiang Town, Changshu City, a beautiful water town in the south of the Yangtze River. By the end of 2020, the total asset is around 8.6 billion yuan with the annual sales of 7 billion yuan, it is the Vice chairman unit of Jiangsu Photovoltaic Industry Association. Awarded as the Jiangsu Provincial Thin Film Engineering Technology Research Center and Jiangsu Provincial High-efficiency Photovoltaic Engineering Technology Research Center, Jiangsu Enterprise Technology Center, Jiangsu Smart Factory, Jiangsu Photovoltaic Engineering Center, National Green Factory, National CNAS Certification Laboratory, TÜV North Germany Witnessing laboratory and key high-tech enterprise of the National Torch Program. The company passed the national knowledge Intellectual property standard implementation certification, 157 authorized patents, including 51 invention patents and 8 PCT patents.

In line with the corporate mission of "less consumption, more power generation", Jolywood has practiced the corporate development approach of "Strive, Innovation and focus" and deeply cultivated the photovoltaic industry. The subsidiaries are "Jolywood (Suzhou) Sunwatt Co., Ltd.", "Jolywood (Taizhou) Solar Technology Co., Ltd.", "Jolywood Minsheng Energy Co., Ltd." and "Jolywood (Shanghai) New Energy Co., Ltd." The four companies, respectively engaged in photovoltaic major businesses include advanced backsheet materials, N-type bifacial monocrystalline high-efficiency cells and modules, residential new energy integration services, and integrated smart energy projects. Among them, the company Jolywood (Suzhou) Sunwatt Co., Ltd. is the world's leading backsheet manufacturer and the world's first class backsheet brand. The company has an annual production capacity of 150 million square meters and can supply backsheet of 40GW of modules. By 2020, the backsheet material has supported 125GW power plants. Jolywood (Taizhou) Solar Technology Co., Ltd. has an N-type TOPCon cell and module production capacity of 6.6GW, is a leader in the N-type bifacial solar cell technology.

SUBSIDIARY CORPORATION INTRODUCTION

Jolywood (Suzhou) Sunwatt Co., Ltd.



The world's leading manufacturer of solar backsheet

Focusing on advanced photovoltaic materials, Jolywood is one of the largest manufacturers for solar backsheet. With annual manufacturing capacity of 200 millions sqm, which equal to 40GW solar modules, Jolywood keeps long term strategic partnership with DuPont, Daikin and other top world-class companies. Till end of 2020, Jolywood has supplied solar backsheet to more than 125GW solar modules, its key product FFC bifacial coating backsheet sold more than 350 millions sqm. Zero quality complain during 13 years outdoor test, Jolywood now becomes one of the most reliable solar backsheet brands.

Jolywood (Taizhou) Solar Technology Co., Ltd.



The leader in N-type bifacial solar cell technology

Jolywood (Taizhou) Solar Technology Co., Ltd., the leader in the industrialization of N-type bifacial photovoltaic cells, is the first domestic and largest professional enterprise engaged in the research and development, manufacturing and sales of high-efficiency N-type TOPCon bifacial photovoltaic cells in the world.

Jolywood Minsheng Energy Co., Ltd.



The No.1 largest Chinese domestic green energy B2C service provider

Devote itself to integrator of domestic residential renewable energy system, build the service platform rooted with smart internet business model. Specialise in the development, design, construction and maintenance of residential solar system etc. Based on the low risk business model, Jolywood has become the major player in residential solar market. Providing its service to millions customers with multiple business model and strong relationship with supply chain partners.

Jolywood (Shanghai) New Energy Co., Ltd.



EPC service provider integrating global sales, operation and maintenance

Committed to the industry innovation and development of new energy plus, integrating photovoltaic power stations with ecological agriculture, transportation, tourism, construction, etc. Through the innovative integration of technology and business models to create a green complex, the company has established Strategic partnership with Xinli Energy, a subsidiary of CITIC Group and looking forward to cooperating with relevant domestic companies to expand business scale.

GROUP INTRODUCTION

— 2008

Jolywood (Suzhou) Sunwatt Co., Ltd. was established

— 2009

Rewarded as the high-tech enterprise and listed in the science and technology support plan of Jiangsu Province

— 2010

Rewarded as the key high-tech enterprise of the National Torch Plan

— 2011

Changed its name to Jolywood (Suzhou) Sunwatt Co., Ltd. and was identified as an innovative enterprise in Jiangsu Province

— 2012

Cooperated with ECN from the Netherlands on research and development of new backsheets and solar cell technology
Product FFC-JW30 certificated by TÜV Rheinland of Germany

— 2013

Product FFC-JW30 got JET certification of Japan
Jolywood solar thin film material laboratory passed the TÜV Nord certification
Jolywood solar thin film material laboratory passed the CNAS on-site review

— 2014

Public listed on Shenzhen Stock Exchange, stock code: SZ300393
FFC-JW30 passed CQC certification, the only one 4A grade in China

— 2015

Acquired the Italian company Filmcutter
Established Jolywood Minsheng Energy Co., Ltd., dedicated to integrated services in the field of distribution and integrated service platform of home Internet.
Established Jolywood (Shanghai) New Energy Co., Ltd., which is mainly engaged in the development, construction, operation and maintenance of industrial and commercial and ground power stations, and expands integrated smart energy business

— 2016

Established Jolywood (Taizhou) Solar Technology Co., Ltd.
Invested and built the world's largest N-type TOPCon bifacial solar cell production line with 2.1GW capacity

— 2017

The annual output of solar back sheet exceeds 110 million square meters
Two products of N-type TOPCon bifacial solar panel have got the world's first certification from TÜV Rheinland of Germany
Efficiency of N-type IBC solar cell exceeds 23%

— 2018

Invented the first transparent backsheet product of the industry
Supported SPIC to build the world's largest N-type high-efficiency bifacial Fishery-photovoltaic complementary power station

— 2019

Developed and mass-produced N-TOPCon solar cells with the efficiency of front side up to 23.5%
Participated and built the world's largest Mono 125MW N-type bifacial power station in Oman, Middle East
Released transparent solar backsheet 2.0 products
The total quantity delivered of solar backsheet exceeds 100GW

— 2020

Launched the N-type bifacial all black solar panels targeting the high-end market
Massively produced N-type TOPCon 2.0 products and the efficiency exceeds 24%
Original organic-inorganic nano-hybrid alloy technology was applied to transparent backsheet

JOLYWOOD

JOLYWOOD (TAIZHOU) SOLAR TECHNOLOGY CO., LTD.

SUBSIDIARY OF JOLYWOOD GROUP



Jolywood (Taizhou) Solar Technology Co., Ltd. was established in 2016 as a subsidiary of Jolywood group, is located in Jiangyan Economic Development Zone, Taizhou City, Jiangsu Province. The company's registered capital is 2.33 billion Yuan and the total assets are 4.855 billion Yuan, and the company's credit Grade is A. As a leader in the industrialization of N-type bifacial solar cell technology, is the world's largest and the first Chinese enterprise to focus on TOPCon bifacial solar cells. The n- TOPCon Bifacial Cell Production Capacity is 3.6GW, n-TOPCon Bifacial Module Production Capacity 3GW, n-IBC Cell Production Capacity 150MW. It is the national high-tech enterprise, the backbone enterprise in the industry and the only enterprise in the industry that has won the double honors of "National Green Factory" and "National Green Supply Chain Management Demonstration Enterprise". Jolywood was listed at the Tier One brand by Bloomberg New Energy Finance and covered by MunichRe reinsurance.

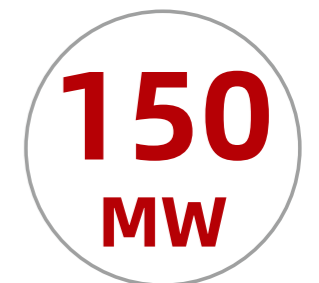
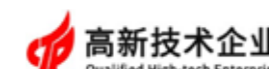
The company has established Jiangsu Province efficient photovoltaic engineering technology research center, provincial enterprise technology center, provincial intelligent factory and CNAS certified Photovoltaic Testing Center. Passed the national intellectual property certification, the company has applied for 157 patents and authorized 72 patents, including 20 invention patents. The company has completely independent intellectual property rights in terms of the technology of solar cells. The company's J-TOPCon2.0 solar cell efficiency reached 24.5%, passed Appraisal of scientific and technological achievements in Jiangsu Province. The company's Niwa series TOPCon products are characterized by its high power, high reliability, high bifacial rate, low degradation, low temperature coefficient and a series of advantages which are deeply praised by customers. Jolywood has delivered more than 4.1GW N-Type solar modules in more than 50 countries.



n-TOPCon
Bifacial Cell
Production Capacity



n-TOPCon
Bifacial Module
Production Capacity



n-IBC
Cell
Production Capacity



ENTERPRISE ADVANTAGE

Technology Accumulation and Precipitation

Jolywood has committed itself to the R&D of N-type cells and modules for years, possess good technology accumulation and technology precipitation.

R&D Investment

Supported by national, provincial and municipal-level scientific and technological projects; annual new investment in R&D investment exceeds 100 million yuan.

Core Equipment

The core equipment is independently researched and developed through independent cooperation, with external sales restrictions; currently 100% of the equipment localization rate can be achieved. The equipment investment GW TOPCon cell production line has dropped sharply, close to Perc

Core Material

Silver paste, non-silvered metal paste, etching additives and other core raw material

300+ Engineers

6 employees
hold doctor degrees

41 employees
hold master degrees

R&D team

157 Patents Applications Submitted

72 patents granted



GLOBAL COOPERATION PARTNERS

Long-term technical and commercial cooperation with world's first-class enterprises, such as Dupont, Daikin, Sharp and etc.

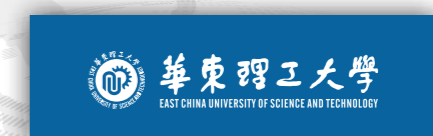
Including long-term technical cooperation with IMEC, the world's top research institution and famous domestic universities.



Signing ceremony of cooperation between Jolywood and IMEC in the field of n-type bifacial photovoltaic technology



The professor team of Nanjing University signed a contract with Jolywood for the next generation high efficiency cell research and development



The first n-type flexible PV module certified by TÜV NORD

EXCELLENT QUALITY CONTROL SYSTEM

QUALITY ASSURANCE

As a global leader in N-type bifacial high-efficiency innovative technology, Jolywood has an excellent quality control system, product and quality certification system. We have won the TÜV Rheinland "Quality in China" award for the outdoor power output of bifacial photovoltaic modules. The company has been awarded the TÜV Rheinland "Quality in China" award for the outdoor power generation of bifacial photovoltaic modules, and was awarded the first N-type flexible PV module certified by TÜV North Germany. The company was awarded the Best Photovoltaic Material Award by PV Magazine, the world's leading PV industry magazine, for two consecutive years. The PV testing centre was accredited as a CNAS accredited laboratory for its testing capabilities and management.

Jolywood's TOPCon modules have been certified by TÜV Rheinland, TÜV NORD Germany, CQC, JET, CSA and other domestic and foreign authoritative organizations.



All Quality Matters Award

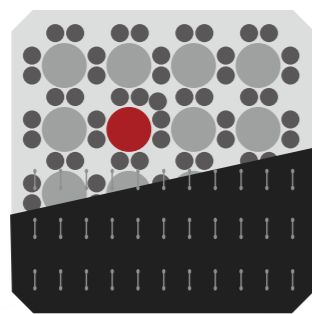


TOPCon TECHNOLOGY

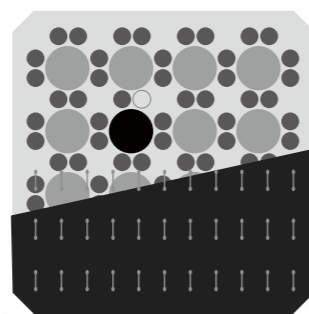
Advantages of N Type Solar Cells



● Silicon ● Electron ● Phosphorus ● Boron



N type solar cells



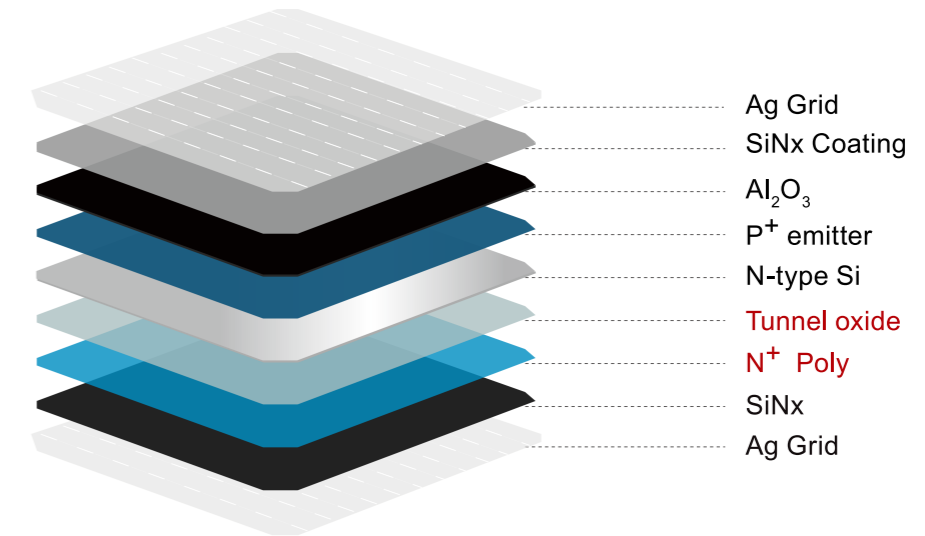
P type solar cells

Comparing with P- type solar cells, TOPCon cells have longer lifetime, lower degradation and higher potential of efficiency enhance.

Advantages of N Type Solar Cells

Passivated contact structure of J-TOPCon 2.0:

- Good interface passivation effect & field passivation effect
- Most of the carrier selective funneling effect,raip carriers transport between absorption and doped layer.



Advantages of J-TOPCon 2.0

- Higher efficiency
- Lower Temperature coefficient
- High bifaciality
- Lower degradation

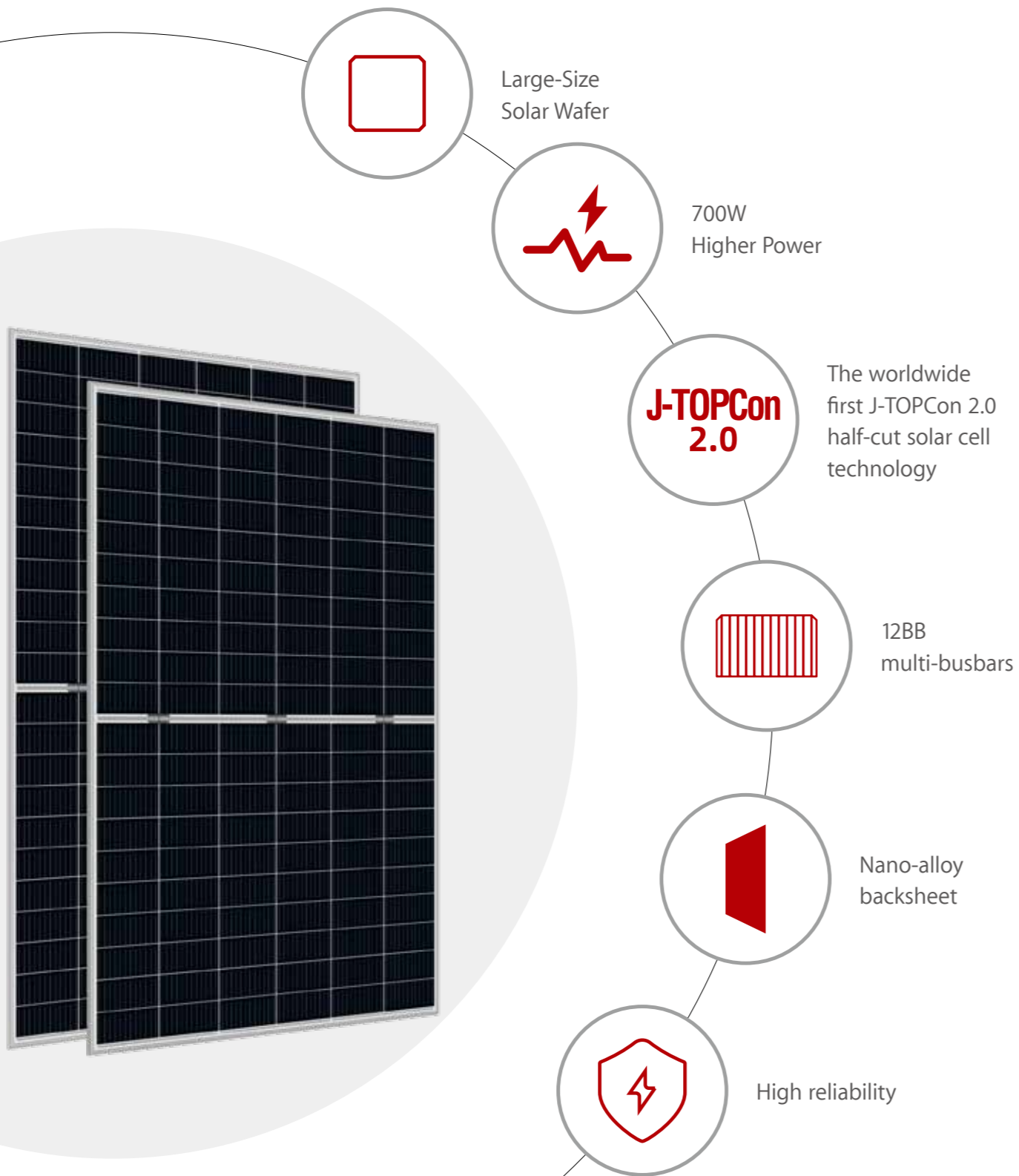
Efficiency **24.5%**

Temperature coefficient reaching **-0.32%**

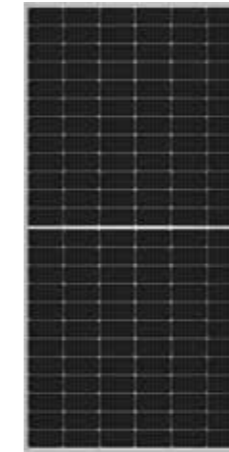
Bifacial rate reaching **85%**

Degradation in first year **1%**

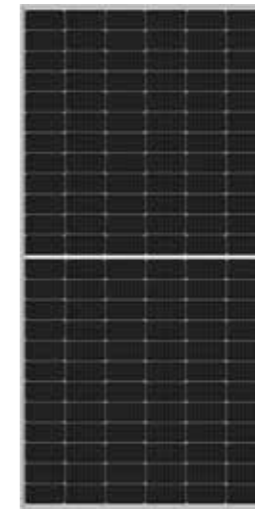
NIWA SERIES SOLAR MODULES



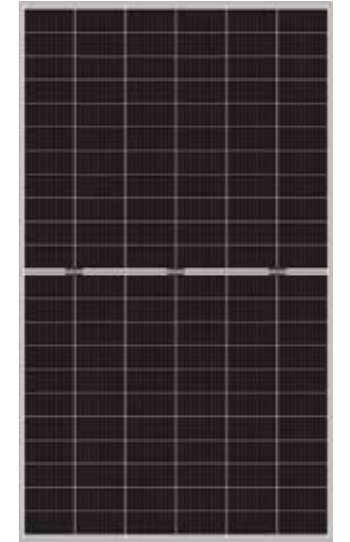
Niwa Black
HT108N-395-415



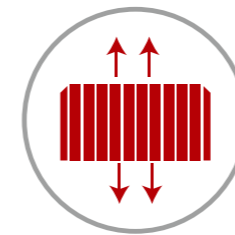
Niwa Pro
HD144N-445-470Wp



Niwa Super
HD144N-545-570Wp

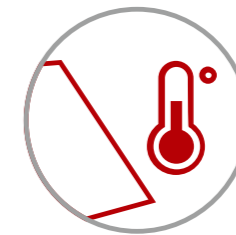


Niwa Max
HD132N-675-700Wp



Additional Power Generational Gain

At least 30-year product lifetime and bifacial design, more than 10-30% additional power gain comparing with the regular modules



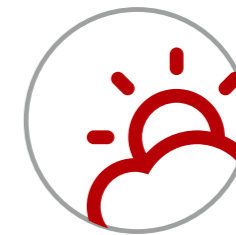
Better Temperature Coefficient

Higher power generation under working conditions adopting Passivating Contact Cell technology



ZERO LETID and LID

N-type TOPCon solar cell technology has no LID and LETID naturally, can increase power generation



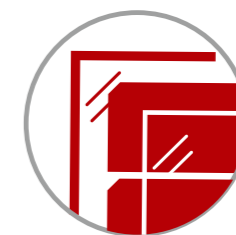
Better Weak Illumination Response

Higher power output even under low-light power generation conditions like smoggy or cloudy days comparing with the regular modules.



Low LCOE

Adopting high-power solar cell with 1500V technology to decrease the LCOE of the whole photovoltaic system to increase the ROI.



Wider Applicability

Wider application with bifacial design, like BIPV, Vertical installation, snowfield, high-humid area, windy and dusty area

8MW

Arnhem Project
in the Netherlands

37MW

The Netherlands
solar energy park

11.75MW

Zonnepark Rilland N-Type bifacial
PV plant in the Netherlands



11.5MW

Bremen port Project
in Germany

4.15MW

Donaueschingen Project
in Germany



125MW
Oman Project, 2019

320MW

United Arab
Emirates ACWA Project

125MW

Oman Project

458MW

Oman Ibri II Project



5.6MW
Starosynyavs'ky, 2019

5.6MW

Ukraine Stara Synyava
N-Type bifacial plant

4.2MW

Ukraine Fruzynvka
N-Type bifacial plant



30MW
Shanxi, China, 2017,
Quanyang Top Runner Project

30MW

Quanyang Top Runner Project

29MW

Panda Solar Project

153MW

Qinghai UHV
PV Plant Project



94.42MW

Jilin Top-Runner Project



64.64MW
Hebei, Haixing, 2019,
Top Runner Hebei Project

64.64MW

N-Type bifacial PV plant in Hebei

74.52MW

N-Type bifacial PV plant in Hebei

44MW

Poverty-relief Project in Hebei

104MW

Sihong Top Runner Project I

90MW

Guizhou N-Type bifacial
PV plant

60MW

Guangxi N-Type bifacial
PV plant

110MW

Sihong Top Runner Project II



JOLYWOD GLOBAL PROJECT FOOTPRINT

Till the end of 2020, Jolywood N-type modules
have installed 4.1GW globally



PANDA POWER STATION IN DATONG

29.2MW

Panda Power station in Datong
Datong, Shanxi, China, 2017

This project is a green energy demonstration project jointly promoted by The United Nations (UN) Development Programme (UNDP) in 2016, with an installed capacity of 50MW, covers an area of 1,234,000 square meters. On June 29, 2017, the power station was on-grid. The average annual effective power utilization hours can reach 1600 hours and the annual power generation can reach 80000000kW-h, the conversion efficiency reached 83%. Jolywood supplied 94248pcs of N-type Topcon bifacial modules, total 29.2MW.



IBRI II POWER STATION IN OMAN

458MW

ACWA Ibri II Project in Oman

Ad-Dhahirah, Oman, 2021

ACWA Oman Ibri II Power station is invested and constructed by ACWA Power. The project is located in the Ad-Dhahirah region of Oman and the total installed capacity is 575MW, wholly using N-type TOPCon bifacial modules. Jolywood supplied 458MW Bifacial module for the project. The project is the largest ground-mounted power plant in Oman. At the peak of power generation, the power station can power 33,000 homes and reduce Oman's carbon dioxide emissions by 340,000 tons per year.





TOP-RUNNER PROJECT IN SIHONG CITY (Phase I & Phase II)

214_{MW}

Sihong Top-runner Project

Sihong, Jiangsu, China, 2018, 2020

The Sihong Top-runner Base is one of the third batch of 10 photovoltaic power generation application Top-runner bases identified by the National Energy Administration. The total capacity of the Sihong Top-runner Project is 500MW. The first phase is divided into five sub-projects, the project capacity of each sub-project is 100MW. Jolywood supplied 104MW modules to China Power Investment Corporation for the Sihong project.

In June, 2019, the National Energy Administration selected three bases with the standards like on-grid on schedule, qualified after inspection, the largest reduction in electricity prices from the photovoltaic power generation benchmark price in the region where the base is located. The Sihong base was successfully selected by adding the same project scale as a reward.

The Sihong Top-runner Project adopts the complementation of fishery and light, with an annual power generation of 650 million kWh, annual tax revenue of 50 million yuan, annual fishery income of 45 million yuan, annual savings of 260000tons of standard coal, and reduction of carbon dioxide emissions by 640,000tons, the entire fishing and light complementary base has created 15,000 jobs for local residents.

VERTICAL INSTALLATION OF AGRICULTURE- COMPLEMENTARY PROJECT IN GERMANY

4.1 MW

Vertical installation of Agriculture-complementary Project in Germany

Donaueschingen-Aasen,
Baden-Württemberg, 2020

The project was developed and installed by Next2Sun in Germany and was on grid connect in 2020. Its unique vertical installation method is a patented technology and the project has received good reputation from the market. The project is Agriculture-complementary Project and it takes advantage of the bifacial modules that can generate electricity on both sides, all modules are installed at a vertical angle. The space between the mounting system can be used for agricultural planting without affecting the growth of crops and greatly improving the utilization of the land.





QINGHAI UHV PV PLANT PROJECT

153_{MW}

Qinghai UHV PV Plant Project

Qinghai, China, 2020

Qinghai UHV project starts in Hainan prefecture of Qinghai Province and ends in Zhumadian City of Henan Province, with a total investment of about 22.6 billion yuan. It was grid connected in September 2020. After the completion of the project, it is estimated that the annual power generation will reach 40 billion kwh, equivalent to replacing the use of 18 million tons of raw coal, helping to reduce emissions of 14000 tons of smoke and dust, 90000 tons of sulfur dioxide, 94,000 tons of nitrogen oxides and 29.6 million tons of carbon dioxide.



GLOBAL COOPERATION PARTNERS



* The names of enterprises are arranged in alphabetical order



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