ZNSHINESOLAR

ADVANCED TECH BOOM -
Dense busbars & Graphene-Coating

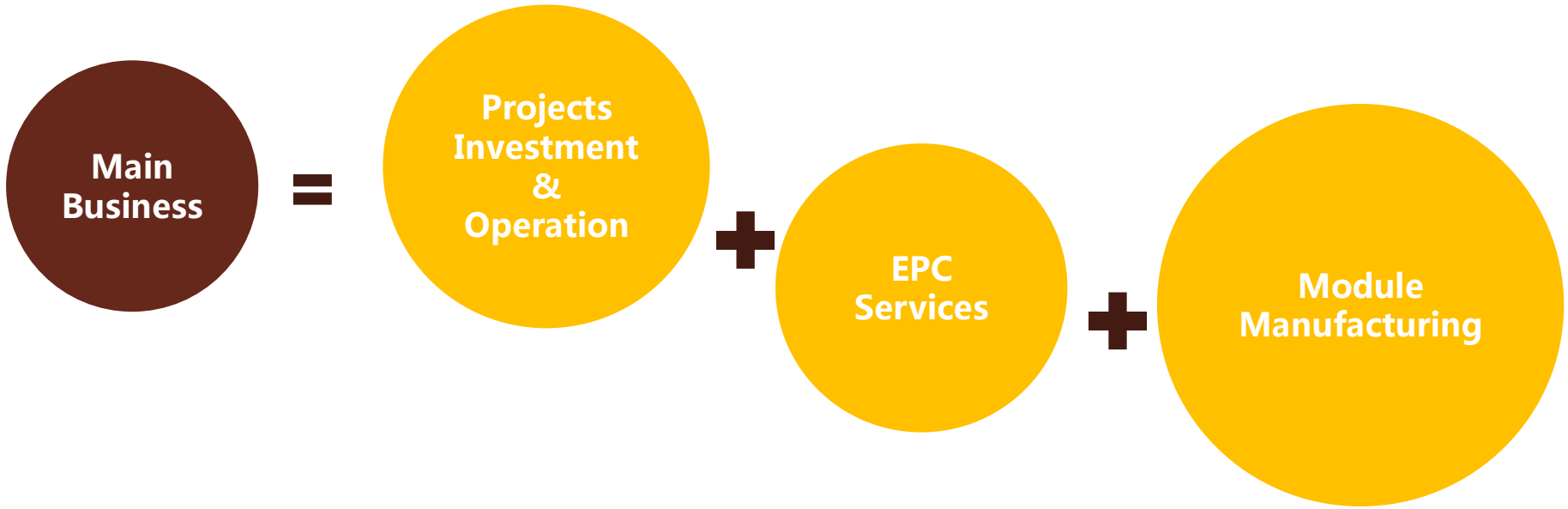
A Trustworthy Partner for Your Projects

NEEQ Code: 838463

Multiple Business Modes

Who is ZNSHINE SOLAR?

ZNSHINE SOLAR (NEEQ Code: 838463), founded in 1988, is one of the Tier 1 PV companies worldwide. It covers a wide range of business including projects investment & operation, EPC services and module manufacturing. The company owns a full-automatic production line, bringing the best value for global customers and the company itself.



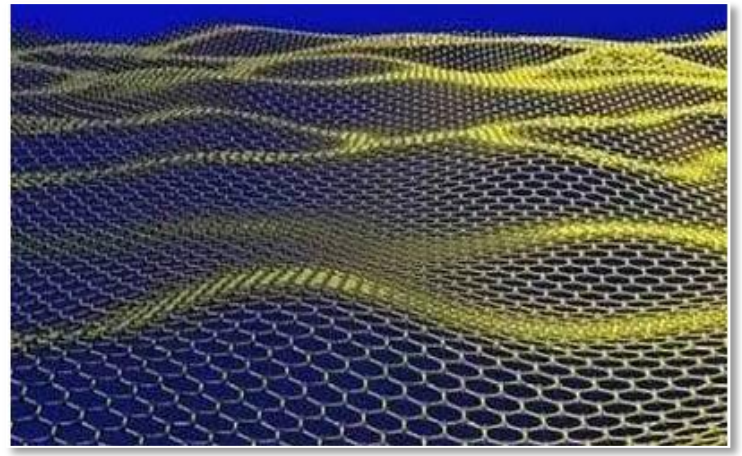
Company Overview-Nutshell

- Founded in 1988 with reaching 30-year manufacturing experience
- Roles: Module Manufacturer, EPC, IPP, Projects Operator
- 5MW/person/year
- 2GW manufacturing capacity worldwide
- 3.7GW projects pipeline worldwide

Company Overview-Global Presence

What is Graphene?

Graphene is a two-dimensional crystal that is peeled off from a graphite material and consists of carbon atoms and has only one layer of atomic thickness. It has a very excellent and unique optical, electrical, magnetic, mechanical and other physical properties and chemical properties, known as "black gold", as "the new king of materials," scientists predict graphene will "completely change the 21st century."



The Technical Advantages of Graphene Glass：

Super hydrophilic: self-cleaning, improve power generation

Photocatalyst: Degradation of organic pollution

High penetration: increase module power

Advantage 1
Super hydrophilic: self-cleaning, improve power generation

Ordinary glass' surface engenders easily static, which can absorb floating dust ,vehicle exhaust in the air. With time being ,the glass becomes smugy without doubt. In addition, when it rains,due to 30-40 degrees contact angle between glass and water , The drops of water on the glass surface come into being fastly which is not easy to slide and drop down. When sun comes out, the drops of water start to desiccate, In consequence of absorbing dust in the air dirt appears.

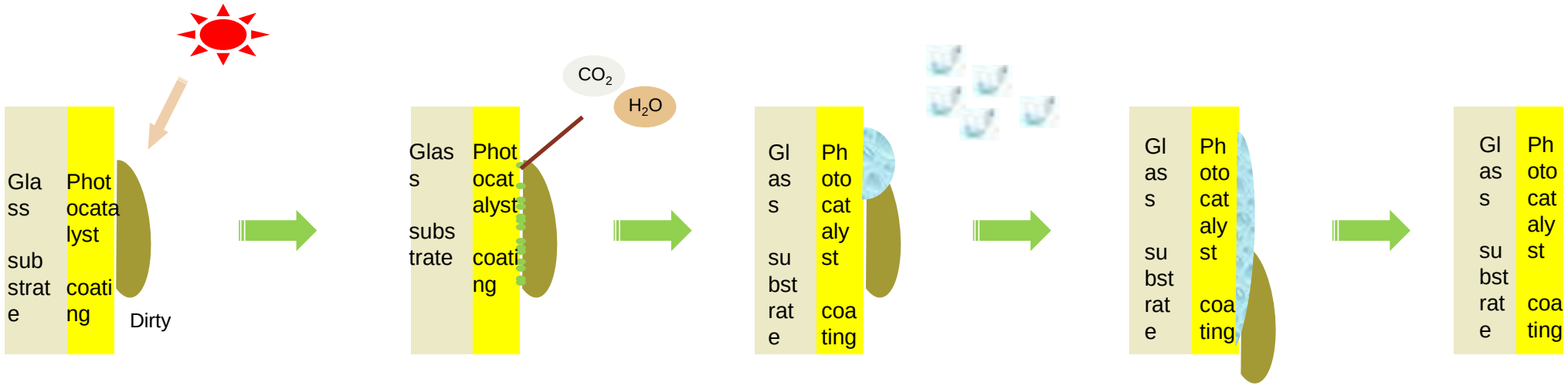
Thanks to the 3-5 degrees of contact angle between water and coated membrane on the surface of graphene coated glass water films come into being ,which seeps in through the roots of dirt ,completely cleans up and takes away dust under gravity. Therefore, after rain or water flushing need no any more manual wiping. At the same time,on the surface of the glass the static can not exist ,that reduces the adsorption of pollutants in the air, such as dust, vehicle exhaust.

Part sprayed hydrophilic self-cleaning solution

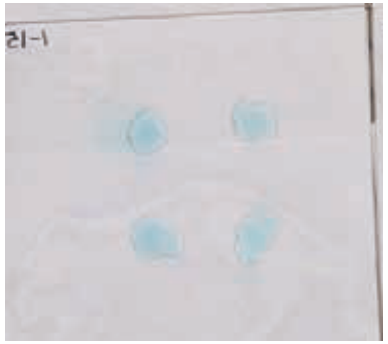
Part NOT sprayed hydrophilic self-cleaning solution

Advantage 2
Photocatalyst: Degradation of organic pollution

PHOTOCATALYST SELF-CLEANING MECHANISM:



METHYLENE BLUE SOLUTION IN PHOTOCATALYTIC DEGRADATION EFFECT :

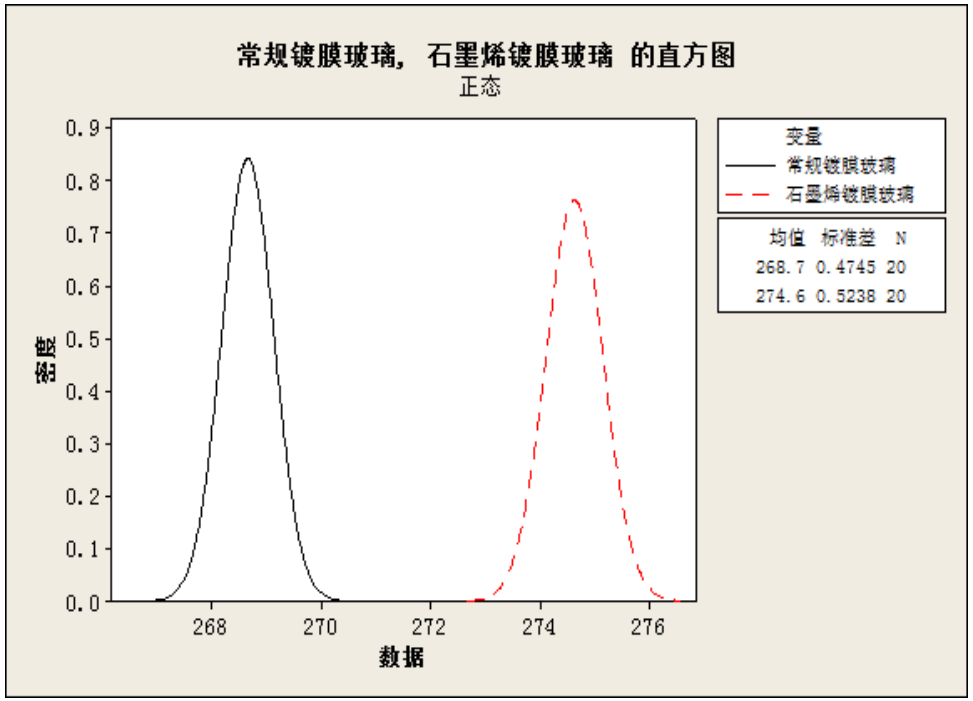


Ultraviolet radiation
500wh/m^2

Advantage 3
High penetration: increase module power

In the same process, the same material (except glass) case, the power ratio of 20 Modules, graphene-coating Module average **powered 5.97W more.**

序号	常规镀膜玻璃组件功率（W）	石墨烯镀膜玻璃组件功率(W)
1	268.44	273.88
2	268.19	274.64
3	269.25	274.56
4	269.53	274.95
5	268.66	273.97
6	268.18	274.66
7	268.46	273.92
8	268.65	274.87
9	268.36	273.94
10	268.92	274.68
11	268.34	275.79
12	269.13	274.86
13	269.02	274.79
14	268.79	274.51
15	268.75	274.79
16	269.02	273.89
17	269.24	274.95
18	268.37	275.59
19	267.46	274.78
20	268.57	274.73



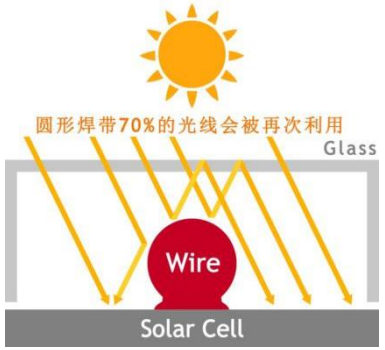
Laboratory Test Data

Technical Advantages of the 12-Busbar Module

A. Effective Shading area

Effective Shading area of 4-busbar Module: (1.2X4)/156 = 3.07%

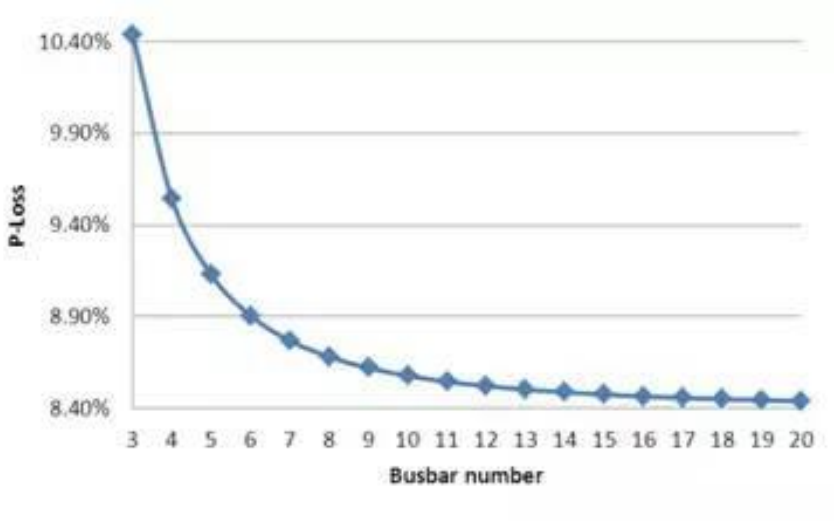
Effective Shading area of 12-busbar Module: (0.4X12)/156 X 30% = 0.92%



70% of the Sunshine will be reused by Round Tape (12-busbar module used)

Summary：12-busbar Module will reduce effective shading area by 2.15%.

B. Resistance loss



Resistance loss of 4-busbar module: around 9.6%

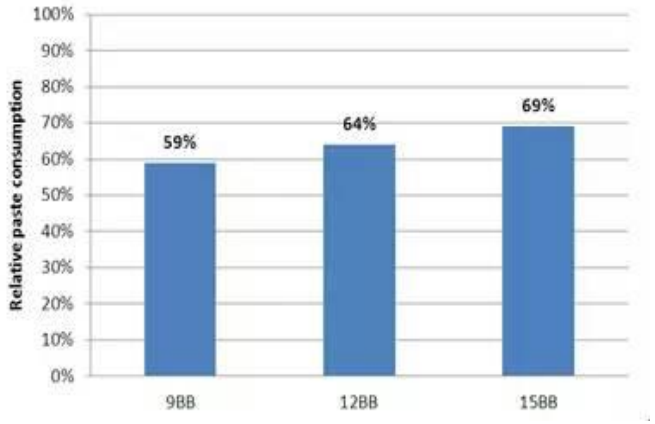
Resistance loss of 12-busbar module: around 8.5%

Summary：12-busbar Module reduced 1.1% Resistance loss in comparison with Standard(4-busbar) Module.

Technical Advantages of the 12-Busbar Module

C. relative silver paste consumption

Due to the short distance between the busbars, the busbar lines can theoretically be thinner.



The relative paste consumption of 4-busbar module: 100%

The relative paste consumption of 12-busbar module:50-64%

Summary：12-busbar module cell theoretically decreased 36-50% of paste consumption.

The effect of cell crack on module power

The current transmission path in the cell is as follows: the thin busbars collect the current generated by the cell and conduct it to the main busbars, and then lead out through busbars and junction box. The current produced by the cell is in proportion to the power generating area of the cell. In case of existing crack , parts of the current fail to transmit to the main busbars, causing short circuit of current . As a result, the output power of the cell decreases.

Technical Advantages of the 12-Busbar Module

If the 4- busbar cell has crack at the thin busbar , the distance of delivering current from one side of the broken line to the main busbars will become longer. This leads to the loss of the current and the power drops.

While the 12-busbar modules are different. Because of much shorter distances among main busbars .Even if some cracks exist., the distance of transmission current from the thin busbars to the mainbusbars is still very short , so the influence on module’ power is greatly reduced, and the module Output power becomes reliabile.

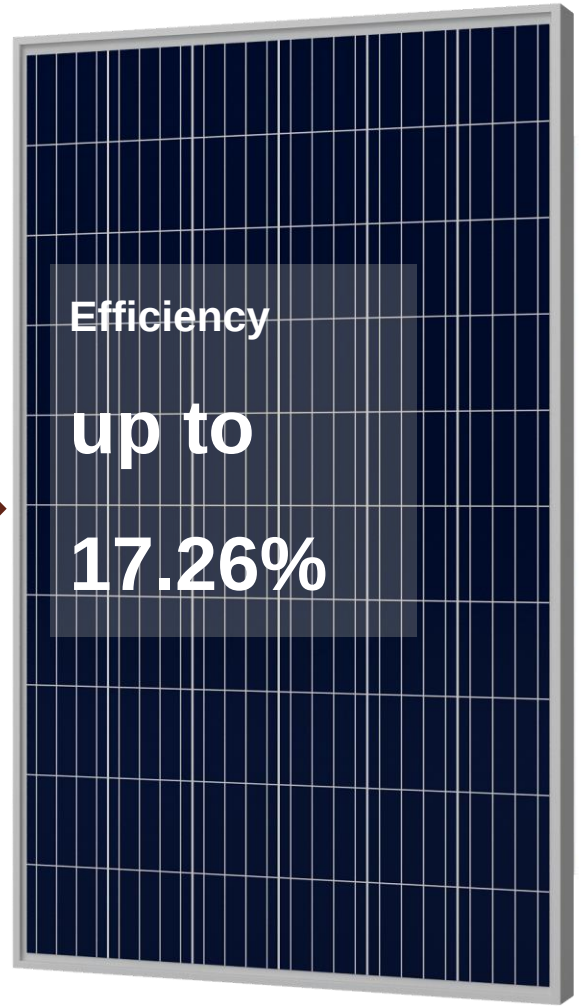
Module Type	Shading Area	Resistance loss	Silver consumption	Cracked Possibility	Performance
Standard Module(4 - Busbar)	3.07%	9.6%	100%	normal	☹
12-Busbar Module	0.92%	8.5%	50-64%	Lower	☺

Summary:
12 busbar technology **reduces costs, increased reliability and increased power,** Compared with the traditional 4-busbar or 5-busbar modules.

Highly recommended：12-busbar Module （with Graphene-coating Glass）

12-busbar cell

Graphane-coating Glass



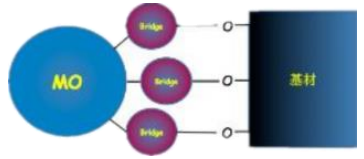
Manufacture:
12-busbar Module with Graphene-coating Glass

Technology :

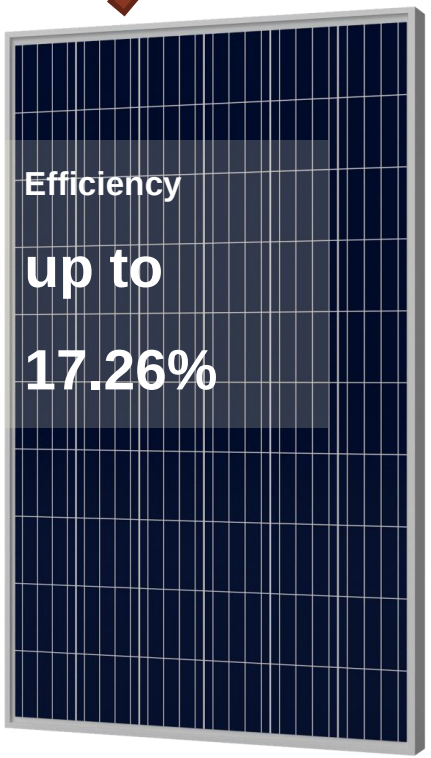
The usage of graphene coating will increase the transmission properties of the glass itself, and give its hydrophobic to the glass to achieve the effect of self-cleaning.

Features :

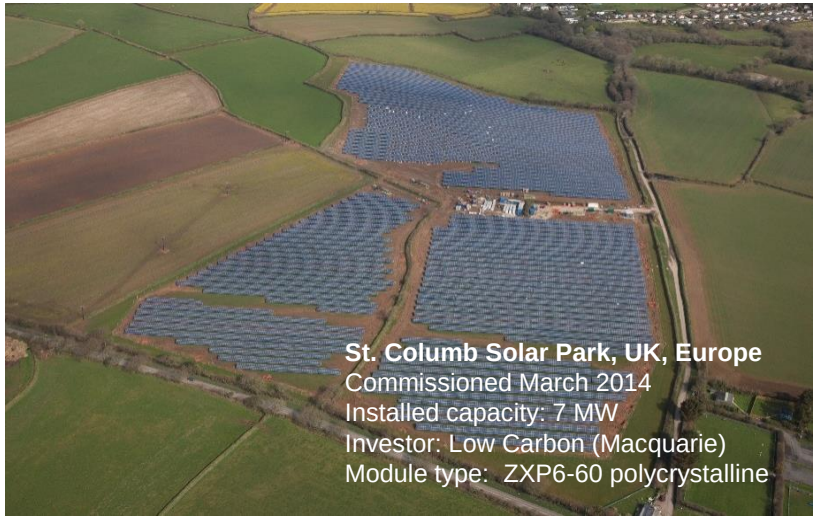
- **High efficiency** — 280w output more than 50%, to meet the super leader certification, polycrystalline module efficiency> 17% of the standard.
- **More power output** — Power output of each module can be increased by 5%
- **Longer lifetime** — Decreased vulnerability to crack, hot spot risk is small; Lower operating temperature and prolong the life span.
- **Fully compatible** — Compatible with all poly & Mono technology, such as: half-chip, double-sided, double-glass, PERC and black silicon, HIT technology,etc.



Titanium dioxide-New glass coating solution



References-Europe



St. Columb Solar Park, UK, Europe
Commissioned March 2014
Installed capacity: 7 MW
Investor: Low Carbon (Macquarie)
Module type: ZXP6-60 polycrystalline

Monroe County, New York, USA
Commissioned October 2014
Capacity: 85 kWp
Construction: Entecco
Module type: ZXP6-60 polycrystalline

Brück, Germany, Europe
Commissioned July 2014
Installed capacity: 4,2 MW
Investor: Naturstrom (GLS bank)
Module type: ZXP6-60 polycrystalline

Rudbaxton Solar Park, UK, Europe
March 2014, grid-connected
Capacity: 10.8 MW
Investor: Low Carbon
Module type: ZXP6-60 polycrystalline

References-3.7GW Projects Pipeline Worldwide

Pipeline in Japan	1.3GW
Pipeline in Europe & South America,Mexico,America	0.5GW
Pipeline in Southeast Aisa	0.6GW
Pipeline in China	1.3GW

正信光伏
ZNSHINESOLAR

正　信

Zhèng　　Xìn

Fairness;
Do the right thing

Trust;
Reliability

= Z(EN) SHINE

Thanks !

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