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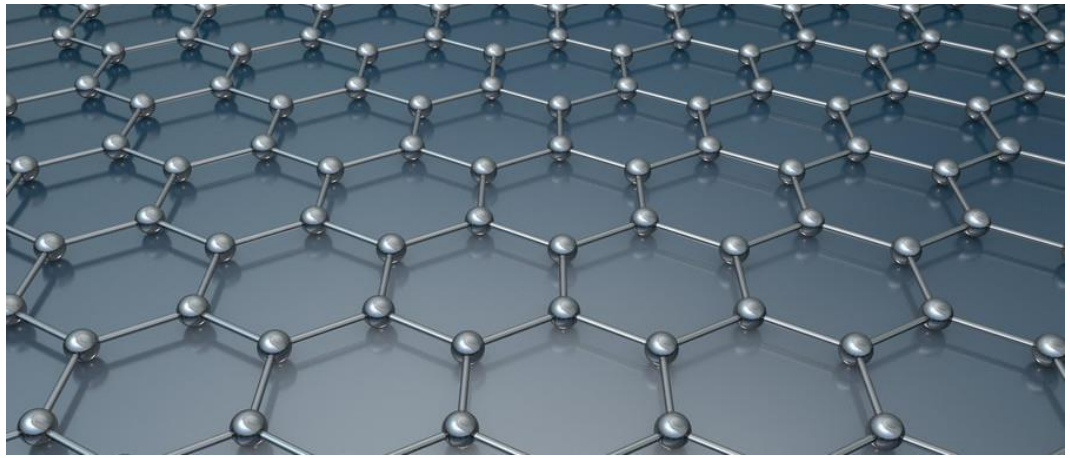
Graphene technology application

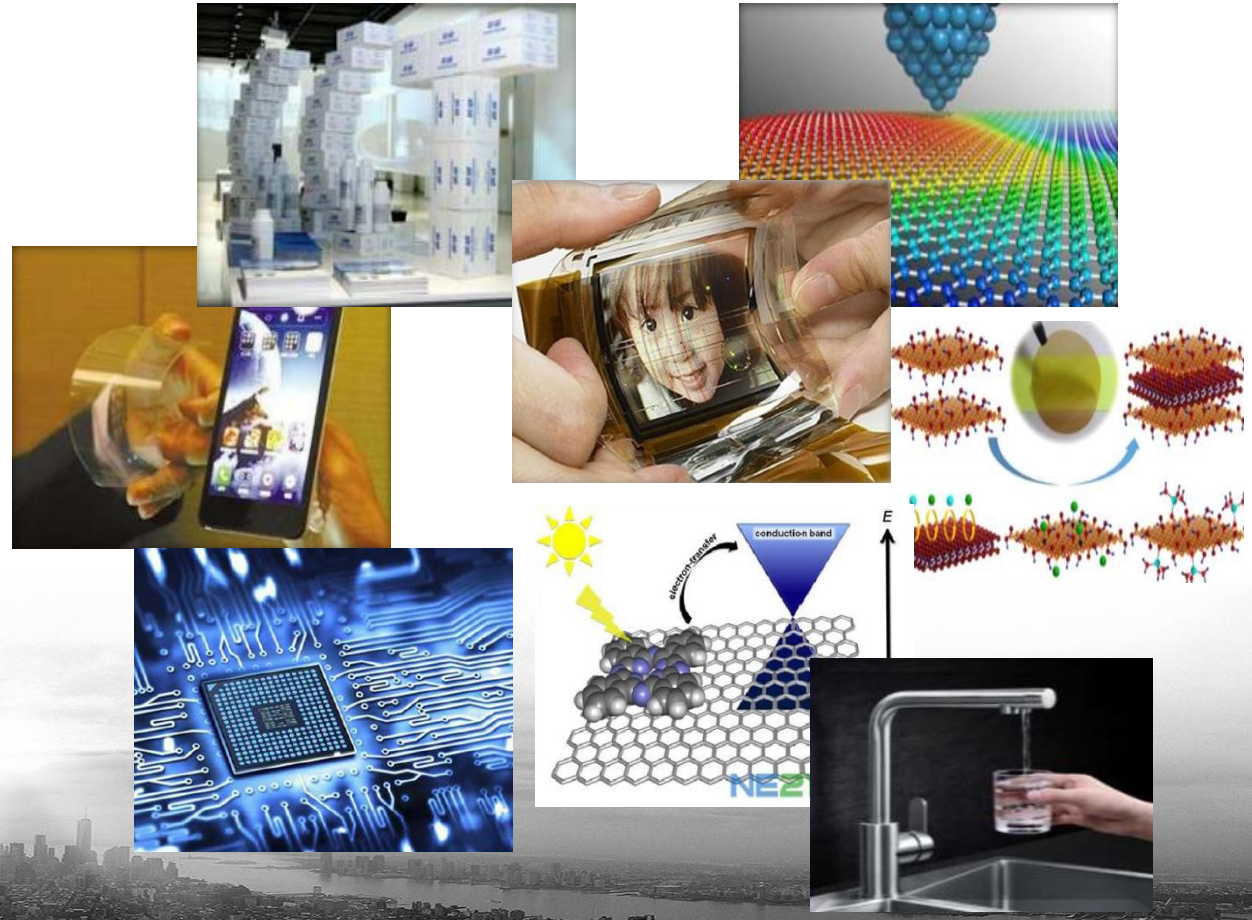
Graphene technology application

Graphene material is known as the king of new materials. It is the world's thinnest, lightest, most flexible, strongest, and most conductive nano-material. It is recognized as a revolutionary and subversive new material in the 21st century.

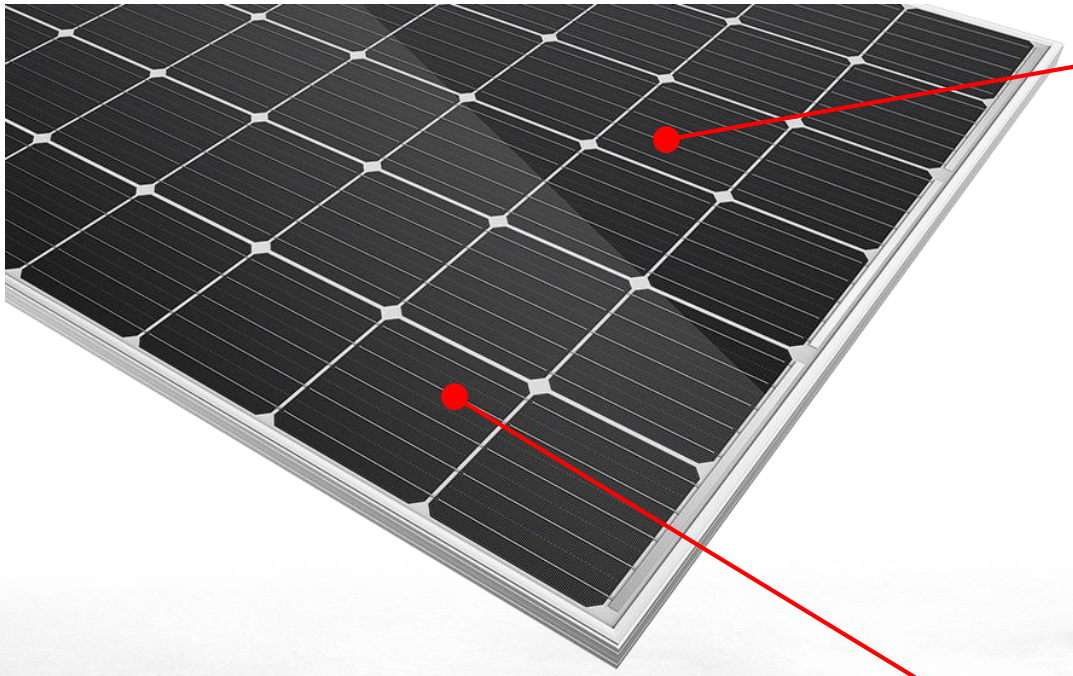


Graphene material application:

- Filter film market in various fields
- Next generation supercomputer becuase of its good electrical conductivity
- Cable for making "space elevator"
- Computer, TV, mobile phone display screen
- New generation solar cell
- Photon sensor
- Medical disinfection and food packaging
- New super-strong materials and plastic composites---new plastics
- Transparent touch screen, light transmissive board
- High-performance integrated circuits and new nanoelectronic devices
- Ultra-thin and ultra-light aircraft materials



Technology introduction of graphene coating solar modules



Graphene coating glass

- Technical principle: The use of graphene coating layer to enhance penetration, self-cleaning, and photocatalyst to increase solar module power and then increase the power generation capacity.
- I generation products: single sided graphene coating technology
- II generation products: double sided graphene coating technology(under developing)

Graphene solar cell with high efficiency(under developing)

- Technical principle: Improve the photoelectric conversion efficiency of solar cells by using the excellent thermal conductivity of graphene and the excellent transmittance of light.

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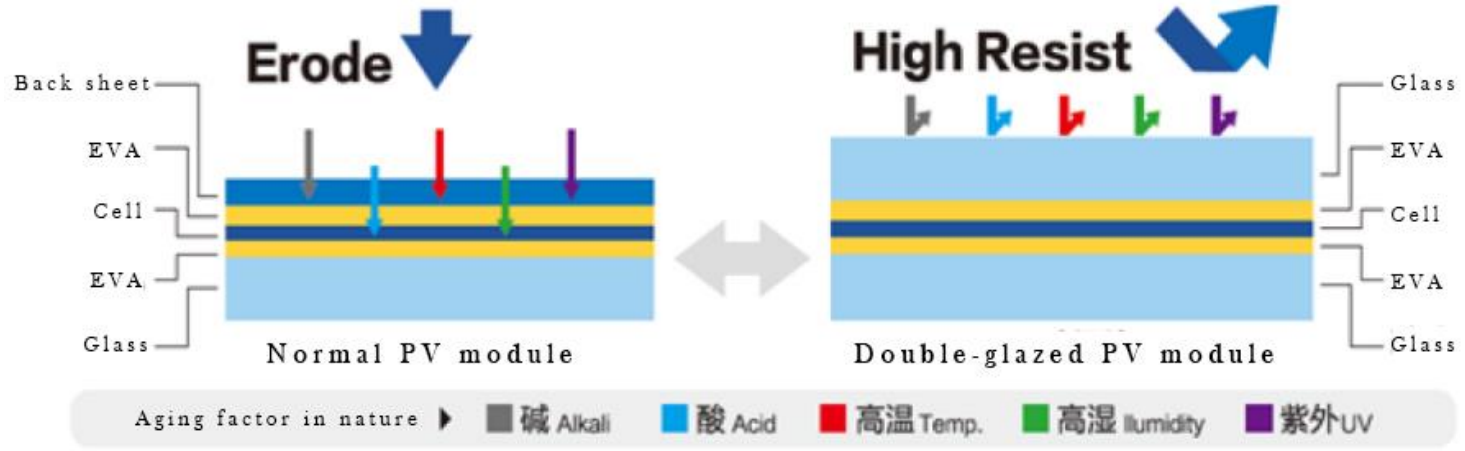
Technical Advantages

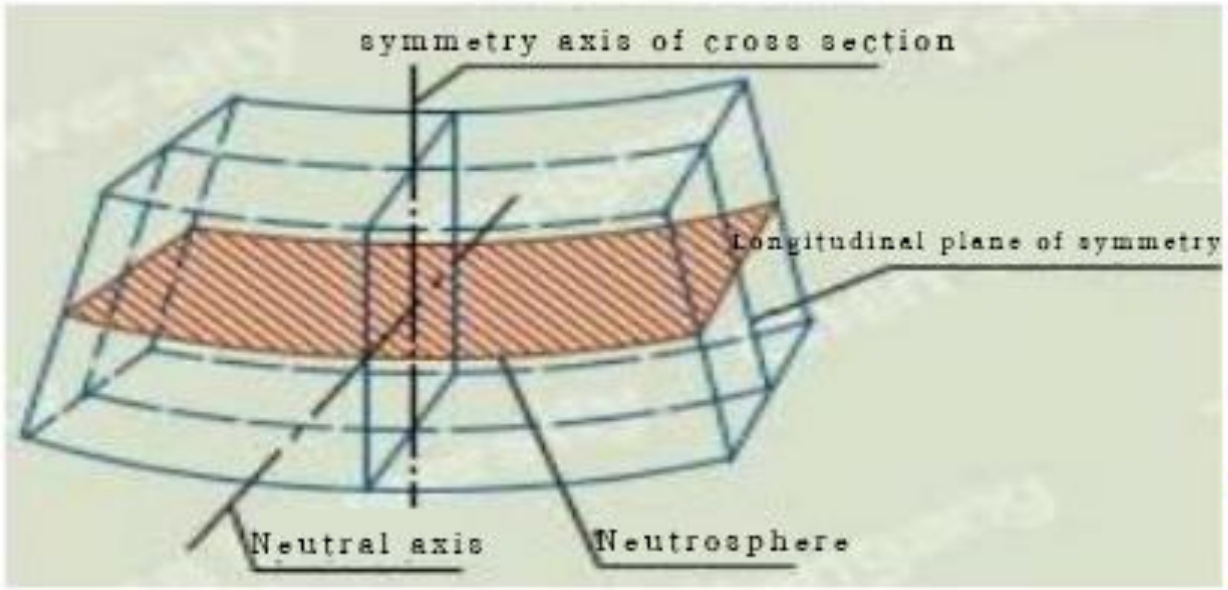
Why long life span?

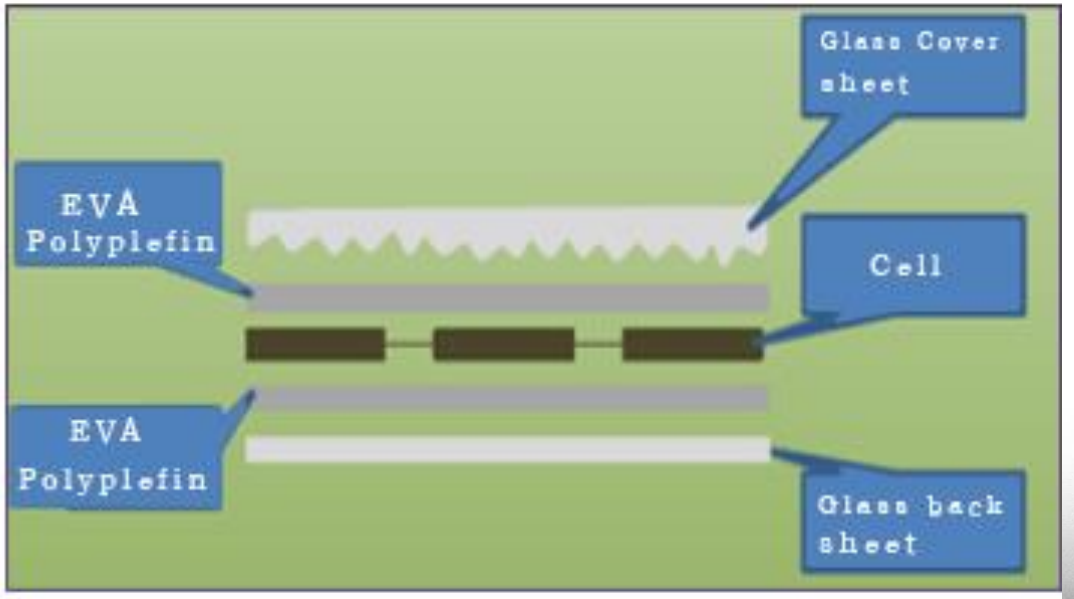


Environment	Regular Back Sheet: Organic composite	Double glass (Tempered glass)
Radiation(UV)	Back sheet aging	No aging
Acid,alkali,salt and water vapour	Acid,alkali,salt and water vapour will go through the back sheet and then solar cells will be corroded(permeable rate:1-3g/m2/day)	Glass won't be easily corroded by acid,alkali,salt and water vapour (permeable rate:0)
Sand and wind	Can be gradually damaged by sand and wind	Not easy to be damaged by sand and wind

Why long life span?

Symmetric “sandwich”structure offers better protection for cells



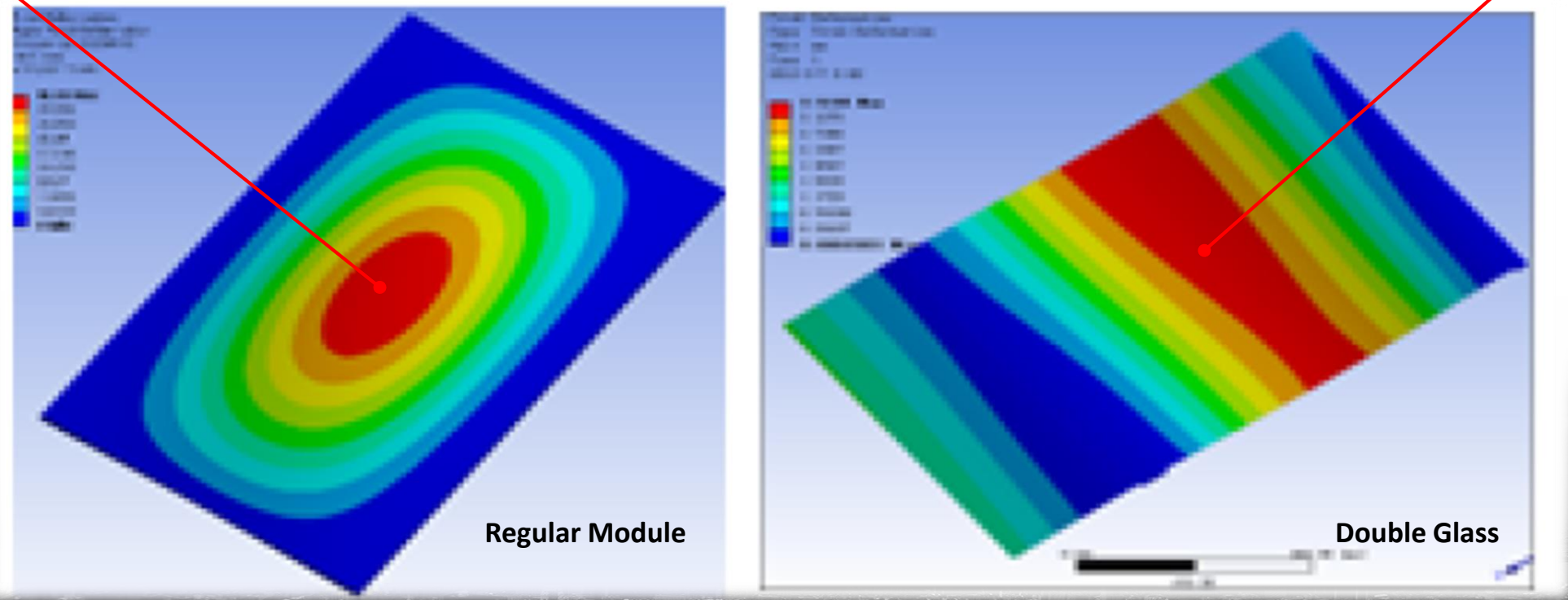


Why long life span?

Symmetric “sandwich”structure offers better protection for cells

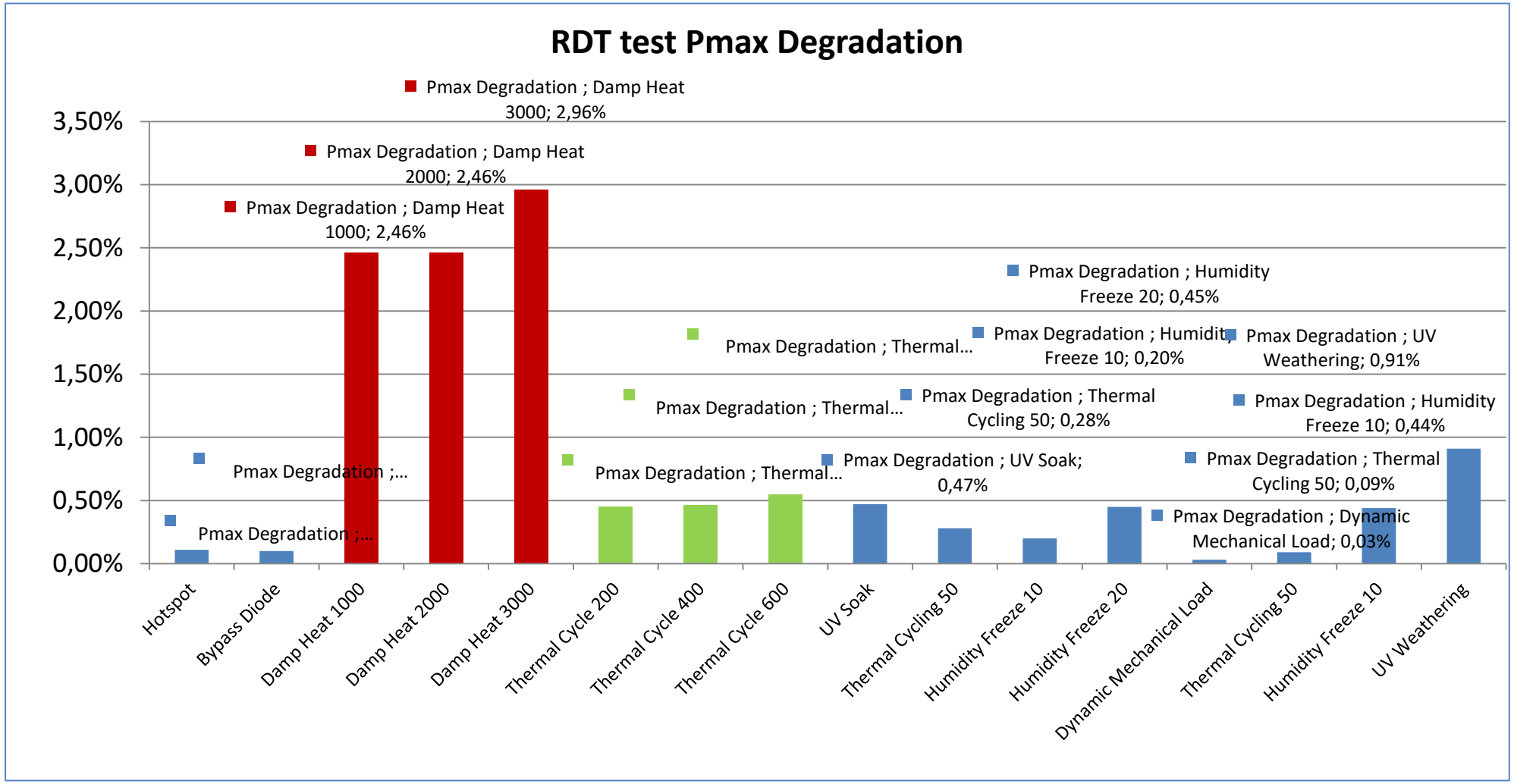
Max bend 31mm

Max bend 16mm



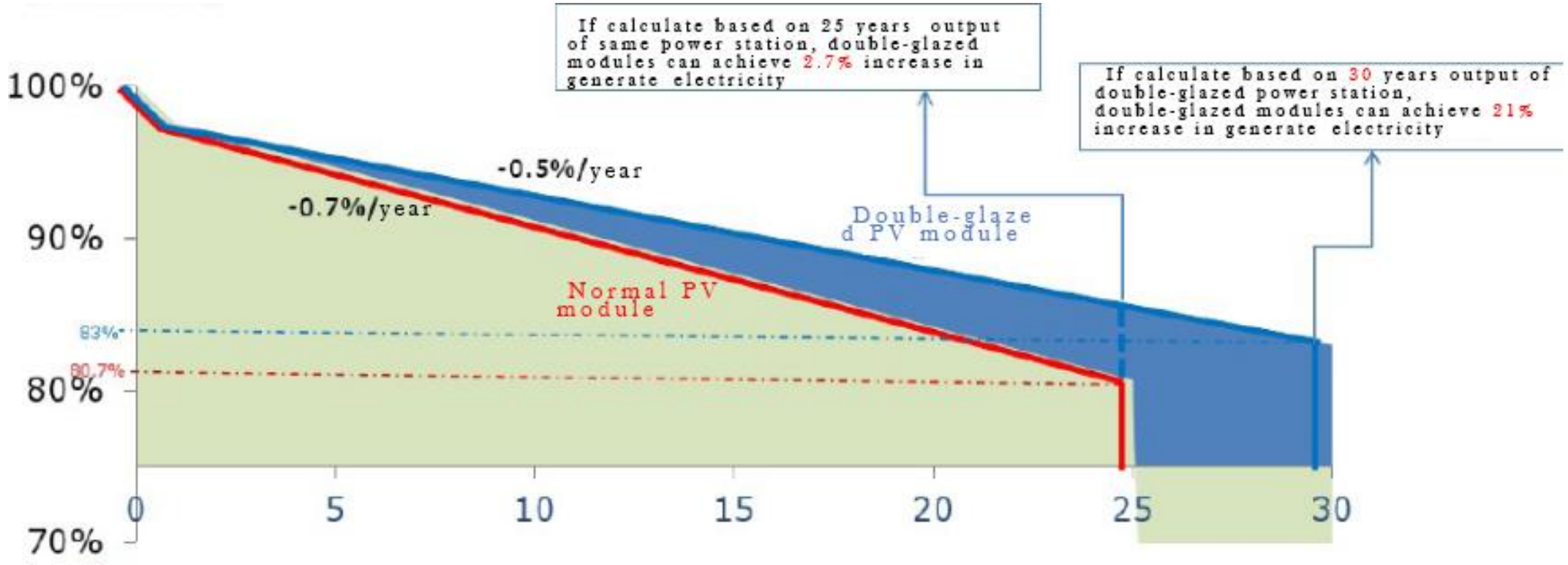
High reliability

3rd party reliability rest: 3 times strength than normal testing standard



High power generation

21% more of solar power generation than regular panels with 30 years lifetime for double glass modules



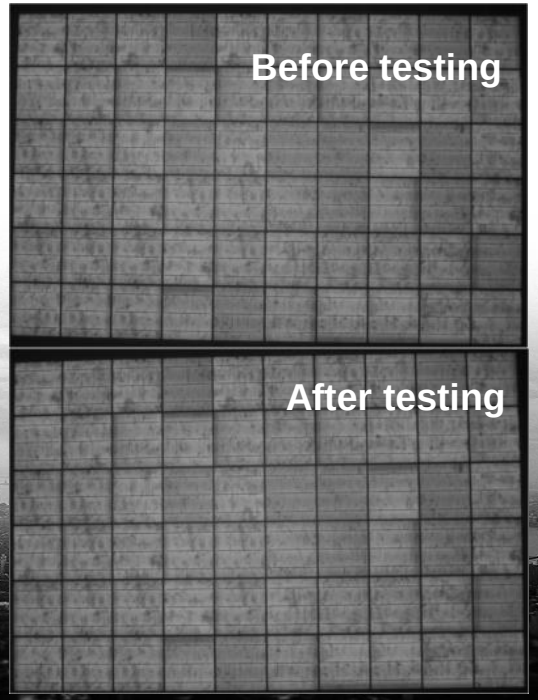
Anti microcrack

Load Capacity：

Static load： Front: 5400Pa，back side: 3600Pa Equivalent to 2meters snow load plus 140km/h wind load

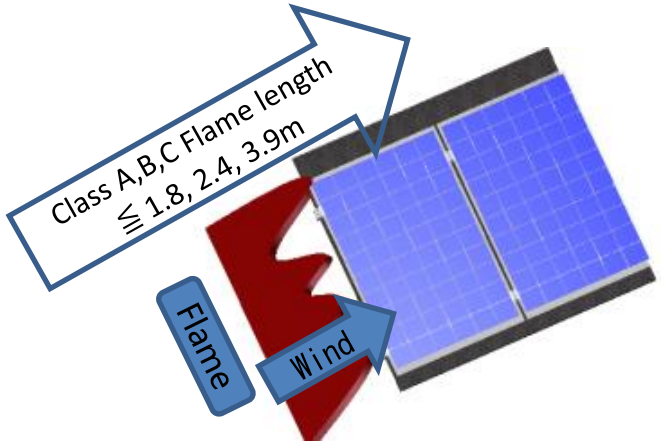
Dynamic Load: 1000 times （+1000Pa,-1000Pa），1 to 3 cycles per minute

0% microcrack

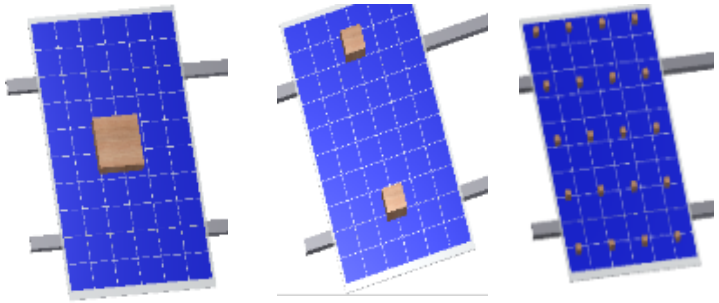


Class A fire rating

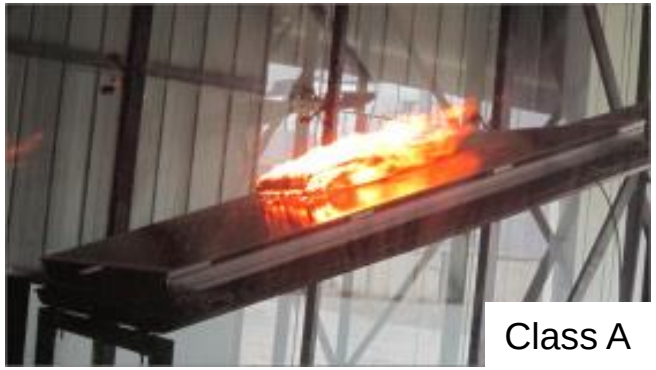
Flame Spread Test: Standard flame burns from the side of the module, determining the fire rating by the flame spread area and burning time length.



Combustion Block Test: Putting different size of the combustion block on the panel until it burns out, evaluating the fire rating by the damage level from the surface of module



Class A　　Class B　　Class C



Class A

1500 Volts

Save 0.2 RMB per Watt for investment

Cable wastage can reduce in 0.27%System efficiency increase in 2%

1500V component applications

Definition of LCOE as below:

$$LCOE = \frac{\text{Total life cycle cost}}{\text{Total life cycle generated energy}} = \frac{\text{Total initial investment cost+ Total operation and maintenance cost-system salvage value}}{\text{Total estimated generated energy *(1-Total decay rate)}}$$

Frameless

Frameless advantage:

- Lower the risk of PID
- Dust, snow easily falling off, reduce the frequency of cleaning, lower the operational cost;

Reduce dust and dirt

Normal module

Double Glass frameless module

Snow falls off easily

Comprehensive use




Character：anti-vapor, anti-salt spray
Project：Salt City、floating project

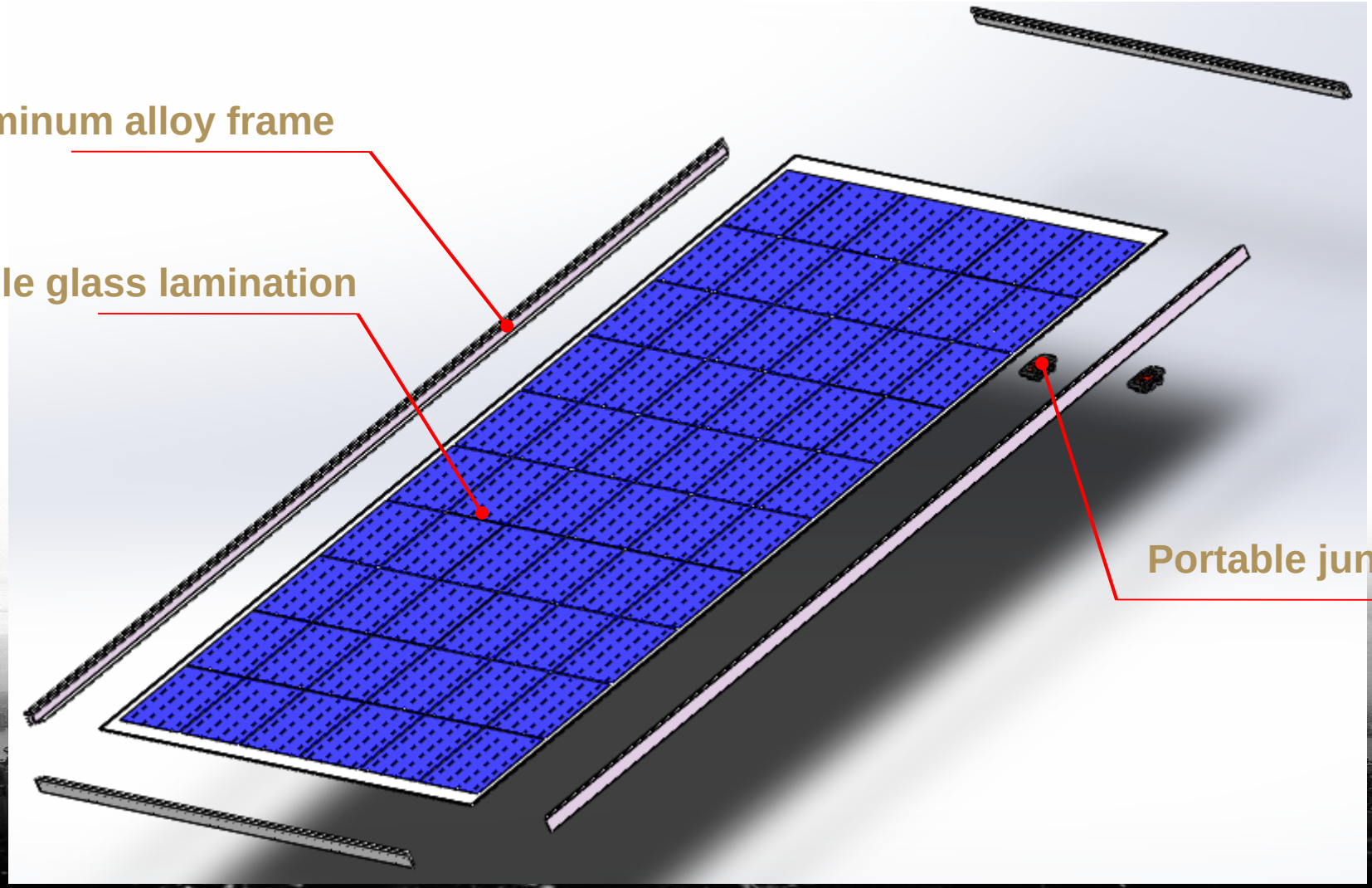
Chracter：anti-vapor、light adjustment and keep warm
Project：Huazhong Agrecutral

Lake、Sea、Oecan → **Utility Scale Project** → **Agrecutral Project** → **Rooftop Project**

Character：anti-polishment、UV resistance
Project:utility project

Character：dust resistance, snow resistance、good-looking
Project：Rooftop

Structure of double glass



Light-weight

Module type	Type	Size	Weight
60 cell type	Regular module（3.2 glass +35 frame）	1650*992	18.5
	Regular double glass（2.5 double glass）	1658*992	22
	1.6mm double glass	1650*992	17.8
72 cell type	Regular module（3.2 glass+40 frame）	1956*992	21
	Regular double glass（2.5 double glass）	1978*992	28
	1.6mm double glass	1956*992	20.5

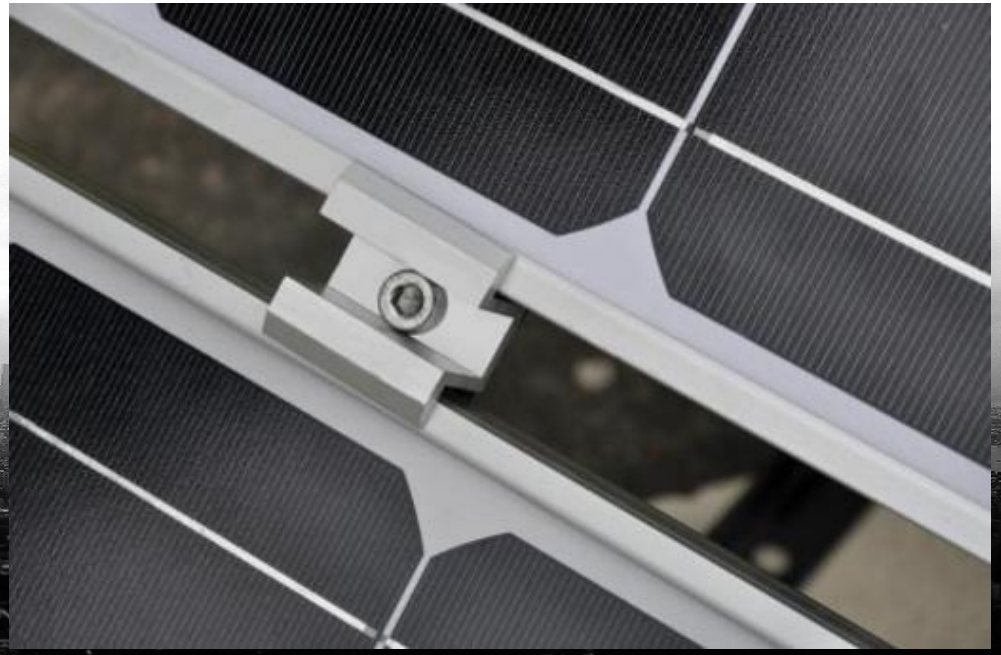
60 cell module, 3.7% lighter than regular module, 21% lighter than regular double glass module;

72 cell module, 2.3% lighter than regular module, 26.7% lighter than regular double glass module;

Easy to move and install

Move and install as the same way as the regular module

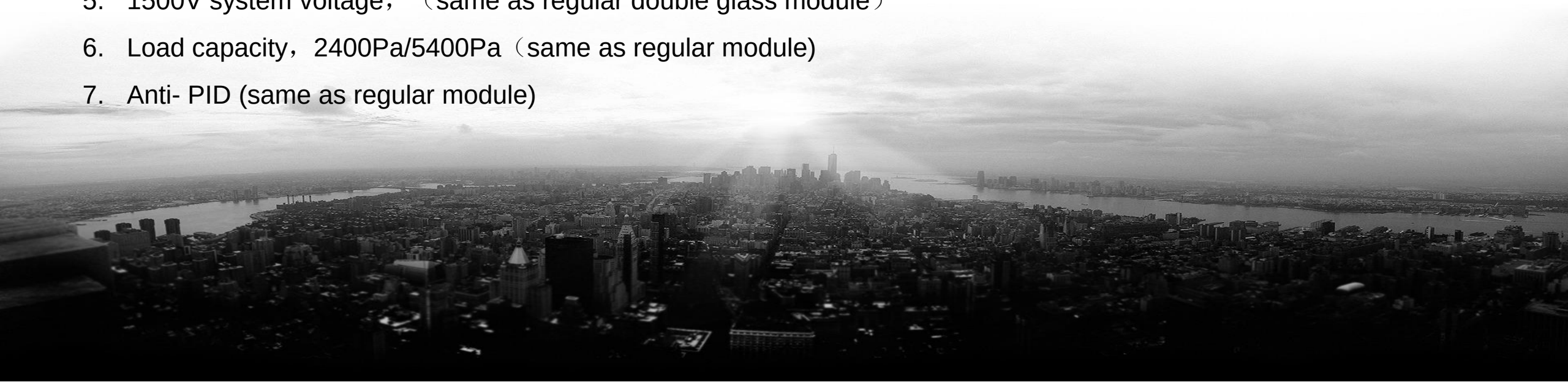
- **Convenience；**
- **Fast；**
- **Safety；**



Conclusion

Lightweight double glass module combines the advantages both from the regular module and regular double glass module, while having some improvement on the disadvantages.

1. Long lifetime (30 years warranty)
2. High reliability, anti-microcrack（same structure as normal double glass modules）
3. Lightweight，（weight is similar to regular module）
4. Easy to install，（similar to the installation method that regular module uses with ballast)
5. 1500V system voltage，（same as regular double glass module）
6. Load capacity，2400Pa/5400Pa（same as regular module)
7. Anti- PID (same as regular module)



正 信

Zhèng Xìn

Fairness ***Trust***

Do the right thing *Reliability*

= Z(EN) SHINE

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Power of Trust

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Thank You!