Trinasolar

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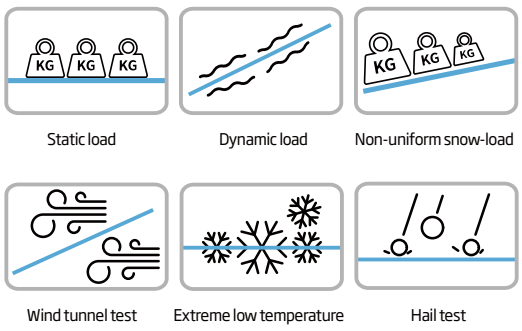
210

TRINA SOLAR

Special Edition

670W

Mechanical load performance of modules



Static load | Dynamic load | Non-uniform snow-load

Wind tunnel test | Extreme low temperature | Hail test

Win-win ecosystem

Trina Solar publishes its white paper on mechanical reliability of the 670W Vertex module

Dynamic mechanical load rigorous test

Passing extreme DML testing with tightened 20-fold loading

Hail test

Stunning performance in 35mm hailstone test

Trinasolar

Power Beyond Solar

The World Leading PV and Smart Energy IoT Total Solution Provider

Building a new ecological photovoltaic industry chain

— Gao Jifan, Chairman of Trina Solar

Nine months ago, President Xi Jinping delivered an important speech in Beijing. In it he said that "we need to deepen the reform of the electric power system and build a new power system with new energy as the main body". What this signals is that the new-energy industry is now receiving more attention at the very top echelons of government than it has ever enjoyed before.

The key to achieving the goal of being carbon neutral is to realize that wind power and photovoltaic power generation occupy a preeminent position, the likes of thermal power being far behind. The 14th Five-Year Plan will be a critical period for building a new power system that takes heed of the dominant position that photovoltaic and wind power now occupy.

The development vision of the photovoltaic industry is "industrial collaboration, co-creation and sharing, building a new customer-centered industrial ecology and helping to achieve carbon neutral". This vision is now gradually becoming a reality.

Last year Trina Solar launched Vertex 600W series modules and promoted the in-depth integration and innovation of the whole industrial chain. With dozens of other companies it took the lead in establishing the 600W + Photovoltaic Open Innovation Ecological Alliance. Those who belong to this great alliance cover the whole industrial chain of photovoltaic upstream, middle and downstream, involving silicon wafers, cells, system integration related links and certification bodies, and more, forming a complete ecosystem.

The 600W + Photovoltaic Open Innovation Ecological Alliance focuses on customers, reconstructs the new ecology of the industrial chain, and opens a new channel for the world in which photovoltaic LCOE falls. The comprehensive deepening and promotion of the alliance will further accelerate the process of carbon neutrality in China and elsewhere. First, the alliance regards technological innovation as the primary driving force, one that can give play to the advantages of the members' various industrial segments as they work with all links along the industrial chain.

What's more, by promoting standardization the alliance can effectively eliminate inconsistencies caused by closed innovation. More importantly, the alliance can avoid excessive repeated investment in similar technologies and reduce possible risks in industrial upgrading.

Trina Solar has entered the 3.0 era and is gradually becoming the world's leading provider of photovoltaic smart energy and energy internet of things solutions. One key idea we will continue to bear in mind is our mission of "solar energy for all". In doing so we will remain steadfast in our commitment to help the world achieve a carbon-zero future.

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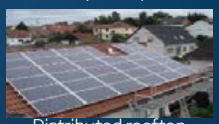
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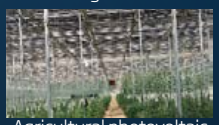
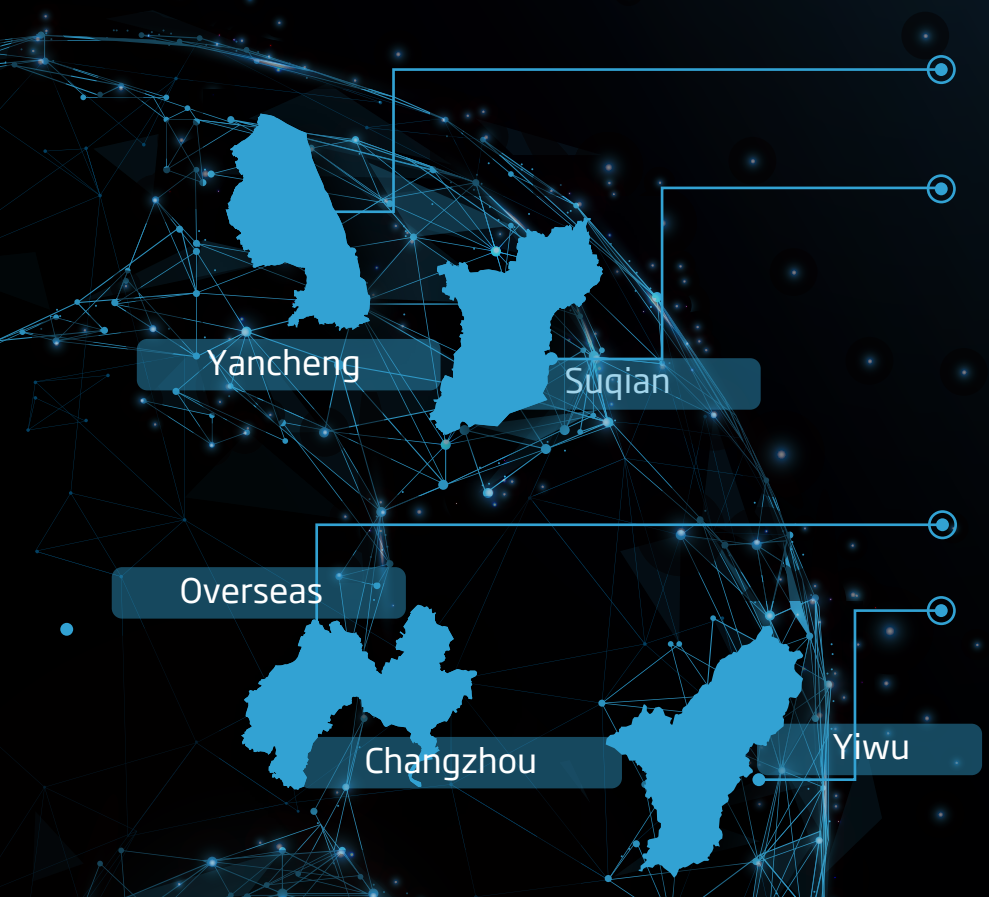

Agricultural photovoltaic solar plant

- Extreme weather conditions such as stronger winds, snowstorms and hail have brought unprecedented challenges to all photovoltaic modules, especially mechanical performance.

Trina Solar's manufacturing plants established globally



Module capacity planned in 2021

50GW+

Cell capacity planned in 2021

35GW+

Trina Solar proves the

high mechanical reliability of Vertex 670W module,

after passing 6 rigorous tests

In middle of this year, Trina Solar released a series of testing results on the mechanical reliability of the 670W Vertex module. Covering six tests, including static mechanical load test and five rigorous tests including non-uniform snow-load test, extreme low-temperature mechanical Load test, hail test, extreme DML test and extreme wind tunnel test, the serial testing results achieved an across-the-board verification of the excellent mechanical load reliability of the 670W Vertex modules.

while the advanced testing in this go-around was to verify that ultra-high-power modules can maintain their outstanding performance even when subject to extreme weather,

Photovoltaic modules can be affected by multiple environmental factors in actual outdoor use, while extreme weather such as snowstorms and gale-force or higher winds necessitates a higher load performance. As a result, to protect the interests of the customers, module design needs to consider the ability to withstand extreme weather over the whole life cycle.

In May of this year, PV Evolution Labs (PVEL), one of the leading independent PV test laboratories, released its seventh annual global PV module test results, the 2021 PV Module Reliability Scorecard Report. Trina Solar again placed as a Top Performer for outstanding product reliability and performance among global PV module manufacturers. Dr. Zhang Yingbin, Head of Product Strategy and Marketing at Trina Solar said that completing the general reliability verification covered all the basics, while the advanced testing in this go-around was to verify that ultra-high-power modules can maintain their outstanding performance even when subject to extreme weather, creating one of the industry's most reliable modules.

Among the lineup of rigid tests, the non-uniform snow-load test simulated uneven pressures caused by a large accumulation of heavy snow on the Trina Solar's 670W module surface, with the highest pressure applied to the bottom end of the module of up to 7000Pa (equivalent to a depth of 2.8 meters of snow), with the results showing that the power attenuation of the module is only 0.56%.

The extreme low-temperature mechanical Load test, a static load testing of positive 5400Pa/ negative 2400Pa under an extremely low -40°C, showed no variation in electroluminescence (EL) and power attenuation of only 0.11%.

In the hail test that simulates the impact of hail of different sizes on modules, the 670W module eventually passed the test measuring the impact of hailstones 35 mm in diameter without causing any damage.

In multiple extreme dynamic mechanical load test, 210 Vertex 670W module delivered better performance than competitors' modules with load capacity several times higher than the IEC standard. When installed by clamps, the 210 mm Vertex 670W double-glass module has passed the 20,000 cycles, 20-fold extreme testing, still remaining intact.

In extreme wind tunnel test, the 670W Vertex module remains intact when the wind speed reached 62m/s (216km/h or 134 mph), passing the extreme wind speed test equivalent to the low end of a Category 4 hurricane on the Saffir-Simpson scale.

Maintaining the consistent ultra-high reliability of Trina Solar modules, the 210 Vertex series modules integrated a series of design optimizations, including added frame wall thickness, larger cavities, optimized material selection and matching designs, to ensure ultra-high structural robustness. Through the series of rigid tests, the series' excellent ability to withstand external mechanical stress that can calmly handle extreme wind, snowstorms, extreme cold, hail and other extreme weather was confirmed.

"As the component with the highest power output in mass production in the industry, the reason we chose 670W Vertex module as a testing object is not only to empower customers to intuitively understand the high reliability of 670W+ modules, but also to share research results across the whole of the industry for continuous innovation, comprehensive application of 600W+ modules and supporting carbon neutral." said Dr. Zhang Yingbin.

Non-uniform snow-load test

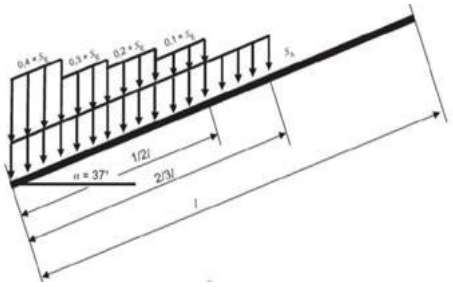
Supreme performance shown under pressure of 2.8 meters of snow

Recently, Trina Solar completed non-uniform snow-load testing at the CGC East China PV Testing Center with its new-generation Vertex 670W modules. The data demonstrate the critical snow-load of Trina Solar's five modules exceeded 6,600 Pa, getting up to 7,000 Pa, equivalent to the pressure generated by 2.8 meters of snow, much higher than conventional non-uniform snow-load norms. This is sufficient proof of the excellent snow-load resistance of Trina Solar's Vertex 670W modules. Moreover, the strength convergence of the non-uniform snow-load testing of the five modules reflects the product's excellent quality consistency.

The current path taken by PV modules is increasingly high power and expanding module size, which poses more severe challenges to module materials, design and process and forces the upstream and downstream industry chain to set stricter requests for the mechanical performance of modules.

After passing the standard 5400Pa static mechanical load test and dynamic mechanical load test, the Vertex 670W module continues to challenge non-uniform snow-load testing in order to more rigorously evaluate the mechanical performance of the PV modules in heavy-snow conditions.

Snow exerts uneven pressure when it accumulates heavily on the module surface, especially at the bottom of the module. The non-uniform snow-load testing specifically evaluates the ability of PV modules to withstand such uneven pressure when encountering heavy snowfall, thus more effectively circumventing snow pressure in areas with heavy snowfall causing module failure. This includes bent or broken frames, uneven backglass breakage and partial or complete disintegration of the installed system. In this way we can provide the optimal solution for our customers and owners.



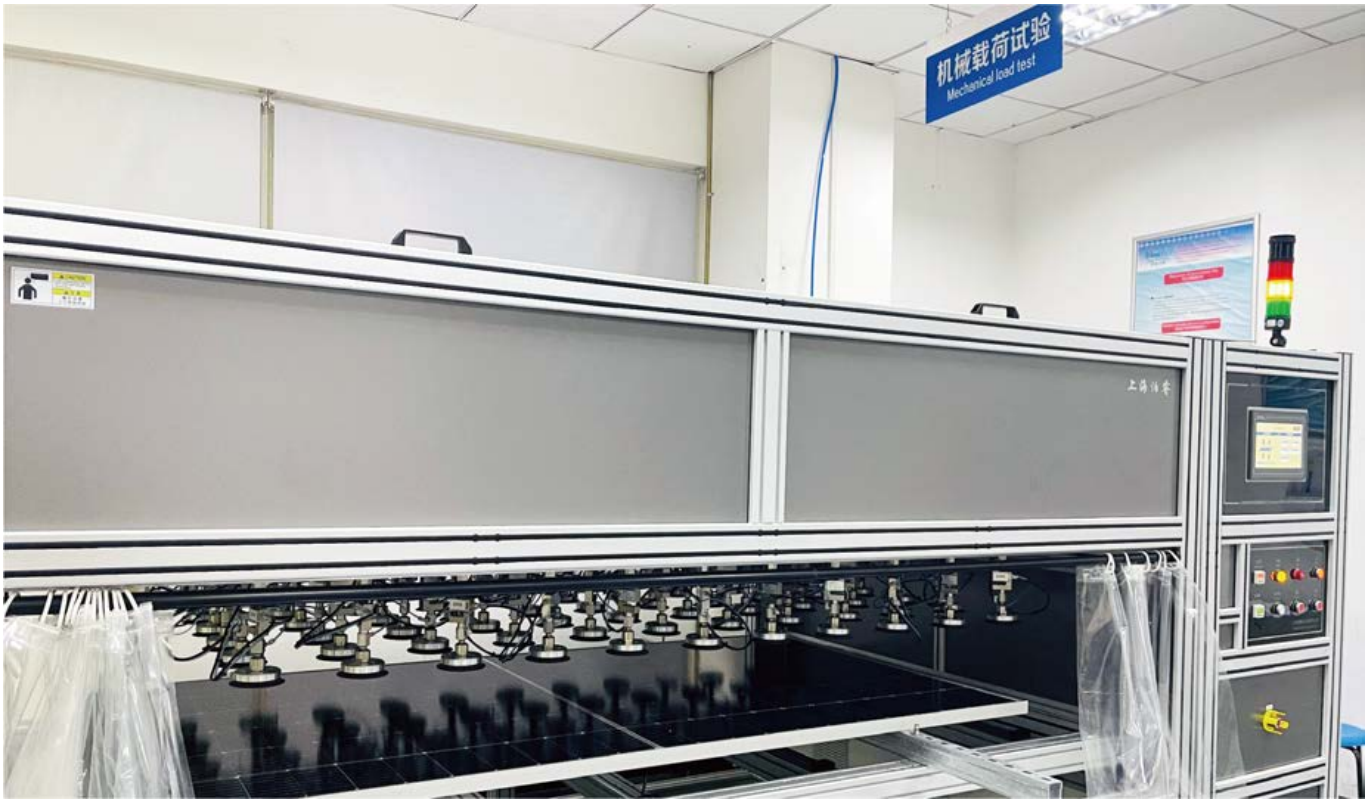
The non-uniform snow-load testing of Trina Solar's Vertex 670W series was conducted at the CGC East China PV Testing Center. In contrast to the dynamic and static load tests based on IEC 61215 and IEC 62782, the IEC 62938:2020-based non-uniform snow-load testing is a standard test that simulates the snow-load resistance of PV modules and can be considered as a risk control for differentiated application scenarios. It does so by simulating the module's snow-load resistance in real-world environmental testing. PV modules that pass this standard test exhibit two characteristic values: the value of snow load that accumulates on the surface when the module fails; and the power attenuation value and electrical safety performance of the module under critical snow-load conditions.

The test data demonstrating the critical snow load for all five of Trina Solar's modules to be as high as 6,600 Pa or more, with a maximum of 7,000 Pa, was much higher than the usual required norms for non-uniform snow loads. Based on the average snow density of 0.25g/cm3, this is equivalent to the pressure generated by 2.8 meters of snow unevenly pressing on the modules.

Combined with the ultimate load capacity of Trina Solar's Vertex 670 modules and a standard introduction of a safety factor of 1.5 for the final snow-load test, the 670 module power attenuation was just 0.56%. This test result thus manifestly demonstrates Trina Solar's Vertex 670W modules, not only integrate advantages of high-power, high-efficiency, and large-size cells, but also possess the excellent snow-load resistance.

Rigorous dynamic mechanical load test

Passing extreme DML testing with tightened 20-fold loading



Trina Solar recently conducted stringent dynamic mechanical load testing (DML) of its 210 Vertex 670W module, comparing with competitor's single-glass 540W and dual-glass 535W modules in extreme environments based on the International Electrotechnical Commission (IEC) standards. The testing demonstrated that the 210 Vertex 670W module delivered better performance than the 540W/535W modules in terms of DML reliability.

In addition, the 210 mm Vertex 670W double-glass module has passed the 20,000 cycles, 20-fold extreme testing, the DML reliability of the module has been fully validated.

Based on the IEC TS 62782 standard for DML testing, the testing was carried out at the State Key Laboratory of PV Science and Technology. Generally, the standard DML testing consists of 1,000 cycles with each circle applying a positive loading (front side) and negative loading (rear side) of 1,000Pa on the module tested, 3-7 cycles per minute. However, in extreme weather such as heavy snow, gale and hail, the PV module may rupture due to high pressure from mechanical loading, which would lead to moisture entry, battery cracks, fatigue of welded joints and battery corrosion, eventually resulting in module and system failure, which calls for a stricter testing.

This time, the extreme DML testing for Trina Solar's 210 Vertex 670W module is operated based on multi-fold standard DML. The 210 Vertex module delivered outstanding performance in the testing.

The testing included two rounds as follows:

Round 1

The multi-fold dynamic mechanical load testing was conducted based on the standard load of ±1,000Pa while the appearance of the samples was observed every 500 cycles.

Secure the Single glass module in the crossbeam which is perpendicular to the long side by bolts.: the 540W module showed cracks near the mounting holes after going through 3,000 DML cycles while the 210 mm Vertex 670W module continued functioning as normally at the end of 7,000 cycles.

Secure the Dual-glass framed module in the crossbeam which is parallel to the long side by bolts: the 540W module showed cracks after 2,000 DML cycles while the 210 Vertex 670W module continued operating normally after 3,500 cycles.

Secure the Dual-glass framed module in the crossbeam which is parallel to the long side by clamps: the appearance of the Vertex 670W module remained intact after 20,000 cycles!

Round 2

The multi-fold dynamic mechanical load testing was conducted based on the standard load of ±1,500Pa and the appearance of the samples was observed every 200 cycles.

Secure the Dual-glass framed module in the crossbeam which is parallel to the long side by bolts: the 535W module failed at the end of 200 DML cycles, with cracks occurring near two mounting holes, and another two mounting holes tore completely, resulting in the screws dropping out; in contrast, the 210 Vertex module only has minor cracks around one mounting hole after 2,000 DML cycles.

Secure the Dual-glass framed module in the crossbeam which is parallel to the long side by clamps: the appearance of the Vertex 670W module remained intact even after 20,000 cycles!

The two rounds of comparative testing once again demonstrate the outstanding capability of the 210 Vertex module in resisting external mechanical stress.

Trina Solar, the world-leading PV and smart energy total solution provider, is committed to developing new and innovative products. With more than 20 years of process and technology expertise, the company has created the world's top modules with high efficiency and reliability, with worldwide shipments of the 210 Vertex module exceeding 16GW.

Wind tunnel test

Withstanding a category 4 hurricane

After passing advanced serial load tests including for non-uniform snow-load and 20,000 cycles of dynamic mechanical load, Trina Solar's 210mm Vertex 670W module has passed the extreme wind tunnel test. The result further confirms that ultra-high-power modules can maintain their outstanding performance even when subject to extreme weather.

Trina Solar, with the third-party authoritative organization CGC (China General Certification), conducted the wind tunnel test on the 210mm Vertex 670W dual-glass module (2.384×1.303m) .

Wind speed (m/s)	Reference modules(580W)	Trina Vertex modules(670W)
30.53	Slight vibration.	Slight vibration.
45.80	The surface of the module bulges in the middle, shake strongly.	The surface of the module bulges in the middle, shake strongly.
59.54	The bolt-mounted location was torn. Module under test(MUT) was blown away.	
62.60	/	Highest wind speed module under test can suffer, shake strongly.

The 210 Vertex 670W module remains intact when wind speed reached 62.6m/s (225.4km/h or 140mph) , which is equivalent to the low end of a Category 4 hurricane on the Saffir-Simpson scale.

The wind tunnel test results prove that the 210mm Vertex module not only generates super high power but also possesses extreme reliability.

The globalization of PV applications and diversification of scenarios have put higher demands on module performance, and extreme weather such as strong winds, snowstorms and hailstorms pose great challenges.

Bearing out Trina Solar's consistent ultra-high reliability, the 210 module has undergone an array of design optimizations, such as increased frame thickness, larger cavities and optimized material to ensure ultra-high structural strength. At the same time the non-destructive cutting gives the smallest cell a bending strength comparable to that of the whole cell, as well as significantly enhancing resistance to hidden cracks.

In addition to the modules themselves, the mounting method is also critical to reliability. Cost-effective screw installation is suitable for large-scale power stations; clamp installation is widely used in distributed rooftop applications, which supports rapid installation. For particularly harsh snow or windy climates, Trina Solar enables customized installation methods to meet customers' higher demands.

In the spirit of innovation and always focusing on customer value, Trina Solar delivers products with the lowest BOS and higher power generation efficiency to promote the sustainable development of the PV industry and lead the transformation of the global energy industry.

Note: The limit value of the test does not mean that the failure will occur only when the limit value is reached. It also needs to consider the actual parameters such as the conversion of local wind vibration coefficient, pulse wind, site category and local shape coefficient. Therefore, the failure may also occur when it is far less than 59 m/ s.

Extreme low-temperature test

Showing remarkable mechanical performance at -40°C

Verified by a serial rigorous tests including non-uniform snow-load test, extreme DML test and extreme wind tunnel test, Trina Solar's Vertex modules continue show outstanding performance and excellent mechanical load reliability by passing another -40°C extreme low-temperature mechanical load test, demonstrating excellent ability to withstand extreme cold conditions.

Trina Solar's modules are applied worldwide in various scenarios including those under extreme cold weather condition, from Heilongjiang in China to the countries within the Arctic Circle such as Sweden and Norway, where the average winter temperature is as low as -40°C.

Thus, it is fundamental for Vertex modules to keep high reliability and high power generation efficiency under low-temperature condition. The extreme low temperature is a major challenge to materials. The coefficient of thermal expansion varies among different materials and poses challenges to connecting parts of modules. For those organic materials such as EVA, backsheet and junction boxes, the low temperature will cause degrading shock resistant ability of materials and affect the ability to withstand mechanical load of module cells.

Trina Solar, together with the third-party organization CGC (China General Certification), according to the testing requirement of IEC TS 62782, conducted the mechanical reliability test to Vertex 670W module under extreme low-temperature condition. The static mechanical load test of 5400Pa at front side and 2400Pa at back side is completed under extreme low-temperate at -40°C and crossbeam screw installation conditions. The mechanical strength, resistant ability of materials and connection of trackers under extreme low temperature are simulated to test the reliability and performance of PV modules.

The results show that the modules maintain good appearance without cracks, and the testing of insulation and wet leakage are both passed, with power attenuation of only 0.11%. This well proves that even under extreme low-temperature condition, Trina Solar's 670W Vertex modules are safe and reliable, and guarantee excellent quality.

The 670W Vertex was launched in March, based on large 210mm silicon wafers, releases low-voltage and high-power and inherits the non-destructive cutting, high-density interconnection, achieving maximum power of 670W with an efficiency of 21.6%, single string power rising by 40%, creating more room for reduction of the LCOE and BOS cost.

Based on the R&D and manufacturing experience for the past 24 years, Trina Solar has been able to lay a solid foundation in technology and forged products with high efficiency and high reliability that possesses world's best performance. No matter it is stronger winds, snowstorms or extreme cold, Trina Solar's Vertex modules exhibit perfect performance and offer customized services including product design and installation design for different application scenarios to provide various total solutions for customers.

Hail test

Modules' stunning performance in 35mm hailstone test

Extreme weather events everywhere are doing what cool logic had failed to do: convince even the most obdurate sceptics that climate change is indeed real. What has also become clear is that photovoltaic modules, one tool in the planet's armory as it seeks to reduce carbon emissions by using alternative energy sources, need to be extremely sturdy as they are exposed to such weather over very long lengths of time.

In an analysis published on 30th July 2021, Trina solar proved the high mechanical reliability of Vertex 670W module, after passing 6 rigorous tests, including the 35mm hail test, non-uniform snow-load tests, extreme DML tests, extreme wind tunnel tests and extreme low-temperature mechanical load tests, among others. They have thus proven their ultra-high reliability in withstanding wind, pressure and freezing temperatures.

In the 35mm hailstone test, power attenuation of single-glass 670W modules was just 0.17%, and no attenuation was detected in dual-glass modules.

Under the stringent requirements of the IEC 61215 series, the hail test of Trina Solar's Vertex 670W modules simulated the shock of hail on the modules' surface. Using a pneumatic emissions device, natural hail was imitated, with artificial ice balls hitting the modules at a constant speed. After the modules had been subjected to these shocks the outward appearance, electrical safety and any change of output performance were thoroughly checked.

In the test ice balls with a diameter of 35mm (similar to a regular egg's central diameter) were used, and these hit the surface of the module at a speed of 27.2 meters a second. Meteorologists class hail as heavy when the diameter of the hailstones exceeds 20mm. After the test the surface of the 670W Vertex modules was intact, and there were no micro-cracks.

The modules also passed insulation and wet leakage tests. Power attenuation of single-glass modules was only 0.17%, and no attenuation was detected for dual-glass modules. All this means that under extreme hail weather conditions, Trina Solar's 670W Vertex modules will withstand high-speed shock and are still safe and reliable. In short, excellent quality is guaranteed.

PV modules' ability to withstand hail is mostly related to the material of the frontsheet, made of glass. The thickness of the glass and its tolerance to shock have direct bearing on its capacity.

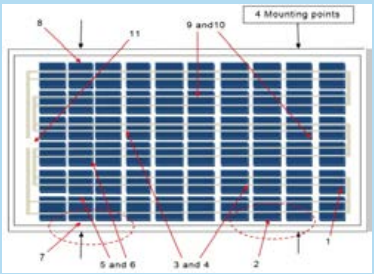
Chen Lin, technology head of Xinyi Glass Holdings Limited, said: "We have enlarged the size of the steel furnace and adjusted fan configuration and strictly controlled our manufacturing and management process, so that the steel strength of the glass, which is matched with 210 modules, is guaranteed, with full technological reliability."

In the 210 modules the ability of the glass to resist shock fully guarantees their safety and reliability.

In addition, based on the structural features of various modules, Trina Solar has special requirements for the performance of glass. The inspection and test specifications of both suppliers and Trina Solar ensure that the reliability of the glass is fully integrated into the design and structure of the products.

This in turn creates a corporate standard that is promoted to become the industrial standard, and indeed a national standard.

In 2007 Trina Solar adopted a management policy of continuing reliability tests that established the material ORT concept in the industry and included it in the reliability corporate standard, including full series testing programs such as the IEC 61215, IEC 61730, and IEC 63216. In most cases the company's internal standards are set at a level two to three times that of the IEC standard.



Hail impact location distribution

Trina Solar sets new world record of 23.03% aperture efficiency for 210 Vertex P-Type PERC module

Trina Solar's State Key Laboratory of Photovoltaic Science and Technology (SKL) announced that its proprietary Vertex high-efficiency p-type monocrystalline silicon module, based on 66 pcs of 210 mm x 210 mm high-efficiency PERC cells, has achieved a record aperture module efficiency of 23.03% for larger-area industrial silicon p-type modules. This is independently confirmed by third-party certification laboratories by both TÜV Rheinland and TÜV Nord with identical efficiency result.

The researchers in the SKL developed a new Multi-Busbar (MBB) technology to improve optical shading, and developed a new hybrid soldering technology to minimize the gap between cells. These technologies greatly improve the module efficiency, with solar cells from the production lines of 210 mm high efficiency PERC cells.

Earlier this year, Trina Solar was the first one to release a new generation of 670W Vertex module, using 66 pcs of 210 mm p-type PERC cells. This time, Trina solar demonstrates that its technology leadership in 210 commercialized modules, not only in terms of ultra-high power, but also the ultra-high efficiency.

"We are very pleased to announce the latest achievement of our R&D team at the State Key Laboratory of Photovoltaic Science and Technology. To the best of our knowledge, it is the first large-area p-type commercial module with aperture efficiency over 23%," say Dr. Yifeng Chen, head of high efficiency cell and module R&D center in Trina Solar. "Improving module efficiency is a key to help the customers to save land, labor and cables and etc. Trina Solar always focuses on developing leading-edge PV techniques and products to achieve commercial success of customers with our innovations."

Trina Solar sets new world record of production 210 PERC cell with efficiency reaching 23.56%

Trina Solar's State Key Laboratory of PV Science and Technology (SKL PVST) announced its proprietary industrial larger-area 210mm×210mm high-efficiency PERC solar cell in mass production, has achieved the efficiency of 23.56%, setting a new record for 210 P-type monocrystalline silicon PERC cells. This is independently confirmed by the third party National Center of Supervision and Inspection on Solar Photovoltaic Product Quality (CPVT).

Dr. Yifeng Chen, head of high efficiency cell and module R&D center at Trina Solar, said, "We are proud to announce the latest achievements developed by our technical team, to realize the batch efficiency over 23.5% for larger-area 210mm high-efficiency PERC cells in production. This demonstrated that 210 cells can achieve very high efficiency in reality. Our technical team will continue to focus on transferring innovative technologies to manufacturing to consolidate our technology leadership in high efficiency cells mass production."

At the end of June 2021, the SKL announced that its Vertex high-efficiency p-type monocrystalline silicon module has achieved a record aperture module efficiency of 23.03%, based on 66 pcs of 210 mm x 210 mm high-efficiency PERC cells, which is independently confirmed by both TÜV Rheinland and TÜV Nord with identical efficiency result.

Fraunhofer ISE study Ⅰ: Vertex 670W's LCOE reduced by 7.4%, Trina Solar 210 mono-facial modules with fixed tilts demonstrate outstanding system value in Germany

Assessment site: Germany

Module types: M6 mono-facial 455W module, M10 mono-facial 540W module, 590W module as well as G12 mono-facial 550W, 600W and 670W module

Method of installation: Fixed-tilts (landscape)

Inverter: String inverter

The assessment took place in a typical photovoltaic site in Germany for design input

Since the launch of the 600W+ series, world leading design institutes and well-known third-party organizations have evaluated and studied the LCOE advantage and value of Vertex modules. Recently, Fraunhofer ISE, the world leading solar institution, has completed the assessment of CAPEX and LCOE of new generation of ultra-high power modules 210mm (G12) from Trina Solar and 182mm (M10) series from other manufacturer.

Founded in 1981, Fraunhofer ISE is the largest solar research institute in Europe. Based in Freiburg, Germany, it is a constituent entity of Fraunhofer-Gesellschaft, the world's leading applied research organization. Headquartered in Munich, Germany, Fraunhofer has more than 20,000 qualified scientists and engineers in 74 institutes and research institutions worldwide.

The study results show that the new generation of 210mm (G12) and 182mm (M10) modules perform better than the conventional 166mm (M6) modules in both CAPEX and LCOE, while the M10 540W mono-facial

Module Power [W]	**455**	**540**	**550**	**590**	**605**	**665**
Cell Type	M6	M10	G12	M10	G12	G12
Module Size [mm]	2102 x 1040	2256 x 1133	2384 x 1096	2411 x 1134	2172 x 1303	2384 x 1303
Inverter	SUN2000-215KTL-H0 / SUN2000-215KTL-H3					
Modules/String	28	28	37	26	34	31
Strings/Inverter	19	16	12	16	12	12
String power [W]	12.74	15.12	20.35	15.34	20.57	20.62
DC/AC Ratio	1.14	1.13	1.15	1.14	1.15	1.15
Pitch [m]	6.03	6.56	6.35	6.56	7.53	7.53
Tilt [°]	20°					
Shading angle[°]	35°					
GCR	54.8%					
DC Capacity [kW]	9,924	9,919	10,012	10,063	10,120	10,143
AC Capacity [kW]	8,815					
Module numbers	21,812	18,368	18,204	17,056	16,728	15,252
Inverter numbers	41					

modules are superior to the M10 585W mono-facial modules.

It is also found that among the G12 modules represented by Trina Solar's Vertex series, the 550W, 600W and 670W modules are superior to the M10 modules in both CAPEX and LCOE. The CAPEX of the Vertex G12 670W is 4.2% lower than that of the M10 540W modules, and the LCOE is 4.1% lower than the latter. The LCOE of the Vertex G12 670W is 4.5% lower than that of the M10 585W modules, and is up to 7.4% lower than that of the M6 455W modules.

In the era of grid parity, the advanced Vertex 210mm series of modules have a prominent edge in Levelized Cost of Energy (LCOE).

Results:

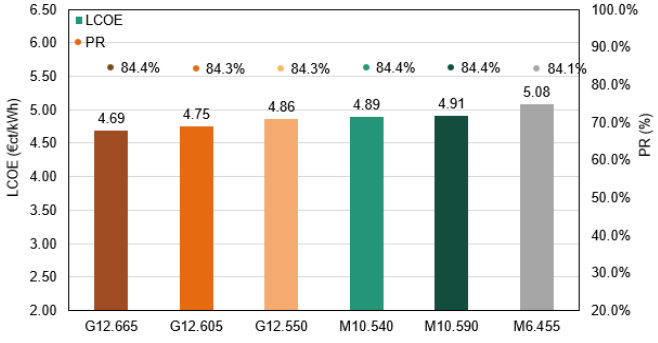
The new generation of high-power modules performs better than the M6 modules in both CAPEX and LCOE; G12 performs better than M10, and M10 performs better than M6. In particular, the costs of trackers and electrical systems of M10 and G12 are significantly lower than other modules.

1. The Vertex G12 modules have the best CAPEX and LCOE. Compared to the M10 modules, the G12 600W and 670W modules perform particularly well, reducing CAPEX by up to 1.5-2 €cWp and LCOE by up to 3-4.5%. Compared to the M6 modules, the LCOE can be reduced by 6.5%-7.4%.

2. The superior performance of the G12 600W and 670W modules is largely due to savings of the costs of trackers, which are up to around 0.5~1€c/Wp or 11% compared to the M10 series.

Germany: landscape-fixed tilts

- 10 MWp
- WACC : 6.0 %
- Design lifetime : 25y
- Residual value : 0 €

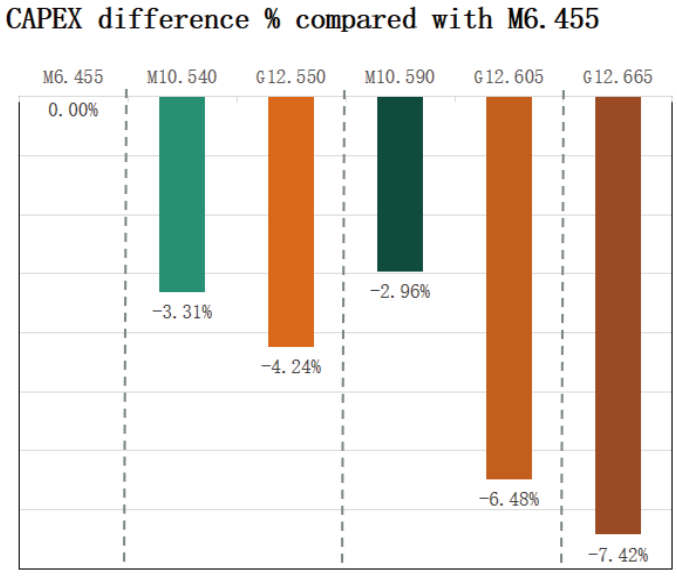


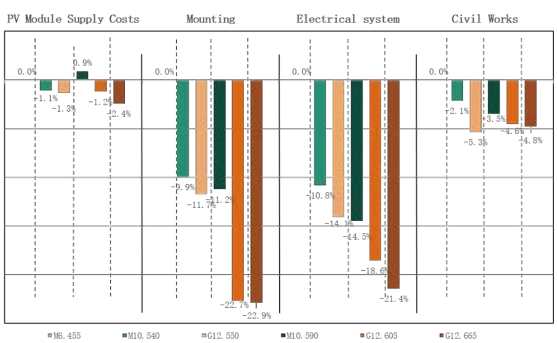
3. Thanks to the innovative design concept of low-voltage and high-string power of the G12 modules, the 210mm 550W, 600W and 670W modules have excellent performance in savings of the costs of electrical systems, which are up to approximately 14.1~21.4% compared to the M6 series.

4. Another reason for the superior performance of the G12 600W and 670W modules lies in their lower transportation costs. Within the same 40-foot container, the power of loadable G12 600W and 670W modules can be increased by about 12%.

The comparisons show that the G12 series of ultra-high power modules represented by Trina Solar's Vertex can significantly reduce CAPEX, LCOE in particular, thanks to their low-voltage, high string power design and superbly efficient power generation capacity. Compared to conventional modules, the single string power is significantly boosted by 36%. In turn, it can save the material and labor costs of DC terminals, thus lowering the initial investment and significantly saving the system's BOS cost and LCOE.

Always driven by innovative, reliable quality and customer value, Trina Solar's high-power, high-efficiency modules are getting inevitably popular in the era of grid parity.





Fraunhofer ISE study Ⅱ: Vertex 210 modules + Trina Trackers leads to 6.0% reduction in LCOE

Assessment site: Spain

Module types: M6 bifacial 450W modules; M10 bifacial 535W modules and 585W modules; G12 bifacial 545W, 600W and 660W modules

Method of installation: TrinaTracker 1P trackers

Inverter: Central inverter

The assessment took place in a typical photovoltaic site in Spain for design input.

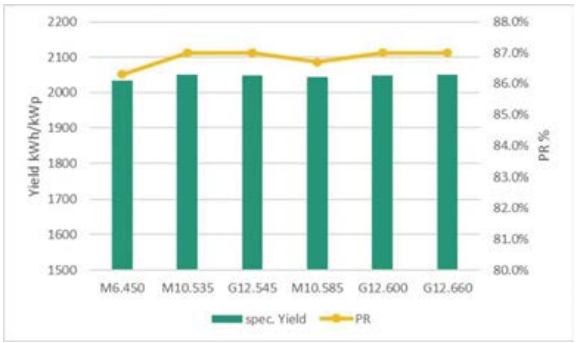
Following the calculation of 210mm modules with fixed tilts in Fraunhofer ISE study I, Fraunhofer ISE, the world leading solar energy research institute, has also evaluated and studied the LCOE of ground power plants, with the combination of the new generation of ultra-high power Module and 1P tracker. The combination of single-axis 1P tracking system and bifacial modules delivers more power generation, thereby significantly reducing the LCOE and improving the return on investment.

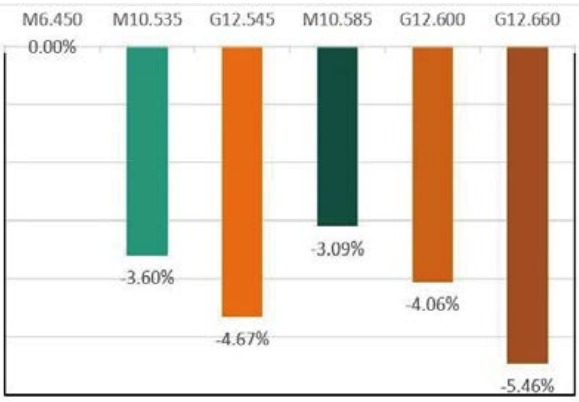
The research results show that, the new generation of 210mm (G12) and 182mm (M10) bifacial modules + 1P tracker perform better than the conventional 166mm (M6) modules in both CAPEX and LCOE.

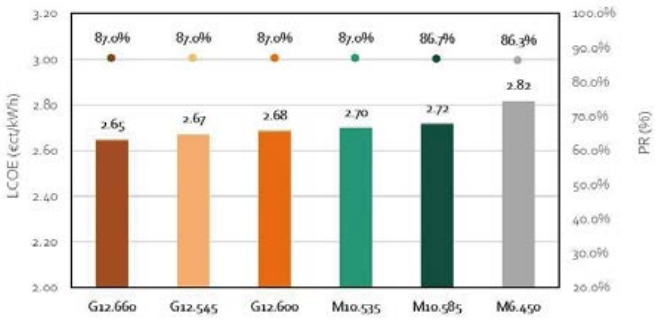
It is also found that among the G12 bifacial modules represented by Trina Solar's Vertex series, the 545W, 600W and 660W modules are superior to the M10 bifacial modules in both CAPEX and LCOE. The CAPEX of the Vertex G12 660W bifacial modules is 1.9% lower than that of the M10 535W bifacial modules, and the LCOE is 1.9% lower than the latter.

The LCOE of the Vertex G12 660W bifacial modules is 2.6% lower than that of the M10 585W bifacial modules and 6.0% lower than that of the M6 450W bifacial modules. Compared to M6, for a 50 MW single-axis system plant with an initial investment CAPEX of about €25.5 million, the bifacial G12 Vertex 660W system saves nearly 1.5 million Euros. The advanced Vertex 210mm series of modules have a prominent edge in Levelized Cost of Energy (LCOE).

Module Power [W]	450	535	545	585	600	660
Cell Type	M6	M10	G12	M10	G12	G12
Module Size [mm]	2111 x 1046	2256 x 1133	2384 x 1096	2411 x 1134	2172 x 1303	2384 x 1303
Inverter	SG3125HV-20					
Modules/String	28	29	38	26	34	31
Strings/Inverter	330	268	201	273	204	203
String power [kW]	12.60	15.52	20.71	15.21	20.40	20.46
DC/AC Ratio	1.16	1.16	1.16	1.16	1.16	1.16
Pitch [m]	5.28	5.64	5.96	6.03	5.43	5.96
Strings/Tracker	4	4	3	4	3	3
Tracker number	990	804	804	819	816	812
GCR	40%					
DC Capacity [kW]	49,896	49,896	49,953	49,828	49,939	49,841
AC Capacity [kW]	43,116					
Module numbers	110,880	93,264	91,656	85,176	83,232	75,516
Inverter numbers	12					

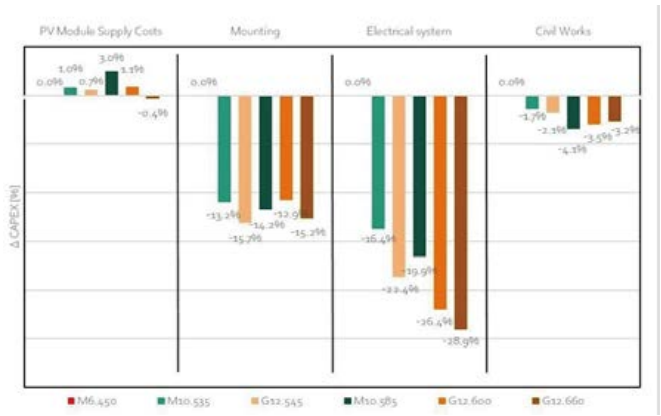






Spain: 1-row tracker

- WACC : 7.4 %
- Lifetime: 30 y
- Residual value: 0 €



* For the calculations, 4mm2 cables are used for M6 and M10, and 6mm2 cables are used for G12 modules

Results:

1. The Vertex G12 modules have the best CAPEX and LCOE. Compared to the M10 modules, the G12 660W and 545W reduce CAPEX by up to 0.81-1.21 €cWp and LCOE by up to 1.8-2.6%. Compared to the 450W M6 modules, the CAPEX can be reduced by 2.39-2.79 €cWp and the LCOE 5.3%-6.0%.

2. The 210mm 545W, 600W and 660W modules have excellent performance in savings of the costs of electrical systems, which are up to approximately 22.4~28.9% compared to the M6 series.

3. Compared with the M6 modules, the cost of trackers for the G12 and M10 modules is reduced by around 13%~15%. Compared with the M10 series, the cost of trackers for the G12 545W and 660W modules is reduced by around 3% or about 0.2-0.3 €c/Wp.

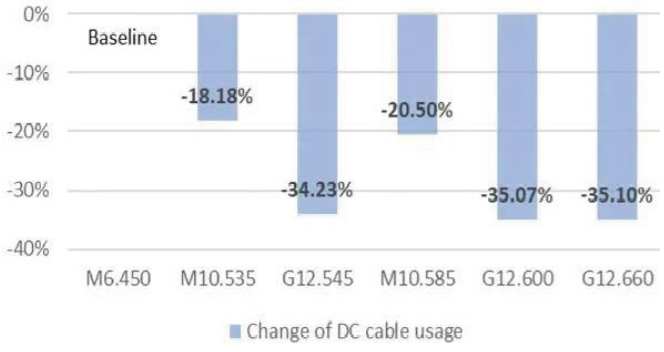
4. The Vertex G12 modules still maintain the optimal LCOE and ROI even 6mm2 cables are used.

5. Whether 4mm2 or 6mm2 cables are used, the G12 series of modules can achieve higher savings in electrical costs and significantly reduce the LCOE. Power plant investors can flexibly select cable cross-sections based on the site's layout, irradiation level and the feed-in price as well as the budget so as to work out the optimal plan.

The comparisons show that the G12 series of ultra-high power modules represented by Trina Solar's Vertex can significantly reduce CAPEX, LCOE in particular. It sets a new cost-saving standard, ultimately ensuring the project's earnings and maximize customer value, making PV solar energy more cost competitive.

Firstly, the G12 modules can reduce the numbers of modules in the setup, reduce installations, and accelerate construction progress.

Secondly, thanks to the iconic low-voltage design of the Vertex G12 module, it is possible to string up more modules with the 1,500V voltage. Compared to the conventional M10 modules, the single string power is significantly boosted by 36%. In turn, it can save the material and labor costs of DC terminals, and thus reduce initial investment.



DNV assessment highlights system value of Trina Solar's 670W series module with Trina tracker

DNV, the world's leading certification body in third-party activities, recently calculated the CAPEX and LCOE of Trina Solar's 670W+ Vertex bifacial dual-glass modules (measured module power is 660W) plus Trina tracker. The calculations show that Trina Solar's Vertex 210mm bifacial dual-glass module can cut CAPEX by up to 1.2 €c/W and LCOE by 2.29% compared with the 182mm bifacial dual-glass module.

DNV, whose headquarters are in Oslo, Norway, is the world's leading independent assessment organization, with offices worldwide. As an international authority on assurance and risk management, DNV is renowned for its large database, world-leading digital solutions and objectivity.

DNV calculated the CAPEX and LCOE of the above three modules with Trina Solar's 1P tracker system based on fixed 100MW DC capacity, with the same DC/AC ratio. In terms of system design, the ground cover ratio (GCR) is fixed to ensure the consistent shadow occlusions on the bifacial module.

Module types: 182-535W bifacial dual glass, 210-545W bifacial dual glass, 210-660W bifacial dual glass.

Method of installation: Trina tracker - 1 P one-in-portrait single-axis tracking system

Inverter: string

Project location: Spain (figure below):

Such design aims to maintain control over the influence of external factors and system configuration on the same site, to objectively compare CAPEX and LCOE based on different modules. The comparisons of the BOS costs of the three modules are all based on local module costs, construction and installation, labor costs, grid interconnection fees, costs of operation and maintenance, land cost and financial cost, so that the calculation is consistent, complete and objective.

According to the design principle, the site system configuration and layout diagrams corresponding to the three modules are as follows:

Monthly GHI&DHI data of project location:

Project location

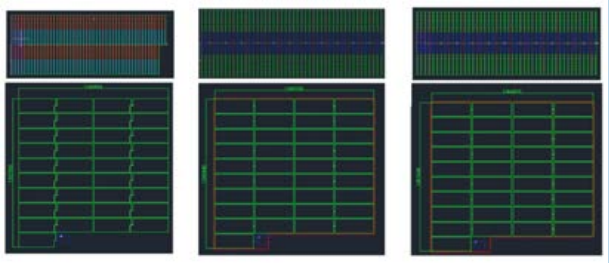
	GHI [kWh/m²] monthly	DHI [kWh/m²] monthly	T [°C]
Source	Satellite derived /4/	Satellite derived /4/	Satellite derived /4/
Period	1994 – 2019	1994 – 2019	1994 – 2019
Jan	80	29	10.7
Feb	99	36	12.1
Mar	148	52	14.9
Apr	176	62	17.1
May	213	72	20.8
Jun	234	69	25.2
Jul	245	64	27.5
Aug	218	62	27.7
Sep	164	54	24.3
Oct	122	45	20.2
Nov	85	31	14.5
Dec	71	26	11.6
Total	1,856	603	18.9

Monthly GHI&DHI data

Site system configuration:

PV system configuration			
Module layout	**182-72pcs**	**210-55pcs**	**210-66pcs**
Module power (W)	535	545	660
Inverter type	String inverter		
Modules/string	27	36	30
Total number of strings	6956	5106	5106
String power (kW)	14.45	19.62	19.80
DC capacity (MW)	100.48	100.18	101.10
AC capacity (MW)	99.9		
DC/AC ratio	1.01	1.00	1.01
Number of modules	187,812	183,816	153,180
Number of inverters	444		
Tracker type	Trina tracker 1P dual row		
Number of trackers	1739	1702	1702
Tracker height (m)	1.68	1.73	1.73
Tracker pitch (m)	7.01	7.41	7.41
Area (ha)	165.77	165.78	163.88

Project layout:



182-535W layout　210-545W layout　210-660W layout

Assessment results: 210 Vertex 660W reduces LCOE by 2.29% and CAPEX by 1.2 €c/W compared with 182-535W

Among Trina Solar's Vertex 210mm bifacial dual-glass modules, both 545W modules and 660W modules have advantages over 182mm bifacial dual-glass 535W modules in terms of BOS savings and LCOE. According to the conditions of this case, it is estimated that compared with 182-535W, the CAPEX of the Vertex 660W modules can be reduced by about 1.2 €c/W (equivalent to RMB 9 c/W), and the LCOE can be reduced by 2.29%, indicating the optimal system value.

A detailed breakdown and comparison of CAPEX shows that the savings are mainly due to three aspects: electrical cables, tracker installation and transportation.

First, thanks to the innovative design of low voltage and high-string power, the 210mm modules have significant savings in the electrical part of the system. The 210mm modules featuring high-string power can significantly save cable length by 30% to 39%. Hence cable costs of 210mm-545W and 210mm-660W are both reduced by more than 20% compared with 182mm-535W.

On the tracker side, fewer modules help effectively reduce the materials of mounting and connecting parts such as purlins, thereby cutting tracker costs. Because of the innovative packaging design, container capacity can be increased by more than 10%, effectively reducing transportation costs and further reducing initial investment.

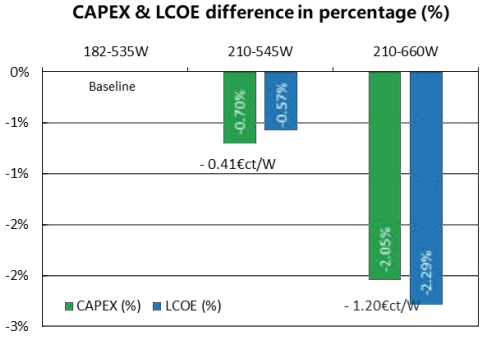
With superior power generation and robust reliability, Vertex is able to maximize value for customers by ensuring minimum LCOE during the system's life cycle.

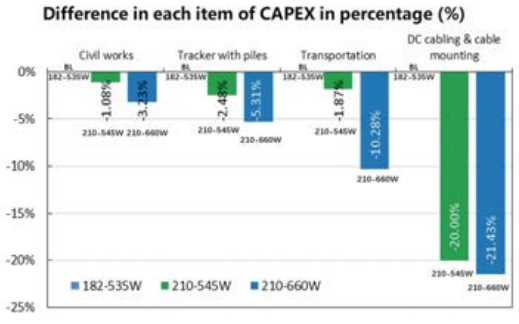
According to the results of the series of research and calculations completed by Fraunhofer and DNV, the 210mm (G12) modules represented by Trina Vertex boast significant advantages in the electrical systems, transportation and tracker installation compared with the 182mm (M10) and 166mm (M6) modules.

The savings have been verified by calculations conducted in various application scenarios (TrinaTracker 1P, TrinaTracker 2P, trackers with fixed tilts) in various project locations (Spain, the United States and Japan), and recognized by many developers, design institutes, research institutions.

For more information about the assessment report on Trina Solar's Vertex modules, please contact Trina Solar's local sales representatives. And please follow "The Way to Best LCOE" series.

Mail to: VertexValue@Trinasolar.com





Trina Solar 112MW power plant with 670W Vertex modules connected to the grid

On September 17, a 112MW PV power plant using Trina Solar 210 Vertex 670W ultra-high power modules successfully completed grid connection in Dachaidan, Qinghai Province.

The first batch of modules shipped on June 16, it took only three months to complete the project and connect to the grid. Covering an area of 217 hectares, the PV project can provide about 220,000 MWh green power per year and reduce carbon dioxide emissions by about 200,000 tons.

With a vast area and an average altitude of more than 3,400 meters, the Dachaidan region offers ample solar resources, which makes it an ideal location for solar power plant. To maximize the efficiency, the owner, Concord New Energy looked for PV modules with high energy yield and great reliability. After cautious comparisons, the project was decided for Trina Solar's 210 670W Vertex series of most advanced ultra-high power modules, which was just launched early this year.

The 670W Vertex modules are built for enduring harsh environmental conditions of this project, including desert, uninhabited land, high altitude, strong wind and sand, and huge temperature difference. The modules have passed rigorous tests including non-uniform snow-load test, extreme wind tunnel test, extreme low-temperature mechanical load test and hail test, which maintains ultra-high reliability. This July, Trina Solar published the serial report on the Mechanical Reliability of 670W Vertex Modules with details on the outstanding module performance in "extremely challenging tests". In the era of grid parity, the advanced Vertex 210mm series have a prominent advantages in Levelized Cost of Energy (LCOE).

Entering the PV 6.0 era and moving towards value collaboration and win-win cooperation, Trina Solar always focuses on adding value to customers by offering the most cost-effective and highly-efficient products.

Trina Solar 210 Vertex module provide backbone for 60MWp solar farm in Singapore, one of world's largest inland floating solar PV systems

Changzhou, China, July XX – The 60 MWp Sembcorp Tengeh Floating Solar Farm at Singapore's Tengeh Reservoir fitted with 122,000 Trina Solar 210 Vertex dual-glass modules, has officially opened in July 2021. Owned by Sembcorp Floating Solar Singapore, a wholly-owned subsidiary of Sembcorp Industries, the Farm is a global showcase of excellent operational performance, innovation and reliability in floating solar photovoltaic (PV) systems. Construction of the project began in August last year.

The Farm is expected to be in commercial operation for the next 25 years and it is Singapore's first large-scale inland floating solar farm, and one of the world's largest. At 60MWp, the floating solar PV system will generate enough energy to offset about 32 kilotonnes of carbon emissions annually, the same as taking 7,000 cars off the roads. Commissioned by Singapore's national water agency, the Public Utilities Board (PUB), the commencement of the solar farm's operations marks a significant step towards enduring energy sustainability in water treatment, making Singapore one of the few countries in the world to have a 100% green waterworks system.

The floating solar PV system has very strict requirements on component functionality, safety and reliability in a water environment. Based on Singapore's climate and its strict environmental protection policies, in order to maximize energy generation, minimize environmental and water quality impact, every component of the system was carefully designed. Trina Solar's 210 Vertex dual glass module was selected for this floating project with its high power generation and reliability in Singapore's hot and humid climate.

Trina Solar's 210 Vertex modules are manufactured based on a 210mm large silicon wafer and have advantages such as high power capacity, high efficiency, high reliability and high power generation. Because the system is based on Trina Solar's 210 Vertex modules it needs fewer panels even as it generates more power than other systems. It thus needs a smaller water surface than would otherwise be the case. Trina Solar's 210 Vertex modules are fully certified for their reliability and can help save construction costs of 0.04-0.07 CNY per watt, compared with 166 modules. "The application of Trina Solar's 210 Vertex modules in Singapore's floating project has produced a highly successful showcase," said Zhao Lei, project leader for Trina Solar in the China region. "With the Singapore project now in operation, more and more other markets will no doubt become aware of the quality of Trina Solar's 210 Vertex modules, thus considerably reinforcing our reputation overseas."


(Image: Sembcorp Industries)

Trina Solar's 210 Vertex modules, which come with a mission of "Solar energy for all" will continue to play a significant role in helping the world achieve a carbon-zero future.


(Image: Sembcorp Industries)

Trina Solar ships 600W+ series Vertex modules for a 850 MWp PV project, one of the largest in Brazil

Trina Solar is the major vendor of photovoltaic modules for the Futura 1 Project, a project with 22 solar energy parks, which is being developed by Focus Energia, in Juazeiro, Bahia, Brazil.

The project will be implemented in three phases. The first phase has an installed capacity of 850 MWp, which places the project among the largest in Brazil, at the moment.

The initial modules left China in 108 containers in the second week of August with 59,292 pieces of 600W series of modules. The bifacial modules, with 210 mm cells, belong to the Vertex line, with the latest technology available in the market. These high-powered products currently produced by Trina Solar are making room for the 670W successor, which can already be ordered for next year.

"Trina Solar has the most advanced technology and the most powerful modules with great performance. This, for sure, helped Focus to choose us," said Álvaro García Maltrás, Trina Solar's vice president for Latin America and the Caribbean.

According to Focus Energia, the project's energy production will be entirely destined for the free market. The strategy follows the latest trend in which renewable energy generation entrepreneurs tend to prefer to negotiate directly with clients, instead of competing in auctions promoted by Aneel, to serve the captive market exclusively.

According to Alan Zelazo, Focus CEO, it is estimated that 2 thousand direct jobs and 4 thousand indirect jobs will be generated during the system's implementation.

Furthermore, Futura 1 comes at an opportune moment. "Despite being a long term project, we are pleased to collaborate with the country to increase its production capacity in an extremely severe hydric crisis period."

The project is already underway and has 550 people working on site. Operations are scheduled to begin in April 2022.

Trina Solar in Brazil

Operating in Brazil since 2017, Trina Solar sees great potential in the country. "Brazil is Latin America's leading market for solar energy. It is a super dynamic market in high growth and a priority for Trina Solar. We entered a little later than our competitors, but we are now consolidating ourselves in the country," says Alvaro.

Trina Solar has already installed hundreds of megawatts in the Latin American and Caribbean region and is advancing with new contracts with other important customers in Brazil.

Integrated supply of Trina Solar 210 Vertex + TrinaTracker supports building 400MW solar plant with enhanced system value

Recently, 400MW agricultural photovoltaic solar plant in Nangong, Hebei Province in China under construction is more than halfway. The project adopts Trina Solar's 210 Vertex 550W series modules and TrinaTracker Vanguard 2P trackers to further increase the power generation and reduce the LCOE through the integrated advantages of "modules + trackers".

As one of the few solar companies in the industry with the ability to supply "modules + trackers", Trina Solar provides integrated solution for power plants, eliminating the pain point of incompatibility and separation between modules and trackers, resulting in no guarantee of product compatibility, high system loss, and difficulty in solving problems, which has long been a problem for customers.

With the core strengths of high reliability, more yield gain, low O&M (operation & maintenance) costs and unified contact channel (modules and trackers), benefiting by the integrated advantages of "modules + trackers", Trina Solar has won the bid successfully.

Vertex Module plus TrinaTracker form core components of Trina Solar's overall smart energy solutions. Based on large-size 210mm silicon wafers, the 210 Vertex module achieves the low voltage and high power with innovative non-destructive cutting and high-density cell interconnection technology, thus the module power gets up to 670W with an efficiency of 21.6%, the single string power gets 40% higher.

The new-generation TrinaTracker uses the intelligent tracking algorithm "SuperTrack" independently developed by Trina Solar which combines bifacial enhancement with intelligent backtracking, allowing high yield generation even with diffuse and indirect radiation. SuperTrack can increase energy production up to 8% over the traditional astronomical algorithm.

The independent single-row Vanguard 2P tracker is fully compatible with 210 modules up to 670W. In addition, TrinaTracker's patented spherical bearing contributes to reducing extra pressure and component failures due to system deformation. TrinaTracker's robust torque tube and multi-drive system provide stability under the extreme wind conditions. In terms of investment, TrinaTracker Vanguard 2P optimized design structure cuts down the number of piles, resulting in reduced BOS cost and installation time.

Besides, TrinaTracker's high-quality components and preventive maintenance reduce the number of O&M activities required during the lifetime of the installation allowing a low LCOE (Levelized Cost of Energy).

"According to the actual local insolation conditions and past data, the equivalent power generation hours over last three years is less than 1,250 when using the conventional solution. while upgrading into the Trina Solar's bifacial dual-glass 210 Vertex modules, the number of hours is expected to increase to no less than 1,350, and plus TrinaTracker, it can be increased by another 9% to about 1,471 hours. This significantly improves the owner's profitability." Wu Tengfei, the head of this project in Trina Solar China, said.

In a word, the "strongest combination" of Trina Solar's Vertex modules and TrinaTracker with state-of-the-art design will further help power plants increase power generation and lower its LCOE.

Trina Solar's 100 MW agricultural PV solar project fitted with 210 modules connected to grid

A 100MW agricultural photovoltaic solar project fitted with Trina Solar's 210 Vertex modules, situated in Luotian county, Hubei province, China, was connected to the grid recently.

The project, covering 160 hectares, uses Trina Solar's 210 Vertex 550W series and is expected to generate 110 million kWh of electricity a year, which may offset 42,000 tons of standard coal and reduce carbon dioxide emissions by 104,500 tons a year.

With the completion of the project, agricultural production and PV power generation will be effectively combined to achieve both agricultural development and solar energy utilization, which not only improves land use but also promotes local economic benefits.

The 210 Vertex module, based on large 210mm silicon wafers, achieves low-voltage high-power characteristics with innovative non-destructive cutting and high density cell interconnect technology, achieving maximum power of 670W with an efficiency of 21.6%, and single string power rising by 40%.

The inverters compatible with Trina Solar's 550W modules in this project are Huawei's latest high-current string inverters, highly adapted to ultra-high power 210 Vertex modules, resulting not only in higher power generation and safer operation, but also performing exceptionally well in terms of system stability of weak-grid connection and intelligent operation and maintenance.

"Ultra-high power modules are an inevitable trend in the PV industry," said Huawei's technical leader, "That's why we have launched matching inverters and provide a complete set of intelligent PV solutions."

After full verification in the market, the high-current inverters not only compatible with 210 modules, but also have the advantage of giving full play to the high-efficiency power generation of ultra-high-power modules and improving the system DC/AC ratio. More than 10 mainstream inverter manufacturers have now put high-current inverters on the market that are perfectly adapted to 210 modules.

The synergy of the 210 industry chain is more seamless and mature than ever, and the ecology is more complete. The ultra-high power modules with low voltage and high string power are widely used in large power plants worldwide.

Vertex modules take Asia-Pacific market by storm

Sri Lanka, meaning "A Land of Brightness and Abundance" in Sinhala, is known as the "Pearl of the Indian Ocean". The breathtaking scenery here mirrors the high performance and beautiful design of the Vertex distributed modules from Trina Solar. The project shown in the picture is located on a residential rooftop in Sri Lanka using Trina Solar's Vertex 550W modules. "This project generates a monthly income of 57,000 Sri Lankan rupees, equivalent to approximately 1,800 RMB," according to the house owner.

Pakistan, beautiful land with the meaning of "a pure site". Trina Solar has come to this sun-immersed land with its Vertex modules. This C&I rooftop project is located in Zephyrs Textile Mills, using Trina Solar's 510W distributed modules with a power generation cost of approximately 0.25 RMB per kWh, and a payback period of 3.9 years. It significantly shortens the payback period for the client. This project also helps local commercial and industrial owners transition to green manufacturing.

A quick fact about India: India has an average of 300 sunny days a year, which makes it an ideal location for solar.

In Coimbatore, an industrial city in southern India, Trina Solar Vertex 510W+ distributed modules are working well on a factory rooftop, integrating advanced 210mm cell technology with the wonderful Indian sunlight in this 1MW C&I project. With high product reliability and efficiency, our overseas customers speak highly of Trina for its C&I and residential solar solutions. Currently, large amounts of Trina Solar Vertex distributed modules have been installed in thousands of projects around the world. More cases will be shared soon!

As a country with tropical monsoon climate, **Vietnam** exhibits high temperatures and humidity throughout the year. Despite the humid condition, Trina Solar's modules still work efficiently and remain highly durable.

Trina Vertex 510W distributed solar module combines 210mm cell, non-destructive cutting, and multi-busbar technology to achieve a maximum power generation of over 510W and a maximum efficiency of 21.1%. Our Vertex 510W modules were implemented on the factory rooftops in both Ho Chi Minh City and Hanoi, making this C&I project a total size of 40MW. Trina Vertex series modules were designed for all types of application scenarios from distributed rooftop, fishing solar lighting, agricultural solar lighting, and power stations, etc. Check back soon for more updates about our products.

Standardization of 210mm-size modules significantly boosts the PV industrial chain and system value

In November last year eight world-leading photovoltaic brands, including Trina Solar, Zhonghuan Semiconductor and Risen Energy, set about promoting the standardization of 210mm silicon wafer modules in the photovoltaic industry. By May the 210-standardization process had achieved significant results, This is significantly driving up the value of the PV industry chain and system level.

Achieving agreement: Uniform size for 210 modules

On May 26 the China Photovoltaic Industry Association organized an online seminar on the standardization of module sizes. Fifty experts and representatives of module manufacturers, developers, system solution providers and third-party organisations, including Trina Solar, Risen Energy, Canadian Solar, Tongwei and TÜV SÜD, agreed on the overall dimensions of modules and technical specifications of mounting holes. Technical details such as cell spacing and design reference standards were also agreed upon to form a group standard. This means 210 module manufacturers, end users and system solution providers have achieved uniformity in technical issues.

Standardization of modules will greatly reduce BOS costs and LCOE, and deliver the convenience and maximum value of ultra-high power modules and solutions to solar applications.

For 110 half cells (55 whole cells), the length is determined as 2384±2mm, the width as 1096±2mm, and the positions of the mounting holes in the long side are put at 400/1400±1mm. Following is a breakdown of the dimensions of the three 210 products:

In addition, all 210 module manufacturers will design products in accordance with the latest international standard IEC/UL 61730.

Module standardization benefits the solar industry and maximizes IRR of solar plant

Increasing module power and reducing power generation costs has become an inevitable trend. Standardization of the 210 module will directly benefit the solar industry, EPCs and project developers.

Standardization of the 210mm wafer, cell and module size will directly result in lower BOS costs, and the supply chain will be made more efficient, achieving the optimum scale effect. In addition, industrial technical innovation stands to be accelerated, reducing manufacturing costs for the industry chain, initial investment of PV systems and LCOE, and ensuring IRR.

Cell type	Module type	Number of cells	Module length [mm]	Module width [mm]	Mounting hole distance in long side [mm]
Half cell	Single-glass, framed/ dual-glass, framed	110	2384±2	1096±2	400/1400±1
		120	2172±2	1303±2	400/1400±1
		132	2384±2	1303±2	400/1400±1

Trina Solar publishes white paper on global Inverters matching for Trina Solar Vertex series modules

Trina Solar has published a white paper on Inverter Matching for Trina Solar's Vertex Series PV Modules, the first intelligent inverters matching database in the global photovoltaic industry.

The inverters covered in the paper are fully adaptive to all modules in the 210 Vertex series, focusing on the Vertex 550W, 600W and 670W series ultra-high power modules, covering 21 mainstream inverter brands and more than 210 inverter models globally, adaptive to utility-scale power plants, as well as industrial and commercial distributed PV projects, and in agricultural, fishery and residential PV power settings.

The white paper provides customers a clear reference for convenient, systematic and multi-choice inverter matching in different settings.

Modules and inverters are important components of power plants, and matching directly improves system safety and value. Publication of the white paper is a milestone in promoting efficient and synergistic development of the industry and the building of a high-power PV ecology.

In addition to the comprehensive inverter matching database, the paper introduces the first quick matching tool (http://invertertool.trinasolar.com/) in the industry globally, which helps customers to locate, with just one click, their most suitable inverter.

Brand/module types	210@410W	210@510W	210@550W	210@600W	210@670W
FIMER	√	√	√	√	√
Fronius	√	√	√	√	√
GOODWE	√	√	√	√	√
GROWATT	√	√	√	√	√
HUAWEI	√	√	√	√	√
Ingeteam	√	√	√	√	√
锦浪科技	√	√	√	√	√
KACO	√	√	√	√	√
KSTAR科士达	√	√	√	√	√
上能电气	√	√	√	√	√
SMA	√	√	√	√	√
SOFAR	√	√	√	√	√
SUNGROW	√	√	√	√	√
TBEA	√	√	√	√	√

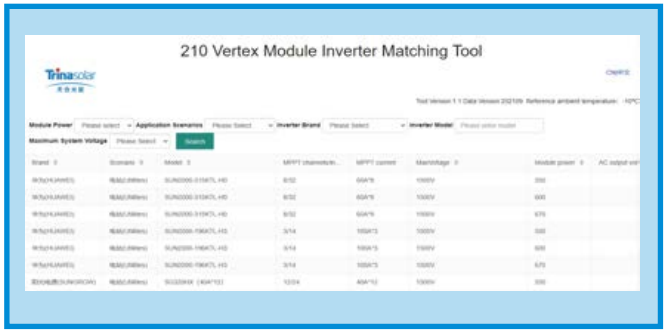
(Companies are sorted by alphabetical order)

Fully compatible with utility-scale power plants

The 210 Vertex series modules adopt a low voltage, significantly increases string power and reduces the purchase and installation cost of cables and auxiliary materials as well as the cost of trackers and pile foundations, reducing the BOS and LCOE of power plants. The 210 Vertex series has become a mainstream product on the market.

Since the world's leading photovoltaic inverter brands announced the market launch of inverters compatible with the 210 Ultra-High Power Modules, the global mainstream inverter brands have perfectly matched including 410W,

510W, 550W, 600W and 670W series. In the utility-scale power plant setting, 13 of the world's leading inverter brands and their products have been selected in the paper.



Fully compatible with distributed scenario: support ultra-high power modules for rooftop applications

Because of significant advantages in BOS and LCOE, 550W, 600W and 670W ultra-high power modules are not limited to utility-scale power plants. Distributed PV power projects have also upgraded to adopt Trina Solar's newest ultra-high power modules. All mainstream distributed inverter brands globally have launched their own series of string inverter solutions for application in distributed and residential PV power projects.

The white paper provides customers with many options for each situation. In the instance of commercial and industrial distributed PV power, 17 inverter brands are listed, such as FIMER, FRONIUS, INGETEAM, KACO, adding up to more than 100 models that all meet the application requirements. In rooftop household settings 11 inverter brands are included, adding up to 47 models to choose from, significantly improving matching efficiency.

With inverter manufacturers all adaptive, a ultra-high power PV ecology is formed

The ultra-high power modules are an unstoppable trend. In terms of market demand, the production capacity for 210 series modules is forecast to reach 147GW this year and 234GW next year, according to PVinfolink report. Large-size modules are forecast to account for more than 70% of overall module capacity worldwide.

In terms of inverter manufacturers, after full validation by the market, upgrading production to match 210 High-Power modules has become a common choice. At this year's SNEC PV Power Expo in Shanghai, dozens of inverter manufacturers exhibited their high-current inverters. With the publication of the white paper 19 mainstream global inverter manufacturers and 180+ adaptive models have joined Trina Solar's Matching Inverter Database, and the number will continue to grow.


(Image: Sembcorp Industries)