

SUNLENS

Suntech
2021 Vol.2



STAND THE TEST OF TIME

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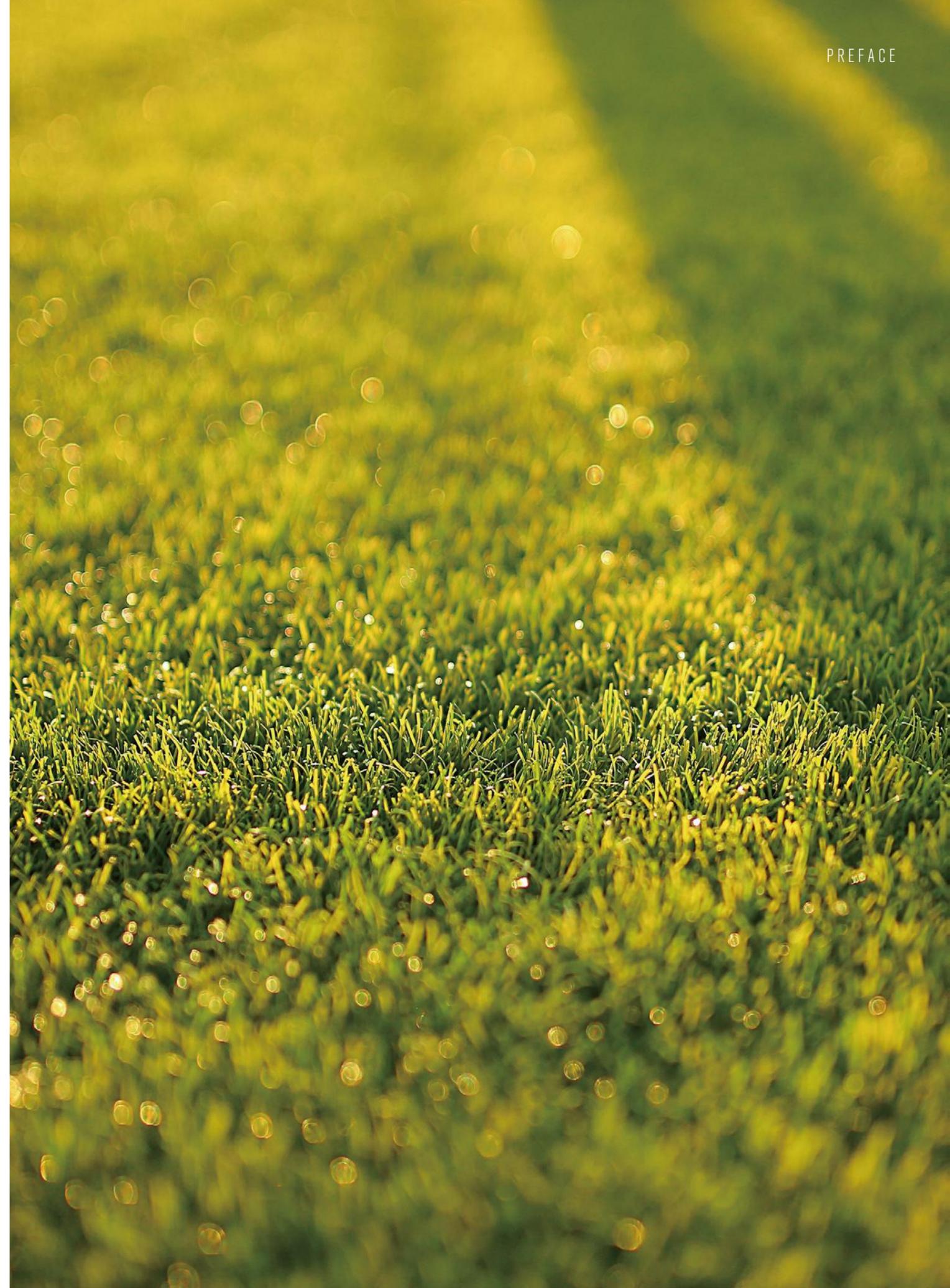
In this prime season of year, we are overwhelmed by vigor, dynamism and promise.

Concentrating on “carbon neutrality”, China and the rest of the world stand in unity and pitch in to tackle global climate change and hereby make a solemn commitment on the matter. As an irreplaceable source of renewable energy, PV industry is granted with a new opportunity for mass application and booming. However, the industry may witness volatility as China is recovering from the COVID-19 pandemic against the backdrop of the anemic industry chain, pricing fluctuation attributable to supply and demand imbalance, and even clouds on the whole traditional manufacturing ecosystem caused by tension of international relations.

Suntech has pulled through, regardless of turbulence of the times or radical movement to the industry. Staying true to our original intention with foresight, we have observed our 20th anniversary - a critical node in our evolution. On an honored footing, we start anew with concentration. Our journey is not all roses. But so long as we keep devoting ourselves to our cause, we will ultimately break through brambles and come to you with smile on a sunny day.

For us, this season suggests exploration, vitality, progressiveness and breakthrough. Out of hope in human nature arises our dedication for light. Ecological environment, enterprise manufacturing, rhythm of life... and all the other objective factors that structure survival of individuals are delivering a message of change, favorable or unfavorable, to us. After the mist comes the sunshine. It is the light that drives us forward.

In this opportune season, let's enjoy what is offered by nature and life with composure.



20 YEARS TOGETHER

20 YEARS TOGETHER



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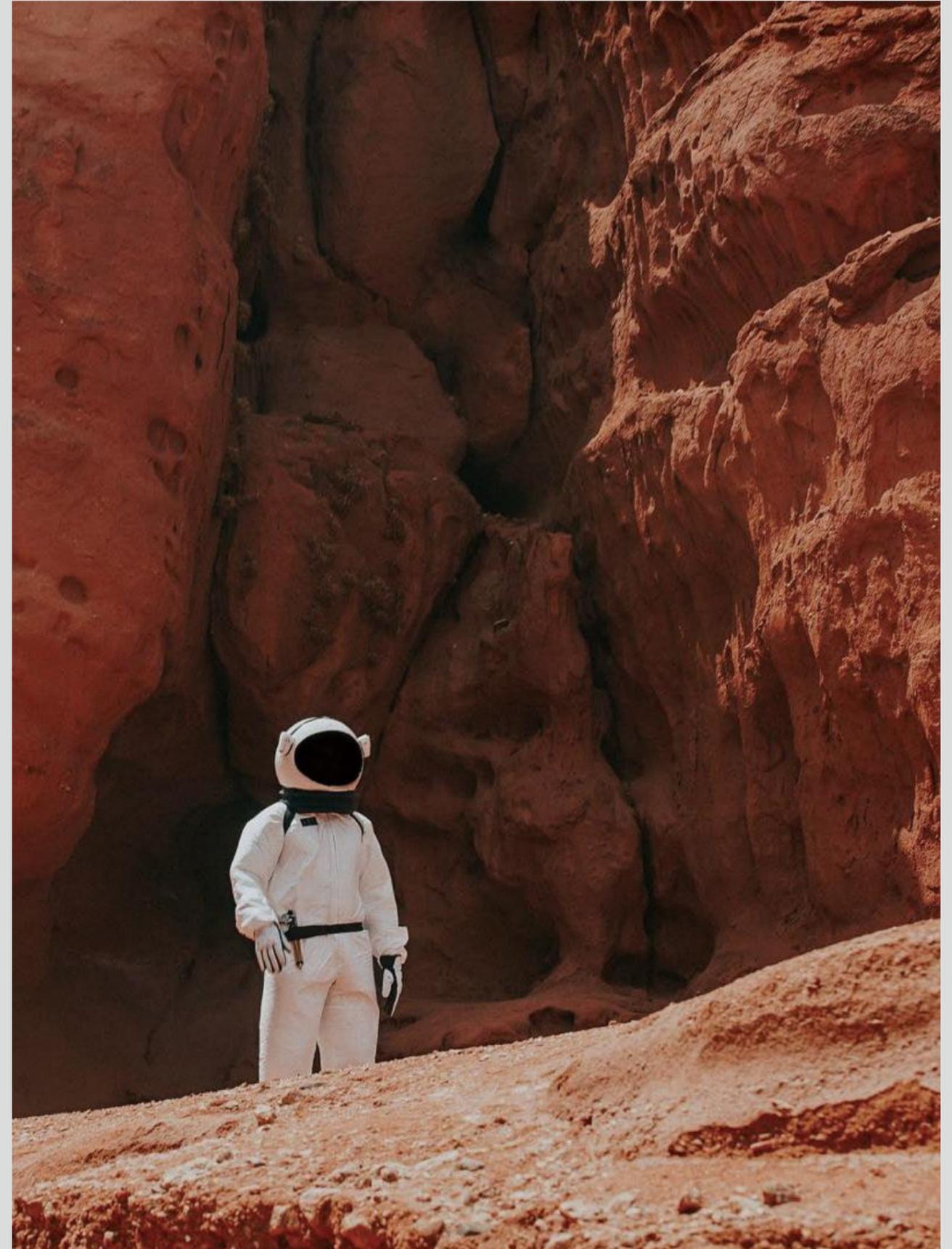
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INSIGHT



Global Action: Carbon Emission Reduction in Progress

1.From "Carbon Emission Reduction" to "Carbon Neutrality": Global Efforts in Tackling Climate Warming.

In 2019, the global average temperature is about 1.1 °C higher than pre-industrial era. In order to jointly addressing global warming, the Paris Agreement was signed with the main objectives of keeping the global average temperature rise within 2 °C, and within 1.5 °C if possible compared with the pre-industrial era. Many countries have put forward the objectives of greenhouse gas emission reduction and neutrality. The European Union, the United States and Japan and other most developed countries proposed to achieve the goal of neutrality by 2050. On September 22, 2020, at the General Debate of the 75th Session of the United Nations General Assembly, Chinese President Xi Jinping proposed that "We aim to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060." During the 14th Five-Year Plan period, China will step into a critical period of peaking carbon dioxide emissions. "Peaking carbon dioxide emissions and carbon neutrality" will have a series of effects on the medium and long-term development of China's chemical industry.

China: Entering into the Critical Period of "Peaking Carbon Dioxide Emissions"

China has put forward the goal of "having Carbon emissions peak before 2030 and achieving carbon neutrality before 2060" and plans to reduce carbon dioxide emissions per unit of GDP by more than 65% by 2030 compared with 2005, and increase non-fossil energy consumption to about 25%. To this end, China has implemented the new energy security strategy of "four revolutions and one cooperation" (consumption revolution, supply revolution, technological revolution, institutional revolution and international cooperation) by giving priority to the development of non-fossil energy, making clean use of fossil energy, and promoting the pilots of energy use rights and carbon emission permit trading.



Japan: Promoting Zero Carbon Transformation Through Green Investment and Technological Innovation

Japan peaked carbon dioxide emissions in 2008. In order to achieve the goal of carbon neutrality by 2050, Japan has proposed five policy measures in terms of fiscal budget, taxation, finance, regulations and standardization, and international cooperation in 14 key areas, including offshore wind energy, hydrogen energy, and electric vehicles. Through technological innovation and green investment, Japan is to ensure the smooth realization of low-carbon transformation.

The US: The Biden Administration Boosting the Process of "Carbon Neutrality"

The US peaked carbon dioxide emissions in 2007. The ruling party has a great influence on the carbon emission reduction policy. The Democratic Party pays more attention to the international emission reduction commitment. The US re-joined the Paris Agreement after Biden took office, and promised to achieve "carbon neutrality" by 2050. In addition to federal policies, local governments and non-governmental organizations also actively responded to greenhouse gas emission reduction by signing agreements and trading carbon emission permits.



EU: Proactive Commitment to Emission Reduction with Remarkable Effects

EU peaked carbon dioxide emissions in 1979, and plans to achieve "climate neutrality" by 2050. EU has also actively adopted a variety of approaches, including implementing corresponding measures in various fields (developing clean energy, electric vehicles, reduction of industrial emissions, etc.), determining "climate neutrality" targets by legislation, and effectively reducing emissions through the carbon emission trading system, etc.

2.Implementation Guideline on Carbon Neutral for Enterprises

Enterprises are the mainstay on the road to carbon neutrality. The government has issued relevant policies to explicitly encourage enterprises to implement carbon neutrality, and introduced supporting relevant incentive measures to mobilize the enthusiasm and initiative of enterprises to implement carbon neutrality, so that enterprises will play a greater role in the process of national carbon neutrality.

Defining Scope Boundaries

The carbon emissions of enterprises can be divided into three types: direct emissions, indirect emissions of purchased electricity and heat, and other indirect emissions. Enterprises with carbon management experience usually bring the three ways into the scope of management. In addition, there is a special boundary which is based on the whole life cycle of the product, that is, the carbon footprint of the product, which involves the carbon emissions generated in the whole process of manufacturing all parts of the product, from raw material mining to scrap disposal. Therefore, when setting carbon neutral goals, enterprises should first determine the boundary of carbon neutral scope, or the carbon emissions of supply chain and products.

Accounting Carbon Emission

Generally speaking, carbon emission accounting can be divided into two calculation methods: organization level and product level. As for the calculation of grid emission factors, the concept of location based power grid emission and market based power grid emission are introduced for the first time in GHG Protocol Scope 2 Guidance on calculating carbon emissions from electricity use issued by the World Resources Institute (WRI) in 2014. When calculating the emission location based power grid, the power consumption emission of enterprises is calculated according to the average emission factor of the whole power grid. In the calculation of market-based power grid emissions, the electricity emission factors provided by electricity dealers are used to calculate. If the electricity provided by electricity dealers for enterprises is clean electricity, and the ownership of its clean property can be proved, the electricity emission of enterprises can be considered as zero. As an important breakthrough, the concept offers a theoretical basis for enterprises to purchase clean power to reduce their own electricity emission. Thus, purchasing clean power has also been widely used in the carbon neutral implementation plan of enterprises.

Putting forward Carbon Targets and Implementing Emissions Reduction

Even if enterprises can achieve carbon neutrality by purchasing environmental rights and interests, their own emission reduction is also a very important part, which is also the part that all enterprises must implement according to the relevant standards of carbon neutrality. Therefore, in the process of achieving carbon neutrality, enterprises must put forward and achieve certain emission reduction targets, and need to regularly check and update emission reduction targets. In order to achieve the overall goal of carbon neutrality, enterprises usually need the support of other sub-indicators, such as the proportion of energy efficiency improvement, the use ratio of new energy and so on.

At present, most of the qualitative descriptions are used for what kind of emission reduction target can be regarded as meeting the standard of carbon neutrality. For example, the advanced value of industrial comprehensive energy consumption index released by the government is used as the basis to judge the achievement of the emission reduction target of an enterprise, but there are still differences among different industries and sectors.

Carbon Offsetting

Carbon offsetting is the purchase of environmental rights to offset the remaining part of emissions. Afforestation and environmental rights and interests based on natural solutions are most sought after by the market, followed by wind power, photovoltaic and other new energy projects. In the future, with the blowout of wind power and photovoltaic projects, their related environmental rights and interests may also gradually heat up.

The contribution of environmental rights and interests of any type of project in any year to the reduction of global greenhouse gas emissions is not significantly different. The subtle difference may lie in other added-value aspects of the project itself. From the perspective of standards, how to reasonably choose the environmental rights and interests that meet the requirements of carbon neutrality, so that carbon neutrality can win more support will be very important criteria to judge the stand or fall of the standard.

External Communication

External action is an indispensable part of the whole carbon neutrality. Enterprises need to make some normative requirements to implement external influence, such as the content of external disclosure, including the carbon neutral

scope, carbon accounting rules, the realization of carbon targets, offset scheme, etc., as well as the disclosure frequency and disclosure methods of relevant information.



Impacts of U.S.' ban on goods from China's Xinjiang

PVInfoLink

Background

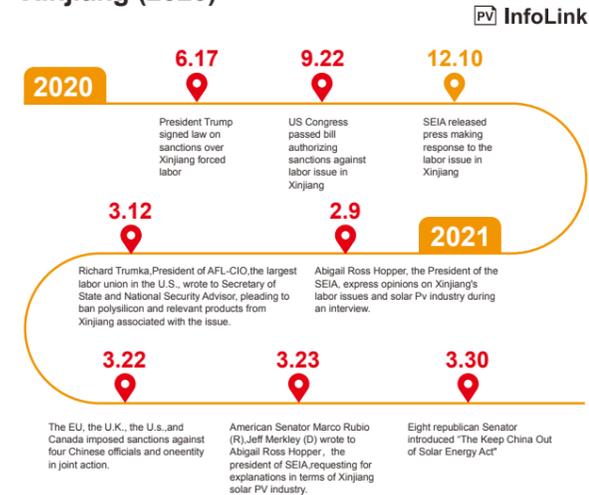
The U.S. House of Representatives has approved legislation that would ban imports of certain goods from China's Xinjiang region last September. Earlier in January, the Trump administration announced a ban on imports of all cotton and tomatoes from Xinjiang, which accounts 20% of world cotton supply. Xinjiang is also a major producer of fossil fuel and industrial materials such as polysilicon, an important material for manufacturing solar panels.

The U.S. recently began investigation on solar products made in Xinjiang. This March, Republican and Democrat senators sent a letter asking the Solar Energy Industries Association (SEIA) for information on "the extent to which the U.S. solar supply chain is currently dependent" on the Chinese PV supply chain and measures it has taken to ensure that solar products

sourced from Xinjiang are not made with forced labor. Recently, Senate Republicans even introduced legislation calling for a ban on all China-made solar products.

The bills will be sent to the President if they are passed by the Congress. Given the recent trade tension, the solar industry believes that the sanctions on solar products from Xinjiang will take effect soon. In anticipation of the import ban, PV manufacturers in China have taken actions in response, including establishing a mechanism that traces the country of origin for raw materials, source polysilicon from non-Xinjiang regions for some facilities, and select provinces outside of Xinjiang for capacity expansion.

Timeline of U.S. laws regarding the importation of goods from Xinjiang (2020)



Overview of Production Capacity in Xinjiang

Xinjiang is a major producer of polysilicon. PV InfoLink made forecast for the worst case scenario for the PV supply chain in Xinjiang.

Polysilicon: The total polysilicon capacity worldwide is estimated to sit at 710,000 MT by the end of 2021, while China alone will see 613,000 MT. Xinjiang, with around 297,000 MT, accounts for 48% of total capacity in China and 42% globally. Polysilicon manufacturers based in Xinjiang include Daqo New Energy, TBEA, East Hope and GCL Silicon.

Wafer: Jinko has 8 GW of mono ingot capacity in Xinjiang

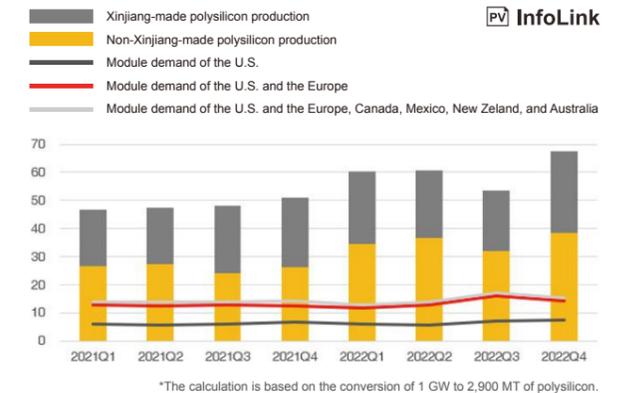
Cell, module: Only a few hundred MW older production lines are located in Xinjiang, which are currently suspended.

Current status

The U.S. Customs and Border Protection (CBP) has not barred imports of solar products made with materials sourced from Xinjiang, but if the sanctions on goods from Xinjiang are implemented in May, the U.S. may begin to bar modules made of polysilicon from Xinjiang between September and October, taking into account the 90-120 days of grace period. Under the scenario that no grace period is given, exports of modules to the U.S. during May to June might be disrupted.

Given the current international situation, it's likely that Europe will follow suit. Other countries such as Canada and Mexico have signed agreements on labor rights with the U.S., while Australia and New Zealand raised concerns about the Xinjiang issue. In light of this, PV InfoLink calculates the estimates for US demand as well as supply and demand of non-Xinjiang polysilicon under three scenarios: the U.S. plus Europe, Canada, Mexico, Australia, and New Zealand.

Non-Xinjiang polysilicon capacity V.S. demand from countries that may ban imports from Xinjiang (2021-2022), Unit: GW



Xinjiang accounts for 45% of global polysilicon production. The U.S. and Europe respectively represents 14-15% and 17-19% of polysilicon demand, while the U.S., Europe, Canada, Mexico, Australia and New Zealand occupy 36% of demand. This means that polysilicon sourced from regions outside of Xinjiang is sufficient even in the worst case scenario.

However, as wafer, cell, and module segment each has more than 100 GW of capacity expansion this year, the market saw panic buying and hoarding even in the low season. Although polysilicon from non-Xinjiang region is enough to meet demand from the U.S. as well as countries that may introduce sanctions against goods from Xinjiang and wafer manufacturers have sourced polysilicon from other regions for some facilities since the end of last year, it's expected that demand for polysilicon in non-Xinjiang regions will be strong if the sanctions take effect. A price gap between polysilicon from Xinjiang and non-Xinjiang region will emerge as a result.

Since the end of last year, vertically integrated companies, US companies, and manufacturers that supply modules to the U.S. market have started to negotiate supply deals of wafers made of polysilicon from regions out of Xinjiang, in case of some countries ban imports of modules related to forced labor. Moreover, wafer and vertically integrated companies now source polysilicon from non-Xinjiang regions to avoid the complicated procedure of tracing the country of origin when exporting modules to the U.S.

Given modules exporting to the U.S. and Europe may use polysilicon from non-Xinjiang regions in the future, Chinese polysilicon manufactures opt to set up new production lines in provinces outside of Xinjiang, such as Sichuan, Inner Mongolia, and Yunnan. Tongwei's unit of Yongxiang will bring new capacity online in Sichuan and Yunnan by the end of the year, while TBEA has capacity expansion plan for its Baotou-based facility next year. Against this backdrop, Chinese polysilicon in non-Xinjiang regions is forecast to grow by more than 50%. Once the polysilicon shortage eases in mid to late 2022, polysilicon in Xinjiang will see serious surplus.

From a quarterly supply perspective, polysilicon in non-Xinjiang regions may be sufficient to supply countries that may ban goods from Xinjiang even in the third quarter of 2022, when the high season falls. Having said that, wafer manufacturers may hoard polysilicon again due to significantly higher volume of capacity than polysilicon.

Polysilicon capacity in Xinjiang and non-Xinjiang regions (2021-2022)

PV InfoLink	2021	2022	YoY
Polysilicon capacity in Xinjiang	102	121	18.5%
Non-Xinjiang polysilicon capacity in China	109	166	52.2%
Polysilicon capacity outside of China	33	35	5.2%

COLUMN



Do we really understand the failure mechanism of PERC cell?



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Abstract: Passivated emitter and rear cell (PERC), due to its higher efficiency than Aluminum Back Surface Field (Al-BSF) cell, has attracted more and more attention in the industry and gained more market shares. However, this cell technology brings new challenges in the degradation phenomenon: we found that some monofacial/bifacial PERC cell modules showed much higher power degradation than Al-BSF cell modules after DH (85 °C & 85% R.H., 1000 hrs.) and PID (85 °C & 85% R.H., -1500V, 96 hrs.) tests, which will be focused in this paper. We also found that the power degradation of PERC cell modules after DH and PID tests is mainly caused by decrease of short-circuit current. For bifacial glass-glass module, PID failure can occur under either negative or positive bias voltage, the power degradation can be recovered after conditioning modules in a dry heat climate chamber at 75 °C for 48 hours and injecting

forward Isc current. This result indicates that such failure does not occur outdoor because the conditions of high heat and no current do not appear in the field. Therefore, deviations of standard IEC conditions from real field conditions might lead to wrong conclusions on the lab testing results.

Keywords: monofacial PERC cell, bifacial PERC cell, PID, recovery.

1.Introduction

Passivated emitter and rear cell (PERC) modules, due to its higher efficiency than Aluminum Back Surface Field (Al-BSF) cell modules, has attracted more and more attention in the industry and become a more promising candidate to reduce the LOCE. Furthermore, bifacial PERC modules fabricated by using glass-glass or glass-white backsheet, which can achieve higher power gain than monofacial PERC cell modules in the field, has gained more market shares. However, in the pathway of PERC cell technology development, the reliability problem recently has caught considerable attentions from researchers, manufacturers, and investors. It has been found that the rear side of a bifacial glass-glass module is more sensitive to potential induced degradation (PID) than the front side, since the rear side of a PERC cell is not equipped with a full-area rear-side metallization[1, 2]. The degradation on the rear side of a bifacial cell module has been shown to be fully or partially recovered under illumination [1-3]. According to the researches of Kai Sporleder et al., the electrochemical formation of SiO₂ and the interfacial Na, K, and Ca contaminations under cathodic conditions seems to play a major role in the degradation mechanism of rear side [1]. However, for module with PERC technology, except for the PID failure of bifacial PERC cells, other failure phenomena such as continuous degradation in the dark at room temperature of bifacial PERC cell module, large degradation after Damp-heat (DH) and PID test of monofacial PERC cell module have not been explored yet.

In this work, not only results of PID test on bifacial PERC cell module fabricated using glass, transparent backsheet, and white backsheet as backboard are shown, results of DH and PID test on monofacial PERC cell module are also presented. We focus on the recovery behavior and how to reduce the degradation. Recovery test is conducted by conditioning modules in a dry heat climate chamber at 75 °C and injecting forward Isc current, which mimics the conditions of light induced degradation (LeTID) regeneration. We found that the power degradation of bifacial cell module can be restored after recovery test. The degradation of monofacial PERC cell module after DH and PID test has also been shown to be partially recovered by injecting forward Isc current. Bifacial PERC cell module fabricated by using glass-glass layout is more sensitive to PID than the one with glass-transparent backsheet layout. In addition, PID failure can occur on bifacial glass-glass PERC module under either negative or positive bias voltage. The PID degradation of a bifacial PERC cells module with glass-white backsheet layout can be reduced by using white EVA as an encapsulation material on rear side instead of transparent EVA.

2.Experimental

2.1 Monofacial PERC cell module test

We used commercial monofacial PERC solar cells from four different manufacturers, abbreviated as cell type A, B, C, and D. Type A and Type B was made from boron doped monocrystalline silicon wafers. Type C and Type D was made from gallium doped monocrystalline silicon wafers. All the modules were fabricated by using glass-white backsheet and transparent EVA as encapsulation material.

In Tab.1 it shows the received test items of all modules. In the first part of the experiments, degradation due to PID test and recovery behavior afterwards was investigated on Module 1 to 4. The PID test was performed by using a high voltage of -1000 V applied to the frame at a module temperature of 85 °C and relative humidity of 85%. For the recovery test, stressed modules were injected forward Isc current for 48 hours at 75 °C. For cell Type D, module 4 was stressed by PID test followed by PID recovery (a high voltage of +1000 V applied to the frame at a module temperature of 85 °C and relative humidity of 85% for 96hrs, and its recovery behavior was investigated afterwards.

In the second part of the experiments, degradation due to high temperature and high humidity and recovery behavior afterwards was investigated on Module 5 and Module 6.

Tab.1. test items of all modules

Module No.#	Cell type	Encapsulation material	Stressed	PID recovery	Forward Isc Current injected	DH	High temperature
Module 1	A	EVA	-1000 V	--	1cycle (48 hrs)	--	--
Module 2	B	EVA	-1000 V	--	1cycle (48 hrs)	--	--
Module 3	C	EVA	-1000 V	--	1cycle (48 hrs)	--	--
Module 4	D	EVA	-1000 V	96 hrs	1cycle (48 hrs)	--	--
Module 5	D	EVA	--	--	1cycle (48 hrs, after DH test)	1000hrs	--
Module 6	D	EVA	--	--	--	--	200 hrs

2.2 Bifacial glass-glass / glass-transparent backsheet module test

We used commercial bifacial PERC solar cells made from boron doped monocrystalline silicon wafers from two different manufacturers, abbreviated as cell type E and F.

In Tab.2 it shows the received test items of all modules. Degradation due to PID test and recovery behavior afterwards was investigated on module 7-16. The PID test was performed by using a high voltage of -1000 V applied to the frame at a module temperature of 85 °C and relative humidity of 85 % for 96 hours. For the recovery test, two methods were used. In Method A, stressed modules were stored in the dark at room temperature for a period of 536 days and subsequently injected forward Isc current at 75 °C till the power was stabilized. In Method B, stressed modules were stored in the dark at room temperature for a period of 6 days and then illuminated in the field for 530 days.

Tab.2. test items of all modules

Module No.#	Cell type	Fabrication	Encapsulation material	Stressed	Dark storage	Forward Isc Current injected	Light
Module 7	E	Glass-glass	POE	-1500 V	536days	4 cycles (each cycle 48 hrs)	--
Module 8	E	Glass-glass	POE	+1500 V	536days	4 cycles(each cycle 48 hrs)	--
Module 9	E	Glass-glass	POE	-1500 V	6days	--	530 days
Module 10	E	Glass-glass	POE	+1500 V	6days	--	530 days
Module 11	F	Glass-glass	POE	-1500 V	536 days	1 cycle	--
Module 12	F	Glass-glass	POE	+1500 V	536 days	1 cycle	--
Module 13	E	Glass-transparent BS	POE	-1500 V	--	--	--
Module 14	E	Glass-transparent BS	POE	-1500 V	--	--	--
Module 15	E	Glass-glass	POE	-1500 V	--	--	--
Module 16	E	Glass-glass	POE	-1500 V	--	--	--

2.3 Bifacial glass-white backsheet module test

Glass-white backsheet module with cell type E and F was fabricated with white EVA and transparent EVA as encapsulation material on rear side, respectively.

In Tab.3 it shows the received test items of all modules. In the first part of the experiments, degradation due to PID test and recovery behavior afterwards was investigated on module 17-20. The PID test was performed by using a high voltage of -1500 V applied to the frame at a module temperature of 85 °C and relative humidity of 85%. For the recovery test, stressed modules were injected forward Isc current for 96 hours at 75 °C. In the second part of the experiments, energy-dispersive spectroscopy (EDS) (ZEISS X-MaxN20 (51-XMX1121)) was employed to investigate the elemental changes of white EVA and transparent EVA before and after PID test.

Tab.3. test items of all modules

Module No.#	Cell type	Encapsulation material	Stressed	Forward Isc Current injected	EDS
Module 17	E	Front side: transparent EVA Rear side: white EVA	-1000 V	--	Y
Module 18	E	Front side: transparent EVA Rear side: transparent EVA	-1000 V	--	Y
Module 19	F	Front side: transparent EVA Rear side: white EVA	-1000 V	2 cycle (96 hrs)	--
Module 20	F	Front side: transparent EVA Rear side: transparent EVA	-1000 V	--	--

3.Results

3.1 Characterization of monofacial PERC cell module degradation and recovery behavior after DH and PID tests

3.1.1 Characterization of monofacial PERC cell module degradation and recovery behavior after PID test

In Fig.1 it shows that all tested modules are prone to PID. The power loss of module 1, 2, 3 and 4 is -5.5%, -6.9%, -7.7% and -5.3%, respectively, where the Isc and Voc loss of the same testing group is -1.4%, -1.4%, -1.8%, -1.0% and -0.8%, -0.7%, -1.0% -0.5%, respectively. It is clear that Isc loss is the dominating loss factor here, which is different from the well-known shunting type PID (PID-s) of Al-BSF solar cell module where Voc loss is the dominating loss factor. Following the PID test, Module 1, 2 and 3 received the recovery test by injecting forward Isc current. The results show that Pmpp and Isc of all modules recovers partially, whereas Voc shows an almost fully recovery. For Module 4, PID recovery test was applied after PID test and the current recovery behavior afterwards was studied. The rel. power loss recovers from -5.3% after PID test to -4.9% after PID recovery. In contrary to recovery behavior of power, Isc and Voc shows continuous loss. However, the rel. power loss recovers significantly from -4.9% after PID recovery to -3.2% after forward Isc current injection and Isc also recovers partially, whereas Voc shows an almost fully recovery.

Electroluminescence (EL) test was carried out in each test stage, see Fig.2. In the stressed state, dark cells can be observed, and the dark cells in Module 1, 2 and 3 can be recovered by injecting forward Isc current. For Module 4, more dark cells can be observed after PID recovery, although they can also be recovered by injecting forward Isc current. The change of EL images are corresponding to the change of electrical characterization. Hence, we think that the LeTID may play a role during PID test.

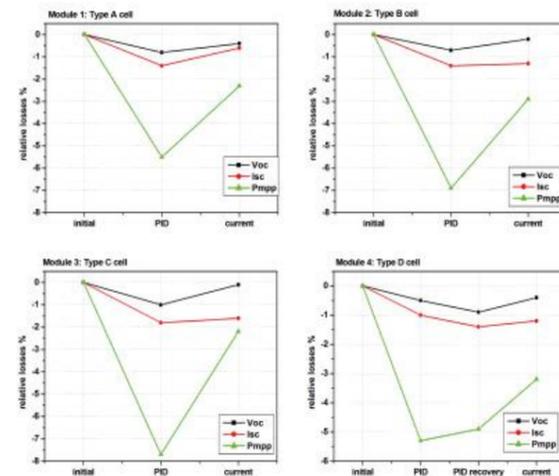
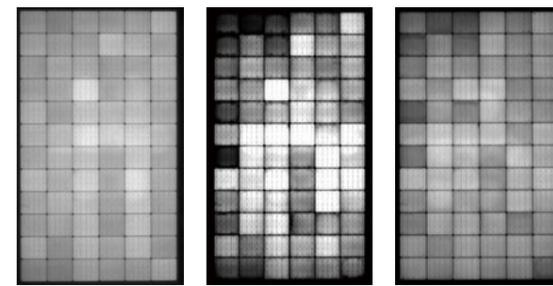
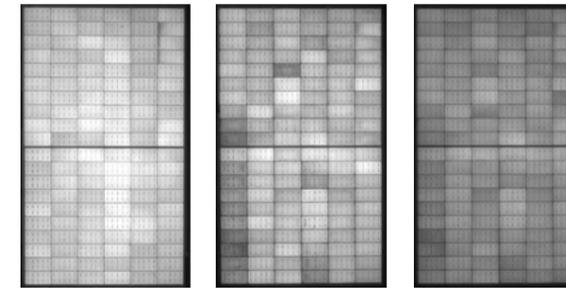


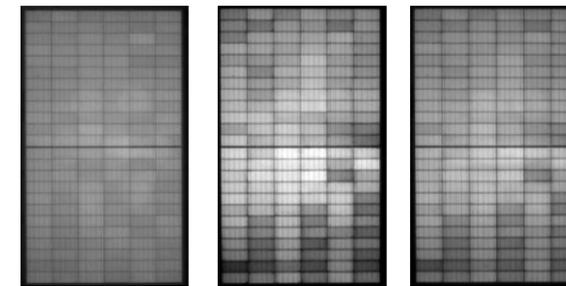
Fig. 1. Relative losses in short current Isc, open circuit Voc, and maximum power output Pmpp of the modules under tests.



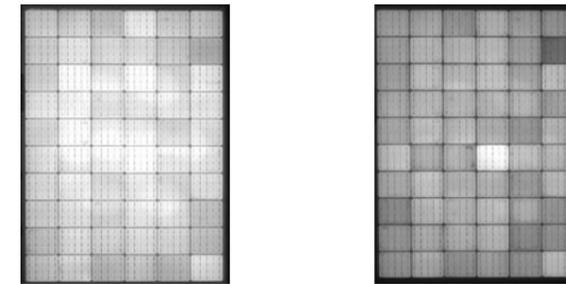
Module 1: Cell Type A (Left: initial; Middle: stressed; Right: current injected)



Module 2: Cell Type B (Left: initial; Middle: PID test; Right: current recovery)



Module 3: Cell Type C (Left: initial; Middle: PID test; Right: current recovery)



Module 4: Cell Type D (Left: initial; Middle left: PID test; Middle right: PID recovery; Right: current recovery)

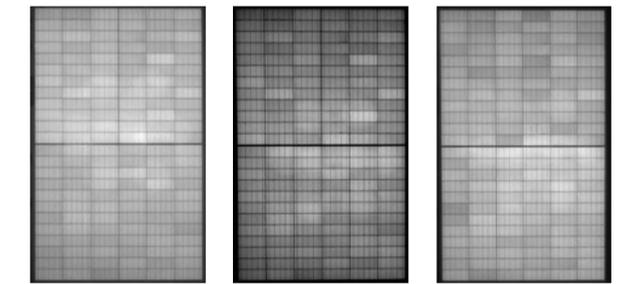
Fig. 2. EL images of the modules under tests (Module 1, 2 3 and 4)

3.1.2 Characterization of monofacial PERC cell module degradation and recovery behavior after DH test

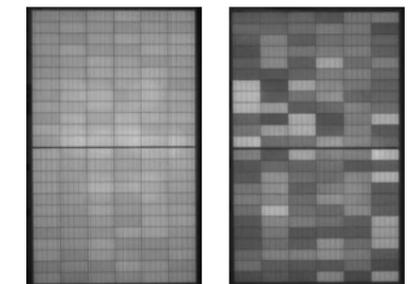
DH (85 °C & 85% R.H., 1000hrs) and high temperature test (105 °C, 200hrs) were conducted on two modules using cell type D and same encapsulation materials which underwent current recovery test afterwards. In Tab.1, the results show that the tested modules are sensitive to high temperature and this degradation can be recovered after current recovery test. The Pmpp and Isc of Module 5 shows recovery partially by injecting forward Isc current, Voc shows an almost full recovery. EL test was carried out in each test stage, see Fig.3. The change of EL images are corresponding to the change of electrical characterization. Hence, we think that the LeTID may also play a role during high temperature and high humidity test.

Tab.4. Electrical characterization of degradation and recovery behavior

Sample No.#	State	Voc	Isc	Pmpp	Voc loss%	Isc loss%	Pmpp loss%
Module 5	DH test	49.26	9.76	382.75	-0.5%	-4.6%	-5.4%
	Forward current injected	49.44	9.88	390.51	-0.1%	-3.4%	-3.5%
Module 6	Initial	49.03	10.08	395.19			
	High temperature test	48.28	9.89	375.76	-1.5%	-1.8%	-4.9%



Module 5: (Left: initial; Middle: DH test; Right: current injected)



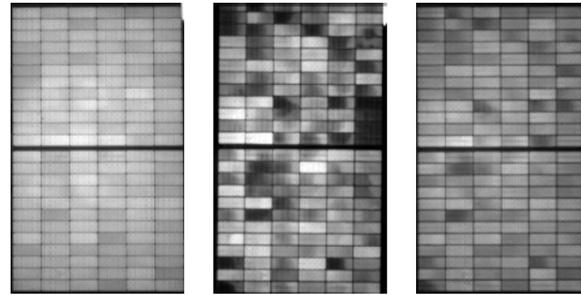
Module 6: (Left: initial; Right: high temperature test)

Fig.3. EL images of the modules under tests (Module 5 and Module 6)

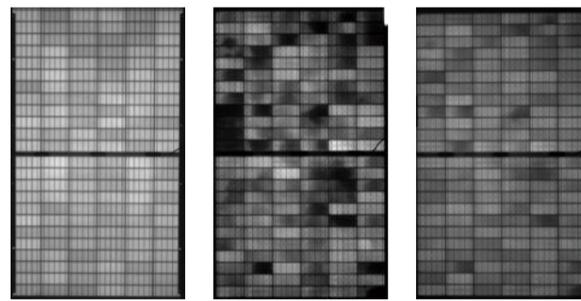
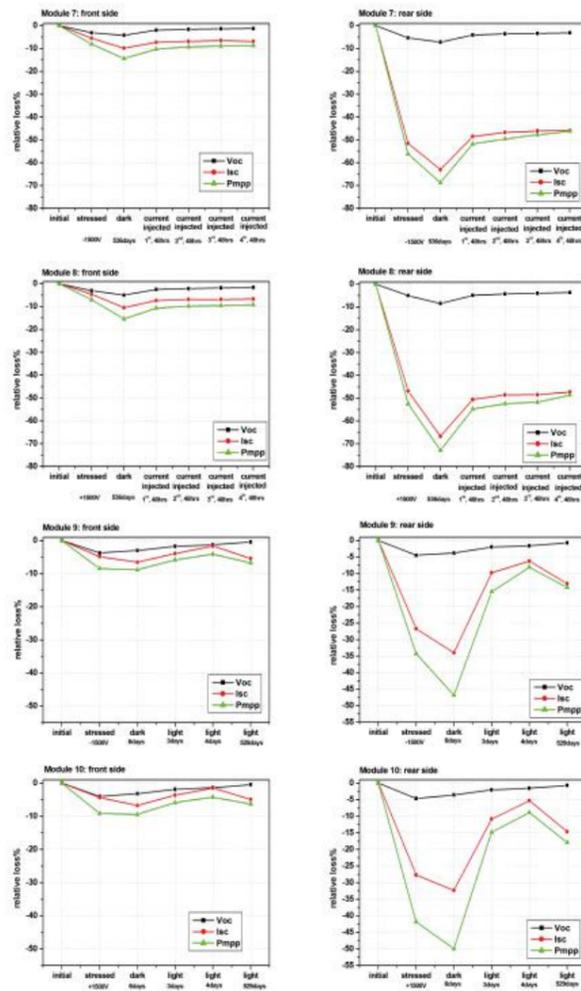
3.2 Characterization of bifacial glass-glass / glass-transparent backsheet modules degradation and recovery behavior

The rear side of modules using cell type E (Module 7, 8, 9, and 10) are found to be more sensitive to PID than the front side. This failure can be observed under either negative or positive voltage, see Fig.4. The rel. Pmpp loss is mainly caused by the loss of Isc. After the PID test, modules were stored in the dark at room temperature. The further loss can be observed on front side and rear side of all tested modules. Subsequently, Module 7 and Module 8 exhibits a recovery behavior after forward Isc current injection, Module 9 and Module 10 shows illumination recovery behavior (illuminated on rear side). The Pmpp and Isc of these modules only recovers partially, whereas Voc shows an almost fully recovery after applying two different recovery methods. Furthermore, the recovery behavior by illumination on rear side is more pronounced compared to that of forward Isc current injection. In Fig.5 it shows the EL images of Module 10 under each test stage. The change of EL images are corresponding to the change of electrical characterization.

Fig.4. Relative losses in short current Isc, open circuit Voc, and maximum power output Pmpp of the modules using cell type E under tests. Module 7 and Module 9: negative 1500V voltage was applied during stress test; Module 8 and Module 10: positive 1500V voltage was applied during stress test.



(Module 10 Front side; Left: initial; Middle: PID test; Right: light)



(Module 10 Rear side; Left: initial; Middle: PID test; Right: light)

Fig.5. EL images of Module 10 under tests

However, for the modules using cell type F, a full recovery can be observed after forward Isc current injection, see Fig.6.

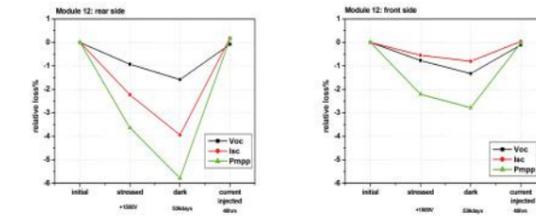
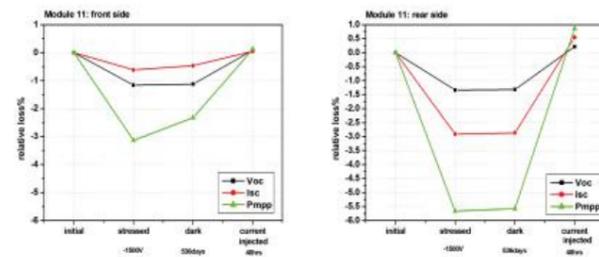


Fig.6. Relative losses in short current Isc, open circuit Voc, and maximum power output Pmpp of the modules using cell type F under tests. Module 11: negative 1500V voltage was applied during stress test; Module 12: positive 1500V voltage was applied during stress test.

The same failure phenomenon is obtained for the bifacial modules from different manufacturers: the rear side is more sensitive to PID compared to the front side. However, it is found that the loss on rear side can be reduced when using transparent backsheet instead of glass, probably due to the fact that backsheet has higher insulation resistance than that of glass (see Fig.7 and Fig.8).

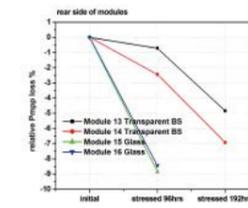


Fig.7. Relative losses in maximum power output Pmpp for modules using transparent Backsheet and glass as backboard.

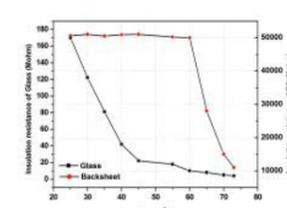


Fig.8. Insulation resistance of glass and backsheet at different temperature.

3.3 Characterization of bifacial glass-white Backsheet modules degradation and recovery behavior

Bifacial PERC cell module with Glass- white backsheet layout can achieve higher power gains than monofacial PERC cell module, therefore, it is normally considered to be an alternative choice for the high power module. Nevertheless, the PID phenomenon on rear side still influences the power output of the module, although the power on rear side cannot be measured due to the use of white backsheet. However, it is found that the PID phenomenon on rear side can be reduced when using white EVA instead of transparent EVA as rear side's encapsulation material, see Fig.8. The difference between white EVA and transparent EVA is titanium dioxide (TiO2), which can enhance the reflection of light on white EVA and therefore increase the power output.

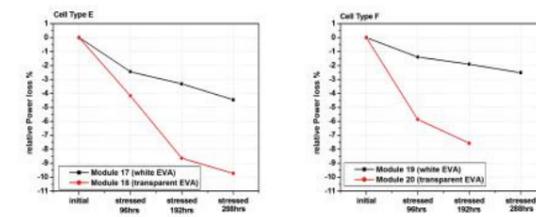


Fig.9 Relative losses in maximum power output Pmpp of module using transparent EVA and white EVA as encapsulation material (Left: modules using cell type E; Right: module using cell type F).

The recovery test by injecting forward Isc current after PID test was conducted on Module 20 and followed by PID recovery test. It can be found that the module recovers partially after injecting forward Isc current, the rel. Pmpp loss reduces from -7.57% after PID test to -1.66% after forward Isc current injection. However, the module shows further power loss after PID recovery test, the rel. Pmpp loss increases from -1.66% after forward Isc current injection to -2.83% after PID recovery test.

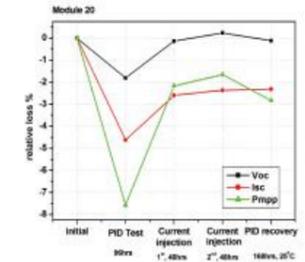
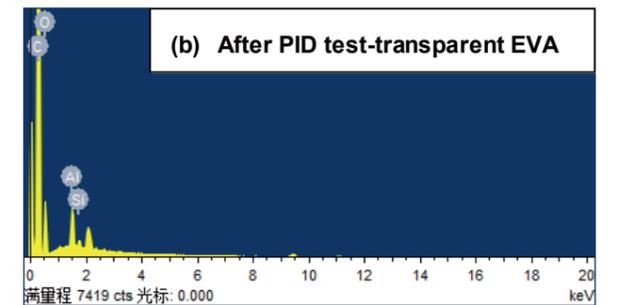
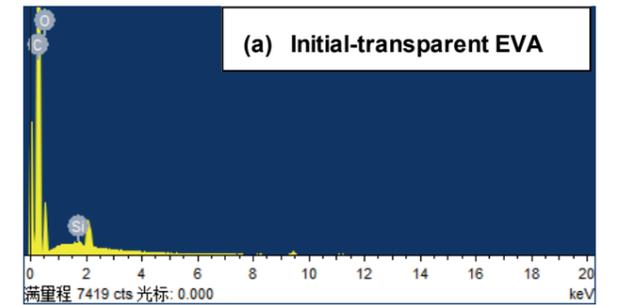


Fig.10. Relative losses in maximum power output Pmpp of Module 20 under forward Isc current injection recovery test and PID recovery test.

Energy-dispersive spectroscopy (EDS) was carried out on Module 17 and Module 18 to analyze the difference between white EVA and transparent EVA after 288hrs stress test. The result shows that Na, K and Cl can be found in white EVA after PID test compared to the initial state, see Fig.11. No any change in transparent EVA can be observed before and after PID test. We believe that the TiO2 in white EVA can influence the movement of Na, K which comes from the cell.



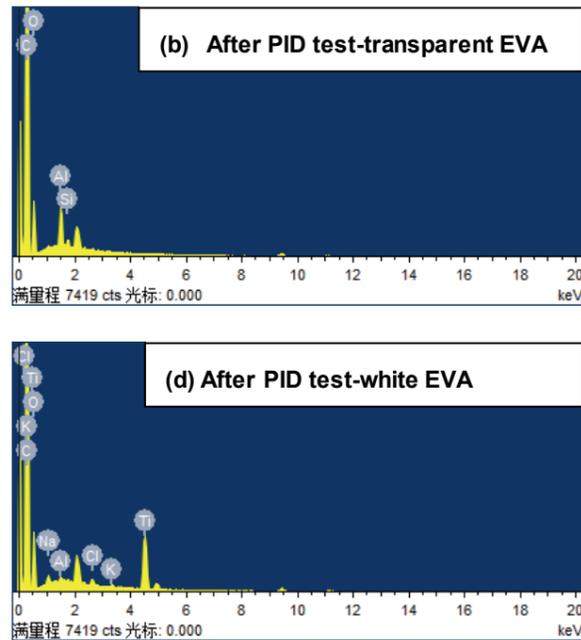


Fig.11 EDS characterization of white EVA and transparent EVA. (a) EDS of transparent EVA in initial state. (b) EDS of transparent EVA after PID test. (c) EDS of white EVA in initial state. (d) EDS of white EVA after PID test.

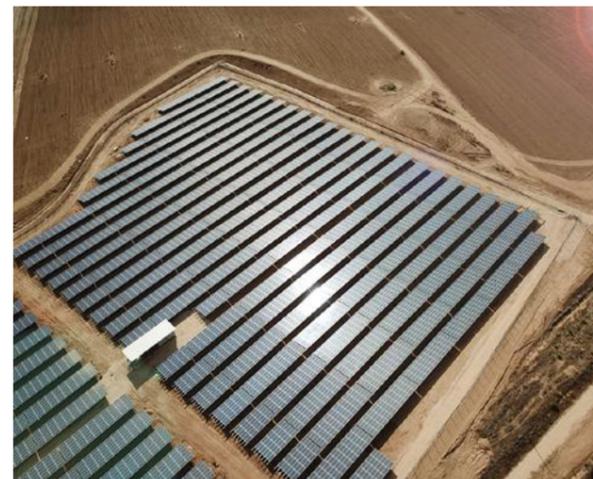
4. Conclusions

Modules using monofacial PERC cells from four different manufacturers (cell type A, B, C and D) were found to be prone to PID. For modules using cell type D, high power loss can also be observed after DH and high temperature test. Relative Pmpp loss of all tested modules recovered partially by injecting forward Isc current at 75 C.

For bifacial glass-glass module, PID failure can occur under either negative or positive voltage. The modules using either cell type E or cell type F were both found to be prone to PID on the rear side, which is in good agreement with the findings in literatures [1-3]. Relative Pmpp loss can be recovered by injecting forward Isc current at 75 C or under illumination. Different recovery behaviors were observed on cells from different manufactures. Relative Pmpp loss of modules using cell type E recovered partially while relative Pmpp loss of modules using cell type F recovered fully.

For bifacial PERC cell modules fabricated using Glass-white backsheet, the PID failure on rear side can be reduced when using white EVA instead of transparent EVA as encapsulation material. EDS analysis showed that Na and K can be found in white EVA after PID test compared to the initial state.

The failure of PERC cells under PID and DH test can be recovered by applying the LeTID regeneration method where injecting forward Isc current at 75 C. Hence, we believe that LeTID may play a key role during PID and high temperature tests.

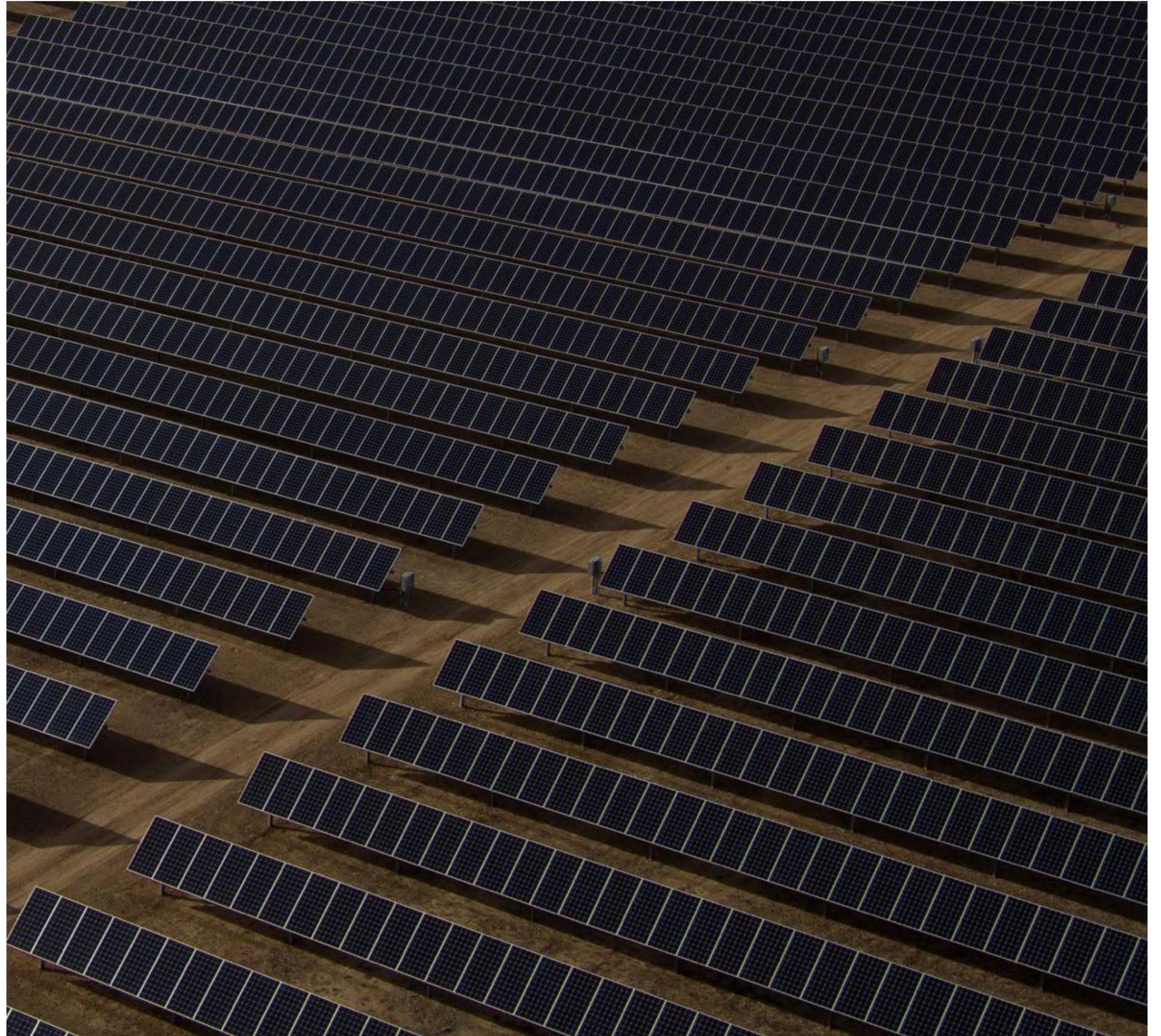


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INSIDE





Suntech Ranked In the “Global Top 20 Companies On PV 2021”

On May 10, the "Brand Power-2021 China Carbon Neutral Summit & Global Top 20 Companies Press Conference on PV/Energy Storage Industry 2021" sponsored by PV 365, Energy Storage 365 and Smart Energy was held in Hangzhou, Zhejiang Province. Suntech ranked in the three lists of "Global Top 20 Companies on PV 2021", "Chinese Top 20 Companies on PV 2021" and "Top 20 Chinese Solar Panel Companies on PV 2021".

As the first-hand Industry Guide for industry development research, credit, investment, cooperation and procurement, the Global Top 20 Companies Press Conference on PV has always adhered to the evaluation purpose of "viewing the development with data, testifying strength with business performances". Through detailed data research and based on the annual business performance of the previous year, it reveals the advantages of enterprises in various segments of PV industry for media, investors, financial institutions, related industries, third party service organizations in the industry. Suntech, with its global famous brand comprehensive influence and excellent product output, is ranked in the three major lists:

- The 8th in the Top 20 Chinese Solar Panel Companies on PV 2021**
- The 13th in the Chinese Top 20 Companies on PV 2021**
- The 16th in the Global Top 20 Companies on PV 2021**

In recent years, Suntech saw steady growth in business, year by year increase of export scale, and refreshing shipment volumes. Relying on pragmatic operation, Suntech has established a sound pre-sales and after-sales service system worldwide, with sales footprints covering 100 countries and regions across the globe and more than 1,500 premium partners. Through the advantages and synergies of vertical integration of the Group, Suntech has 10 GW+ global efficient module production capacity currently. In April this year, Suntech officially launched the 2 GW TOPCon cells capacity layout with the commitment to forging the first digitized smart factory for high-efficiency TOPCon PV Cells in the industry, marking a new breakthrough in the advanced capacity of the company.



Suntech Moistened The Driest Land

Back in March 2020, Suntech supplied 206 kW high-efficiency poly modules to Sudan market. It marked the 100th countries and regions of Suntech's shipment worldwide. Now let's go to Sudan, to witness the performance of Suntech modules in the "Stove of the World".



Active Transformation of Energy Structure

Sudan, located in the northeast of Africa and the eastern end of the Sahara Desert. Featured with dry and hot climate which provides favourable objective conditions for the development of photovoltaic industry; on the other hand, Sudan's economic structure is single and dominated by agriculture and animal husbandry industries. In recent years, Sudanese Government has introduced a number of initiatives to increase the share of renewable energy in the country's energy structure, and Suntech modules are part of the program.



Tickles Breeding Hope

Suntech has supplied about 5.3 MW PV modules to Sudan market in 2020. More than 13,336 pieces of Suntech's high-efficiency modules were ingeniously installed on the yellow earth of the dried-up rivers to absorb the sunlight. The solar-powered electricity pumped water in a steady stream from the underground water sources. The land is barren, but the trickles of water breed hope.

In Sudan, the reasonable utilization of geographical

advantages to solve the power problem has stimulated the huge potential of solar market. Suntech has expanded its distribution scale in Sudan, holding 70% of the local market share so far. By setting up a new office in Khartoum, the footprints of Suntech modules have covered both south and north Sudan. Meanwhile, technical support and warranty work will also be provided by the local teams in Sudan.

Improving Livelihood

In recent years, Suntech has many other supply projects in terms of ensuring people's livelihood besides Sudan: In March 2020, the photovoltaic pumping irrigation system supplied by Suntech in Yemen was completed. In 2021, Suntech continued its global layout and set up a local distribution agency in Sri Lanka to provide professional and convenient photovoltaic products and services for its market.

"Solar Powering a Green Future" has been the corporate mission of Suntech since 2001. Over the past two decades, every Suntecher has been staying true to the original

aspiration, continuously improving the product transfer efficiency, keeping on strengthening the R&D of new technologies and the improvement of production technology. In the future, Suntech will continue to improve global pre-sale and after-sale service systems and light up every corner of the world with the cleanest and richest solar energy.



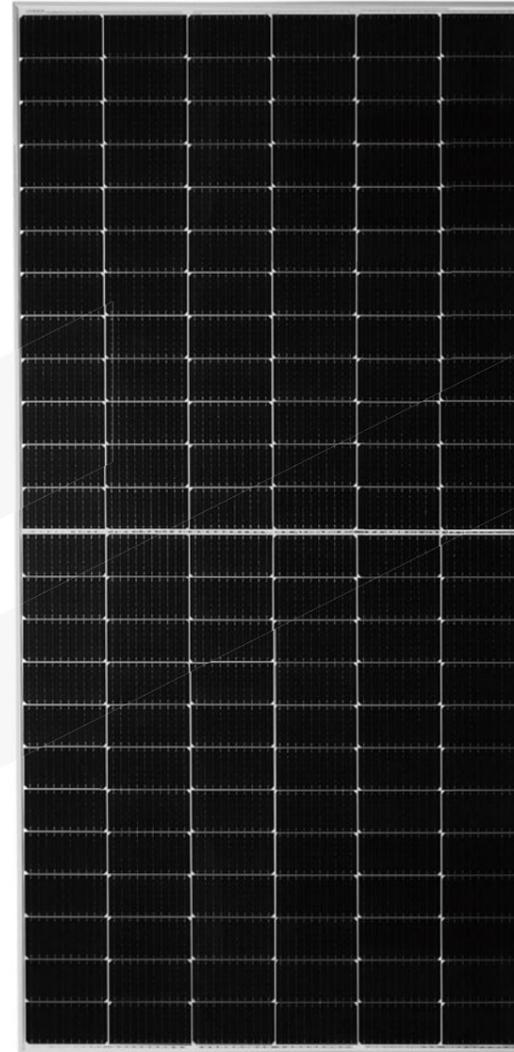
2 GW

of Digital Intelligent Production Line for
TOPCon High Efficiency Batteries



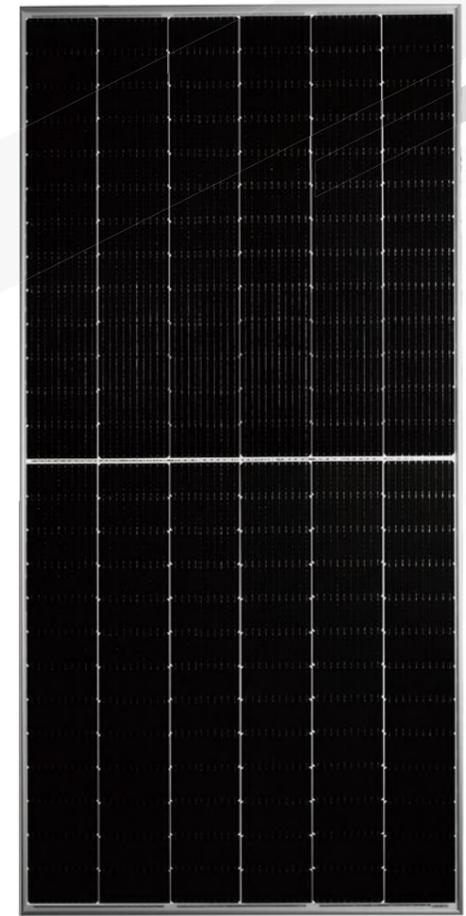
Ultra-high Efficiency

- TOPCon battery efficiency over 24%



High Bifacial Rate

- Module bifacial rate over 80%



High Intensity Design

- Front maximum load: 5400 Pa
- Back maximum load: 2400 Pa

Suntech, Lead Intelligent and Leadmicro Forge a 2 GW Digitized Smart Factory for High-Efficiency TOPCon Cells

On April 21st, Suntech, together with Lead Intelligent and Leadmicro signed a cooperation agreement for the three parties to forge the first digitized smart factory for high-efficiency TOPCon PV Cells in the industry. President of Suntech, Tang Jun, and Chairman of Lead Intelligent, Wang Yanqing graced the occasion to witness the ceremony.

The smart factory for high-efficiency TOPCon PV Cells developed by Suntech, Lead Intelligent and Leadmicro utilizes leading industrial internet technology for smart factory solutions. Based on ALD atomic deposition coating techniques, silkscreen printing technique, smart TOPCon turnkey production line, automatic material feeders, unmanned AGV for PV cell plates and widespread adaptation of FMS operations control, the production line can produce both M10 (182mm) and M12 (210mm) cells. The conversion efficiency of TOPCon is in excess of 24% and the total production capacity can achieve 2 GW.

The smart factory is the first in the industry to establish a fully digital-based production line. It is equipped with sensor technology and intelligent & connected equipment production technology to automatically monitor and collect data in real-time, allowing production, logistics, and storage to make automatic changes accordingly. The factory also uses visual data augmentation to monitor the product quality in real-time for the prevention of defects and the need for rework. Based on industrial internet technology, the smart factory solution will include big data analysis and control. Man-Machine Interface technology will also enhance efficiency on decision-making. It can be seen that the fully digitized TOPCon production line would stay competitive, enhance control of the production process, reduce the need

for human intervention and achieve the standards of a highly efficient factory.

This partnership will continue the long history of collaboration between Lead Intelligent and Suntech. Lead Intelligent developed the first-generation automatic PV module production line for Suntech, thus successfully ended the dominance of foreign PV equipment manufacturers. On the 20th anniversary of Suntech, the two pioneers joined hands again to mark a more significant milestone.

In recent years, through Suntech Group's successful vertical integration, it had accumulated a combined 10 GW of high-efficiency production capacity worldwide. The insistence on innovative PV technology has always placed Suntech in a leading position in the industrialization of new technology applications. The forging of the 2 GW smart factory for high-efficiency TOPCon PV cells is a testament to Suntech advanced production and breakthrough techniques. In 2021, Suntech will continue to improve and increase collaboration with the industrial chain, be devoted to servicing the global customers and satisfy the global PV industry's demand for high-quality and high-efficiency PV products.



Suntech, Lead Intelligent and Leadmicro Forge a 2 GW
Digitized Smart Factory for High-Efficiency TOPCon Cells



Improving Grid Integration of Renewable Energies

A success story based on combinational PV power forecasts

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In this paper we present an integrated combinational solar power forecast based on machine learning algorithms. The forecasting system is used to optimize the grid and market integration of Renewable Energies. Solar Power Forecasts; Machine Learning; Grid Integration

I. Introduction

Renewable energies represent an increasingly important contribution to our energy supply system. In Germany alone, installed photovoltaic (PV) capacity is around 45 GW (as of July 2019). However, a strong increase in capacity can also lead to challenges in terms of secure grid integration. One way of making it easier to plan the production and feed-in of renewable energies is to draw up and optimize solar power forecasts. This paper presents a combinational approach to improve solar power production forecasts, especially in the short-term area (intraday). The results are discussed as examples for the German market, but can be generalized to other countries.

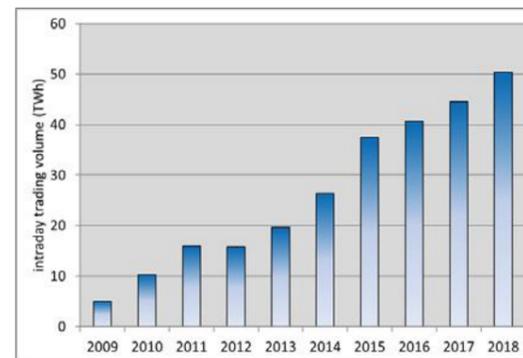


Figure 1. Intraday trading volume in Germany from 2009 to 2018.. Data source: Epex Spot – European Power Exchange.

II. Need for Solar Power Forecasts

A. Energy Trading

Until a few years ago, the market integration of solar power in Germany took place exclusively in the day ahead segment. Due to the uncertainties in the weather models, however, this is associated with forecasting errors that have to be compensated during the actual day. As the share of renewable energies increased, the amount of unbalanced energy due to these forecasting errors for the following day became increasingly large. This was associated with steadily rising costs due to the procurement of balancing energy. For this reason, intraday trading was also opened for renewable energies. This market has developed rapidly since its introduction. Figure 1 shows that the intraday trading volume has increased tenfold within only 10 years to around 50 TWh (for the year 2018). It can be assumed that this process will develop even faster in new, faster growing markets. New, optimized short-term forecasts are therefore essential.

B. Grid Stability and Redispatch

Another important area of application for short-term forecasts is grid stability. The spatial distribution of energy generation and load often differs in grids with a high share of renewable energies. The associated energy flow can lead to a high load on individual power lines. To prevent this, the network operators carry out redispatch measures. This can mean that in case of strong wind or solar power production renewable energy plants have to be reduced in output in certain grid areas. At the same time, conventional plants have to be ramped up. Figure 2 shows the strong increase in redispatch measures (in terms of redispatch energy). Improved short-term forecasts can be an effective means of reducing the further increase in this energy and the associated further increase in costs.

III. Combinational Forecasts

State of the art forecasting methods combine different information or input forecasts. Especially for short-term applications, numerical weather prediction models, satellite images and current PV production values from monitoring systems are usually used. These 3 products are described in more detail in the following sections. The combination factors are usually learned from machine learning methods based on historic measured values.

A. Cloud Motion Vector Satellite Forecast

For the short-term range of some hours a 'cloud motion vector' prediction based on current satellite images is used [1,2]. The displacement of cloud structures is determined from two consecutive satellite images by pattern recognition. The method is applied to each pixel of the image. This results in a vector field that describes the speed and direction of the atmospheric flow. These vectors are used to extrapolate the current cloud structures into the near future. In the last step irradiance at the ground is calculated from the predicted cloudiness [3]. The latest development is the use of satellite images in the thermal (infrared) spectral range [4]. This makes it possible to calculate forecasts for the early morning hours, even if no satellite information in the visible spectral range is available at the time of calculation. The 'cloud motion vector' forecasts are produced in cooperation with the University of Oldenburg.

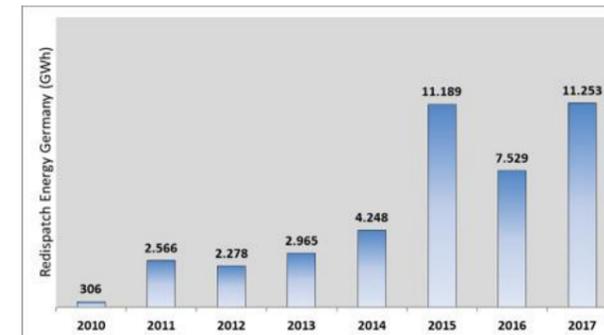


Figure 2. Redispatch energy in Germany from 2010 to 2017. Data source: Bundesnetzagentur.

B. Grid Stability and Redispatch

Numerical weather prediction models have been state of the art in calculating renewable energy production forecasts for many years [5]. The models of several international and national weather services are combined in order to generate the best possible combinational forecast depending on the weather situation. The main focus for the use of numerical weather forecasts is the day ahead application. For a long time, these models were also used for intraday short-term forecasting. Due to the complexity and the associated long computing time, however, the accuracy of the numerical models is particularly limited in the short-term range.

C. PV Monitoring Data

Further important information is provided by measured values of solar power production from monitoring systems. In contrast to the two methods described so far, in which the PV output is only calculated, monitoring systems provide real PV power measurements. The data can therefore be used very well for the calibration of satellite and numerical forecasts. At the same time, the actual production value can be used to create an estimate for the next few minutes by means of a persistence forecast. Naturally, the accuracy of a forecast based on a persistence approach, i.e. the assumption of constant cloud structures, may be very limited depending on the weather condition.

D. Combination by Machine Learning

The decisive step in the forecasting process is the optimal combination of the three input forecasts mentioned above. The ideal model combination depends on the geographical location of the PV system, the forecast horizon, the position of the sun, and other parameters. Machine learning methods can be used for the combination. In the present case, a simple linear regression approach was implemented. Production data in 15 minute resolution from 786 solar plants in Germany for one year were used for validation. A new simulation was calculated every 15 minutes. The forecast was adjusted separately for each quarter of an hour of the day to the measured values.

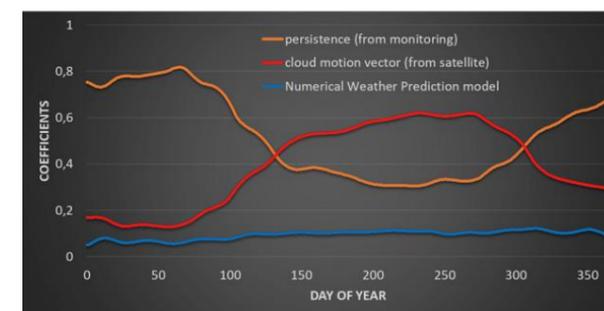


Figure 3. Weighting factors for the 3 input forecasts in dependence of the day in the year. Forecast horizon: 15 minutes.

Figure 3 shows an example of the combination factors determined for locations in Germany for the year 2017 for a forecast horizons of 15 minutes depending on the day in the year. The variation of the weighting factors depending on the season is clearly visible. For this short forecast horizon of 15 minutes the persistence forecast dominates in winter. Summer, on the other hand, was characterized by unstable weather conditions with frequently changing clouds. Accordingly, the cloud motion vector satellite forecast was increased in weighting by the regression models. The numerical weather models receive only a low weight throughout the year.

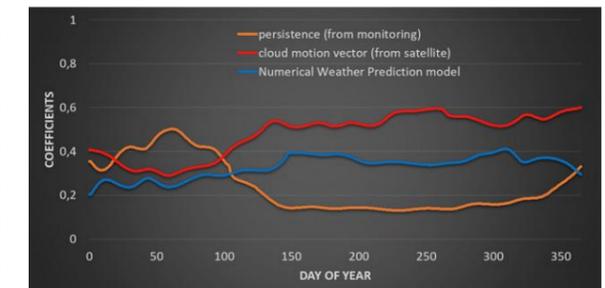


Figure 4. As figure 3, but for a forecast horizon of 2 hours.

A changed picture emerges in the short-term range of 2 hours, see figure 4. Even in winter, the dominance of the persistence forecast is no longer very pronounced. In summer it even receives the lowest weight of all 3 input forecasts. Here, as already for the 15 minute horizon, the satellite forecast dominates. The consistently high weight of the numerical forecast is conspicuous, especially in combination with the satellite forecast. This can be explained by the cloud motion vector prediction method. This is based on a shift of existing cloud patterns into the future. Meteorological effects such as cloud formation or dissipation are not represented in this method. This information was taken from the numerical weather models, whose weighting was chosen accordingly high by the regression algorithm.

IV. Results

In summary, figure 5 shows the accuracy achieved with the combined forecast system as a function of the forecast horizon. Results are normalized to the root mean square error of the numerical weather forecast, which was used as standard for forecasts also in the short-term range for a long time. The graph also summarizes the respective advantages and disadvantages of the individual forecast approaches. The persistence forecast derived from the measured values has advantages especially for the current time step and the short term range, since it concerns real power measurements. However, the accuracy decreases rapidly as the forecast horizon increases. The cloud motion vector forecast derived from the satellite data is, as described above, subject to certain uncertainties due to the conversion of a cloud image to irradiance. Nevertheless, it is the most precise source for the forecast period between about 2 and 4 hours. Decisive for the approach chosen here is the result that the calculated combination forecast always has a higher accuracy than each of the 3 individual input forecasts. This applies to all forecast horizons.

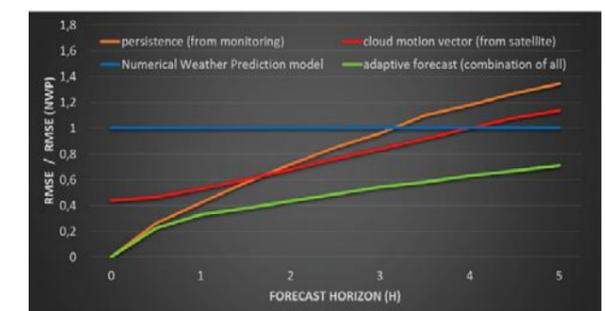


Figure 5. Normalized root mean square error of the 3 input forecasts, and the combinational forecast in dependence of the forecast horizon.

V. Conclusion

Current forecast solutions for the short-term sector generally consist of a combination of different forecast approaches. This paper presented a combination of numerical weather prediction, a cloud motion vector forecast derived from satellite data, and measured production data from a monitoring system. The weighting factors were learned by linear regression models depending on the season, the weather situation, and the forecast horizon. It was shown that by this combination the forecast quality in the short-term range could be clearly increased. These improved forecasts are an important prerequisite for secure grid integration and successful market integration of renewable energies.

Acknowledgment

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Biographical information

Dr. Christian Kurz is a senior expert in energy meteorology for almost 20 years. After his studies of Atmospheric Physics at Munich University he worked at the German Aerospace Center (DLR) for many years. He mainly worked on the parameterization of clouds and cloud-irradiation interactions in a Global Atmospheric Circulation model. His Ph.D. thesis was about the development of a coupled model for atmospheric chemistry and circulation.

Since 2007 he is Head of Prognoses & Data Analytics at the international energy service provider meteocontrol in Augsburg, Germany. He is responsible for the development of Renewable Energies power forecasts for grid operators and trading companies. Together with his team he set up the first operational system for online feed-in estimations and forecasts of PV power for the German Transmission System Operators. A further focus of his work is Data Analytics of monitoring data by using machine learning methods.

Meteocontrol is specialized in developing and providing professional monitoring systems and plant controllers for solar systems and system portfolios. We offer planning and commissioning of monitoring solutions, as well as solar power forecasts, technical due diligence, and energy and weather data analytics. With our solutions for precise and professional monitoring of PV systems, reliable grid integration and intelligent feed-in management, we ensure plant operation and secure yields. At this moment, meteocontrol is monitoring over 50000 PV power plants with a installation capacity more than 18GW in 120 countries.

20 Years: Embarking on A New Journey, Our Love and Care Remains the Same

At Suntech, we help care for our people so they can enjoy work and life, and contribute to the company and their families. Through love and care, we treat our employees like our own family. It is Suntech's duty to take care of our field employees, and we've been committed to this mission since the start, and we will continue to bring more care and love to our people in the future.



Work for Suntech, and We Promise You A Future

Spend More Time with The Ones You Love and Care About the Most

On the annual Family Day, parents and kids get the opportunity to have fun without having to worry about work or school. Family Day is a one-day gateway that increases family happiness. On that day, the company turns into a kids' paradise where stages are set up for them to watch performances or perform themselves. Children are freed from homework in the small playground we set up for them, and in the mini studio, their imagination can soar through their paintings.

The holding of the Family Day event is to show the people that the big Suntech family cannot do without the support of each and every small family. The small "home" brings us warmth and happiness, and the big "home" allows us to grow and embody value, spreading warmth and love from our Suntech home to your home.

What Is Left Is the Seed, We Nurture It with Love

At Suntech, 70% of our staff come from out of town. For the children who were separated from their parents, nothing could be more precious than spending time with mom and dad, and for the parents who travelled thousands of miles to work at Suntech, their biggest wish is to see their children grow up happy. That's why on the International Children's Day, Suntech will mail out a special customized package for all the children who can't be with their parents. There is a bookbag, toys, a hand-written letter by their parents, and a photo of their parents at work. All flowers are beautiful and all children deserve the absolute best. We will guard the children of our staff so even if they are thousands of miles away, they will know for sure their children are taken good care of. Let's always keep this in our hearts, so that all children can grow up worry-free.

Skills Contest, "Gathering of Talents"

In order to reduce stress and improve morale in the workplace, the company organizes the "Skill Contest" every year to allow each employee to demonstrate what they have learned in the workplace. As the saying goes, "Every profession produces a master", it is through this kind of contest that we can discover the talented staff within the company. Thomas Edison once said work brings about production, fun and accomplishment. If you dedicate yourself to the work you love, you will get a steady stream of happiness and sense of accomplishment. Every employee has fully prepared for the contest, which proves their dedication to their work. Each of them has a confident smile on their faces and is showing their proficiency in their field.

"No pain, no gain". The reward for the contest is not only a recognition of each employee's work, but also an encouragement for employees to stay enthusiastic and creative in the future.

Stay United and Move Dreams Forward Come Rain or Sunshine, We Won't Give Up

Last year, nearly a hundred Suntech employees participated in the "Stay United and Move Dreams Forward" hiking event. Since the first event, the hike was held every year in either rain or sunshine, on that same day. This is not only a sports event, but also a good opportunity for staff to get to know each other better, which improved their relationships while strengthening the body.

Everyone withstood the challenges, exercised, enhanced friendship between colleagues, and demonstrated the team spirit of the Suntech family. Life and work are just like hiking. As long as we work together, never give up hope, have a clear goal, and persevere toward this goal, we will succeed.

Spread Hope Through Love and Donations

Suntech actively practices corporate social responsibility with a heart of gratitude. We want to spread hope through love, and help the needy as much as we can. Hope can bring warmth to lives, and light can brighten up the future!

Home for the Elderly in Shuangliu Town, Yingshan County, Sichuan:
China is becoming an aging society, and the older population continues to grow at an unprecedented rate. Suntech also cares about the living conditions of the elderly. With the distributed PV power station donated by Suntech to the nursing home in Shuangliu Town, Yingshan County, the local residents do not have to worry about daily power usage, and on the top of that, they can earn extra income when there's excess power, alleviating poverty for the local population, so that they can enjoy their retirement.

Jiutiandong Miaopu Hope Primary School in Zhangjiajie, Hunan:
Lifuta Township in Sangzhi County, Zhangjiajie is a small village in Hunan Province. With an average annual income barely above 1,200 RMB, the young labor is forced to leave their underdeveloped hometown to make a living, leaving behind the elderly and young children. Before the renovation, Jiutiandong Miaopu Hope Primary School was outdated and had insufficient power supply. To this end, Suntech contributed to the "Design for Love" charity program by donating the PV power generation system for the school, so that the students of Hope Primary School can thrive with solar-powered electricity.

Donate New Energy Logistics Vehicles:
Suntech has always been actively engaged in ethically-oriented practices contributing to societal goals of a philanthropic nature and we treat helping the disabled as a way to fulfil our corporate social responsibility. The donation of new energy logistics vehicles to the "Home for the Disabled" in Liangxi District is a measure of Suntech's modest contribution to the cause of people with disabilities, aiming to gather the understanding, respect and care of the whole society for the disabled. The company will continue to care for and support the cause of the disabled, and contribute to help people with disabilities fully participate in society.

We've definitely had our share of ups and downs as a group in the past two decades, but every step we took was firm and steady. In the future, the competition in the market will only grow fiercer, which will bring us challenges but also opportunities. Though 20 years has past, we have never lost sight of our mission. And we will keep marching towards new achievements together!



I'm a Studious "PV Designer"

Nanwai King's College School Visit to Suntech for Extracurricular Practical Activities

On April 13, more than 130 students and teachers from Wuxi Nanwai King's College School visited Suntech to carry out extracurricular practice activities with a theme called "I am a studious PV designer", to promote the concept of green and low carbon and learn the knowledge of PV power generation.

Suntech's receptionists gave students from primary and secondary schools a lively science lesson on solar knowledge from the aspects of basic knowledge of solar energy, power generation principles and PV application in daily life, which is easy to understand. All the students listened carefully and were very proactive in the Q&A session. And they learned, through this activity, the principles of solar power generation and the application of solar modules in daily life, and completed the popular science study from theory to practice. The

teacher mentioned that the students would make a "PV building integration" design drawing after returning to school, and provide the text description for their own design.

It is a social responsibility of Suntech to publicize the concept of green and low carbon, which it has been persisting in and practicing year by year. Suntech actively spread the awareness of energy conservation and environmental protection through exhibition publicity and professional interpretations. From Suntech management, it is the key stage for students to establish their correct awareness for life and society while they are learning at primary and secondary schools. As a student, they should establish the awareness of energy conservation and environmental protection from childhood, and with that can they contribute to the green and low-carbon cause when they grow up.



[Introduction]

The unexpected outbreak of COVID-19 in 2020 once stopped people's outdoor entertainment in China. With the pandemic being stabilized, the fervor for camping swept the country. People started engaging in outdoor activities when the anxiety of getting infected in urban environment aroused the inherit long for the outside nature. Replacing the conventional ones, the rising outdoor activities gradually won over the younger generation. According to experts from several sectors of outdoor activity, outdoor lifestyle will dominate life, industry and socialization in the future.

Moreover, humans are born with the pursuit of happy life. Restless souls that are confined by buildings are released to the mystery and the reward from the nature. Sunny days are just perfect for seeing something new.

It's the time for us to go outside, and to observe, feel and embrace the real nature.





Ride into the Sunset and Take a Pilgrimage to Meili Mountain

Witnessing the magnificence of the sun's rays turning the Meili Mountain golden should be a goal of every outdoor enthusiast. With a spirit of adventure, the road to Yubeng slowly stretches around the mountain before you.

The plateau climate in May is warm but can suddenly turn cold, and the weather can be overcast or sunny. Yubeng's road into the mountains is muddy and hard. All of that said, "If you don't go to heaven, go to Yubeng". The pilgrimage into Yubeng through the mountains cleanses your spirit and mind by testing your physical strength and mental willpower and is also astonishingly beautiful.

Yubeng Village is located at the foot of Niancimu Peak and Wuzi Peak on Meili Snow Mountain, surrounded by mountains on all sides. Because of its unique geographical location, there are only a hundred households in the village, and it is connected to the outside world by only one post road. Therefore, if you want to witness the magnificent scenery up close, you

need to hike on foot and cross the 3,700-meter pass to get a glimpse of its true beauty.

As the altitude continues to rise throughout the way, the clouds and fog gradually thicken, and the snow-capped mountains become hidden in the thick fog, but still exuding a mysterious attractive pull. Yubeng Village is divided into an upper and lower village. The upper village leads to the Sino-Japanese joint mountaineering base camp for climbing Kawagebo and to the glacial lake, while the lower village goes to the sacred waterfall and virgin forest. With an exhausted body, heavy shoulders and a pounding heart, only faith continues pushing you further towards the waterfall of Yubeng Lower Village. It is said that the scenery of Yubengshen Waterfall changes with the seasons. As the ice and snow melts in spring and summer, the water flow of the waterfall increases, cascading to the ground, and the splashing water looks magnificent. Fortunately, the sun is rising diagonally at this moment, passing through

the waterfall, and casting a beautiful rainbow.

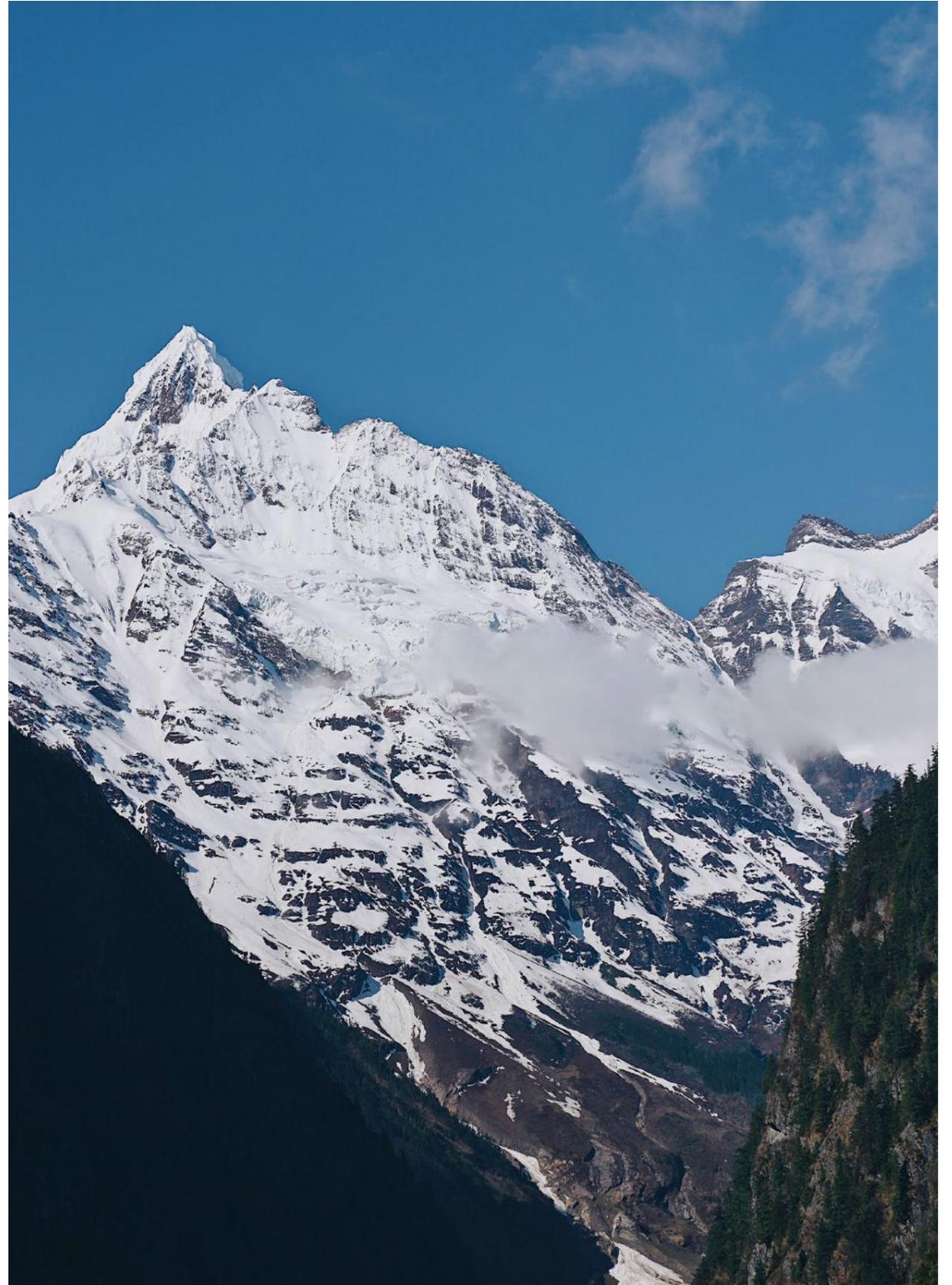
It was also in Yubeng Village that we saw the most magnificent scenery of Meili Snow Mountain: a star filled sky, towering mountains, verdant vegetation, high-altitude rain forest and rhododendrons as far as you can see, even the traditional life scene of farming and animal husbandry is revealed. The cattle, sheep, mules and horses stroll casually and comfortably all around. Surrounded by mountains, there is no modern transportation, let alone the bustle of urban life. To measure the original charm of nature, you can only rely on a strong will and courage to stay on the road. Although there are clouds and mists from time to time, you can still feel the vastness at the foot of the snow-capped mountains and the solemnity of the village, with the sound of chanting filling the air.

A few days of hiking have exhausted both body and mind, but when you embark on the road to Yubeng, you will once again be shocked by the sights along the way: the Ninon Canyon, which has a different style from

the original village, is full of rushing torrents, magnificent and full of adventure. Along the 20-kilometer-long Lancang River, you can take in all of the lush nature. At that moment, walking along the cliff path by the canyon, life seems to be condensed into an amazing adventure.

Fortunately, in the best season, the original yearning for nature has been realized as the wind rushes past your ears and the path is underneath your feet. Setting out with a spirit of adventure and pursuit of nature, you will find that all kinds of weather create breathtaking scenery. It was not until the thick fog cleared that you will discover that beautiful things are always worth waiting for, and the wait is an equally precious part of the journey. Perhaps the charm of nature lies here: unpredictable, uncontrollable, and the unexpected beauty.

Many roads are calling for you to embark on an adventure. Follow the call and step onto the road.



Travelogue: Popular Trekking Routes in China



Kulagangri Snow Mountain

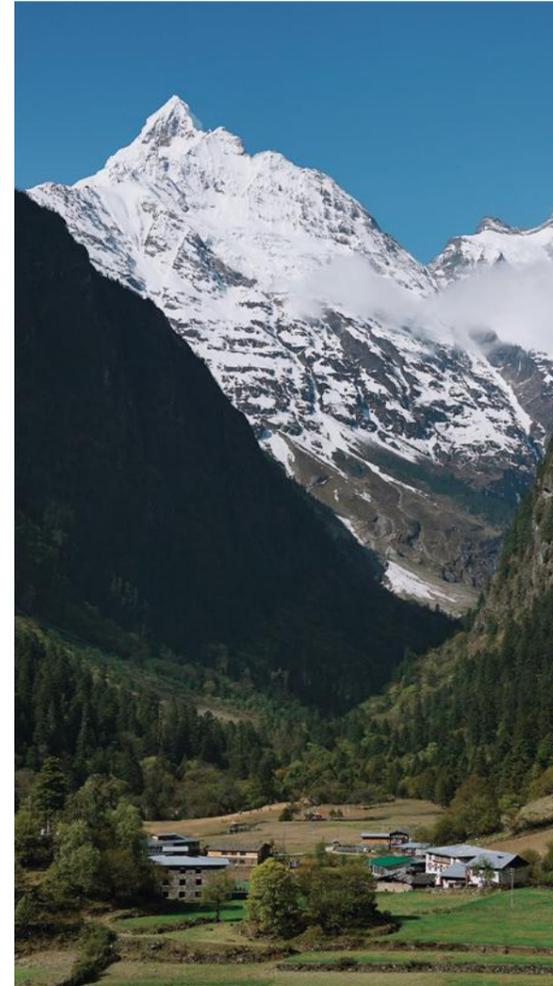
Location: Lhozhag County, Shannan District, Tibet

Season: All Year Round

Duration: 6 Days

Distance: Approx. 33-35 km

Kulagangri is one of the four sacred mountains of central Tibet, reaching an altitude of 7,538 meters. There are several treks that rival the EBC (Everest Base Camp) and offer close views of the Himalaya. This trek is one of the less strenuous and newcomer-friendly options. It is the closest trek to Lhasa, covering natural landscapes including lakes, snow-capped mountains, monasteries and hot springs.



Meili-Yubeng

Location: Yunling Township, Deqin County, Yunnan

Season: All Year Round

Duration: 5-7 Days

Distance: Approx. 55 Km

The Yubeng is known as the "trekkers' paradise", a paradise hidden beneath the Meili Snow Mountain, with its unbroken snow, isolated villages and picturesque surroundings. Yubeng has an impressive trekking route, with low altitude, adjustable difficulty levels and varied scenery throughout the seasons. Compared to the past, the village is now well equipped.

Wusun Ancient Road

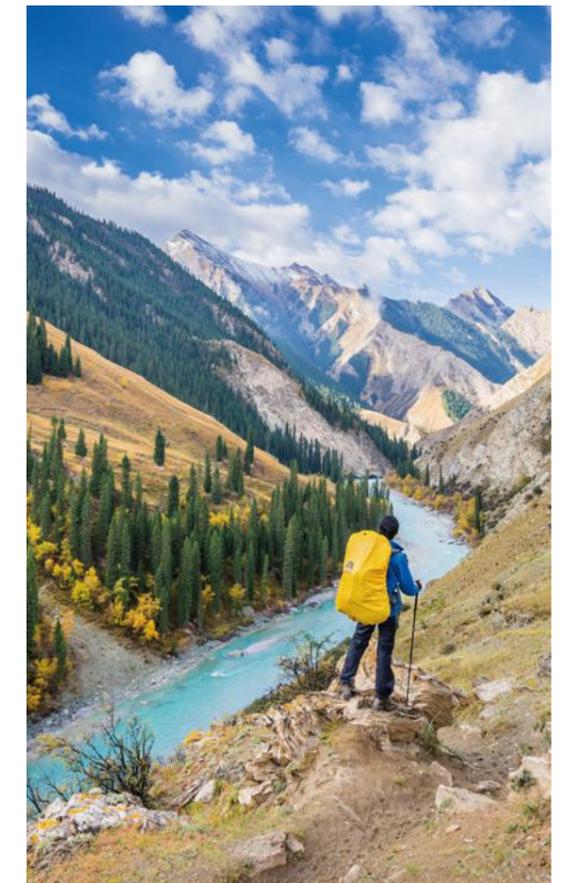
Location: From Turks County, Yili to Baicheng County, Aksu, Xinjiang

Season: June to October

Duration: 9 days

Distance: Approx. 120 km

The Wusun Ancient Road is the path taken by the Wusun tribe, who lived in the western corridor of the river and were forced by the Xiongnu to move westwards along a rare route into the Yili Valley in the heart of the Tianshan Mountains. Travelling from the south to the north, the journey takes you through four seasons in a day, with alpine meadows, forests and pastures, snow-capped mountains and lakes at your fingertips. The Wusun Ancient Road is also one of the top trekking routes in China, with extremely cold weather conditions, and is suitable for those with more than 3 days camping experience.





Kangrinboqe Mountain Crossing

Location: Pulan County, Ali Region, Tibet
Season: April to October
Duration: 11 days
Distance: Approx. 56 km

Kangrinboqe is known as the center of the world and has never been accessed. More and more people are aspiring to the journey to the sacred mountain in Tibet, and Mount Kangrinboqe, which represents immeasurable happiness, is a sacred place of pilgrimage that Tibetans dream of. The route takes in five 8000m peaks and even offers the chance to see the sun shining on the roof of the world at Everest Base Camp. Due to the high altitude of the route, it requires trekkers to have a high level of fitness, so that it is not recommended for beginners.



Rock Route

Location: Muli Tibetan Autonomous County, Liangshan Prefecture, Sichuan Province
Season: June to October
Duration: 5 days
Distance: Approx. 80 km

Discovered in 1933 by Josep F. Rock, this route from Muli to the Gonggarling region was named the "Rock Route" in his honour. The route crosses three major scenic areas - Yading, Taicheng and Gonggarling - and is impassable by vehicles, so only trekkers will enjoy its stunning beauty. The average altitude of the route is 4,000m, with four 4,500m passes to be crossed. The route also challenges the trekkers physically and mentally, while enjoying the magnificent scenery of the three sacred mountains (Senai Ri, Yangmayong and Xanaduoji). It is advisable to have a professional outdoor travel team to reduce the risk.

Dangling

Location: Bianer Township, Danba County, Sichuan Province
Season: August to November
Duration: 7 days
Distance: Approx. 12 km

April and May is the rainy season in Dangling, when the gerberas are in full bloom. While in early autumn, they are like oil paintings. This unique trekking route is a great way to avoid the commercialisation, but it also boasts magnificent snow-capped peaks and lush forests, and the colour of the leaves on the plateau changes gradually due to the undulating altitude.



Tengger Desert Crossing

Location: Alashan Zuqi, spanning Inner Mongolia, Gansu and Ningxia provinces
Season: May to October
Duration: 5 days
Distance: Approx. 50 km

The Tengri Desert is the fourth largest desert in China and also suitable for hiking. When you enter the desert along the Helan Mountains, the signals start to be cut off. You will be isolated from the outside world at the most time. Instead, you will be greeted by hundreds of beautiful lakes in the Gobi, sunrise and sunset, the starry sky and the Milky Way. Accompanied by camel bells in the morning, you will have an adventure in a deserted world.

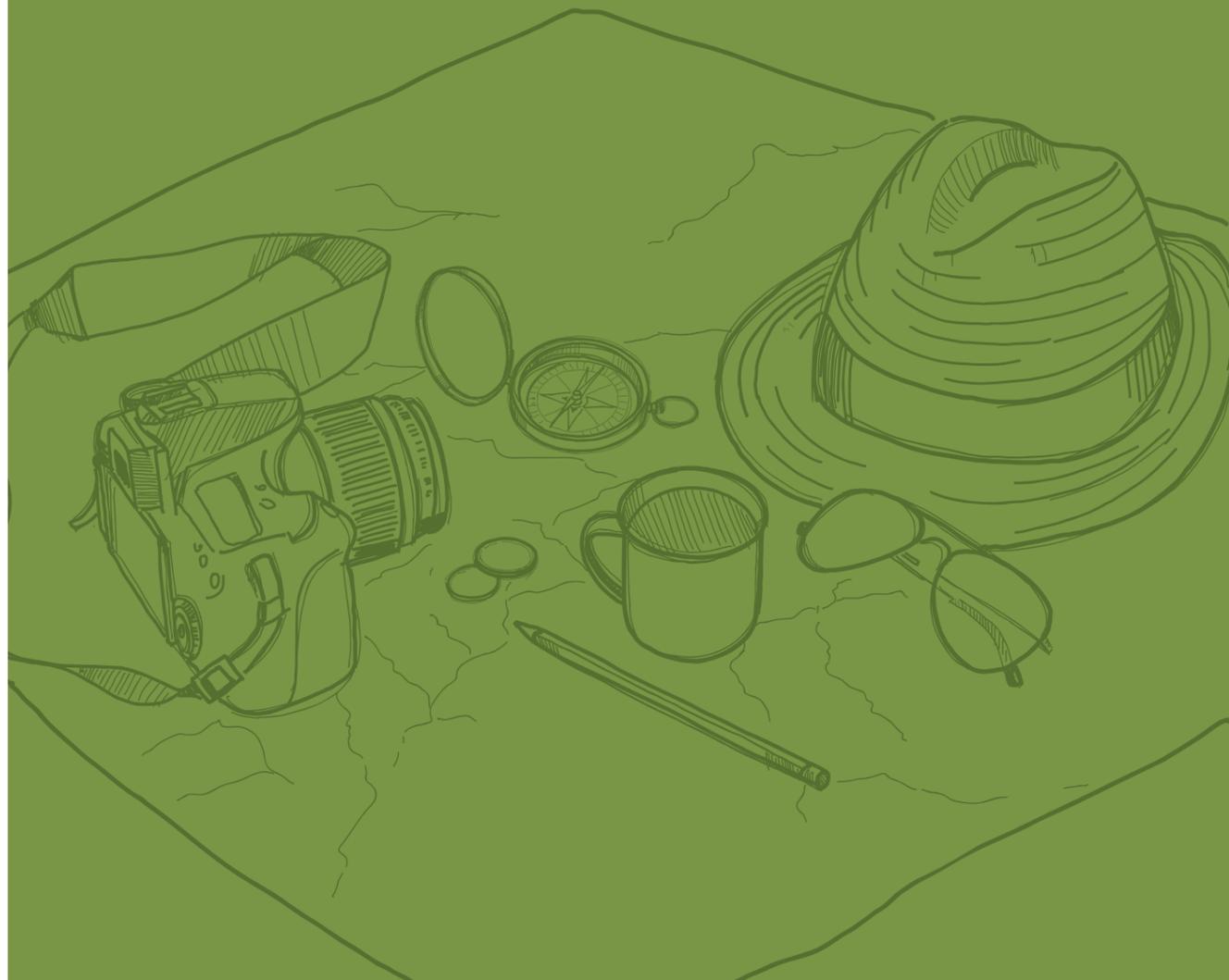
Chang Chuan Bi

Location: Siguniang Mountain, Sichuan Province
Season: May to November
Duration: 5 days
Distance: Approx. 40 km

The "Chang Chuan Bi" is a trekking route linking Changpinggou and Bipenggou in Siguniang Mountain, known as the "Alps of the East", and is the preferred route for beginners at high altitude. The route has few elevation changes and takes you deep into the heart of the Siguniang Mountain and over the 4800m high pass. The route is a great way to see the sea of clouds and snow-capped mountains, and the scenery is unpredictable.



Outdoor Rules for Urbanite: Beyond Mountain Gear, Brand Attitude Focused



01 CHUMS: Outdoor Concept of Ease and Fun

CHUMS was established in Utah, USA in 1983. Since its inception, this brand has won good reputation for its affordable prices based on its brand policy of comfort and fun.

Beyond its outdoor brand concept, CHUMS is an assembly of outdoor lifestyles. Comparing to conventional outdoor groups, CHUMS focuses more on family outdoor crowds, aiming to provide a low-cost experience and chance for more people who want to get close to outdoor activities, and the mascot "Booby Bird" embodies the concept of CHUMS well, this visual idea, full of fun and interest, adds not only stylish feeling to the brand items, but also amiability and respect to the nature.

Besides clothing, CHUMS also produces picnic cook-wares, very

suitable for travel and daily outdoor activities.

Distinguished from the main outdoor brands that focus more on tech-research and skills development, CHUMS encourages and inspires urbanite to embody the outdoor lifestyle and keep enthusiasm and original mindset to the nature through simple clothing of fun and visual designs.





02 Patagonia : Strengthening Connection between Human and Nature

Yvon Chouinard started Patagonia brand in USA in 1973. Once he drove to Patagonia in Chile from USA California together with Doug Tompkins, the founder of the North Face. With this travel, the brand emerged and the visual identity of the brand was also created.

Patagonia is well known for its clothing and gear, the endurance of its main brand articles and items against rough topography and environment. In 1977, the first batch of jackets of PILE Fleece featuring high collar and the material of shearing wool emerged, with outdoor warmth retention property greatly increased.

In the environmentally-friendly field, Patagonia is well pursued by many outdoor lovers. Yvon Chouinard's love for environment-protection and hand-made craft helps him create this clothing brand aiming to strengthen the connection between

man and the nature. While the other main clothing brands are busy in establishing more branches, Patagonia strives to innovate and make clothing to be more environmentally-friendly by using organic and recycled materials. Not only that, the headquarters of the brand uses outdoor solar panels to provide power supply, it takes the lead in collecting 1% tax from its sales for the Planet protection purpose, striving to make the brand mission of "we're in business to save our home planet" to take root in every aspect of the brand.



03 Snow Peak: Outdoor Lifestyle Creator

Early in 1958, Yukio Yamai created the brand of Snow Peak, implying to challenge the peak. In the 50-60s of the 20th century, outdoor lifestyle emerged in Japan, while the outdoor clothing and gear could not meet the needs of the outdoors lovers, with this trend, Snow Peak emerged as the times require.

In the professional gear field, Snow Peak constantly strives for perfection, with this spirit kept in mind, it has become an outstanding brand. Snow Peak deeply realizes that sustainable development of the brand shall keep abreast of aesthetic standards with the times, bringing utility integrated with aesthetics. Through several decades of development, artisan spirit and aesthetic mindset has been infused into its every piece of high quality products, taking the brand's continuous development and application in titanium metal as an example, it

has pondered over the light-weight, corrosion resistance, hot conductivity, recyclability and sustainable environmentally friendly property of the metal.

Choosing Snow Peak means to enjoy the outdoor aesthetic experience and stand fast in the faith. The brand always strives to focus on the lifestyle of harmonious development between human beings and the nature, and the brand mindset of anti-fickleness has taken root in its lovers beyond trend leading ideas.



04 Salomon: Running into Vogue with Professionalism

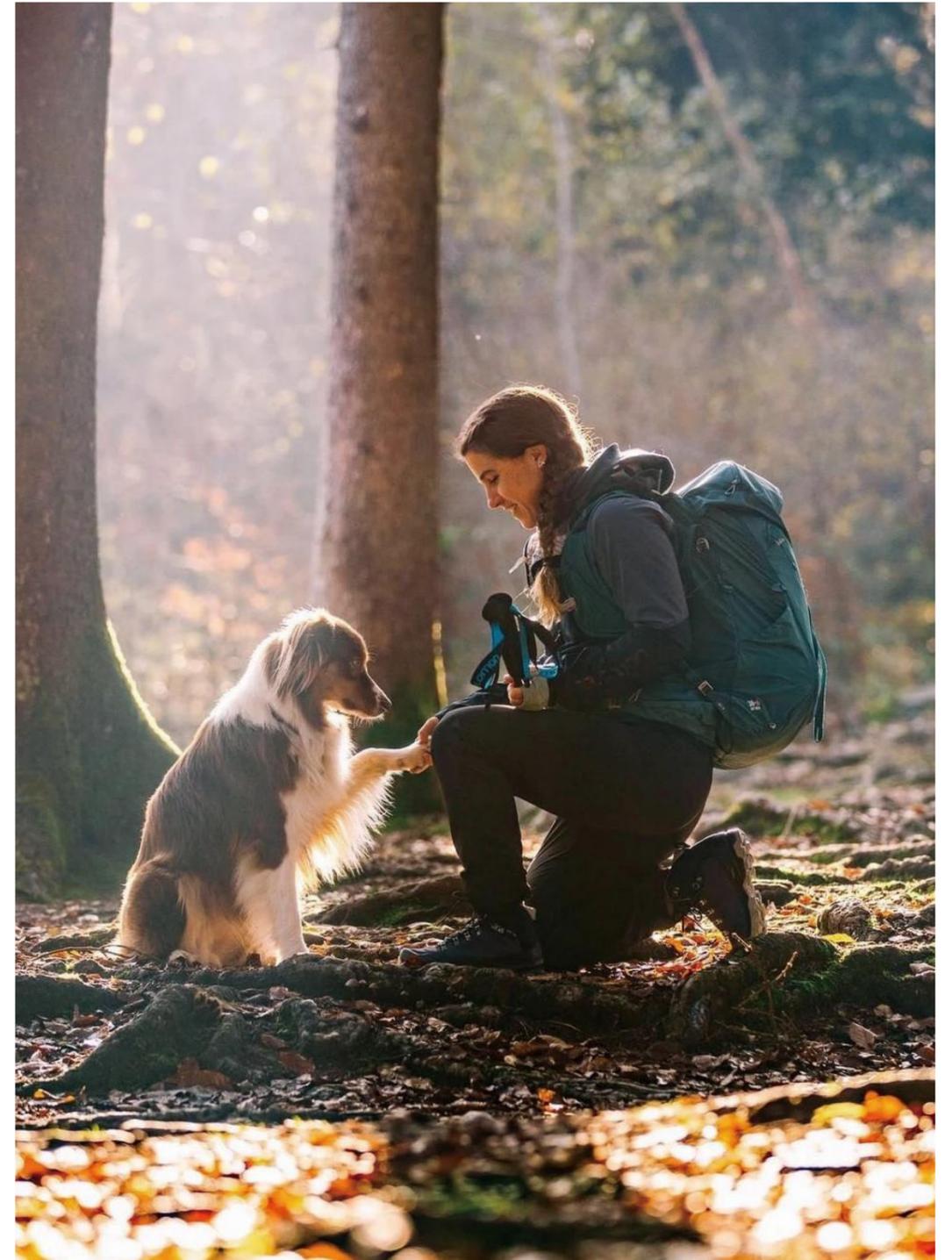
Salomon has been playing in the French alps since 1947, starting from skiing related fixtures business.

With the development of the brand, it began to get involved into the ski gear. Salomon is very strict in footwear, and its professional attitude has attracted many outdoor lovers, but what makes Salomon well-known among the mountain lovers is its launch of the first XA PRO 3D series of cross-country shoes, which made a great success for breaking up impression on conventional heavy outdoor shoes.

While focusing on the professional gear, Salomon started to march into the fashion circle. Without studios intent to cater for tidal wave, the brand has always focused on the functionality of shoes, but Salomon stands out with its unique aesthetic perception. Over recent years, with the trend in China changing to the outdoors, Salomon has enjoyed good reputation and

become a first choice among the lovers of the outdoors.

From collocability of urban commuting to functional adaptation to the outdoors, Salomon enables people to play, progress and connect with nature. Quality shoes are needed for outdoors. Taking this opportunity to experience this professional shoes that will bring you refreshing attitude of lifestyle.





05 Mountain Research: Born-free Punk Culture

The predecessor of Mountain Research is General Research founded by Setsumasa Kobayashi in 1993.

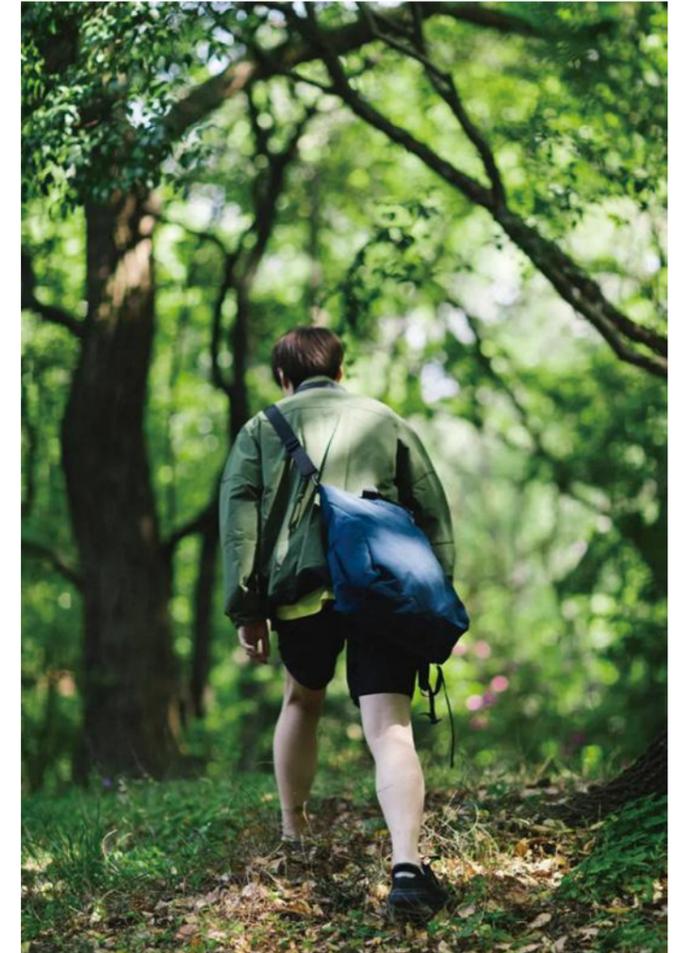
Mr. Setsumasa Kobayashi learnt the craft of shoemaking from his father and became interested in dress-making. At the same time, Mr. Setsumasa Kobayashi became involved in building an outdoor space for himself, having spent seven years to build a secret base for himself somewhere in a birch forest in Nagano Prefecture, and this campsite became his research centre, a best site for development and testing besides sparking inspiration for products.

Reclusion in mountain forest and getting rid of the shackles of society is a lifestyle at Punk. Inspired by Punkism in the eighties of 20th century, Mr. Setsumasa Kobayashi began to introspect the waste in the existing dress-making industry and reveal his experience of "mountain" by using choice materials based on its

unswervingly strong brand outdoor design, encouraging its lovers to enjoy a lifestyle in their own way. Just like its name of Mountain Research implies, Mr. Setsumasa Kobayashi always encourages people to enjoy the comfort and amenity that its unique fabrics and dynamic cutting bring to us with attitude of living far away in the mountains.

It is thus clear that a brand proposition is also a weight factor to lure the target crowds based on choice products. It does not only bring goods and gear, but also brave exploration and try of diversified lifestyles.

Adhering to the mission of "solar powering a green future, we always strive to move forward and provide clean energy for over 100 countries and regions around the world, having paid close attention to sustainable development and lifestyle. In every sunny day, we create a connection between city and nature and bring an immersive experience of happy life.



EXPLORATION



Escalating The Outdoor Lifestyle: PV Systems for Caravan Power Independence



With the new outdoor lifestyle, the traditional outdoor scene is being modernized, creating a variety of mobility options that combine camping and transportation, of which the caravan is a good example.

PV systems are an excellent medium for converting natural resources into electricity and providing sustainable, green power for caravans outdoors. The PV system and the caravan create a free and environmentally friendly way of supplying power for outdoor travel, a cross-border association that upgrades both utility and value.

The Principle of Solar Power Generation in Caravans

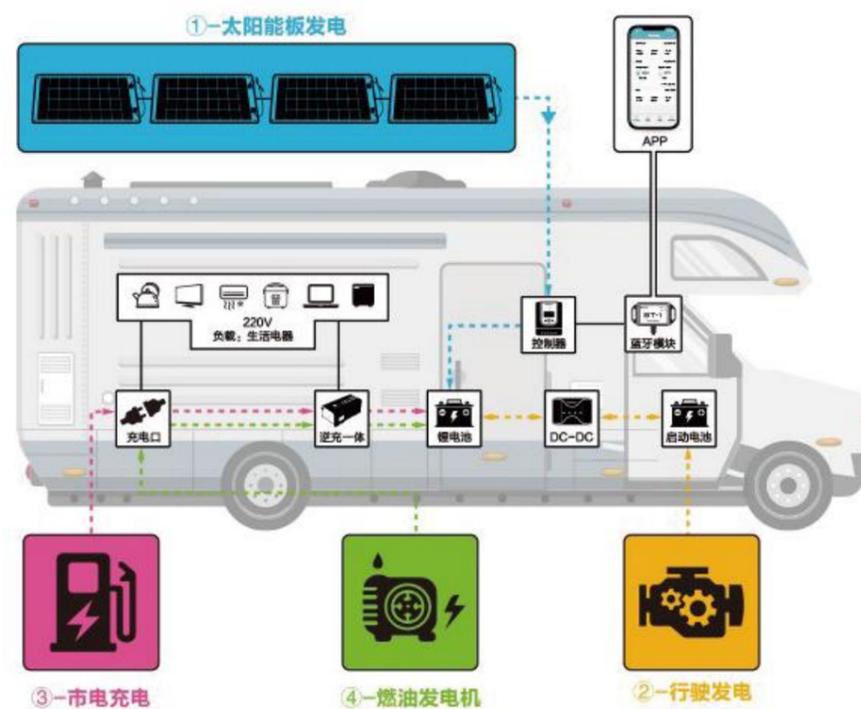
Solar energy is absorbed by the modules on the roof of the caravan and converted into AC power through an inverter, providing power for lighting, refrigerators, audio-visual entertainment and other equipment in the caravan. The converted electricity can be used directly or stored in the battery for emergency use.

If you are travelling to a camp site, you can usually charge your caravan directly from the electric pile at the camp site; however, if you are travelling long distances and do not have a fixed route, applying a PV system to your caravan will not only use solar energy as the main source of electricity, but will also effectively protect the caravan's batteries.

Exploring the Application of Modules in Caravans

The application of PV system in caravans is a complete electrical energy system, which is roughly divided into "three segments and seven links".

The three segments include: power generation, storage and consumption; the seven links include: power generation, transmission, charging, storage, inverter, distribution and consumption. And these are all realized by the components of the system: modules, batteries, inverters, controllers to achieve electricity consumption. Among them, the topic of focus is the direction of module devices.



Types of Modules

The main types of modules are monocrystalline, polycrystalline and a-Si modules.

- Monocrystalline modules take up the least amount of space, but usually are more costly.
- Polycrystalline modules are more affordable and available in larger sizes on a per-watt basis. It has the same longevity and durability as monocrystalline modules.
- The a-Si module is quite different from the other two types: it is less efficient, heavier and larger and more costly than the other two types of modules. But it performs best in cloudy weather and is not heavily affected by shadows. And the a-Si panel is fairly durable, even if it is flexible.

Considering the limited roof space in caravans, the use of mono-crystalline modules is not less optimal for caravan.

Rigid/Flexible Modules

Rigid modules are mounted under tempered glass. They are available in various sizes and are mostly mounted in aluminium frames for easy outdoor installation. They are constructed to resist hail, sand and strong winds. The glass is suitable for long-term use as it is scratch-resistant.

Features of rigid modules:

- Wide ranges of sizes
- Cheaply priced on a per-watt basis
- Robust and durable, with a longer warranty (over 10 years)
- Easier to orientate towards the sun with robust frames

Rigid module is the best choice in terms of performance and durability.

Flexible modules are flat, covered with a protective plastic sheet. As there is no frame, they have a small shape and can be bent appropriately, for example to fit the curved roof of a car. However, as the protective plastic sheet on the surface is soft, it is easily scratched and can withstand fewer shocks. Moreover, over-bending often leads to problems with internal connections and even to short circuits between the cells. Due to these problems, the warranty on flexible modules tends to be shorter than that of rigid modules.

Also, as the placement of flexible modules depends on the surface to which they are attached, it is not easy to adjust the angle of illumination.

Features of flexible modules:

- Thin and lightweight
- Bendable to 30 degrees
- Easily scratched
- Short life span

Flexible modules are more suitable for surfaces with significant curvature whereas rigid modules are recommended for flat surfaces.

Module Placement

- Fixed

The fixed modules are installed on top of the caravan. Users can additionally install tilt mounts to manually adjust the angle and obtain the best power generation efficiency. When installed, modules perform best at low temperatures and it is best to leave a small gap between the module and the roof to allow air circulation to reduce the temperature of the module; if the module is mounted directly or glued to the roof, cooling airflow to the underside will be lost.

This is another reason why rigid modules have an advantage over flexible panels. Most rigid modules have some clearance within the frame, which prevents the modules from overheating and affecting the efficiency of the electricity generated.

- Portable

Portable modules and solar suitcases are lighter and can be placed in the vehicle and removed when camping. Portable modules are perfect if you wish to charge your mobile phone or laptop at the campsite.

Installation Capacity

The size of the modules required depends on the actual electricity consumption of the caravan. In general, a C-type caravan with 3-5 solar modules of 300-400 W can ensure the basic operation of the lighting and other small appliances in the caravan.

PV is an important part of a low-carbon lifestyle. The use of PV systems in caravans will not only generate electricity, but also maintain the caravan batteries, increasing the life span and bringing convenience to caravan users.

On 09 November 2020, the China Association of Automobile Manufacturers (CAAM) released the draft opinion on the "Application Specification for Solar Energy Systems for Travelling

Vehicles", which specifies the type and classification, technical requirements, experiments and methods of solar energy systems for caravans. Although the application of PV systems in caravans is not yet fully mature, it is pleasing to note that, as an obvious intrinsic demand of the market, this will provide a new direction of development and a much richer content scene for a green, environmentally friendly and lightweight way to travel and live outdoors. It is believed that in a constantly updated and extended technological environment, the multiple applications of new energy will bring more ways and channels to get closer to nature in urban life, allowing us to contribute to energy saving and environmental protection in a free and comfortable mobile scene.

Diversified PV Applications

In recent years, encouraged by policy released by Chinese government, PV applications is combined new ways and continuously developed. At the same time, diversified PV consumer goods in a variety of forms and designs emerged. In outdoors, as PV application in recreational vehicle has become more mature, it has tapped the activities in outdoors step by step.



Beyond the traditional field, let's see PV applications in different lifestyle.

Mobile Backup Battery

Powered by solar modules, it can provide a variety of appliances. The light size specifically caters to the needs of the outdoors. In sunny days, it can provide you with power supply and let you enjoy environmentally-friendly travel.

Multifunctional Emergency Flashlight

Powered by Monocrystalline silicon solar modules, it is portable and recharged easily. Also, it is a mobile power supply created with reverse charging function. Featuring diversified uses, it is the first choice for outdoor activities.

Solar Charging Backpack

With a solar charging design, where there is sunlight, there is a charge that can be done. When light energy is converted into electric power, it can quickly charge for your digital appliances. The solar charging backpack is not only designed for outdoor activities, but also for urban business people, as really a carry-on "mobile power pack".

Solar Air Bag Camp Lamp

Self-contained design helps the lamp fold in a solar battery piece size. When there is light, charging can be done, and lighting can be used at night when camping in outdoors. It applies conventional solar lighting design, but its light and portable feature provides more options for outdoor activities.

Solar Blue-tooth Speaker

This blue-tooth speaker has become one of the low-carbon travel items. The solar charging function, without effect on the original design, adds greatly to environment-protection, music experience and delight atmosphere in outdoors.

PV applications is mainly applied in functional uses including mobile power pack and lighting, based on which, portable emergency travel items emerged to satisfy the needs in outdoors, However, when new energy is applied in life

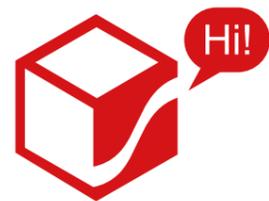
activities, trials are inevitable. Small light energy distribution density and large coverage are the main difficulties that can't be avoided in the design of the outdoor and travel items.

By leveraging of part of electric power, PV applications in portable power pack for travel activities become a main trend today. It is believed that PV applications, promoted by technology, will become more mature and stable. We are striving to let more people to experience sunny life.

Suntech Officially Launches Online Shopping Mall

SunMart

enables you a pure experience of signing for natural goods at home



After 120 days, Suntech official online mall finally came into being.

It is "SunMart", a milestone for Suntech brand to start to stride towards end users while the company is running a B2B business.

So far, "SunMart" has become a cross-border cultural platform to create objects with the harmonious concept of practicality, technology and aesthetics. It aims to convey the core concept of a better life, satisfy the sustainable demands of human circular development, and voice for the enterprise's publicity, so as to enhance the digital interaction between the brand and the new generation of users.



Scan code and enter mini programs.

SunMart



[A Mystery in SunMart]

We firmly believe that the realization of a better life comes from the harmonious interaction among human beings, nature, cities and objects.

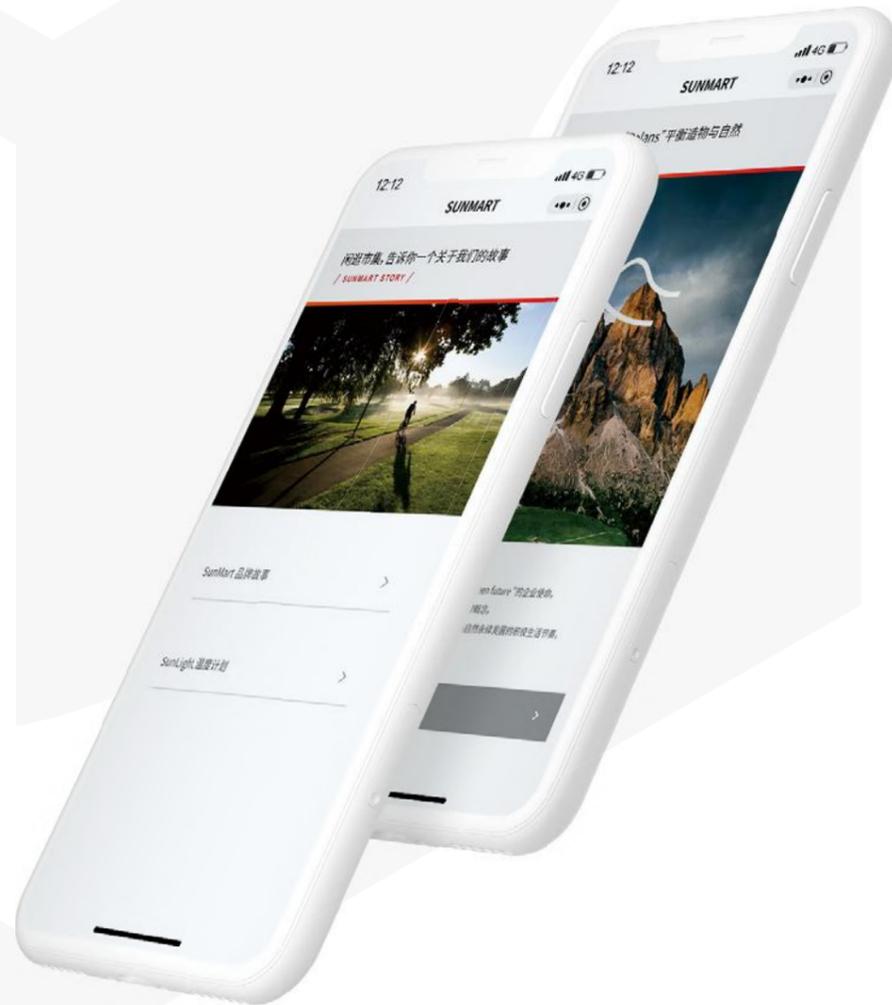
Adhering to Suntech's brand mission of "Solar Powering a Green Future", it is to create a balanced connection between natural existence and man-made things that works as an important driving force to encourage us to take this step. Therefore, "SunMart", a cross-border cultural platform, came into being.

Patronage on a market can accommodate the lifestyle and thinking habits of a group. Although nothing can be accomplished without norms or standards, fortunately, our definition of a better life is always unlimited. Thanks to the innovation of technology, there are more ways for groups to communicate and interact with each other. We are eager to convey the urban conditions and inspire the imagination of green life through the objects and events in the SunMart. Time will prove that our choices for development could expand the possibility of digital space. The sale is not only for interest, benefits and bonus, but also the manufacturing spirit and ingenuity.

[Independent Concepts, Higher Harmony]



Scan code and enter mini programs.



SunMart mainly consists of two commodity series as follows:

"Sunlife" is the main series with the concepts of "business office, green life" and advocates that the products should enter our life in a lightweight, eco-friendly and concise style, and enrich the fun of daily life by meeting the practical needs.

"Suntech x Balans" is the another series with the coming concepts of "balance aesthetics, upscale consumerism" jointly launched by SunMart and fire-new brand "Balans". This series continues the guarantee of practicality and quality, and extends higher-level aesthetic ideas for products, so that objects can convey the harmonious life rhythm of sustainable development between human beings and nature.

The concept of "Balans" is an innovative brand concept based on the corporate mission of Suntech-- "Solar Powering a Green Future" and is committed to pursuing the positive rhythm of life for the sustainable development between human beings and nature. The concept of "Balans" derives from "balance", which means a state of natural balance for people to feel relaxed and comfortable. It covers our attitudes towards "practicality and aesthetics", "absorption and gift", "exploration and return". On the visual signs, it combines harmonious natural elements to build a balanced state of being characterized by potentiality, comfort and simplicity.

[To Improve the Aesthetics with Simplicity]



For the visual interface design of SunMart, we have always implemented the restrained, concise and calm brand style, and created with the user's visual perception as the primary consideration.

The theme of the interface style is extremely simple, with clean content layout, avoiding stacking and complicated; the overall color tone make full use of the harmonious collocation of white, gray and black to show the professional restraint of brand characteristics. Meanwhile, it is decorated with red. While highlighting the information, it reveals potential vitality and publicity. The harmonious coexistence of warm and cold colors makes the interface convey a friendly and personalized brand image; designs of interesting details, simple but not monotonous, also make the official propaganda of the brand more distinctive and attractive.

Every seemingly flat interface is actually reflecting our ultimate pursuit of lines, icons and modules: to simplify and avoid the form covering up the key points of contents. Simplicity and restraint are the power of concentration.

[Natural Gifts and Beauties]

As an online mall, excellent brand goods are indispensable.

The creation concept of SunMart has always focused on the keywords of "green, eco-friendly, harmony and beauty". Based on that, environmental protection canvas bags, environmental protection notebooks and other objects that make your life and office simple have become the representatives of practicality and concept. They not only meet the needs of daily practice, but also combine the brand's consistent idea of a better life with personal attitudes to enrich the value cores of life and office.



At the same time, with an open and cooperative attitude, we explore objects with higher quality. SunMart cooperates with Miir (an American minimalist lifestyle brand) to jointly launch the portable thermal-insulation cup. More reliable quality, more advanced appearance, simpler design, the most important thing lies in the common mission and responsibility. Let's try our best to contribute to global sustainable development, and let's make a deeper communication and cooperation between brands.

The meaning of creation is not only the sale, but also the precipitation of brand culture and concept.



[Indoor Convenient Life]

Based on the simple and restrained brand tone, the operation experience of "SunMart" will also show product characteristics of light-weight, portability and user first.

The operation interface of SunMart is filled with specific functions. The guidance for buttons is clear, and users can log in and order quickly based on Wechat. For the payment state and logistics status of the goods, the relevant information can also be obtained clearly and completely. What is more, SunMart is equipped with relevant text instructions to answer the common problems met in the shopping process. One key for manual customer service could provide warmer services for users in the whole shopping process.

In order to deeply implement the core concepts, "natural creation for a better life", we designed a low-key but highly textured logistics package, which can hold the qualified goods of SunMart, and send them to the users with our unique intentions and blessings.

"Good things of SunMart with a unique package". However, it is not proper for us to define "SunMart" as a simple online shopping platform only. It represents our yearning for future life, pursuit of natural existence, and practice of green harmony concept. We wish a better life could show in front of you at the moment you sign for it.

Suntech 



Wechat



Tik Tok



LinkedIn



Facebook



Twitter