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TOP 12 STRATEGIES

FOR THE SUCCESSFUL SOLAR MODULE BUYER

Version 2.0

SINO VOLTAICS

Hello solar enthusiast!

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Introduction

The '**TOP 12 Strategies for the Successful Solar Module Buyer**' are derived from our experience of working in the solar photovoltaic (PV) industry in Asia for the past 9 years and from helping hundreds of solar companies, organizations and architects to purchase solar modules, inverters, mounting racks, batteries, isolators and other PV components in Asia.

To learn more about the team behind Sinovoltaics Group and its activities, scroll down to the bottom of the e-book.

This Guide has been written by and for PV professionals working in the solar industry. This is the 2nd edition of this ebook and has been fully revised and updated to make it reflect the latest 2017 developments in the PV industry.

We hope these 'strategies to success' will help you avoid the major challenges and pitfalls when buying solar photovoltaic (PV) modules and make you **save valuable time, money and stress** when importing solar modules from the **heartbeat region of the global PV industry - Asia -** wherever you're based!

By highlighting these 12 strategies we want to make our contribution towards a 100% renewable future and finally stop relying on those hazardous, expensive and non-regenerative fossil fuels!

The Top 12 Strategies for the Successful Solar Module Buyer highlighted in this e-book are:

- **Strategy #1** - Do not rely on manufacturer warranty
- **Strategy #2** - Understand PV certifications
- **Strategy #3** - Make sure to purchase truly certified modules
- **Strategy #4** - Perform on-site quality control
- **Strategy #5** - Choose a bankable manufacturer
- **Strategy #6** - Buy with technical know-how
- **Strategy #7** - Handle your own logistics
- **Strategy #8** - Keep track of latest import regulations
- **Strategy #9** - Smart price negotiations in Asia
- **Strategy #10** - Pick the correct PV insurance product
- **Strategy #11** - Perform a background check on the manufacturer and its projects
- **Strategy #12** - Buy from a financially stable manufacturer

Strategy #1

Do not rely on Manufacturer Warranty

Some people call module warranty the **curse of the PV industry**...

Why?

Can you name one single electronic product that comes with a 10 years product warranty and a 25 years performance warranty?

Even **world-leading pacemaker brands** only offer max. 7-10 years warranty on its pacemakers. So did solar modules reach the point they're more reliable and durable than a pacemaker?

We don't think so…

Most people realize today's manufacturers probably won't be around in 25 years. So do PV module warranties **have any serious meaning**?

Whom will you contact with your complaint and replacement request regarding a malfunctioning module after 15 years, when the manufacturer is no longer around?

And: if one day you unfortunately have a warranty claim, will you actually be **compensated** by the manufacturer or will the company seek for tiny **loopholes** in the warranty certificate to wind out itself from its warranty obligations?

The key to understanding the warranty on your solar power system is considering each component separately. The warranty for a single component of a PV system, and that's no different for solar modules, inverters, batteries and mounting racks, come from the actual manufacturer itself. Any warranty offered on the complete solar system comes from the solar installer.

Also: solar module warranties are **often misunderstood** by module buyers, neglecting the small prints. This is something you should pay specific attention to and ask questions, our advice to you is to get those explanations/ clarifications in (signed/ stamped) writing.

Of course, there are a number PV manufacturers that offer valuable warranties, however even these warranties only partly protect you as buyer.

Strategy #1

Most warranties offered to solar module buyers can under no circumstance be relied on as a complete safety net.
The reasons for this are:

1. The solar module manufacturer may not be around by the time your PV system is failing.
2. Warranty policies are complex, not sufficiently transparent legal documents that only cover your modules under specific circumstances.

Team SINOVOLTAICS' quick tip:

Don't assume any warranty policy is a good one, and don't rely on product or performance warranties to cover any defect you may encounter during the lifetime of your PV installation. Instead, focus on purchasing a quality product from the start.

Read the warranties carefully and get written explanations of aspects you don't quite understand or feel are not sufficiently well explained.

Here are two examples of solar module warranty statements that illustrate to be careful with manufacturer warranties:

Example #1 - Not following the manufacturer's installation manual will void warranty.

This is a tricky one, as there are many ways and solutions used to install solar modules. The only way to be safe is to take the installer manual from a manufacturer and follow each step exactly how it is described and document this. And better you document your installation process to show you did as required by the installer manual.

Common installation mistakes where installers go wrong is:

- Inappropriate sizing and installing too many modules in a string
- Improper grounding
- Wrong number and position of rails / clamps used
- Unqualified technicians to install the system

Once you encounter problems with your solar modules, and file a claim with a manufacturer, the manufacturer will – following clarification discussions and ask for proof of your claim – in larger cases dispatch technical staff or hire a **3rd party inspection company** to review the installation. You want to make sure any defects are not caused by 'negligence of the installation manual'.

In smaller warranty cases, for example a hand full of affected modules only, you may – depending on how the warranty policy is written - be required to **send back the module** for replacement on your own account. This may in many cases actually not be worth the time and money spent and your supplier is aware of this.

Here another sample extract from **Yingli Solar's warranty policy** (most manufacturer have this clause in their warranty policy):

"The Limited Warranty does not apply to any PV Modules which have been subjected to Non-observance of Yingli Solar's Installation and User Manual".

Amongst those installation guidelines, several manufacturers now also specify the way their products need to be maintained. Not following the proper maintenance guidelines in the installation manual will void warranty as well.

Example #2 - Exposure to extraordinary salt or chemicals will void warranty.

This point is extremely important when you're installing modules **in maritime locations near the coast**, which will inevitably expose your modules to salt mist. If the salt mist is degrading your solar modules (which it will over time), most manufacturers are not going to cover this.

Ask the manufacturer upfront about their exact policy.

Here's a quote from **Trina Solar's Warranty policy** (this clause can be found in nearly all manufacturer's warranty policies):

…"Limited Warranty" does not apply to any Products which have been subjected to extreme environmental conditions or exposure to corrosion, oxidation".

The goods news is that certain insurance products can help the solar module buyer reduce risks.

High quality solar modules do withstand the degradation from salt mist corrosion and certification bodies have introduced a special lab test and certification for this: **IEC 61701 – Salt Mist Corrosion resistance test**.

If you're installing a solar system near the coast, make sure you purchase modules that carry this certificate.

Read more about solar module certifications in Strategy #2..

Strategy #2

Understand PV certifications

Solar module certifications are another complex and important subject where a lot of buyers run into trouble.

The basic idea of solar module certifications is simple:

Solar module certifications have been put into place to make sure that solar modules sold in certain countries or market regions **meet strict safety and quality standards**. Therefore, local laws in many countries mandatorily require that modules sold and installed in that country are certified to locally applicable quality and safety standards.

These standards are linked to dozens of **lab tests** that simulate extreme circumstances in the field and can give an indication of the possible lifetime of the module.

So that's all very important to make sure your module is of high-quality and a real top performer… **or not?**

Commercializing certifications and the trend of diversification and regionalization

Mirroring the growth of the PV industry, the creation and issuing of solar module certifications is booming and has become a profitable industry of its own as well.

When observing the trend of increasing **certification diversification** and **regionalization** and related compliance requirements to benefit from government subsidies, it is obvious that this poses challenges for importers to follow up on the certification requirements.

Even though certifications certainly have **strong signaling effects**, yet the quality, stability and output performance difference between two different PV modules A and B can be quite large and diverging from the conforming certification-passing module.

Lacking regular inspections and verification by the issuing body, the informative and signaling value of solar module certification regarding the overall quality of a manufacturer's modules is quite limited.

Manufacturers of solar PV modules can obtain these certifications by submitting their solar module samples - the so-called 'golden' modules - to **certification bodies**, that will – for a costly fee - process these modules through sequences of tests and will issue the certifications once passed.

Known **certification bodies** are TUV Sud, TUV Rheinland, Intertek, VDE and SGS.

Common solar module (PV) certifications

If you're already selling or installing solar modules, you're probably familiar with the most common certifications. These are:

UL 1703	Main solar module certification for US and Canada. Mainly focused on safety
IEC 61215	Silicon solar module certification for non-US countries. Covers safety and aging. *
IEC 61646	Thin film solar module certifications
IEC 61730	Safety qualifications
IEC 62108	CPV, Concentrator PV modules

There are additional certifications for specific conditions:

IEC 61701	Salt mist corrosion
IEC 62716	Ammonia testing
IEC 62804	PID testing (technical specification)

* This standard has recently been sub-divided into cell technology-specific standards

Above is only a snippet overview about a few major certification standards… there are many more international, regional and national standards to be aware depending on where your solar power system shall be shipped and installed…

Are all certified products of good quality?

One thing to keep in mind is that a PV manufacturer can own all the certifications in the world, unfortunately this doesn't mean all their solar modules are actually of good quality. It's actually merely a question of money…

In fact, when a manufacturer applies for a certification, it can submit optimal solar module samples for lab testing that 'have been **altered / improved**' in order to pass stringent tests.

Another phenomenon - particularly popular in the solar PV early mainstream days - was that not few manufacturers used to have their 'golden' modules manufactured by technically more advanced manufacturers, only to use them to get over and pass certification.

Once the manufacturers passed the lab tests and received the certification, they may decide to start manufacturing solar modules with **lesser quality** to save costs as most certification bodies have no regular quality check up process in place, many times due to capacity problems.

The production of lesser quality modules often goes in line with the usage of cheaper, low quality raw materials, which brings an even more nerve-wrecking set of problems and challenges on the importers' tables and which we will elaborate on in the next chapter.

A certification thus basically only means that the manufacturer succeeded at a certain point of time to submit a module that well passed the tests and that actually this specific test module only is conforming to the certification standard.

The other solar modules of the same type in the manufacturer's product line thus basically **derive the certification** from that module.

From our experience in performing quality inspections on-site at manufacturers in Asia for many years, it is common practice for many manufacturers to undertake great (quality) efforts to get the certification and then scale down such commitment once mass production and sales are starting…

So is every solar module manufactured according to the strict certification safety and quality standards? Most likely it's not, and this is where the **quality issues** may come up..

The reason why we explain this, is that we recommend people not to fully rely on solar module warranties and certifications and understand the loopholes and dark sides behind the shiny world of cool looking certification logos...

There are **additional precautions** that you can take to ensure quality.

Uncertified solar modules

You would be surprised still how many uncertified products are being sold, just because solar module buyers are not aware of which certifications are needed in a specific country or market region. Yes, even in the year 2017! And this is not only about manufacturers having no certifications at all for their modules… we will explain this in detail in the next Strategy #3…

So, why is it a problem to purchase uncertified solar modules? There are a couple of reasons:

1. The manufacturer may not be capable at all to produce a single solar module that meets the quality and safety standards you need.
2. These solar modules, not having passed the strict standards related to **aging, degradation, performance losses** etc. may not be durable in the long run.
3. You may not be able to **legally sell** or import these solar modules in your jurisdiction.
4. You may not be able to receive the **FIT (Feed in Tariffs)** subsidies, tax refunds or other subsidies for these solar modules.

New technology solar modules

Pay special attention with new technology solar products, as these products are usually still going through the certification process. Also: be aware of manufacturers that are 'in the process of having their product certified with a certification body'.

Acquiring solar module certifications usually takes longer than expected and final certification deadlines are hard to estimate.

Team SINOVOLTAICS' quick tip:

Make sure you understand the limited informative value of certifications in terms of your module's overall quality. Know, what certifications are required to import, install and operate solar modules in your target country and understand the certification requirements to benefit from subsidies or refunds (if any).

After your contact person at the factory presents you with the power range of the solar modules available, always ask for a copy of the latest certificates to confirm if the range of power types is truly certified. In particular, pay attention with uncommon power sizes. Usually the manufacturer only certifies the most common models, for instance ≤250Wp.

P.S.
In case you want to dig deeper into this highly controversial topic and learn more about certifications of PV modules, including industry insights, background information and the various local and regional standards for PV modules, then the authors' 300+ pages **Comprehensive Guide to Solar PV Module Certifications (2016 edition)** might be interesting for you…

To date it is the most specialized and comprehensive guide on PV module certifications available in the industry:

http://sinovoltaics.com/solar-module-certification-world-map/

Strategy #3

Make sure to purchase truly certified modules

You bought PV modules from a manufacturer that has them certified to the standards as required in your country and before buying you also verified that the certificates were genuine… yet, ultimately you still bought an uncertified module.

Pardon?

One of the major hidden problems in the solar PV industry is actually the vast amount of modules produced, sold and installed around the globe without many stakeholders being unaware that these modules are narrowly speaking **uncertified**.

Suppose you want to make a cake. What ingredients are required for this, in what quantities and what shall the final cake look like? A good baker will stick to a well-tested and proven recipe that is skillfully and in detail adhered to during the baking of the cake and reject deviations to the established composition of the cake, unlike the hobby baker.

In the solar PV industry, the applicable (and frequently confused) terms are **bill of materials** - abbreviated as **BOM** - and **constructional data form (CDF)**. The aforementioned differences between a hobby baker and a professional baker probably best describe the nuanced differences between BOM and CDF.

What is a Bill of Materials?

A bill of materials or BOM is a **list of all material** (raw materials, sub-assemblies, sub-sub-assemblies, down to individual nuts and bolts) that is used at a specific point of time to make a finished product.

Generally, a BOM will be prepared against a specific production order with **complete specifications.** When specifications change, the materials requirements will change, and that means the BOM will change.

For example, a BOM for production of a printed circuit board (PCB) will include all the components and materials that go into its production like resistors, capacitors, fuses, fuse links, etc., along with the quantities required.

A good BOM for a typical **crystalline silicon PV module** will include information such as:

1. **component type,** such as solar cell, superstrate, frame and encapsulant
2. **details about the manufacturer** of the respective component type
3. **details about the specific component**, including material specifications and characteristics

4. **quantities** of the respective component required in the manufacturing of 1 solar PV module
5. **material quota**
6. **specific manufacturing details and material coding remarks** regarding the respective component
7. component **purchase dates**

The BOM is not only useful to document the raw materials and components used in the production of a product, but it is also helpful for **economical procurement** and stocking, and with the addition of other costs, helps in estimating cost of the finished product.

What is a Constructional Data Form?

The constructional data form (CDF), also sometimes called engineering BOM, is a comprehensive document that specifically lists all **critical raw materials and components** as well as **design and labelling information** for the manufacturing of a product as required per applicable standards.

Constructional data forms are usually compiled during the certification process when qualifying a product's design according to the relevant **design qualification and type approval standard** for that product type.

When submitting testing samples, the manufacturer of the to-be-certified product is required to submit detailed documentation about all the raw materials and components used in the production of this submitted product which will also be thoroughly verified by the certification body concerned.

Upon successful testing and consequently certification of that product to the related qualification design standard, the responsible certification body will attach CDF documentation to the **certification report**.

All components used during certification testing as well as the labeling design and other parameters are fixed in the CDF of this specific, certified product. The manufacturer is obliged to use the components in the CDF to be able to state that their product is certified.

The reason for this strict requirement is obvious: the **performance** and **safety qualities** of a product are significantly geared to the raw materials and components used in the manufacturing of that product.

When qualifying a product to a standard, testing and related product performance and safety evaluation by the concerned certification bodies takes place only on the basis of its given construction at that point of time.

Solar PV module CDFs

A typical CDF of a crystalline silicon PV module usually contains following information:

1. about the **certification-applying manufacturer**
2. the **production facility** of that module
3. **PV module type** and model details
4. **rated power output**, usually at standard test conditions (STC)
5. **mechanical characteristics**, such as dimensions, weight

6. **electrical characteristics**, such as maximum system voltage, over-current protection rating as well as product electrical ratings including open-circuit voltage, short-circuit current, voltage and current at maximum power and maximum power with tolerance
7. **cell technology type**
8. applied **test specifications**
9. **components** and **sub-components**, naming the specific supplier, detailed information about the component and test marks where applicable. Those components and sub-components include cells, cell interconnectors, superstrate, substrate, frames, adhesives for frames and junction box, junction box, bypass diode, cables fixing tap and more
10. **rating label** and **serial number** design and content details
11. details about **warning label** and **grounding symbol**

First of all, it will greatly simplify the certification process when a manufacturer uses components, such as junction boxes and solar cells, that are **certified or well known in the market** – meaning there is plenty of information available regarding the certifications of the components and the constructional data form.

It is common among PV module manufacturers in China and Asia that a CDF contains a range of **qualified components and sub-components** and their respective suppliers for one and the same component type, so to give the PV module manufacturer greater tolerance room for standard-compliant manufacturing, especially addressing the constant need of manufacturers to reduce costs.

CDF versus BOM and compliance issues

In simple terms, while a PV module BOM can be regarded as the composition information document of a PV module of a specific production run during a specific point of time, the CDF can be regarded as the qualified, valid and certified "recipe" of a PV module.

It is not rare that Asian manufacturers - especially in China - **modify raw materials, components and even design details** during mass production of solar PV modules.

Major triggers and reasons for these modifications are:

1. manufacturer changes raw material supplier in order to **reduce costs**
2. raw material is **modified or even phased out** by the supplier
3. raw material supplier is **out of business**
4. **new technology developments**, such as for example new solar cell types
5. **buyer-side requirements**: buyer asks the manufacturer to use specific raw materials for the modules purchased

Strictly said, the materials listed in the BOM **must match** those of the CDF. Deviations from the CDF in usage of materials and components construe design changes that may potentially affect the performance of a PV module, therefore manufacturers are obliged to **notify the certification bodies** of this change and either update the CDF of a module model after consultation with the certification body or even be required to subject the specific module model to re-testing.

However, as raw material changes are often frequent and rather fast, some manufacturers rather opt to skip and ignore this time - and cost- intensive process and sell their modified modules with the qualification design and type-approval standard certification mark printed on the label of the very same product. Basically, selling an **uncertified product** along with all the commercial, legal and safety consequences for importers and their clients that apply in different countries and regions.

Without at least witnessing the use of qualified raw material and components as per CDF on-site during production, such as during an **in-line inspection at the factory,** it is very difficult to trace the original components starting from a readily assembled PV module.

Being subject to regular changes and compiled by the manufacturer itself, there is **no 100% guarantee** that a BOM as compiled by the manufacturer will truly reflect the real and whole composition of a PV module.

Some manufacturers may knowingly exploit this loophole and sell modules made of significantly cheaper low-grade components behind the protecting curtain of the qualification design certification mark obtained earlier.

Team SINOVOLTAICS' quick tip:

Make sure that you buy certified PV modules whose raw material and constructional design are in line with the CDF. This can only be achieved by following two undertakings from your side:

1. add a clause to your purchase contract with the manufacturer that clearly confirms that your modules are produced exactly in line with all raw materials and design requirements as per the module type's applicable CDF

2. perform an in-line inspection from the very start of the production of your PV modules so to witness on-site that all CDF-qualified materials are on-site and used during the product of your modules

Strategy #4

Perform on-site quality control

Strategy #4

Some buyers trust a manufacturer only because the manufacturer owns the right **certifications** and offers a **warranty** on the solar modules. You already know that you can't solely rely on these when purchasing solar modules.

There are dozens of possible **quality defects** that we come across at solar module manufacturers in Asia.

Some defects can only be detected by using **advanced testing equipment**, such as electroluminescence (EL) testers, solar simulators, thermal cameras or resistance testers.

Other defects can only be spotted by inspecting the non-assembled components that are used prior to production.

However, some defects you can detect by yourself...

If you've already bought solar modules, you can do the following directly.

Here are five common **visual defects** that you can **easily avoid by yourself by visually checking a solar module**:

Defect #1 – Broken or chipped solar cells

Broken and chipped solar cells are common and can indicate different issues. If several solar modules have chipped solar cells, your manufacturer may be using **Grade B solar cells**.

Grade B solar cells are a serious problem as they may be cheating you on the most valuable component used in the solar module (!).

Alternatively, the solar cell has been damaged during handling, most likely during the soldering process. During **manual soldering** the solar cell breakage rate is higher than during automatic soldering.

As you can see this defect can be easily spotted by performing a visual inspection. Also the problem is visible during an EL test.

Your quality inspection person on-site can trace the exact cause and correct it for future shipments.

Below an example of a broken/ chipped solar cell:

Defect #2 – Scratches on the glass

A major and prevalent quality issue are scratches on the glass cover of the solar module.

On average, small and large scratches on the thin glass covers are found during 82% of independent 3rd party quality inspections as for example performed by Shanghai-based Kisun Solar Consultancy Services.

These scratches mostly are a result of **improper handling** of the module at the factory or **negligent and unsafe packing**.

Scratches, small and large, potentially lead to **output degradation** of the affected module. While less severe scratches superficially may cause some slight shading on the cells, larger and deeper scratches can heavily compromise the sensitive and nanometer-thin antireflection coating that nowadays many module manufacturers apply, impacting the transmittance of light.

The coating being damaged, air, dust and water can get underneath which then causes the lifting of the rest of the coating and in the long run cause a delaminating effect.

Here an example of scratches on the glass:

Defect #3 – Solar cell string alignment

A misplaced string alignment is usually an **aesthetic problem**. It usually won't affect the solar module's safety, performance or lifetime unless certain minimum gaps between cells as well as between cells and frames are not adhered to. However…

String alignment is easily picked up by the eye and will therefore be picked up by the end customers.

Also: if the spacing between the solar cells is too small (standard is 2mm), it may cause arching.

String alignment is such a simple thing to do right, if your manufacturer does not master this, there will most likely be **negligence in other aspects** of the PV module.

Here an example of improper solar cell string alignment:

Defect #4 – Fading labels and barcodes

According to IEC standards, every solar module needs to have a **barcode** encapsulated inside the PV module behind the glass.

This is important because in case of a warranty claim, you'll need to present the barcode number to the manufacturer.

Nowadays most professional manufacturers have **databases** where they can trace the date the module was bought, check the **Bill of Materials** and which **distributor** bought the module.

What if the barcode is not included inside the solar module? In that case you better have a high quality barcode and label on the outside (back).

If you want to check the quality of these labels on the outside, you can simply rub the label for a couple of seconds with some pure alcohol and a cloth. If the text/barcode comes off, the manufacturer used a cheap label (to save a couple of bucks) and needs to replace these.

Still happens a lot!

Here an example of a non-compliant barcode:

Defect #5 – Laminated debris inside the solar module

Another defect you can easily spot yourself are **laminated debris** inside the solar module.

These particles may vary, including simple **soldering debris** (often small pieces of tab wire), cloth, human hair or even **insects**.

Similar to previous visual defects: if you spot such problem, it means a manufacturer is much likely neglecting simple quality checking procedures and there may be other problems.

Debris the size as per below will have certain shading effects

For any professional PV buyer it remains unclear if a solar module was made with the right 'best practices' manufacturing processes in place, where it was manufactured and if certified **grade A** components were used.

As we have outlined during the previous chapters, it is essential to make sure that your modules are produced with qualified raw material, thus requiring witnessing such conformity during the production of the modules.

So how can you be 100% sure you purchase quality solar modules?

As you've seen from the 5 Defects above, it's possible to perform basic visual quality control by yourself. It's a first indicator for the quality of the product you bought.

When you want to perform a thorough quality check of the PV products you're buying, most companies either dispatch their quality auditors or hire a 3rd party inspection company to perform quality control in particular during production (in-line).

Team SINOVOLTAICS' quick tip:

In most countries the importer is directly liable for the quality of the solar modules imported. In case there's a major defect and you find out about this only when the solar modules are already shipped or installed, it will require major costs to have it replaced.

We recommend that you perform quality inspection during production to witness raw material conformity, get an early impression about the quality of the modules manufactured and make corrections early on. At the very latest, when for example buying modules in stock and thus in-line quality inspections are not feasible, quality inspections should be performed prior to shipment.

Strategy #5

Choose a bankable manufacturer

Strategy #5

One of the worst things you can do is to pick a PV manufacturer as a partner without considering if their products are bankable.

Bankability of a PV module means that your bank is **willing to finance a project** with the PV modules that you selected as they're confident about the quality and durability of the PV module and the sound state of the manufacturer.

Bankability depends on a large number of criteria and bankability in the PV industry is a term used to describe the **degree of financial risk**.

Whether a PV manufacturer is bankable or not is not a black or white judgment. The degree of bankability of a PV project will affect the availability and cost of capital.

Simply said, banks need to know if the cash flow is secure or not and that their loan will be repaid. A secure cash flow means the PV project is quite secure from a **legal, technical and economic perspective**.

But what do banks know about PV... really?

Even though in the past decade bank financing of PV projects has become more common, still only a small percentage of banks are willing to step in and finance solar projects. The reason for that is simple:

Most banks do not understand the risks involved in solar projects.

Further, you may of course ask yourself: are banks themselves 'bankable'? ;)

How to turn a PV module brand "bankable"?

As there's no clear or sole path to bankability, lots of different companies have jumped on this subject and came up with 'The Solution'.

A. Insurance companies

Several insurance companies claim that once you purchase their solar insurance product, the solar modules become bankable. This is usually the case when the performance warranty and product warranty are insured.

B. Factory audits

Some companies say they can help you to turn your PV module "bankable" in the eyes of purchasers, investors or governments with the help of **factory audits**.

This process usually goes beyond standard certification testing.

A full-scale solar module manufacturer audit is usually quite an extensive research that will investigate many aspects, such as the **financial background**, components used, production lines, in-house expertise etc.

After this audit, a report can be issued that should provide additional certainties about this particular manufacturer and its PV modules.

C. Analyst companies

Some analyst companies have their own criteria for bankability. For instance: Bloomberg New Energy Finance (BNEF) has created a database with PV manufacturers categorized as Tier 1, Tier 2 and Tier 3.

Tier 1 companies are the ones with bankable products. Their criteria are:

"Tier 1 module manufacturers are those which have provided own-brand, own-manufacture products to five different projects, which have been financed non-recourse by five different (non-development) banks, in the past two years".

This is a pragmatic approach, however it doesn't explain the exact criteria that banks look at to consider a company PV module manufacturer bankable. They simply look at which PV modules have already been financed by several banks in the past.

Looking at bankability from BNEF's perspective, it is extremely difficult for new manufacturers (or new technologies) to gain bankability, as they don't have any reference to previously financed projects.

D. Certification bodies

Certification companies are nowadays offering **additional lab tests** that go beyond standard certification testing. Larger international bodies offering such additional lab tests include:

1. TUV Sud
2. RETC labs
3. TUV Rheinland
4. Intertek
5. VDE

Such reports can be useful information to show to a bank that '**this PV module is better than others**', and can in some cases turn a PV module bankable.

Yet, in such cases it still depends on the manufacturer or sometimes even the solar project investor to approach these labs, get the additional (costly) tests done and negotiate with a bank.

Are bankable solar modules quality solar modules?

Finally, is bankability the guarantee that solar modules are of high quality?

Even though certifications, warranties and bankability are all indications that a PV module is more reliable, it is not a guarantee that the PV modules are of the highest quality.

Also bankability is by no means a guarantee that a PV manufacturer may be around for the long run.

Look at manufacturers that were previously considered bankable and later went down… Suntech, Solarworld, BP, Siemens and Bosch to name a few.

Team SINOVOLTAICS' quick tip:

Purchasing solar modules from manufacturers evaluated as bankable carries a higher certainty of buying goods from a company that underwent some tighter scrutiny, increasing the chances of the reliability of your supplier and its solar modules.

Therefore, you should check with your manufacturer if it is bankable and if so, evaluated as bankable by which institutions/ assessing bodies? You should also request project samples were applicable and assess the performance of these.

However, keep in mind that increased chances of reliability do by no means indicate that purchasing solar modules from a bankable manufacturer is 100% safe harbor!

Strategy #6

Buy with technical know-how

With the ongoing boom of the solar PV industry since the mid 2000s, numerous solar companies have been mushrooming, eager to get a part of the delicious, big PV cake.

Yet, with many start ups set up to cash in on the still attractive profit margins when importing modules from Asia and selling them back in Europe, Americas or Oceania, many of those working and operating in this large PV food chain have not undergone specific **technical education**, training or lack the understanding of even basic technical aspects of the products they are working with daily.

When buying solar modules from far distant places, it is essential to have at least some minimum understanding of the technical aspects of the very electronic product you are dealing with.

This is not only important in order to reduce misconceptions about the market status, specialty and technical performance of a solar module, but also to avoid giving the manufacturer the impression you lack knowledge, making it much easier for him to **abuse this and cheat on you**.

So what minimum technical know-how do you need about solar modules? Let's look into some basics.

1. Electro-technical working of a solar module

How do solar modules actually work and have the **photovoltaic (PV) effect** – sunlight converted into electricity - coming into play?

When you import solar modules, you are confronted with various types and configurations of solar modules, however for simplification let's focus here on the electro-technical working of a standard module.

Standard solar modules are rectangular-shape electronic devices that comprise several highly-purified strings of sandwiched slices of silicon cells pasted on specific sheets (called: substrates) on the back of the module and protected by a layer of tempered glass (called: superstrate) on the front, the whole to be tightly sealed with frames - most models have aluminum frames.

The photovoltaic cells made of **silicon (Si)** – a widely used semiconductor in microelectronics - are flat and depending on the type of silicon used – monocrystalline or polycrystalline – mostly come either in square or octagonal form.

They are created flat and larger than normal cells you would find in other microelectronics. This is in order to allow for more space to capture more sunlight to be converted into power.

Electrochemically put simple, the silicon-made photovoltaic cells work by having the income sunlight particles – **photons** – to break the electrons lose from the atoms of the silicon and thus creating an **electron flow** that powers connected loads (devices).

To this effect, the cells need to create an electric field which requires the silicon slices to be provided with positive and negative electric charges and which occurs when the positive and negative charges are separated.

These charges are created by doping the silicon slice layers on top and bottom with materials of positive (fewer electrons) and negative charge (extra electrons).

Usually, cell manufacturers dope the silicon cells with **phosphorous** as the thin, sunlight-permitting **top layer (n-layer)**, adding electrons (n, negative charge) and **boron** on the **bottom layer (p-layer)** with fewer electrons (p, positive charge)

creating an electric field at the center between the n-layer and p-layer, the so called pn-junction.

Now, the photovoltaic effect then occurs with incoming sunlight photons break the electrons out of the pn-junction with the positive charges sent through the p-layer and the electrons flowing up the n-layer. The electrons – being collected by the metal plates of the silicon cell – create charges which then run through wires and connect with the charges of other wire-connected cells in the string. This direct current (DC) electricity is run into an inverter that converts it into alternate current (AC) electricity and then powers your connected loads.

2. Solar module performance parameters

The overall electric performance of a solar module is dependent on a range of **geographic**, **environmental** and **installation factors**, covering aspects such as location, module angle, solar irradiance, temperature, wind, nearby objects (shading) and the type of cells used.

Solar modules are usually rated under specific conditions they were tested on, the most common being the **Standard Test Conditions (STC)** which specify 25°C cell temperature,

1000W/m² solar irradiance and a solar spectrum of 1.5 air mass (AM). Manufacturers of solar modules provide data on the electrical performance characteristics as per STC.

So, what are the most important performance parameters you typically encounter and should know about?

We list and explain them here below:

Maximum rated power (Pmax): measured in watts (W) and indicated on labels as watt peaks (Wp), the Pmax specifies the maximum power output a solar module can achieve under a particular testing condition (e.g. STC).

Power tolerance: measured in %, the power tolerance specifies the range within which the module will overperform or underperform its Pmax at the testing condition applied, with industry general values in the range of ±3%.

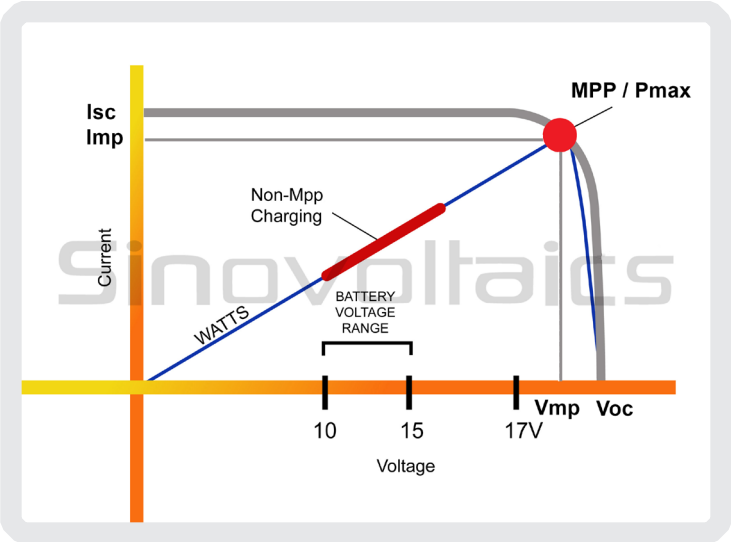
The more narrow power tolerance range, the better you - as importer - can nail the manufacturer on the rated power you expect and thus plan your projects accordingly. Many buyers actually demand positive power tolerances only.

Short-Circuit Current (Isc): measured in Amps (A),the short-circuit current is the amount of current that the PV module supplies into a dead short.

Open-Circuit Voltage (Voc): measured in Volts (V), the open-circuit voltage is the voltage output of the module measured with the module disconnected from any load.

Maximum Power Point Voltage (Vmp): measured in Volts, is the voltage at which the module puts out the most power ***(maximum power point – MPP)***. All voltage measurements are made at the module's electrical terminals mounted on the module's back. These measurements are made with a highly accurate voltmeter.

Maximum Power Point Current (Imp): measured in Amps, the current at maximum power point (Imp) is the number of Amps delivered by the module at its maximum power point.



Fill Factor (FF): measured in %, the fill factor is an indicator of the performance losses regarding parallel **intra-cell resistances**.

The higher the fill factor value is, the better, with grade A modules typically linked with a FF of > 70%. The fill factor is the maximum power produced, divided by the product of Isc and Voc.

Generally, the fill factor will always be less than 1. Due to the difficulties in measuring conversion efficiency quickly, it is common to measure the fill factor instead.

Module Efficiency (Eff.): measured in %, the solar module efficiency specifies what percentage of incoming sunlight is potentially converted into electricity in relation to the modules total size.

It helps you to determine **how much power you can optimally generate with a specific module**, at your specific location with your specific space conditions.

People often tend to confuse module efficiency with **solar cell efficiency**, the latter which usually a few percentages higher as efficiency-impacting factors such as reflection from the glass layer are discounted.

Solar cell technologies

Before deciding what solar modules to purchase, let's have a look at the main important solar cell technologies on the market.

1. Crystalline-silicon solar modules

The most popular solar cell technology by far is the crystalline silicon solar cell. With a Market share of 80-90%, it's the most popular cell technology and there's no sign that any other

technology will surpass the success of the almighty silicon cell any time soon.

The main reasons why crystalline silicon (c-Si) solar cells are the most popular cell technology:

Proven technology

Silicon is already widely used for semi conductors in the computer industry. Therefore, massive amounts of research have been done on silicon. A lot of technology that we currently use to make silicon solar cells are 'borrowed' from the computer industry. Think about methods of making wafers, doping, patterning and making electrical contacts.

There's an abundance of silicon

Silicon can simply be won from SAND! It is the second most abundant element available on earth. This is an extremely important point when solar energy will fulfill a decent portion of the energy needs on earth. We need a lot of it!

Silicon is stable and non-toxic

Silicon solar cells de-grade slowly and last well over 25 years. When silicon cells de-grade it's not even the silicon that is affected, it's the electrode on the cells.

The efficiency of commercial c-Si solar cells varies between 15-20%, and has the potential to reach 20-23% efficiency in the future.

c-Si solar cells can be divided in two main types:

Mono crystalline solar cells

You can recognize mono crystalline solar cells by the 'rounded corners'.

During manufacturing the wafers are sliced from a high-purity single crystal ingot. Mono cells are slightly more efficient than poly cells, but they're also a bit more expensive.

Poly crystalline solar cells

Poly cells can be easily recognized by their square shape.

Poly crystalline solar cells are made by sawing a block of silicon into bars and after cutting these bars into wafers.

2. Thin film solar modules

Thin Films are considered a potential **alternative** to crystalline silicon solar cells, because the costs have long been considered to be cheaper than c-Si solar cells. The main way in saving costs is the use of an ultra thin semi-conductor layer, bringing the costs down.

The price advantage of Thin Films has mostly evaporated due to the rapid decrease in Si solar cell pricing in recent years. Thin Film has lost much of its price advantage.

Thin film solar panels now account for a market share of 10-20%, with First Solar being by far the largest Thin Film manufacturer.

Each Thin Film cell technology can be manufactured fully automatic. The cell materials can be deposited onto glass or aluminum substrates.

The most common Thin Film technologies are:

a. Amorphous silicon (a-Si)
Amorphous silicon has a high absorption capacity and can therefore be used in solar cells with very small layer thicknesses (usually about a factor of 100 smaller than in crystalline silicon), saving on material costs.

Amorphous silicon (a-Si) material is prone to electricity conversion efficiency degradation in the sunlight. Efficiency is around 8-10%.

b. CdTe
Cadmium Telluride (CdTe) solar cells have a number of advantages that make this technology popular in the US.

i. Fast manufacturing
One of the advantages is the relatively quick way of manufacturing. First Solar is known to produce one CdTe module in about 2.5 hours, which is fast.

ii. Few semi-conductor
Less semi-conductor is used which has long been seen as a major cost advantage. However in recent months the cost of silicon solar cells has come down significantly, making CdTe solar cells less competitive.

iii. Flexibility
CdTe solar cells can be flexible, and manufactured on various substrates, which allows integration in construction / roofing materials.

The efficiency of CdTe thin film modules is around 14-15%.

Disadvantage of CdTE: the use of rare and toxic elements

Tellurium is a **rare element**, which is extracted during copper mining. There's only a limited quantity available on earth. It's nearly as rare as gold!

If we assume that CdTe will fulfill a large amount of our future electricity need, there will likely be a shortage of tellurium, because we can't start mining more copper just because we need more Tellurium!

If that is not enough, CdTe Thin Film solar cells contain **Cadmium**, which is a **highly toxic element**. Even though it won't cause a problem during the usage of the CdTe module (even though you could ask yourself what will happen in case of a fire). After the panels have reached their end of life, the CdTe modules need to be **recycled**.

c. CIGS

CIGS is a semiconductor material composed of copper, indium, gallium, and selenium. The largest manufacturer of CIGS solar modules is Solar Frontier in Japan. Hanergy, the by far largest Chinese player in the CIGS-field could develop itself as a large player as well, as it bought CIGS technology from companies Miasolé, Global Solar and more.

Some advantages of CIGS cell technology:

i. Heat resistance
Just like CdTe solar modules, CIGS modules show a better resistance to heat than silicon made solar panels.

ii. Non-toxic materials
CIGS does not contain the toxic element Cadmium, or any other toxic materials.

iii. Flexible
CIGS can be applied on an ultra thin, aluminum flexible sheet.

The downside of CIGS technology is the cost, lower efficiency and the difficulty manufacturers has in the past to ramp up production.

3. Multi-junction solar cells

Multi junction solar cells are solar cells that contain several p-n junctions. Each junction has a different band gap and is made to receive a different wavelength of light.

This results in a highly efficient solar cell that have reached efficiencies of up to 43.5%.

Usages of multi-junction solar cells

Multi-junction solar cells are still very expensive. Initially the only application for these solar cells has been in space.

However when researchers started concentrating sunlight and point this at multi junction solar cells, the cells became price competitive for use in CPV (Concentrated Photovoltaic) power plant installation.

CPV system make use of concentrator lenses that are used to bundle the sunlight, which can be concentrated around 500 times. When the concentration factor is very high, the efficiency of the solar cells is drastically increased, making the solar cell more cost effective.

A tracker system following the path of the sun during a day is needed because the lens optimally bundles direct sunlight.

Future solar cells

Currently over 350 start-up companies worldwide are working on solar cell technologies, to increase efficiencies, cut costs and experiment with new materials.

New types of solar cell technologies are **organic solar cells** and **dye sensitized solar cells**.

With all this R&D being done, the price / watt for solar modules will gradually come down, which will lead to grid parity in more and more countries around the world.

4. Components

Following a basic overview about the main solar cell technologies available, let's have a look at the different components a typical solar module consists of:

1. Solar glass

The type of solar glass directly influences the amount of **solar radiation** that is being **transmitted**. To ensure high solar energy transmittance, glass with **low iron oxide** is typically used in solar panel manufacturing.

Solar modules are made of **tempered glass**, which is sometimes called toughened glass. Known disadvantages of glass are the **heavy weight** and **breakability**.

2. EVA film

In the solar industry the most common encapsulation is with cross-linkable ethylene vinyl acetate (EVA). With the help of a lamination machine, the cells are laminated between films of EVA in a vacuum, which is under compression and is done at temperatures of around 150° C.

One of the disadvantages of EVA is that it is not fully UV resistant and degrades over time.

3. Solar cells

See previous chapter on solar cell technologies.

4. Backsheet

Backsheets are used on the backside of the solar module and need to be of high quality.

Critical properties of solar module backsheets are weatherability, adhesion and mechanical strength.

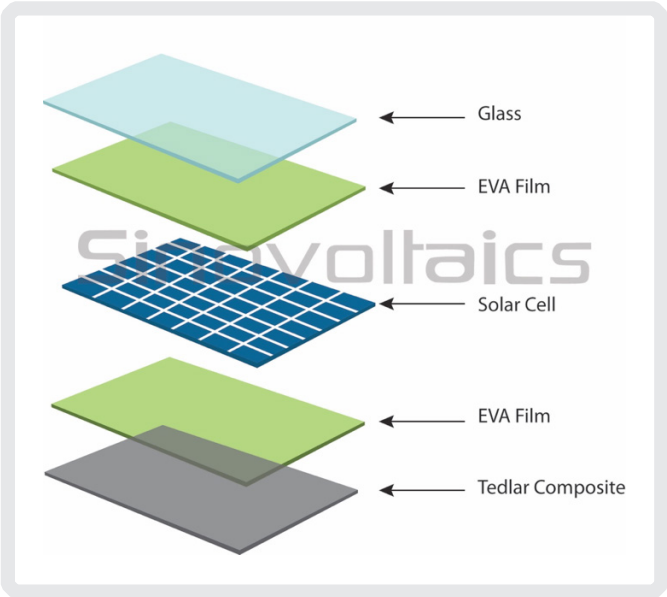
We recommend to use a TPT (Tedlar/ PET/ Tedlar) back-sheet that has been in the field for over 20 years. A known manufacturer and name patron for the ingredient materials is Dupont.

5. Junction box

A photovoltaic (PV) junction box is an important part of the solar panels. The junction box is an enclosure on the module where the cell strings are electrically connected.

With the use of a junction box, it becomes easy to connect a solar module to another and thus interconnect the whole PV array. Usually cables with MC4 connectors are used.

A good junction box keeps corrosion at the terminals to a minimum, as it will prevent water from coming in.



Team SINOVOLTAICS' quick tip:

When dealing with solar modules, basic electro-technical know-how and understanding about different technologies, cell technologies, components and performance parameter interpretation will greatly reduce the chance that your prospective supplier would think about hoaxing you but see you as someone who understands what he is dealing with.

Moreover, it enables you to question technical claims and actually better filter the white manufacturing sheeps from the black manufacturing sheeps...

No need to be sheepish anymore... ;)

Strategy #6

Handle your own logistics

Thomas Friedman is right when saying that the world has 'flattened', which has led to an explosion of trade and global sourcing.

As global logistics professionals know only too well, **it is still a long way from Shanghai to Dakar**, especially when the solar modules have to go through numerous steps from manufacturing to delivery, involving multiple governments, companies and third party service providers.

The bottom line is: going global means adding time and distance to your supply chain.

Those two factors add **cost**, **complexity**, and **frequently risk**... and headaches..

Handling the logistics of solar module shipments can be complex and there's a good reason that large companies have their dedicated logistics department.

But what if you are a small company?
Right... you'll have to deal with it by yourself.

When you are purchasing solar modules in bulk, there's a good chance that at a certain point you will consider to import your modules from Asia.

Currently over 80% of solar modules are made in Asia, thereof more than 60% in China, and anyone dealing with Asian manufacturers will need to arrange the logistics to import the goods safely and on time.

Who controls your shipments?

Some manufacturers will offer to help you ship your modules from their factory to the destination port.

Generally, ***we at Sinovoltaics prefer to handle the complete shipping process by ourselves***, from the beginning until the end, instead of relying on a solar module manufacturer to handle the logistics.

Actually we don't handle the complete logistics ourselves, we hire our own **Freight Forwarding** company.

You may now ask yourself: why hire my own freight forwarder? We will tell you some very good reasons to hire your own freight forwarder instead of relying on the manufacturer:

- When you use your own logistics company, the shipping agent is working for you and will act on your behalf and **in your interest**.
- You can decide to purchase proper **insurance** for your shipment. Proper insurance is not often the case with corner-cutting manufacturers handling logistics.
- You can pick the **fastest shipping routes according to your schedule**.
- You pay for the **real charges**, no additional (hidden) profit for the manufacturer

EXCEPTION: favorable payment terms

There's one exception when we would accept the manufacturers to handle the logistics:

The PV manufacturer offers credit / extension on the balance payment of a shipment.

A common attractive payment term is to pay a down payment, and pay the balance payment before the goods arrive in the port of destination. In this case, the manufacturer obviously wants to control the logistics.

Selecting the right freight forwarder

There are thousands of freight forwarders that you can pick to work with. Choosing a reliable forwarder is extremely important.

Any freight company we work with needs to meet the following requirements:

1. English speaking staff on the ground (*own staff, not an agent*).
2. One central, 24/7 available contact person
3. Familiarity with solar PV
4. Referred by a trusted contact
5. Credit arrangements

What is key knowledge in logistics?

Before you can successfully handle shipments, there are a number of things to learn. In this e-book we won't go into great detail, however we provide you here with the important main points to look into:

A. Shipping docs

When preparing a shipment, you'll need to collect all shipping documents. These include:

1. Commercial Invoice
2. Packing List
3. Bill of Lading
4. Packing Declaration

B. Incoterms

Incoterms are shipping terms that set the parameters for international shipments. Most common incoterms in the solar industry are **CIF (Cost Insurance and Freight), FOB (Free On Board) and Ex Works**. Previously, manufacturers would even use DAP (Delivery At Place) terms, but this is currently not popular.

C. HScodes

When you ship your solar modules across borders, your freight forwarder will need to inform customs about the types of goods that you're shipping. This is done with HS codes.

There are many ways HS codes are used by governments, including freight tariffs, internal taxes and quota control.

Strategy #7

You need to know the HScodes for your solar products, so your freight forwarder or your contact at the customs can inform you about the latest tariffs (such as anti dumping duties which we will look into next), which can drastically affect your costing.

These HScodes will come in handy when shipping solar products across borders:

Solar modules and solar cells	**854140**
Solar inverter	**850440**
Solar mounting racks	**7610** (aluminum structures)
Solar mounting racks	**7308** (iron / steel structures)
Thin Film solar modules	**845154000**

Team SINOVOLTAICS' quick tip:

Spend some time picking the right Freight Forwarding partner. Many people working in the industry are in touch with their logistics company almost daily.

Having a direct line with one or two logistics experts will save you a lot of time and trouble in the future, as they can advise you on latest regulations, import duties and fastest or most affordable routes.

Pick a Freight Forwarder carefully, as if you're picking your new business partner.

Strategy #8

Keep track of latest import and customs duty regulations

Strategy #8

When purchasing solar modules from Asia, you need to be aware of a range of different conditions and regulations specifying under which circumstances these electronic devices can be imported into and operated in your target country.

Apart from the **certification requirements** to legally import, operate and eventually claim subsidies for your modules, you should also pay attention to the specific **customs regulations**, especially in the case of **import tariffs**.

With China having in the past years become the world's main manufacturing and exporting base of solar PV modules, this did not only heavily bring down module prices, but also lead the downfall and nearly total **bankruptcy** of solar module manufacturing in the Western hemisphere.

These bankruptcies since 2012 (and in some countries also political-economic factors) triggered the **imposition of import tariffs** on Chinese-made solar modules as a means and hope to balance the market and protect local producers. But not only Chinese modules have been targeted...

Other countries and regions started to follow, the overall dispute having resulted into a cycle of **tit-for-tat sanctions** on either side and even resulted in the inclusion of other Asian countries and regions into those **tariff black lists**.

The import tariffs heavily impacted business of distributors, project investors and installers that for years benefited from the competitive prices of modules from China, certainly boosting solar PV electricity generation in many parts of the world.

Now in 2017, if you want to benefit from the good price/quality ratios of Asian-made solar modules, what do you need to know as an importer? Let's have a look at situation in some of the major solar module import countries and regions.

USA:

The USA were the first to impose **punitive tariffs** on China-made solar modules in 2012 following a complaint by German **Solarworld**.

The import duties are targeted against specific companies with duties ranging in the 2digit percentage ranges, while other manufacturers not in the list facing duties in the **3digit percentage range**. Further more, anti-subsidy rates on solar

products from China were imposed on top.
In case you consider importing from China, you can find a list at the U.S. Department of Commerce to see whether your manufacturer of choice is on the list.

Quite some of those manufacturers, such as Trina Solar or Canadian Solar have found ways around these tariffs thanks to their manufacturing operations outside of China.

Note that there are currently petitions in the U.S. (filed by recently bankrupt Suniva) to slap higher duties on Chinese-made solar modules.

European Union:

Following complaints lead by (again) German Solarworld and having triggered a war of heavy words on both the EU and Chinese side, the EU slammed Chinese solar module manufacturers in 2013 with punitive tariffs in the framework of an **"join or pay more" tariff model**:

Solar manufacturers would be expected to agree to the EU's **minimum import price (MIP)** agreement and maximum annual import quota cap, otherwise higher duties to non-com-

plying manufacturers would apply.

The MIP had in the past 4 years been changed back and forth from 0.56 Euro/Wp to 0.53 Euro/Wp, in 2015 back to 0.56 Euro/Wp following the declining exchange rate of the Euro. Since 2017, the MIP is at 0.46 Euro/Wp

Note that quite several PV module manufacturers from China have been removed from the undertaking by the EU as they were found in violation of the MIP regulations, while others have voluntarily withdrawn and supply the EU from their manufacturing operations outside of China, such as in Malaysia, Vietnam, Thailand and South Korea.

Australian importers:

Australian importers can breathe a sign of relief, there are no import duties on solar modules imports. Though, for some time, there were discussions about these...

The Australian anti-dumping commission had been investigating on punitive tariffs on solar modules made in China after a domestic solar company lodged a complaint in May 2014.

Strategy #8

Although having determined that the largest Chinese players in Australia dumped their modules, Australia's anti-dumping commission though decided in April 2015 to **terminate its investigation** as the dumping margins were too low and damaged caused by low-price Chinese solar module minimal.

Team SINOVOLTAICS' quick tip:

Get acquainted with the latest customs duties and - if applicable - anti-dumping duties in your country/ region before starting to search for suitable manufacturers and import solar modules.

Not only in terms of quality, warranty or certification you need to carefully choose your prospective manufacturer, but also understand if it is affected by duties, allowing you to consider other worthy alternatives…

Strategy #9

Smart price negotiations in Asia

Many solar companies select their PV manufacturer after communication by email. **Pricing** is often the main selection criteria why business is done with a certain manufacturer.

And let's be honest:
who doesn't like good products for low prices?

Surprisingly it's often the small manufacturers that offer **lower than average** market price. You would think that they have **no competitive advantage i**n the market, as they are **not vertically integrated** and purchase their raw materials in fairly small, order-concentrated amounts.

Obviously the difference is in the **quality** of the materials used. Every component of a solar module is variable in quality.

As it is important for small manufacturers to win clients and gain market share by promoting their own brand, competitive pricing plays an important role, with many **cutting corners** wherever possible.

Many manufacturers tend to produce at very minimal profit margins (or even minimally below).

Often they promise quality modules and show off the certifications they received, while actually they're cutting

corners by purchasing medium-quality raw material.

These raw materials are sometimes mixed with quality material in the production process of a module, including cells, tedlar backsheets, EVA, glass etc.

Grade A and bottom pricing?

Nearly all would claim to produce **A-grade panel modules**, while in fact it may be impossible to produce these at your low negotiated price to even make something called a profit margin.

Most importers not having any deeper clue about quality standards will face the truth sometimes only after many years with the manufacturer in between having earned quite good money to expand business (and eventually even rise prices to maintain quality standards).

To avoid falling trial victim to such practices, it is not only important that you diligently assess the quality of your modules before they are shipped to you, but much more in the first place to engage into fair price negotiation.

Squeezing manufacturers to a maximum low price while expecting A-grade is certainly **contradicting**, with most Asian small and mid-size (and even larger) companies be smilingly willing to

accept only to have you as a client while then thinking of ways to make profit at your quality expense.

Manufacturers in Asia value **long-term, often personal relationships and** in this regard developing these relationships is critical, helping you also to feel out the manufacturer's real read line which to cross bears above mentioned dangers.

Optimally, after having singled out suitable suppliers for your modules, initial price negotiation shall therefore be followed by phone calls/ video conferences and much better even personal visits, either at the manufacturer or at least on exhibitions.

Fostering a trustworthy and fair relationship will ensure that both sides engage in a win-win situation which in the end is a big win for you as an importer.

Team SINOVOLTAICS' quick tip:

Carefully review the small PV manufacturers that offer lower than average market price.

Every solar module component is available in a range of different quality grades and Asian manufacturers are the masters in earning profits on even the cheapest products.

Don't we all know this already? : D

Strategy #10

Pick the correct PV insurance product

Last time we wrote something about solar insurance we received a letter from a lawyer to remove our post. So we decided to give it another shot ;) Our email addresses are on the bottom of this page in case a lawyer is looking for us...

It's pretty clear why anyone would purchase solar insurance: you want a **worry-free, zero risk** solar module installation investment that will guarantee the projected ROI.

So it makes complete sense that a solar module insurance helps you achieve that, right?

Yes, solar insurance can help you achieve that, but don't assume that any solar product carrying an insurance automatically protects you from all risk that comes your way.

In fact, often it's the PV manufacturer's risk that is insured, not the project owner's...

Complexity

Few people fully understand which solar insurance products

they need and what exactly these insurance products cover. Multiple contracts, agreements, warranties, terms and conditions in place often create **complexity and confusion.**

Risks to protect yourself from

There are now excellent solar insurance products available that will help you to protect your PV installation against a dozen of risks.

These risks include component defects, system performance, product warranties, project delays, liability issues, fire, theft and even de-commissioning.

It's interesting to see that the most common insurance products are aimed at protecting the PV manufacturer from any liability.

Let's have a brief look at the most common types of solar module insurance and the main players in the market.

Common types of solar insurance

Product liability insurance (often called Error and Emissions insurance)

E&O insurance is usually bought by the solar module manufacturer. This type of insurance is designed to respond to claims during the policy period for economic losses sustained by their customer because of a defect, deficiency or inadequacy in the PV modules or the failure of the PV module to meet the agreed performance.

If someone falls off a roof because this person received a shock due to a malfunctioning solar module, the PV manufacturer is covered for that. However, this may not be that helpful for the guy who fell off the roof...

Inherent defect insurance

Inherent defect is a fault from within the module or inverter that causes damage either to the component itself or to the system as a whole.

Product- and Performance warranty insurance

This type of insurance is limited to the repair or replacement of the solar module.

Warranties only apply to product **design defects** and **faulty workmanship** and warranties explicitly disclaim responsibility for all other damages, loss, and any other costs or expenses.

This is especially useful when the PV manufacturer goes bankrupt and disappears...

PV Insurance providers

According to Bloomberg, the market for insuring renewable-energy projects is set to triple to $2.8 billion of premiums by 2020.

That's a very large, new market and insurance companies are now eager to learn to understand the risks involved and jump in.

Strategy #10

When you're involved in solar energy projects, you're probably already familiar with some insurance companies. Their insurance products may be the reason why you bought a particular product!

Here are the players that have been around for some time and are widely accepted in the industry:

- CHUBB
- Munich Re
- PowerGuard
- Ergo
- Solarif
- PICC

The above insurance companies all offer different types of solar insurance products. These policies are complex. You can look forward to a future post making a comparison.

Team SINOVOLTAICS' quick tip:

Do your own, **thorough research** on any insurance product you're interested in. The above has been written up to give you a general understanding and the companies above may offer slightly different and additional insurance policies. There are increasingly more players in the solar module insurance field...

Strategy #11

Perform a background check on the manufacturer and its projects

Strategy #11

A big mistake many importers of solar modules make is to concentrate the whole undertaking of their business on email and telephone, also including the lookup of information regarding the potential supplier.

While nice homepages and photos are designed and made within few hours time, the real check about your potential supplier should be happening **on site**.

While such undertaking maybe cost-intense for small-scale importers, however we recommend that you make a decent background check about your potential supplier before buying.

You should check whether your supplier really manufacturers itself or if it's a trading company.

If the latter, what extra value would they offer you? If it's a manufacturer with factories, you should optimally visit and check the factories in person and find out whether the factories you are shown are really pertaining to the manufacturer or are subcontracted/ OEM factories.

Learn about the projects the manufacturer did and let them show you **proof of implementation**.

Also research about the company's organization and establishment is important to filter whether it's a well structured professional

enterprise with long history, or a 1year old workshop in a village with no presentable projects at all.

We recommend that you go with a **locally-specialized PV quality consultant** on-site to assess the potential supplier.

Team SINOVOLTAICS' quick tip:

Out of 1000 people - how many would directly marry a partner they have just met on the internet 5 minutes ago? Probably not many...

Marrying someone for your life is not much different from engaging in a partnership with a solar module manufacturer... well, let's say at least some aspects are very similar... ;)

Nothing beats an on-site thorough check up of your prospective long-term partner and this is even truer for importers of solar modules... face-to-face contacts, an understanding of your supplier's situation, background and ambitions greatly helps to get a feeling about whether you want, should or do not want and should not work with this manufacturer...

If confronted with the uncertainties of local regulations, cultural differences and language problems, this is when locally-specialized solar PV consultants come in handy and save you a great amount of time, money and stress...

Strategy #12

Buy from a financially stable manufacturer

While it's been a while since we've seen a large Asian solar PV module manufacturer file for bankruptcy, the past years have taught us to always keep a close eye on the financials of the large Asian manufacturers. One quick method to evaluate the financial shape of a PV manufacturer is to use the **Altman Z-Score**.

In 2015 we saw Taiwanese CIGS manufacturer **TSMC** close its doors, while we all clearly remember both **Suntech** and **LDK** file for bankruptcy in 2014, not to mention many more small- and medium-sized manufacturers all over the continent.

So which PV manufacturer is next?

As a PV plant developer, installer or distributor that fully relies on the supply of its modules from an Asian manufacturer and in this regard also the related warranty policies, how to assess the risk of your manufacturing partner going bankrupt, without devoting a complete study on its financial reports?

How to quickly see which PV manufacturer may be in financial distress? One proven and fairly quick way to predict if a PV manufacturer may face bankruptcy within the next 2 years is the **Altman Z-Score**.

What is the Altman Z-score?

The Altman Z-score is a formula to predict bankruptcy. This formula is used to **predict corporate defaults** and the **status of financial distress**. The formula can be used to predict the probability that a firm will go into bankruptcy within two years.

As the Altman Z-score was originally designed to assess public manufacturing companies with assets of more than USD 1 million, this formula is an excellent way to assess which PV manufacturers may be in trouble within the next 2 years.

The formula is nowadays **widely accepted** by auditors, accountants, courts and database systems used to evaluate loans. The formula dates from the 1960's and was published by Edward L. Altman, who back then was working as an Assistant Professor of Finance at New York University.

The Altman-Z score formula is reliable enough to make a proper judgment on the financial situation of a PV manufacturer: between 1968 and 1999 the formula has been put to the test multiple times.

The model was found to be about 80-90% accurate in predicting bankruptcy one year before the event (with a Type II error (classifying the firm as bankrupt when it does not go bankrupt of approximately 15%–20%*).

(*Source: pages.stern.nyu.edu/~ealtman/Zscores.pdf)

How's the Altman Z-score calculated?

Altman Z-Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E
The original formula is broken down as following:

A = Working Capital/Total Assets: measures liquid assets in relation to the size of the company.

B = Retained Earnings/Total Assets: measures profitability that reflects the company's age and earning power

C = Earnings Before Interest & Tax/Total Assets: measures operating efficiency apart from tax and leveraging factors. It recognizes operating earnings as being important to long-term viability.

D = Market Value of Equity/Total Liabilities: adds market dimension that can show up security price fluctuation as a possible red flag

E = Sales/Total Assets: a standard measure for total asset turnover)

How are the the Altman Z-scores interpreted?

The scores are categorized into 3 zones called the Safe Zone, Grey Zone and Distress Zone:

Z > 2.6 - "Safe" Zone
1.1 < Z < 2.6 - "Grey" Zone
Z < 1.1 - "Distress" Zone

The graph on the following page presents the Altman Z-Scores of selected solar PV module manufacturers from Asia, Europe and the U.S. calculated based on Q1 2017 financial data. It shows that not necessarily the "big", "famous" or so-called "tier 1" manufacturers are the financially most stable ones…

Altman Z-Score of selected PV module manufacturers – Q1 2017

Team SINOVOLTAICS' quick tip:

As warranties are only valid as long as the warranty policy-issuing manufacturer is still around, it makes perfectly sense for PV project developers and owners to ensure buying from manufacturers who will likely still be around in future for any potential warranty claims.

Therefore, keep track on the financial healthiness of your prospective PV module supplier!

Sinovoltaics publishes every quarter a comprehensive and updated list with Altman Z-Score calculations of more than 60 solar PV module from all around the globe, mostly from Asia.

The list is for free and can be accessed directly through our portal website www.sinovoltaics.com

Who are we?

Dricus de Rooij

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Dricus is co-founder and Managing Director at Sinovoltaics Group "Your Solar Supply Network", a solar technology company fully specialized in the Supply Chain Management of solar energy components.

He is based in Hong Kong and has been living in China for the past 9 years.

In the past he set up and managed two solar module factories in Shanghai, China for a Canadian publicly listed company. Prior to setting up a solar module factory, Dricus founded Kisun Solar (www.kisunsolar.com), a company specialized in solar quality inspections across Asia.

Dricus is highly interested in solar energy innovations and was closely involved in the development and UL /IEC certification of world's first non- glass/EVA/TPT solar module on the market.

Besides manufacturing, Dricus has been involved in the implementation of numerous solar off-grid system projects in South East Asia and the Middle East.

Who are we?

Niclas D. Weimar

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Niclas is co-founder of Sinovoltaics Group and Managing Partner at Kisun Solar, a subsidiary of Sinovoltaics Group specialized in solar PV Quality Assurance and Technical De-Risking of PV investments.

He is based in Shanghai and has been living in Asia for over 9 years, including Mainland China, India, Iran and Taiwan.

He is a solar quality specialist with extensive experience with manufacturers across Asia and has advised distributors, project planners, investors and manufacturers worldwide on PV technology trends, quality and market conditions.

Niclas is highly interested in solar technology developments, solar rural electrification and related microfinance economics and has in the past worked on energy efficiency and rural electrification projects at UNIDO ITPO in Beijing and Grameen Shakti in Dhaka.

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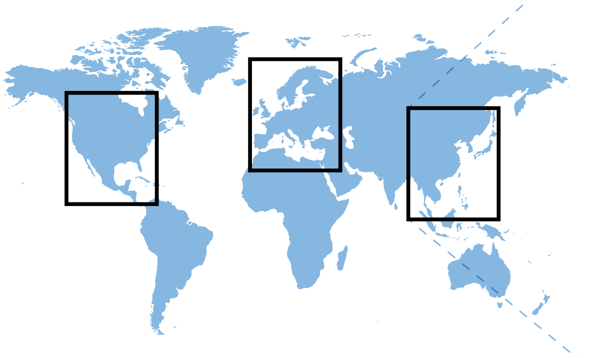

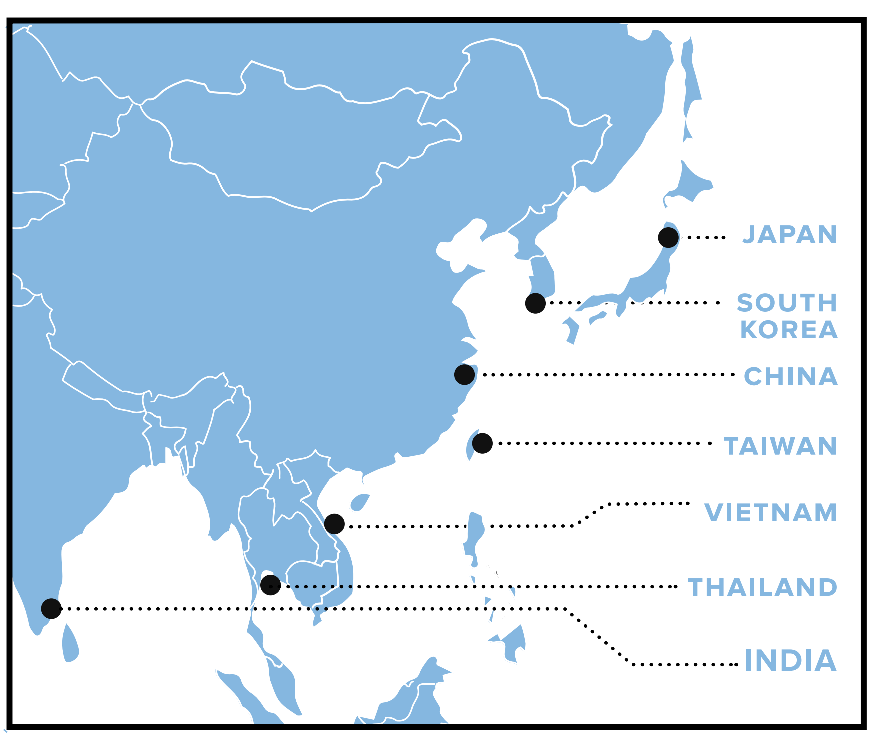

and
Become part of our NETWORK of WORLDWIDE MANUFACTURERS

ACCESS TO

62 SOLAR MODULE manufacturers

21 INVERTER manufacturers

8 STORAGE manufacturers

23 B.O.S. manufacturers

How does the Process Work?

1 Formulate your REQUIREMENTS

- PRODUCTS
  - Solar Module
  - Inverter
- TECHNOLOGY
  - Mono
  - MWT
  - IBC
  - Li-Ion
- QUANTITY
- TERMS
- TARGET PRICING

2 Receive your OFFER

- ***Free** of Charge*
- ***2+** Suppliers*
- *within **48 hours***
- ***No strings** attached*

GO AHEAD!

3 Contract NEGOTIATION

- PAYMENT TERMS
- SHIPPING TERMS

4 Quality ASSURANCE

- **80+** Factories Audited
- **1.3 GW** of PV Assured
- **European** Managed

5 LOGISTICS

- Trusted partners specialized in solar
- Best practices in packing and tracking
- Meeting your deadlines

Your Benefits

- 100% QUALITY GUARANTEE
- HIGHEST RETURN
- PURCHASING OUTSOURCED
- 3 MW+ INSURANCE
- IN-HOUSE PRODUCT ENGINEERING

WANT TO LEARN MORE?

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