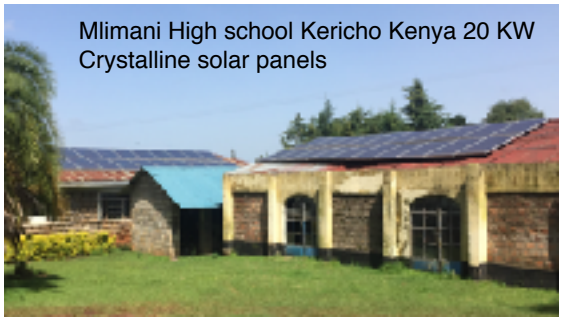
Sunnytek Solar Sweden

Thin film versus crystalline solar panels

Maison Dorcas / Panzi hospital system Bukavu Congo
4 KW thin film panels



Mlimani High school Kericho Kenya 20 KW
Crystalline solar panels

There are several ways to make solar panels based on different technology. All suppliers enhance own products and neglect others as this is sales to a high degree. Sunnytek Solar work with all technologies and here we compare and explain differences and advantages with the 3 different solutions. All are good and less good in some points so nothing is easy to understand in a few words. Here we talk about what we use and why and give some background about this.

CIGS Panels Thin film panel CIGS technology from Germany made under licence from Uppsala University Sweden. This is a good looking panel made in laminated glass and is very strong and solid. The 2 glass design have no plastics on back side and have very god chances to live for many years. Hardened glass and very strong. Some say 40 years life cycle. No de-lamination problems. Good characteristics in cloudy weather and twilight compared to Crystalline panels. Our panels are normally 145W in output and are 1 M2 (800x1200+7 mm) in dimensions. They are available with frameless design or with an aluminum frame. Solid IP 67 design. Not very angular sensitive to sun rays. Same output / M2 as crystalline panels. Very good design but they do not like earth negative grounded inverters due to internal corrosion issues.

Amorphous Silicone panels a Si Solar Thin film panels based on silicon coating. Hardened NSG glass and 2 glass laminated design. China production with high grade materials. EVA sealed. Similar to CIGS panels in most points. Dimensions 1414x1114mm x 3.4 / 6.8 mm with 130 W output. Available with frame and with no frame. IP 67 design and very rugged. They are very good in twilight and cloudy weather with often 30% more output than crystalline panels the difficult days. The panels have lower efficiency and need more surface + 30% to CIGS panels. Pls. Se measurements in this paper with comparisons between Crystalline panels and the silicon panels done in a lab. Not sensitive to corrosion at negative pole like CIGS panels.

Crystalline solar panels Mono or Multi crystalline. This is the most common panel in Sweden as it was the first design made in high volumes. They are based on wafers laminated into glass normally protected on back side by a plastic thin film layer. Glass is hardened but a single not laminated design. Normally delivered with a frame but we also have frameless designs. Good output when clear weather and cold. Dimensions typically 1600x900 for a 270W panel but we have up to 350W from one larger panel. Mostly we use panels from Poland but we have low cost China brands if preferred.
These panels prefer straight sun rays and not reflected light. They do also not like disturbances on surface , partial shadows (dirt and leaves) and twilight with hazy days. There are clear limits here but they are also the cheapest calculated per rated W output.

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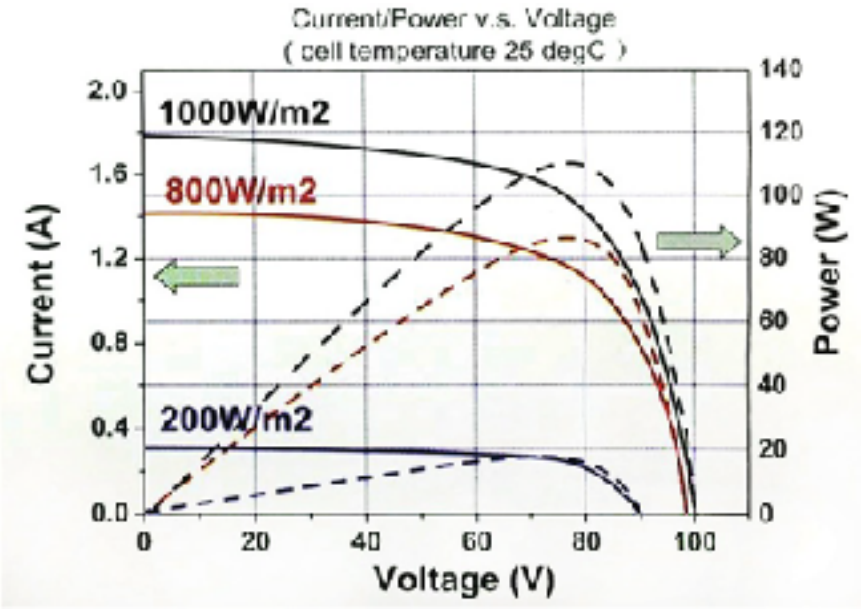
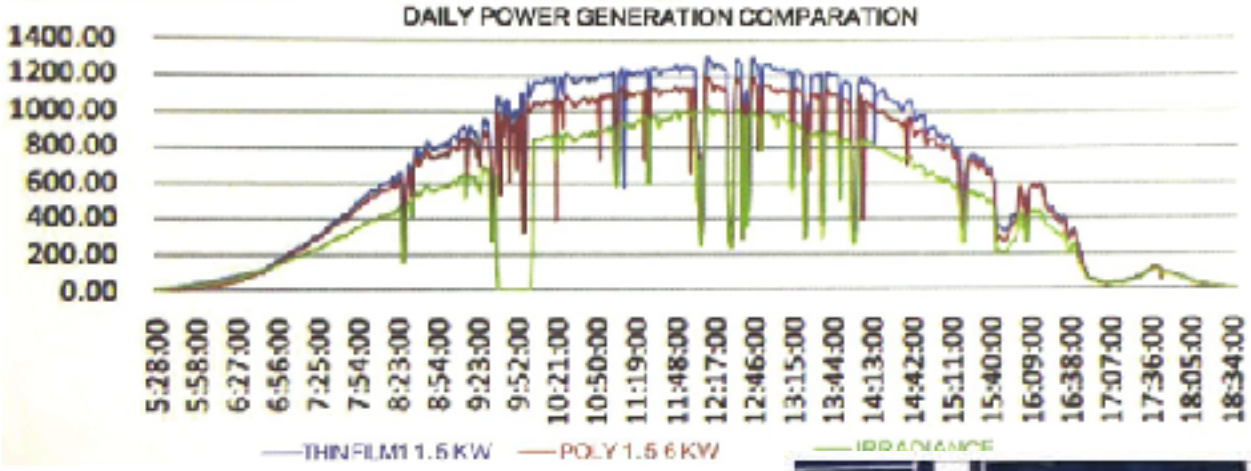
Output versus solar radiation in density of a a Si Solar panel . There are large differences between 200W solar radiation / M2 and 1000 W / M2.
Sunny days in Sweden is about 800W / M 2 while if you are on mountain top at equator it is far over 1000W / M2.
The standards to measure is a lab specification and not fully related to real applications so there are differences. Crystalline panels are better valued in spectra and diffuse light compared to thin film panels. This is why thin film panels in real world gives more KWH compared to Crystalline with same outputs. Here it can differ 10-30% depending on how all is done.





Comparison between Polycrystalline panels and a Si Solar panels a typical day side by side. Here it is clear the thin film is better all time. Drop outs here are passing clouds that shadow panels.

Crystalline panels partially in shadow loose a lot of power. If you cower 10% of surface it can be a drop of 90% of output . This is because resistance in shadow drop voltage a lot and this part in shadow get hot. In large farms this can cause damage of cells.

Thin film panels drops proportional output and here 10% coverage gives 10 % drop in output. If there are objects like leaves on panels this can have large effects of output power.

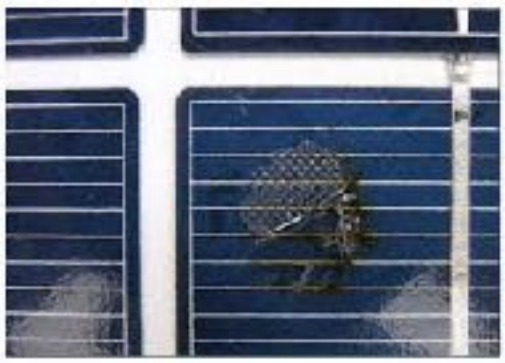


Image of solar panel shadow overheat and burned surface due to resistance change

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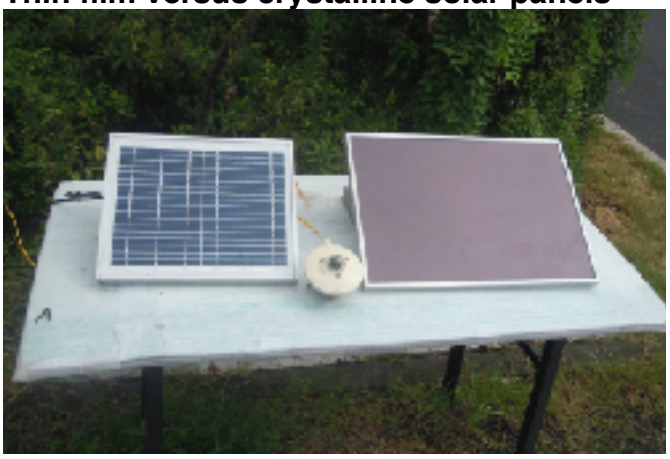
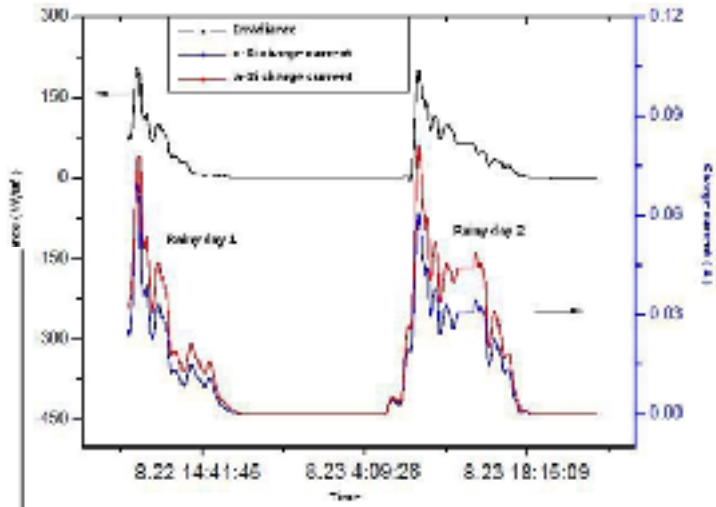
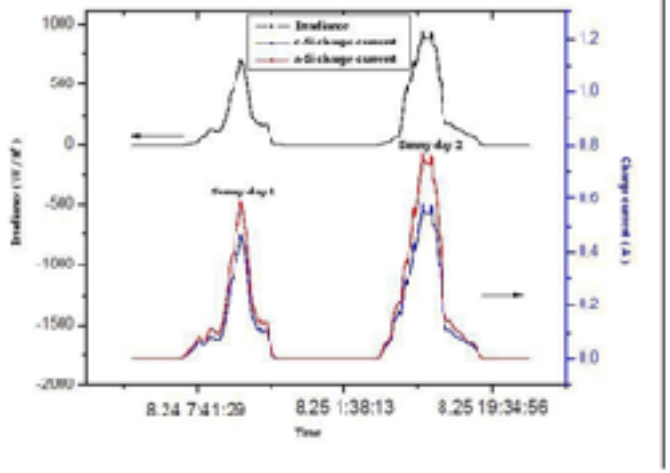


Practical test and measurement. On top we have 2 panels side by side. Left is polycrystalline and right is thin film a-Si Solar panel. Panels are 12 W each and only difference is type of panel. In centre there is a solar radiation meter. Booth panels charge battery and charging is compared.
Data was logged in a logger for 4 days and compared.

Graph at right show 2 days measurements of much much can be charged to battery packs. Red graph is Crystalline panel and blue the a-Si Solar panel. Here we see clearly more output from this panel. Note days are bad weather and rainy weather. Black is solar radiation graph. Difference is about 30% better for thin film panels.





Left shows same measurements but day is sunny and fine weather. Here it is also very clear thin film is a lot better than Crystalline panels and difference is about 25% better. It was a surprise for all the difference was so large in favour of the a-Si panels.

Keeping this in mind it shows clear the normal max power all panels have is only a piece of the complete picture. In many areas bad weather is common. You can say the KWH produced in bad weather can have a higher value than sunny days if you use power your self.

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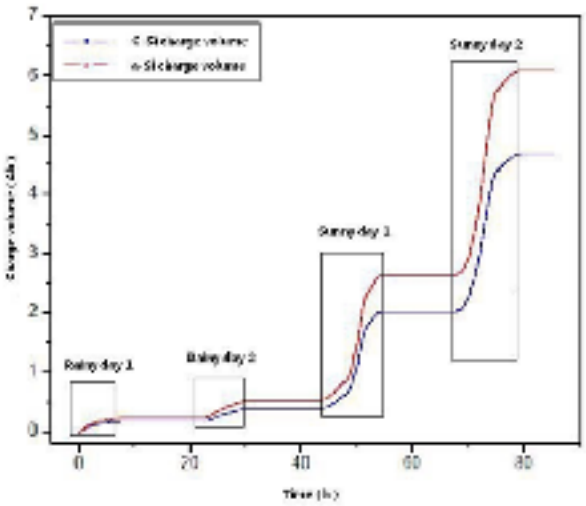
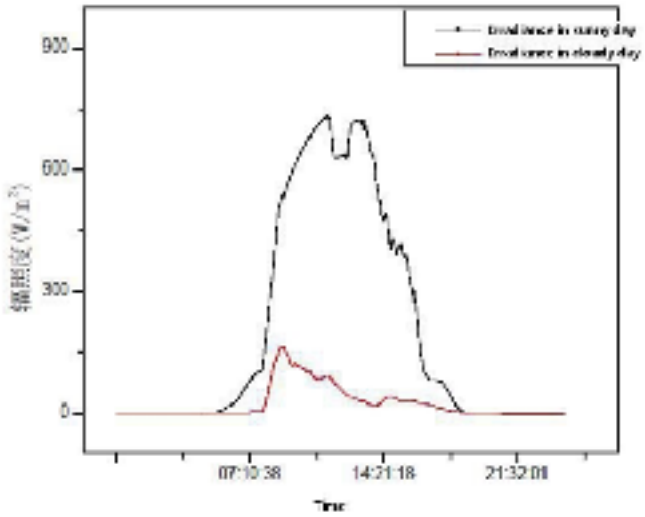
Summary of 4 days and accumulated charging for batteries. Here we have booth sunny and rainy days so this is closer to what normal installations will have.
Summary is that a-Si panels charge 1.3 times better than Crystalline panels. This is a lot and keeping this in mins it have large impact when you calculate costs for solar power. The KWH is what you pay for and not a number in a paper from a . This change calculations dramatically about what is cheapest and most cost efficient. CIGS panels are somewhere in-between we guess but do not know yet.
Photos below shows the sunny days and rainy days by camera eyes.



Right and down we show irradiation differences a sunny and a rainy day to compare. It can easily be 90% less when rainy. In extremes we can lose 95% intensity if we have a thunderstorm so weather have more effects on output than what we can imagine.



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