



Sunnytek Solar Sweden



1MW solar power unit with energy storage 3MWH capacity

Draft paper

Many industries in tropics have problems with reliable power from a grid. Often it is on and off and this interrupt the processes to high costs caused by trouble. On other issue is that power costs are often very high and this gives very high costs for energy per year. In many industries the electric bill is the highest cost the factory have over the year. The smart way to solve booth these problems is to make own power by a Sunnytek Solar solar power unit.

Technical developments last years has been dramatic and new solutions are far ahead what was available 1-2 years ago. Costs has also raised when the solutions proved too be mature for the mission to make cheap reliable power. Sunnytek has selected what is best to use hot tropical areas only. We also use a Life Cycle Cost calculation (LCC) to really see numbers what is best for short time but alos a longer life cycle. Investments like this needs to be evaluated for 10-20 years to make user happy.

New generation solar panels for tropical areas.

There are many ways to make solar panels. Tropical areas with high temperature and intense heat gives one type of problem in output and also reliability. Over heating reduce power output power and panels with plastic foil at back suffer the heat and UV radiation with reduced life time.

Our first choice here is thin film CIGS panels that have far less problems with high temperature and can operate at very intense sun with limited reduction in output. We normally use German or Japanese panels of best quality and reliable tryst worthy warranty of 25 years.

These panels do also have laminated glass so there is no plastic foil at back side that crack after some years as UV light was so strong.

One other feature is that these panels are much better than crystalline panels in twilight. cloudy weather and fog. In all installations the limit is often limited sun (rain season) and here we often have a 20-30% advantage in electrical output.

Panel output are specified in W after a standard that do not match all places on earth. This is a lab method to compare different brands. We talk about output / year in KWH that is what customers sell and use.





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New generation of energy storage battery solutions

In a power unit like this the battery is the most costly part and much more than panels if we want a reliable system working for many years. Life cycle differs a lot between different models of battery and site and how out is used. There exist no simple solution what is best here and all installations need a deeper analyse of what is best keeping all parameters in mind.

Under final line cost per KWH produced and stored is a key. Life cycle cost is here and of course financial costs. Is a costly such better system always better than a not that good and much cheaper solution. This can be discussed forever so this needs to be analysed and calculated.

If we look at what is best here and say let us forget battery solutions with less 10 years life cycle we have some alternatives. All are green and have no large impact on environment. What is best depends on how it is used and where it is installed. Policy financially is important and here question is. Cheap to buy with shorter life time and a bit higher costs per KWH. Or more costly to buy and longer life time and lower life cycle cost.

Alternatives we use and where we have cooperation with factory are as follows.

- * **Lead Gel OPZV cell** designs is the old style used for about 100 years. Can get 10 years life cycle if not deep cycled and not to hot when charged. This solutions is now getting rare and will soon be replaced by other solutions. Not deep changed to more than 40% of capacity so battery needs to be much larger than what is frequently cycled. Preferable max 25-30C in temperature. Cells can have 4000AH and many used.
- * **Lithium Iron Phosphate** is more modern with good and less good characteristics. Sometimes a good solution. Life time reliable 10 years for best brands and warranty is possible for 10 years life cycle. Capable of 60C in temp. Can be pre-installed in containers up to very large sizes or as used smaller units.
- * **Salt battery systems** is a new design comping strong and suitable in many cases. Large heavy and very good for environment reasons. 10 years life time possible and warranty 7 years. Available in large pallet designs with 25KWH modules and we use as many as needed.
- * **Zinc Hybrid battery** is now attractive in many cases. Preferable very large installations where it is good in many ways. 5000 cycles 15 years life cycle with 75% depth of discharge
- * **Zn-Fe flow battery** is excellent as battery for installations where life time is a key. This battery is offered with 20 years warranty spec to 95% of original capacity. The battery needs yearly maintenance that is not to complex but outputs in always and Life cycle cost is excellent. Capacity from 160 KWH for smallest system up to many MWH. Modular design makes it easy to scale up.



Battery systems can be operated with and without grid connection. It can store power but also equalise power and handle a bad grid. The new designs are well adapted for the future and makes our solar power units to make very cheap and reliable power for many many years. Diesel generators etc are not needed. If site have old diesel generators they can be connected to be used as emergency units.

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Energy production is normally done by solar panels. Here an analyse is needed of what area have in available solar power and this differs a lot over areas and locally. This shall balance real needs of what is required KWH. Some safety margins are normally needed and in final end all shall balance in a secure way to have reliability and no problems. Graph at right shows in a simple way a bit about what is needed here. Rain seasons with cloudy weeks must be considered in this work.



Left side the new container with Ni-MH battery system of 500 KWH and inverters and electronics for handling a solar power unit installation. Here we can add solar panels but also wind power and hydro electric systems. The system works as a peak power absorber if there are rapid peaks from motors etc. Applications is all from industry and mines to population centras where we make a city grid and can sell power.

Beyond we have a vertical wind turbine. ORC generator that makes power by burning waist from city dump. Left 2 models of hydro power systems of 10 KWE and 1.8 MW output.



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