

## Environmental and Technical Analysis of Photovoltaic Systems

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**Abstract:** Sites for installation of solar photovoltaic panels are discussed. To achieve maximum solar radiant energy, to achieve maximum efficiency, taking advantage of the minimum standards required must be in optimal working order. Including that, they (northern hemisphere) are facing towards the south. In addition, structures installed with photovoltaic cells with a specific angle that the angle of latitude, according to the desired location, slope, location, time that the sun is higher and situations according to consumer requirements, could be achieved. Therefore, it is necessary to install photovoltaic panels topographic site types incorporating local winds and the region as part of the building ventilation system are considered volatile. Any installation-taking place closer to target is better because less waste will be in the wiring. However, the task is to design a proper balance between environmental conditions and design achievements.

**Key words:** Photovoltaic • Energy • Systems • Potential • Modules • Panels • Electricity

### INTRODUCTION

**Installation of Photovoltaic Systems:** Bending angle of environmental and technical analysis of photovoltaic systems optimized for a large array of photovoltaic modules to the south approximately latitude location with a tolerance of  $10 \pm$  degrees. This arrangement at best is a balance of energy conversion created during all the year. Environmental and technical analysis of photovoltaic systems can also angle for optimal performance through the winter or summer, more or less the amount to be set. To neutralize the effect of too much shadow, arrays must be given within a module, which by distance  $d$  are separated [1-2].

$$d / a = \cos \beta + \sin \beta / \tan \xi \quad (1)$$

Where,  $\xi$  that can be by latitude angle  $\phi$  and express the desire to be  $23.5 = \delta$ :

$$\phi - \delta - 90 = \xi \quad (2)$$

So, shading angle  $\xi$  of the former equal to angle toward the rows of solar modules in the noon sun in winter.

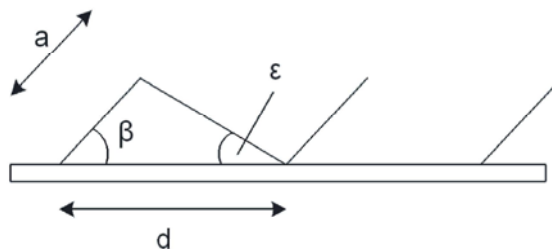


Fig. 1: Layout large number of rows of photovoltaic modules

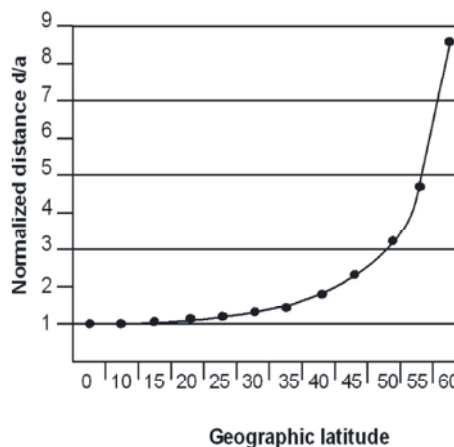


Fig. 2: The distance between rows

According to the chart can be seen that the required level by a photovoltaic field with increasing latitude, the speed increases. Net level should also needed most of what is to be considered as additional space for routes available in basic electrical installation and services are needed.

Very low level for a basic layout for cell bifacial is needed. The cells from each direction are sensitive to light. The first advantage is that the available areas can be the best place for their use. The second advantage is that each module consists of cells more radiation from a bifacial module for an optimal alignment. Modules on the same terms made up of 6,1 cells bifacial have more output (this limit reflects the losses which are included) and in the first order approximation are independent of the collector and the roof and can be compatible with a set of problems occurring and it is radiated in the direction perpendicular to the surface module in a non-regular manner. Considering that no non-regular Parallel landscape plans exist on its effect can be modulated, given their expense relative to the mirrors, which are cheaper alternatives. Therefore, additional cost savings to the surface produces a smaller lead.

The installation of pv systems in connection to the building; an additional level is not necessary because the manufacturer or the sun's position can affect the parts of a building such as roof or facade where the emplacement is. Flat roofs to install solar producers are very good. In this way, solar modules can be mounted to optimize and to follow trends. Producers installing solar on the roof or the facade of steep, must realize that only parts of the building to the south can be used. Potential of photovoltaic systems on rooftops and on the facade in different countries also differ (Table 1). In addition, with regard to this issue, use the electricity produced by PV systems is different (Table 2).

One should be careful in the case of pv systems installed on the roof of steep, modules in a distance of about 5cm of clay. In this case the space between the sun and clay roof modules, allow cooling of solar modules are provided. Pv systems installed in the state on a flat roof, are directly installed on the inverter and have the advantage that the cable between the solar inverter manufacturer is short. Another advantage of producing solar panels installed on flat roofs is that the optimum method of solar modules in the right direction and orientation is affected. PV installations with state buildings in view, as part of their structure and surface

Table 1: The potential of photovoltaic systems on rooftops and Name in the various countries

Australian	Roof	422.25	68.176
	facade	158.34	15.881
Austria	Roof	139.62	15.197
	facade	52.36	3.528
Canada	Roof	963.54	118.708
	facade	361.33	33.054
Denmark	Roof	87.98	8.710
	facade	32.99	2.155
Finland	Roof	127.31	11.763
	facade	32.99	3.063
Germany	Roof	1295.92	128.296
	facade	485.97	31.745
Italy	Roof	763.53	103.077
	facade	286.32	23.827
Japan	Roof	966.38	117.416
	facade	362.39	29.456
The Netherlands	Roof	259.36	25.677
	facade	97.26	6.210
Spain	Roof	168.31	70.689
	facade	448.82	15.784
Sweden	Roof	218.77	21.177
	facade	82.04	5.515
Switzerland	Roof	138.22	15.044
	facade	51.83	3.367
United kingdom	Roof	914.67	83.235
	facade	343.00	22.160
United states	Roof	10096.26	1662.349
	facade	3786.10	418.312

Table 2: Consumption of electricity in 2000 and produced by PV systems

Country	Electricity consumption in 2000 (in)	Percentage of PV power generation on roofs and facades
Australia	192.58	43.7
Canada	521.5	29.1
Germany	549.21	29.1
Italy	301.79	42.1
Japan	1057.33	13.9
Spain	209.55	29.4
United kingdom	358.28	54.6
United states	3812.00	41.3

view of the building and are taking the many actions such as, Protection against weather conditions (eg rain, wind, humidity), use daylight, noise protection and thermal insulation, Electro Magnetic Protection. Manufactured solar modulation for the facade do not have optimal direction and orientation and usually are installed vertically. It should be noted that output in this case depends on the latitude location [3-4].

**When Installing Solar Power:** Large power plants often have a high MW on their broad surfaces, but mainly in rural areas but are mainly installed in rural areas. For a comparative development, they are normally placed in conjunction with wind turbines and this happens in the limit of large-scale PV power plant.

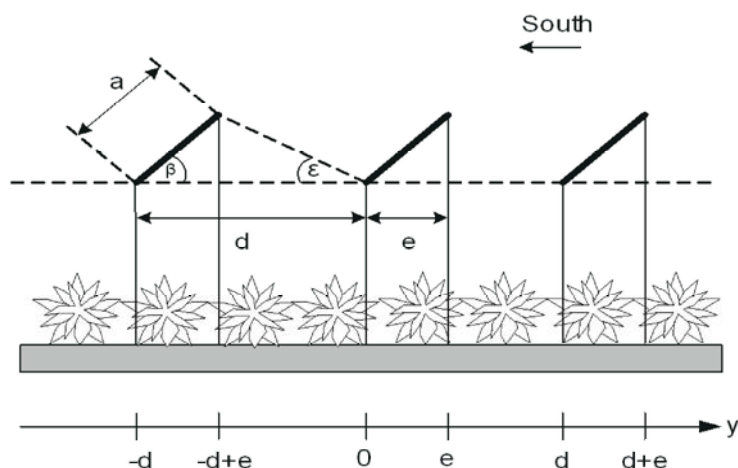


Fig. 3: Order pv system in a crop area

PV systems can be compatible for agriculture and cultivation of plants in the same areas. In fact, this interest and importance of the sun's energy use is increasing, so the potential for PV is growing. For conventional PV power modules that are installed on open ground. Depending on the form is placed on the ground (similar to what the buildings on the flat roof have installed). This arrangement makes the array down to the ground in winter, unlike the direct solar radiation with shadows, but in other seasons, more light will come to land. So access to the underlying light collector with a growing season of plants is consistent with this.

If the modules to be placed in the ground, depending on the light penetration, they will be very irregular. Regular lighting solutions to create modules that support distribution by a structure that is scant show doing to a certain level can be raised from the ground.

In areas close to the equator, the angle is very large so a shadow by modules that can be formed as a protection against excessive solar radiation for sensitive plants that are under the terms of PV and using this method, products can be in the wilderness and in the same time are growing. Solar energy can also make use of fresh seawater to irrigate the plants. An optimal performance condition for a system that is state pv solar radiation on the solar surface manufacturer is continuously vertically. In practice, for the entire solar surface continuously producing the actual position of the sun is set detector system is used. The detector system to one or two axis systems is divided. A detector axis, the effect is just one angle. If better conditions are provided for tracking and earth axis is parallel to the two-axis tracking the sun, perpendicular to the modules are used [3-4].

Table 3: The average energy return for pv modules with different technologies

Technology	Mono Si	Multi crystal Si	a-Si	CIS	CdTe
Mean payback time [years]	7.3	4.6	2.8	1.9	1.5

Table 4: Energy return per year for full pv systems

Technology	Alsema	4.8	Knapp	Kato
Single crystal	5.2	...	7.0	...
Poly crystal	4.4	...	...	...
a-Si	3.6	....	...	3.5
CdTe	...	Jungbluth	...	2.8
CIS	..	5.5	3.9	...

### Environmental Impact of Photovoltaic Systems:

Environmental impact by photovoltaic systems can be divided into two categories, influences the production of components and PV system (influences of the daily performance of PV systems).

Silicate is the most common material of solar cell production derived from chemical manufacturing industries. Chemical product manufacturing process as a closed loop process with materials is turning again. Penetration of solar cell industry to process oxygen and related chemical differences that occur needs. They also use a re-rolling process with high control. Small modules, including various industrial processes are sometimes gas. Of course, all of these processes are precisely controlled. Return energy over time is defined as an energy source, or other words, in order to cover for energy production is more precise, only renewable energy sources can have an energy return, ie energy input to a primary energy needs (Table 3 and 4).

Naturally, PV systems for performance do not affect the environment and they have no noise emissions, no solid waste and the toll or gas that can be harmful for the environment, do not occur. So PV systems and electricity they produce are an important factor in protecting the environment in considering their usage.

PV cells produce adverse effects to non-tolerant silicate is possible unless the great events in plant cells occur manufacturer. PV cell material made of silicate, which is not harmful. However, small amounts of toxic chemicals in the production of some PV modules are used. CdTe modules in the production of cadmium, clearly a toxic material, are used. Small amounts of cadmium in the production of CIS and CIGS modules are also used. Although the new production process has removed this element. Like any other chemical process, careful design for a factory and its operation is necessary to not release any hazardous chemicals in case of accidents. Although the PV arrays are inherently long life, but finally arrive at the end of its life and must be eliminated or return to the cycle [2-3].

**Photovoltaic System Reliability:** Reliability of photovoltaic systems may be able to run the system, according to the given time period features, is defined. Restrictions designed to run due to factors such as shade week or unusually bad weather should be excluded from this definition. Photovoltaic panels whenever the sun shines, they will produce electricity for the first year if they do well, likely, that will continue for a long time and they shall be active further. So far, no system in operation has a lifetime longer than expected lifetime of photovoltaic panels. Reliability design for Photovoltaic panels often is quite related to their demolition. Also installed on non-building such as weak street lighting, they are often in areas vulnerable to damage. When the public are aware of photovoltaic systems applications, the panels are considered to be worth stealing. Projects with destruction and stealing in mind during the system design stage are minimizing these problems. Photovoltaic panels in general should be exposed out of reach and they can catch the thief by installing a camera. Fuses, the fragile parts and the keys normally are required on site.

**Test Conditions and Standards in Photovoltaic Systems:** PV panel under a defined set of conditions known as Standard Test Conditions (STC) are measured. These include cell temperature PV (25°C), irradiation intensity (ID) and spectral distribution (SD), range distributed charts that can show changes in solar radiation

wavelength range depending on the show. Just outside Earth's atmosphere, solar radiation has a power density approximately equal to 1365. At ground level, the various gases in the atmosphere interrupt solar radiation by reducing the different wavelengths. The rate of decrease with increasing solar radiation in the path to the atmosphere will increase. When the sun in places Zenith (i.e., just above the head) is the distance the light of the sun must be over until the PV is minimal.

As part of an electrical system, photovoltaic energy must be based on laws and an order is provided by the foundation initiated. System components should be applied to the product standards to achieve operations to ensure safety and security. Installation should be applicable to the electrical code and still ensure safety of operations. Furthermore, conditions attached to a photovoltaic system may require additional measures to achieve that are by the local electricity authorities have been left to ensure that public safety systems that, by connecting this type of energy supply systems, do not fall into risk category. Photovoltaic systems technology development with the development standard is followed. Standard PV by a number of countries and standards organizations, have been developed. Each country sets its design standards based on local conditions and characteristics. To work with technology that has recently been developed, the installer should use different electrical standards and sometimes will act in a contradictory manner [4-5].

## CONCLUSION

Sites for installation of solar photovoltaic panels to achieve maximum solar radiant energy, to achieve maximum efficiency, taking advantage of opportunities to achieve the minimum conditions necessary measures must be physically suitable, including that they (northern hemisphere) are facing South. Structure also affects installed photovoltaic cells in that a certain angle is required according to the latitude angle of the desired location, slope, location and time that the sun is higher and also according to the power requirements coming from the consumer. Therefore, it is necessary to install photovoltaic panel's topographic site types of local winds and the region as part of the building ventilation system be considered [7-8].

Naturally, PV systems because of their performance have no impact on the environment and are not harmful. Their noise emissions and loss of solid or gaseous wastes that could be harmful to the environment, do not. PV

systems and electricity production are important factors in protecting the environment and are considered here, but the reliability of photovoltaic systems may be able to run the system, according to the given time period features complement. Restrictions designed to run due to factors such as shade or an unusual week of bad weather should be excluded from this definition. PV panels under a defined set of conditions known as Standard Test Conditions (STC) are measured and these include cell temperature PV (25°C), Irradiation intensity (II) and spectral distribution (SD).

System components should be applied to achieve product standards to secure and reliable operation in a guaranteed manner. Installation should be applicable to the electrical code and still ensure safety of operations. Moreover, conditions attached to a photovoltaic system may require additional measures to achieve that which is enforced by the local electricity authorities ensuring that public safety systems that by connecting to these systems provide energy with no bad risk factors [4-7].

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