Key Factors for Solar Performance

You may be hearing a lot of promises about how much output or savings you'll get with different solar technologies. To help you get a clear picture, we're going to go into a little more depth about the factors that influence solar energy production.

Understanding these factors will help you to make accurate predictions for cost-savings and smart decisions on choosing a product. With that in mind, here are several factors and how they influence solar energy production.

Overview

It's a fact that the weather changes every day, and the earth's position towards the sun changes throughout the year. That means that a solar panel at a fixed location may produce 50 W at noon in December and 100 W at noon in June. Similarly, the same panel may produce 120 kWh per year in one geographic location and only 95 kWh in another.

In both situations, the production difference is largely because of differing amounts of sunlight. But other external factors like temperature, shading, weather, and soiling also affect the total energy a system can produce.

Solar Efficiency: The Central System Factor for Performance

Before getting into the external stuff, let's take a moment to reinforce the importance of solar panel efficiency. This is pretty straightforward: The more efficient a solar panel is, the more electricity it can create from sunlight. A solar panel with 18% efficiency converts more light to electricity than a solar panel with 12% efficiency. Nothing tricky about this solar fact. Consequently, high efficiency solar panels often offer the best economics because they will:

- Generate more electricity with fewer panels
- Require less space than lower efficiency solar panels
- Offer more long-term savings

When you're looking for solar panels, you can expect to be quoted solar efficiencies ranging from 6% to 20%. As we mentioned in another solar bulletin, be sure that you compare solar panel efficiency rates and not solar cell efficiency rates.

By the way, you might want to ask about efficiency loss from initial break-in. High quality solar panels will maintain their rated efficiency, but lesser quality solar panels may lose up to 3% of efficiency during their initial exposure to sunlight. That's almost as bad as all the value you lose in driving a new car off the lot. But in this case, this loss is totally avoidable.

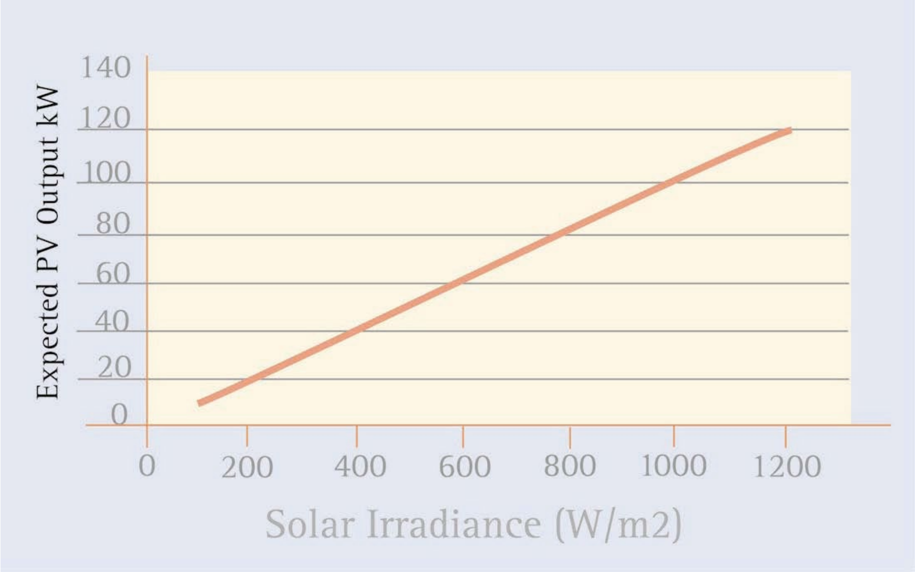
5 Critical External Factors Influencing System Performance

Irradiance

We've talked about irradiance before, but it bears repeating since it's not exactly an everyday word. You just don't hear people say, "Hi. How are you? Man, that irradiance outside is killer today." Nope. Not normal speech for most of us. Essentially, irradiance is a measure of the amount of sunlight falling on a given surface. The higher the irradiance on a solar cell, the more energy a cell will produce. More sunlight = more electricity. If only sunlight were constant.

The fact is that irradiance varies throughout the day. The angle of the sun, passing clouds, hazy weather, and air pollution can affect irradiance levels. However, the total energy received by the system from the sun remains relatively constant from year to year. Typically, energy from the sun only varies between 5-10% of the average in a given year.

Consequently, quality solar energy output projections can be made based off of past years (Usually the data comes from national weather databases, but we'll talk more about that in another solar bulletin).

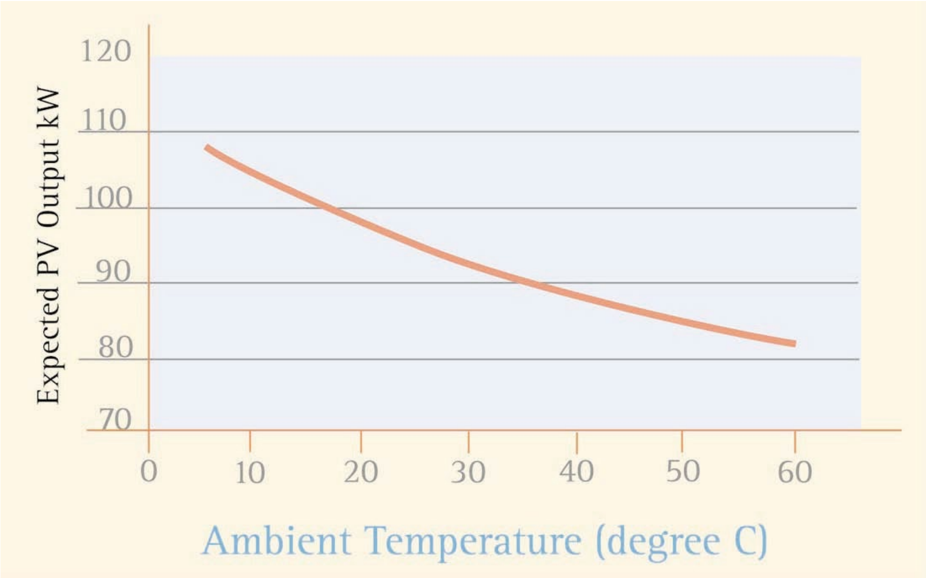


Temperature

Here's an interesting fact about solar power: the warmer solar cells get, the less efficient they are. This may be surprising, but think about walking through air versus walking through water in a pool. You move pretty quickly with only air around you. You're not quite as quick walking through water because of the resistance.

Same goes for those little electrons. The hotter the cell material is, the more resistance there is and the slower the electrons can move through it. This means that production goes down because not as many electrons can get through the circuitry in the same amount of time as before.

This is another situation where quality matters. High quality panels are designed to maintain performance levels in extreme heat. Lower quality panels lose efficiency and produce less energy. What a bummer. We can't imagine making a huge investment only to watch it underperform on a July afternoon when it should be creating lots of free electricity.



Shading

This is a no-brainer: shaded solar panels produce less electricity. One thing to consider is that shading varies seasonally. As the angle of the sun changes through the year, trees and other barriers may become shading issues in different seasons. It all depends on the size, height, and proximity of surrounding barriers. Properly designed solar systems minimize or eliminate shading. Under some circumstances, it is not possible to avoid all shading, so proper design will minimize it during peak mid-day production periods.

You'll want to pay attention to the effects of adding future roof-top structures (like putting up an enormous Santa in a sleigh with eight reindeer around x-mas time). You'll also want to minimize the effects of shading from nearby tree growth.

Soiling

This is another no-brainer. Dirty solar panels produce less electricity. The term "soiling" sounds fancier than it is. All it refers to is dust, dirt, and other debris settling on the surface of the solar panels. This blocks sunlight from reaching the solar cells and reduces solar system performance. Yada yada yada. In areas with frequent rain, soiling is not usually significant.

Areas that experience long periods of dry weather, such as California and the desert Southwest, experience more soiling during the summer. Rapid soiling can also occur on systems located near construction sites and other places that produce dust.

Cleaning the system may be undertaken to keep things looking nice, but it shouldn't be necessary to maintain the expected energy cost-savings from a properly-designed system.

Snow

Snow blocks production of solar energy until plowed or melted. (Seriously, we're just being thorough. We know you know this.)

Because snow limits energy production, the effects of snow should be incorporated into any energy estimates. In general, assumptions for performance degradation may range from a minimum of 8% performance degradation (for early spring and late fall months) to a maximum of 30% (for mid-winter months) for systems in regions that experience significant snowfall.

Coming Up Next

Those are the key factors to be aware of for solar power production. Nothing too difficult to understand. This solar power business isn't as complicated as other people may be making it out to be. Our next bulletin will feature tips about how to calculate comparisons between projected and real world system performance.

As you learned in our bulletin about solar ratings, a system's rated production is very rarely what it produces, and this next solar bulletin will help you to understand how to determine if your solar system is performing as it should.

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