ELECTRICITY ESSENTIALS FOR SOLAR POWER

SUNPOWER

Solar power is a hot topic these days and for good reason. Who wouldn't want to save money and be worry-free from ever-rising utility rates? You may be wondering if solar power makes sense for your organization, however. Maybe you aren't as familiar with the complex data and language like "photovoltaic" and "irradiance." That's okay. Let us simplify the terms so that you can better understand solar power and feel more confident for future decisions.

Let's start with some helpful basics. This may only be a refresher course for some of you, but regardless of how much you know, you should feel more comfortable with several key electrical and solar power terms after this article.

ELECTRICITY 101

Okay, so electricity has three key terms: amperes (or amps), volts, and watts. Current (amperes) is a measure of the flow of electrons. Volts are a measure of electric potential. Watts measure the amount of power supplied by a given amount of current at a certain voltage. In case there's a random pop quiz in the office, the math looks like this:

Amperes (current) * Volts (potential) = Watts (power output)

Technically speaking, electricity is a current (flow) of charged particles called electrons, but instead, let's think of it as water moving through a hose. The electric current, or amperage, is like the size (diameter) of the hose. The voltage is like the amount of pressure behind it. The greater the size and pressure are, the greater the rate of water flowing from the hose.

So, the more the amps and volts in a wire, the more watts will come out of it.

Energy and Power

Moving on, energy and power are next up. We mentioned that power is a measure of electrical production, but specifically, power is a measure of production at a snapshot in time. Although it seems to get confused a lot as an amount of energy production, power is really just a rate of energy production. Most people in the solar industry refer to power as watts or kilowatts, e.g. a 5 MW solar system.

Energy is the amount of power produced over a length of time. This is a really important one to remember when you're researching solar products. You want to find out how much energy a solar product will actually produce not just the power that it can produce at a moment in time. Energy is measured in kilowatt-hours (kWh). Here's our next equation for our arithmetically-inclined:

Power x Time = Energy

Okay, time for another analogy. Imagine that you're driving a car. Power is the speed you're going at the moment you look down at your speedometer. Energy is the total distance you've traveled. See? It's really simple after all.

Irradiance and Insolation: Measuring the Sun

Honestly, we're almost through the definitions, but believe us; understanding these definitions will make it a lot easier to discuss solar power after our review. Next up are irradiance and insolation. Irradiance is the amount of sunlight available at a moment in time. Insolation is a measure of the irradiance over a period of time. Here's another equation to remember for your next appearance on a trivia game show:

Irradiance x Time = Insolation

Irradiance is the most important factor in solar power production. The higher the irradiance, the more sunlight hits the solar cells. That means more of those little electrons get boosted out of the semi-conductor material to flow through the circuitry. The more electrons flow, the more electrical power gets produced. So there you have it: lots of sun means lots of electricity.

Solar Efficiency: Converting the Sun to Electricity

At last, we've come to our final term of the day. Solar efficiency refers to the amount of sunlight that can be converted into usable electricity. Solar photovoltaic efficiency is often discussed as solar cell efficiency or solar panel efficiency. Why is this distinction important? A lot of times, people may quote you amazing cell efficiency numbers. That sounds great, but what you really want to know is the solar panel efficiency. The solar cell efficiency number is only for the amount of light that a single solar cell can convert to electricity. But solar panels are made up of multiple cells, and the spacing between cells among other things reduces the overall efficiency. That means that the efficiency of a solar panel will typically be lower than that of a solar cell.

So the panel's efficiency will be a better predictor for the actual electricity that the system can generate. It really doesn't matter if a company's solar cell has a 43% efficiency if their panel's efficiency is 6%. (We're exaggerating here, but you get the point. The top solar panel efficiencies now-a-days are around 20%, by-the-way). Therefore, you'll want to pay attention to the solar panel efficiency number when shopping around.

COMING UP NEXT

So now you've got an overview of the basics. Hopefully that was more manageable than a high school physics class. You should be ready to use some of that new knowledge to better understand the half-a-gazillion solar choices out there. But before you forge ahead or maybe while you forge ahead, we're going to talk to you about another potentially confusing topic: solar system ratings. By understanding what the different ratings mean, you can make accurate apples-to-apples comparisons and smart decisions in selecting your solar panels.