UNDERSTANDING SOLAR SYSTEM RATINGS

SUNPOWER

WHY SOLAR RATINGS MATTER

In our Electricity Essentials solar bulletin, we laid down some groundwork to help you understand key terms. Now, we're going to tackle another topic that can be confusing: solar ratings. Solar power ratings allow you to make direct comparisons between solar panels of different sizes from different manufacturers.

Sounds good, right? Well, there's more than a little scientific and industry jargon to wade through. Don't worry. We're going to simplify it for you, and when we're done, you'll feel more confident in making comparisons and accurately predicting energy output and savings for different solar products.

WHAT IS A SOLAR RATING?

Solar photovoltaic (PV) panels are classified (or rated) by the power they produce under specific conditions. The most common ratings used in the industry are peak/STC, PTC, CEC-AC, and AC. Take a deep breath. They're just acronyms. Let's start with the first one.

PEAK/STC RATING

Every solar panel has a published power rating. This is its rated power under Standard Test Conditions (STC). If you add up the rated power for all of the panels, then you get the peak rating of a solar system.

The STC rating is always the highest rating. This is because it rates solar panels in terms of the instantaneous power that they produce under a set of ideal conditions. But when do ideal conditions ever exist in anything in this world? The reality is that solar panels will produce different amounts of power throughout a year. That's why the other ratings were created–to give people a more accurate picture.

Standard test conditions are defined as follows:

- 1000 W/m^2 solar insolation
- 25 °C solar cell temperature (which assumes roughly 0 °C ambient temperature)
- Absolute air mass of 1.5

Let's pause for a moment to break this down a little. We talked about insolation previously. That's just a term for sunlight. The temperature metric takes into account increases or decreases in production due to heat. The last metric accounts for effects from atmospheric pressure. All this does is to standardize the way panels are evaluated. You won't need to know the math behind this.

Two last things about peak ratings:

- These ratings are measured in terms of direct current (DC).
- They require a high level of solar radiation at a very low temperature to produce the rated amount of power. (That means their production values are very rare, occurring on only a few mild, clear spring or summer days.)

UNDERSTANDING SOLAR SYSTEM RATINGS

SUNPOWER

PTC RATING

Here's today's fast-fact that you will otherwise never need to know about: The PVUSA Test Conditions (PTC) DC rating came out of work by the Photovoltaics for Utility Scale Application (PVUSA) team in the late 1980's and early 1990's.
PTC rating conditions are defined to be:

- 1000 W/m² solar insolation
- 20 °C ambient temperature at 10 meters above ground level
- 1 m/s wind speed
- Absolute air mass of 1.5

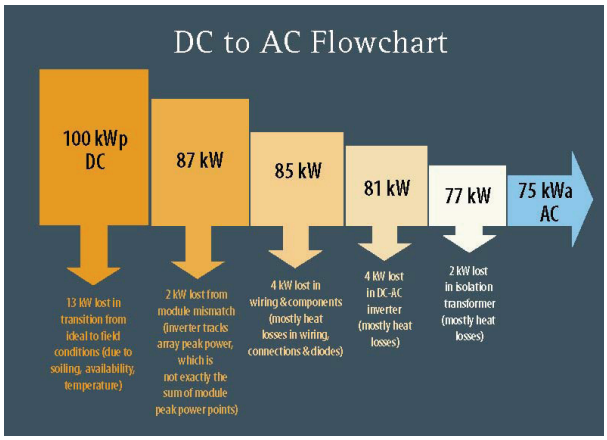
So, you can see the similarities with the STC ratings. It's a little more realistic, right? It takes into account influences from the wind (because solar panels are going to experience some amount of wind being outside, of course), and the rating standardizes against a slightly lower temperature. As you can tell by the name, this is also rated in terms of direct current. PTC-DC ratings are published by the California Energy Commission (CEC) if you need to go find them.

CEC-AC RATING

The CEC-AC system rating is used to determine the eligibility of a solar system for the California Solar Initiative (CSI) Program. But even if you're not in California, this rating is closer still to real world production. Therefore, it can still be helpful in your comparison shopping, and that's why we're telling you about it.

This rating uses the PTC-DC rating of the solar panels and multiplies it by the number of solar panels and the inefficiency introduced by the DC to AC inverter. The inverter efficiency is usually around 95% in case you're curious. Here's the basic equation:

PTC Rating x Number of Panels x Inverter Efficiency = CEC-AC Rating
As you can tell, we're getting closer and closer to actual production values.



AC SYSTEM RATING

The AC system rating is based on actual simulations of the solar system, and it attempts to account for all possible inefficiencies. In addition to the inverter inefficiency, the AC system rating includes inefficiencies from shade, soiling, wiring energy losses, and trans-

former energy losses. The AC system rating is usually 80% of the peak rating, but it is still based on the PTC rating conditions. Obviously, since the AC system rating takes into account multiple inefficiencies, it is the most accurate rating. A solar system should produce power at its AC rating at noon on a very clear, cool day.

THE KEY TAKEAWAY

So why wouldn't you just go with the AC system rating for all your evaluations? Well, sometimes it'll just be easier to get the STC ratings from 3 different solar providers as you do your homework. What's important is that you're making an apples-to-apples comparison by using the same ratings. That's the big take-away from this solar bulletin. So if you're getting STC ratings from one solar provider, you'll want to get STC ratings for all other solar products. You don't want to be comparing a CEC-AC rating against an STC rating for 2 different solar panels. It just wouldn't make any sense, and it could lead to a poor decision like choosing the STC rated panel because it seems high

COMING UP NEXT

There you have it. That's the basic overview of ratings. We hope that it's cleared up any confusion. Along the way, you've probably realized that there are a number of additional factors that influence how much electricity a solar system can produce. We've already mentioned the two biggest ones: sunlight and solar efficiency. Look for our next bulletins where we'll discuss those in a little more depth as well as talk about other important performance factors. Stay tuned.