

Specific photovoltaic power output

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Here you will learn how to calculate the annual energy output of a photovoltaic solar installation. The global formula to estimate the electricity generated in output of a photovoltaic system is : $E = A * r * H * PR...$

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Specific yield (kWh/kWp) is one of the most commonly used performance metrics for solar systems of all sizes. It's used to compare different locations, to analyze different designs or to assess the health of an array. As the team behind HelioScope, we are frequently asked, "What's a good value for kWh/kWp?" The answer is, as with many solar design questions, it depends.

In this article, we discuss the factors that drive specific yield up or down and present typical kWh/kWp values for a variety of locations, weather data sources and representative designs.

Specific yield (or simply "yield") refers to how much energy (kWh) is produced for every kWp of module capacity over the course of a typical or actual year. While typical values can range from 1,000 kWh/kWp to over 2,000 kWh/kWp, the actual value is driven by many factors, including:

Now that we've defined the drivers of yield, let's drill down to yield values for a couple of real examples to see how location, weather file and design individually impact yield, starting with location. Figure 2 shows GHI for four representative locations, as reported by NREL Solar Prospector.

For any given location, you may have access to a number of weather files. In Figure 3, you can see that different sources of weather data report different irradiance values for the same location, and that the ranking of values reported by different weather file sources is not consistent from location to location.

Finally, design is usually the biggest driver of yield at your control. While there are infinite design options, we'll stick to five representative designs, as shown in Table 1.

Table 2 shows yield values for these designs in four representative locations:

In each location, there's a difference of 20% or more between the lowest yield design and the highest yield design (that is, between the high-shade residential design and the utility design). All of these designs have different impacts of shading, temperature and even plane-of-array orientation adjustments.

Many solar developers have a sense for the kWh/kWp yield they expect to see based on their own history. But not many appreciate how those will vary based on the location, the system type or even the weather file used. As with everything in solar, the devil is in the details!

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