How to calculate solar panel system size

Solar panel sizing starts with the **load** to be supplied. In the case of a home, then the annual, monthly or daily **kilowatt-hours** can be used.

The fastest and easiest way to get this is to take it from **last year's utility bill.**

Once you have the home's kWh, then it can be translated into solar panel **generated energy**, system rated watts and work out **how many panels** are needed.

How much energy does the average home use per day?

According to US government, the average American consumer uses about **30kWh per day** or 900kWh/month. Using this as the goal for solar panel sizing, we can work out the solar power needed.

How does irradiance affect solar panels?

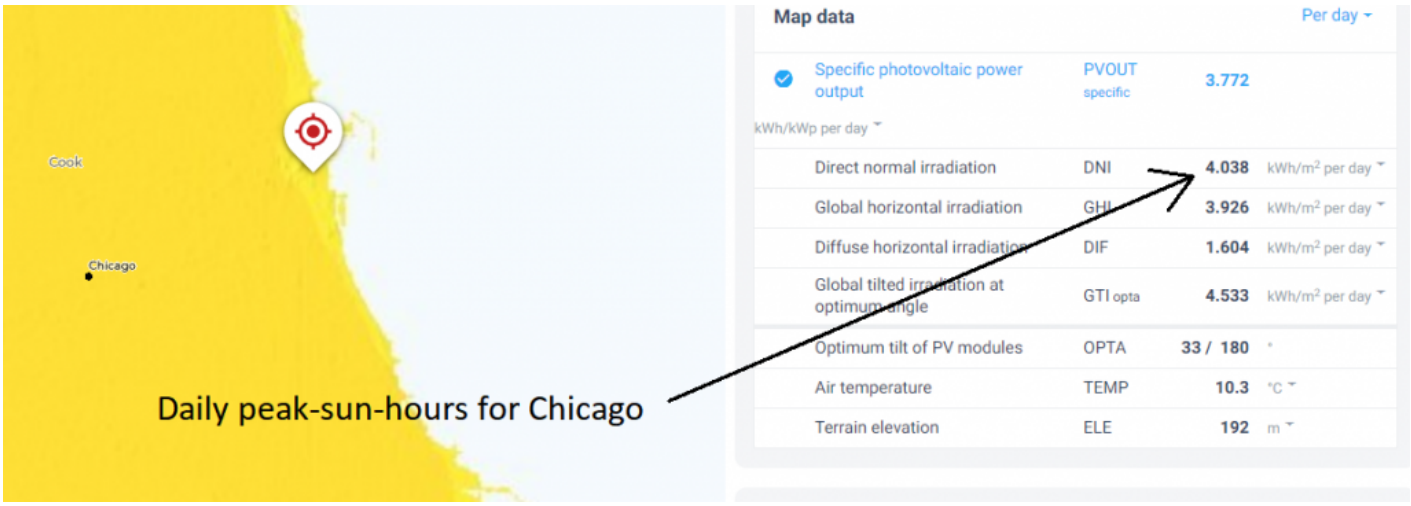
Although there are several factors impacting solar panel power output, irradiance or the **sun's energy**, is by far the biggest.

Read about solar panel efficiency on one of my blog posts.

Irradiance is measured in kilowatt-hours per square meter per day or year (**kWh/m2/day**) and varies considerably depending on your geographic location.

Irradiance values in kWh/m2/day are also known as **peak-sun-hours** and this is used by solar installers to work out **how much energy** a solar installation can generate.

It can be found from historical data using database lookups on sites like GlobalSolarAtlas. Simply enter your city and note your local peak-sun-hours – see image below:



Chicago peak-sun-hours is almost the US average

Incidentally, the **peak-sun-hours** for Chicago is about the US average (4), so I'll use that in my calculations.

Solar panel sizing calculator

Daily energy required = 30kWh

Solar power wattage required = 30kWh/4 peak-sun-hours = **7.7kW of solar power rating**

Let's say we uses 300 watt solar panels, then:

Number of solar panels = 7700 watts/300 watts = **25 solar panels (each 300 watts)**

Average pv system losses

Unfortunately, the above calculation assumes that we **get all the power** indicated by the solar panel power ratings – we don't!

PV system losses amount to almost 25%, so we need to **add at least 25%** to the number of panels needed:

Number of panels to account for losses = 25 + (25 x .25) = **38 panels (each 300 watts)**

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