

# Very important - Please Read

## Calculation of Solar Panel Size

In designing a solar panel package, the most important number on the supply side of the equation is the amount of sunlight available in your area. Many terms are used for the measure of Solar Radiation: "Incident Solar Radiation" ("Insolation" for short), "Solar Hours", "Sun Hours", "units of solar irradiance", or "solar kilowatt hours per square meter" (kwh/m<sup>2</sup>). ***All of these terms are equivalent.***

To select the proper size & quantity of solar panels, you need to know how much Incident Solar Radiation is available in your area on the dreariest days of the year. This is determined by using historical charts of solar radiation data. ***It is critical for the reliable operation of your system that this data is accurate!***

The most commonly used Solar Radiation charts provide appropriate information for sizing systems which include a backup generator or power grid connection, but this data is not at all adequate for sizing a pure solar powered installation. The problem is, this data-base provides only solar radiation *averaged* over many years. Since your speed display relies *completely* on solar power, you need to know *not* how much sunlight you have on an *average* day, but how much is available on the *Worst Days of the year*, (there is commonly a 2 to 1 difference in those numbers).

Solar installations based on this highly optimistic data fail consistently during the worst part of the year *almost every year!* In addition, an under powered system such as this puts a much greater cyclical load on the battery, resulting in *dramatically* reduced battery life and increased maintenance requirements.

The *most reliable* data for this type of solar installation is provided by the U. S. Department of Energy in their 30 year Incident Solar Radiation charts. You can view this data at: [http://rredc.nrel.gov/solar/old\\_data/nsrdb/redbook/mon2/](http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/mon2/) or you can call us for the appropriate information from this chart for your area (we have an automated method of selecting the correct data and calculating the minimum and standard deviation).

As an example of the difference between these two data sources; for Fresno California, the commonly cited data mentioned shows a "Low" of 3.42 Sun Hours, but the DOE's historical data shows that December and January *averages* of 2.4 Sun Hours and less are *common*, and the *worst* December in Fresno actually provided *less than 1/2 that amount of average sunlight!* A system designed around the assumption of 3.42 sun hours would often be inoperative throughout the winter months in Fresno.

We calculate two figures from the DOE database. For absolute maximum reliability, we design around the Worst Case Method, which is based on the worst month in the 30 year database. For a system that will be 100% operational in all but the very worst years, we use a Solar Radiation number based on the standard deviation from the mean.



**To accurately size your solar panel installation, and to make an accurate comparison between vendors, carefully consider the following:**

- 1) Using the DOE 30 year data, determine the minimum Insolation that your system needs to be designed for . . . and be certain that all vendors base their quotations on that same number.
- 2) In the traffic flow data that you provide to the vendor, allow for the anticipated increase in traffic flow expected over the lifetime of the installation.
- 3) Check that in their calculations, all vendors are allowing for the long term degradation of solar panel output over the expected lifetime of the installation.
- 4) Are there any overhead obstructions (trees, buildings, etc.) which will now, or during the expected lifetime of the installation, block the sun? If so, what percentage reduction in direct sunlight do those obstructions represent?

To have us calculate the solar panel requirement for your application, using the DOE data, fill out the form on the back of this page and fax or call it in to us.

Customer supplied data:

**Please fill in the following data & fax to us at 503-626-3417**

(call us with any questions: 800-421-8325)

Name: \_\_\_\_\_ Phone #: \_\_\_\_\_ Fax #: \_\_\_\_\_

Your City (or nearest large city): \_\_\_\_\_

Times of operation:  24 hours / day  Selected hours: \_\_\_\_\_Days of operation:  Mon  Tues.  Wed.  Thurs.  Fri.  Sat.  Sun.Type of system:  VSC  ASL  CSL**Number of hours & Density of traffic flow** (allow for increases in traffic flow during life of installation):

# Hours

\_\_\_\_\_ Peak Hours  High (720 / hr.)  Med (500 / hr.)  Low (240 / hr.)  Very Low (120 / hr.)\_\_\_\_\_ Off Peak  High (720 / hr.)  Med (500 / hr.)  Low (240 / hr.)  Very Low (120 / hr.)\_\_\_\_\_ Night-time  High (720 / hr.)  Med (500 / hr.)  Low (240 / hr.)  Very Low (120 / hr.)**Overhead obstructions:**

Will trees, buildings, or other overhead obstructions completely or partially shade the solar panel from direct sunlight?

 No over-head obstructions Yes, the solar panel will be shaded from direct sunlight for \_\_\_\_\_ % of the day, during  morning  mid-day  evening

Will the solar panel be shaded from direct sunlight seasonally?

Summer (tree foliage, other)  Yes  No Winter (low Sun angle - obstructed by buildings, trees, etc?)  Yes  No**Solar Panel Size & Price based upon above data:**

Closest city in the DOE database: \_\_\_\_\_

**Worst Case method - DOE 30 year database:**

Based on data you provided above, this system will provide 100% continuous operation during even the worst winters.

**30 year Minimum Incident Solar Radiation based on DOE data:** \_\_\_\_\_ .

Solar panel degradation allowance for decreased output over time \_\_\_\_\_

Watt rating required, based on above specifications and Solar Hours: \_\_\_\_\_ .

Solar panel package cost: \$ \_\_\_\_\_ .

**Standard Deviation method - DOE 30 year database:**

Based on the data provided, this system will provide 100% continuous operation during all but the very worst winters.

**Standard Deviation Incident Solar Radiation based on DOE data:** \_\_\_\_\_ .

Solar panel degradation allowance for decreased output over time \_\_\_\_\_

Watt rating required, based on above specifications and Solar Hours: \_\_\_\_\_ .

Solar panel package cost: \$ \_\_\_\_\_ .

NOTES: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_