TRACSTAR

Should You Install a Solar Tracker?

What are solar trackers?

Solar trackers are racks for photovoltaic modules that move to point at or near the sun throughout the day. Trackers add to the efficiency of the system, reducing its size and the cost per KWH.

- Dual-axis trackers ("full tracking") move on two axes to point directly at the sun, taking maximum advantage of the sun's energy.
- Single-axis trackers follow the sun accurately enough that their output can be very close to full tracking.

Trackers need not point directly at the sun to be effective. If the aim is off by ten degrees the output is still 98.5% of the full-tracking maximum.

Advantage of solar trackers

The main reason to use a solar tracker is to reduce the cost of the energy you want to capture. A tracker produces more power over a longer time than a stationary array with the same number of modules. This additional output or "gain" can be quantified as a percentage of the output of the stationary array. Gain varies significantly with latitude, climate, and the type of tracker you choose—as well as the orientation of a stationary installation in the same location. (The energy required to move the tracker is insignificant in these calculations.)

Climate is the most important factor. The more sun and less clouds, moisture, haze, dust, and smog, the greater the gain provided by trackers. At higher latitudes gain will be increased due to the long arc of the summer sun. In the cloudiest, haziest locations the gain in annual output from trackers can be in the low 20 percent range. In a generally good area, such as California, annual gains between 30 percent and 40 percent are typical. The gain on any given day may vary from almost zero to nearly 100 percent.

Seasonally in California, gain ranges from 20 to 30 percent in winter (October through March) to between 40 and 55 percent in summer. In general, a tracker adds most to output during the hours when a stationary array produces the least power.

Seasonal Variations in Output

Gain from trackers is much greater during the long days of summer than in winter. There is strong sun for many additional hours, including the utility's peak use hours (noon to 6 pm). If your system is connected to the grid and your utility has time-of-day metering, the tracker's ability to capture all the afternoon sun can mean money in your pocket. Time-of-day metering means that utilities purchase excess power during peak hours in summer at a significant premium, adding even more value to a tracker system. On off-grid systems, however, a tracker may not add as much value if a stationary array will produce all the power you need in summer.

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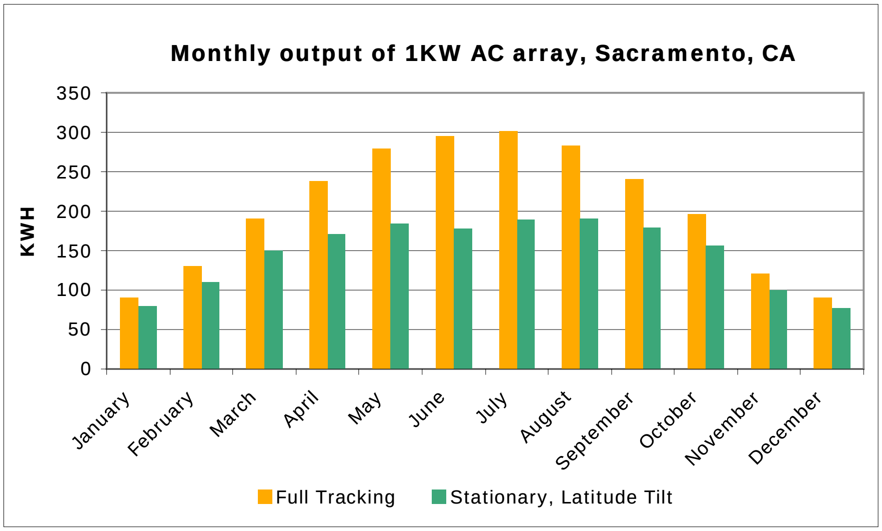

The graph above compares output, over the course of a year, for full tracking and a stationary array with the same number of modules in Sacramento, CA. The data is from National Renewable Energy Laboratory (NREL) web site: http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/

Shading

Shade during part of the day from trees, hills, or nearby buildings can be a factor in the efficiency of any solar installation. In planning for a tracker it is important to know when the site is shaded as extended hours of operation are important to good performance.

Shading very early or late in the day, when insolation (sunshine) is weak and output is minimal, is not significant. However, insolation increases very rapidly as the sun rises so shading becomes important about an hour after sunrise and the inverse is true at sunset.

Reliability

A tracker needs to work consistently to be cost effective. While it is true that trackers have had reliability problems in the past, there is no inherent reason why trackers cannot be very reliable. The motors run only a few minutes a day and the electronics are pretty simple. Note that if the tracker stops working the array will still work as a stationary array.

Are the Benefits Worth the Costs?

For a completely accurate comparison one must design and compare tracking and stationary systems that meet the same design goals.

- For a good site in a good climate, the power a tracker adds to output costs about $1/watt compared to the $4/watt cost of PV modules.
- The tracker itself costs from about $0.75 to $1.25 per watt of the modules it carries.
- A smaller array may mean a smaller, less expensive inverter and other components.

To compute the approximate net savings from a tracker, subtract the cost of the tracker, the reduced number of PV modules, and the appropriate-size inverter from the cost of the larger array, inverter, and stationary rack required to produce your design amount of power.

A growing number of states have financial incentive programs that reward performance of solar systems—which adds to the value of trackers.