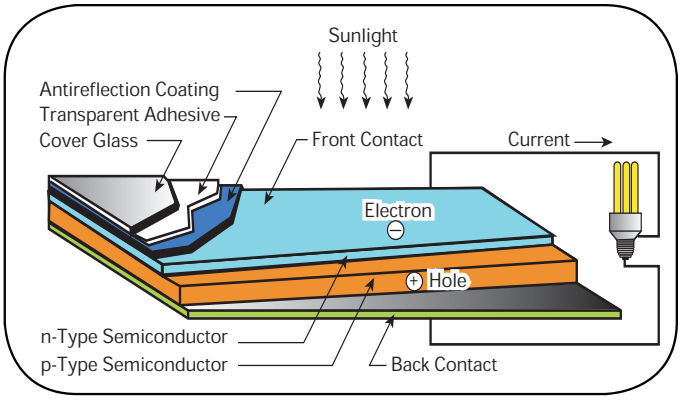
Frequently Asked Questions

Q1…
How do solar cells generate electricity?

A1…

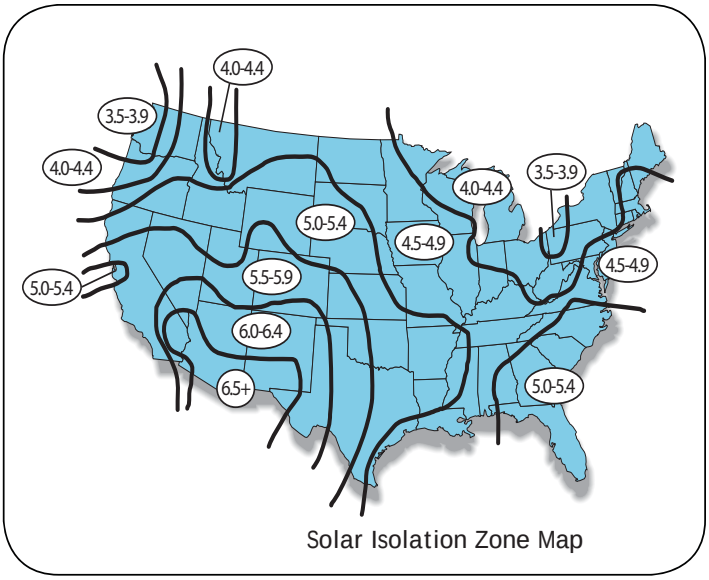
Photovoltaics (PV) can be thought of as a direct current (DC) generator powered by the sun. When light photons of sufficient energy strike a solar cell, they knock electrons free in the silicon crystal structure forcing them through an external circuit (battery, inverter or direct DC load), and then returning them to the other side of the solar cell to start the process all over again. The voltage output from a single crystalline solar cell is about 0.5V with an amperage output that is directly proportional to the cell's surface area (approximately 7A for a 6 inch square multi-crystalline solar cell). Typically 30-36 cells are wired in series (+ to -) in each solar module. This produces a solar module with a 12V nominal output (~17V at peak power) that can then be wired in series and/or parallel with other solar modules to form a complete solar array.



Q2…
Will solar work in my location?

A2…

Solar is universal and will work virtually anywhere, however some locations are better than others. Irradiance is a measure of the sun's power available at the surface of the earth and it peaks at about 1000 watts per square meter. With typical crystalline solar cell efficiencies around 14-20%, that means we can expect to generate about 140-200W per square meter of solar cells placed in full sun. Insolation is a measure of the available energy from the sun and is expressed in terms of "full sun hours" (i.e.4 full sun hours = 4 hours of sunlight at an irradiance level of 1000 watts per square meter). Obviously different parts of the world receive more sunlight than others, so they will have more "full sun hours"per day. The solar insolation zone map will give you a general idea of the full sun hours per day during the summer for your location.



Solar Isolation Zone Map

Q3…
What components do I need for an off-grid system?

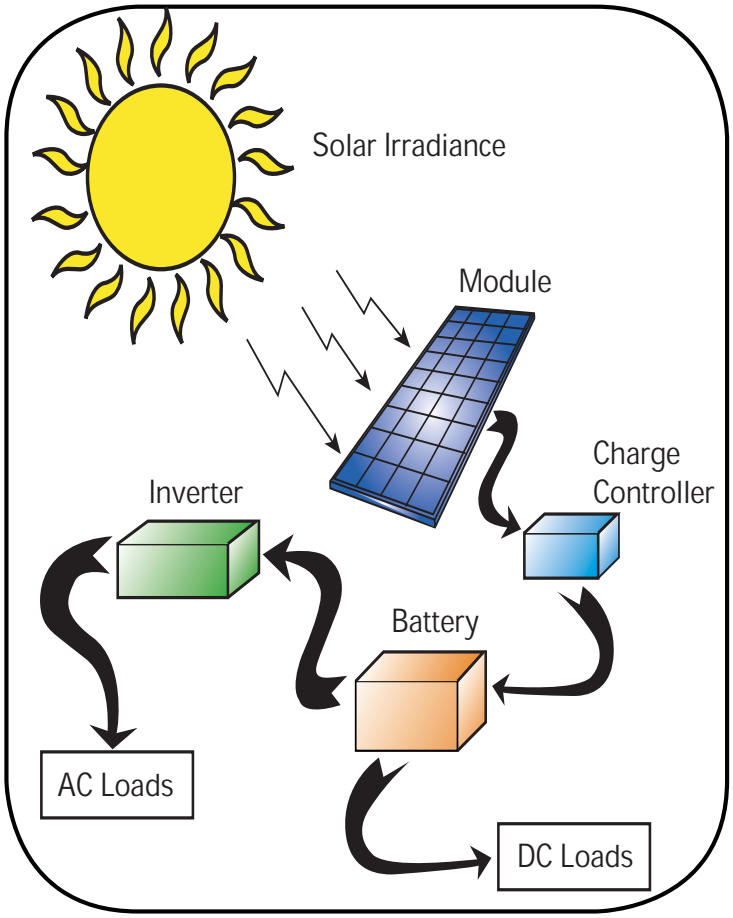
A3…

There are many components that make up a complete solar energy system, but the 4 main items on an off-grid stand-alone system are: solar modules, charge controller(s), battery(s) and inverter(s).The solar modules are physically mounted on mount structure (see question 6) and the DC power they produce is wired through a charge controller before it goes on to the battery bank where it is stored. For more detailed information on solar modules, turn to page 16. The two main functions of a charge controller are to prevent the battery from being overcharged and eliminate any reverse current flow from the batteries back to the solar modules at night. Turn to page 34 for more detailed information on charge controller functions and features. The battery bank stores the energy produced by the solar array during the day for use at anytime of the day or night. Batteries come in many sizes and grades, which you can see starting on page 41. The inverter takes the DC energy stored in the battery bank and inverts it to 120 or 240 VAC to run your AC appliances. For more detailed information on different inverter models and features, turn to page 54.

Q4…
What components do I need for a grid-tie system?

A4…

Other than safety disconnects, mounting structure and wiring, a grid-tie system is just solar modules and an inverter! Today's sophisticated inverters incorporate most of the components needed to convert the direct current from the modules to alternating current, track the maximum power point of the modules to operate the system at peak efficiencies and terminate the grid connection if grid power is interrupted from the utility



Q5…
How much will solar cost for a 2000 square foot home?

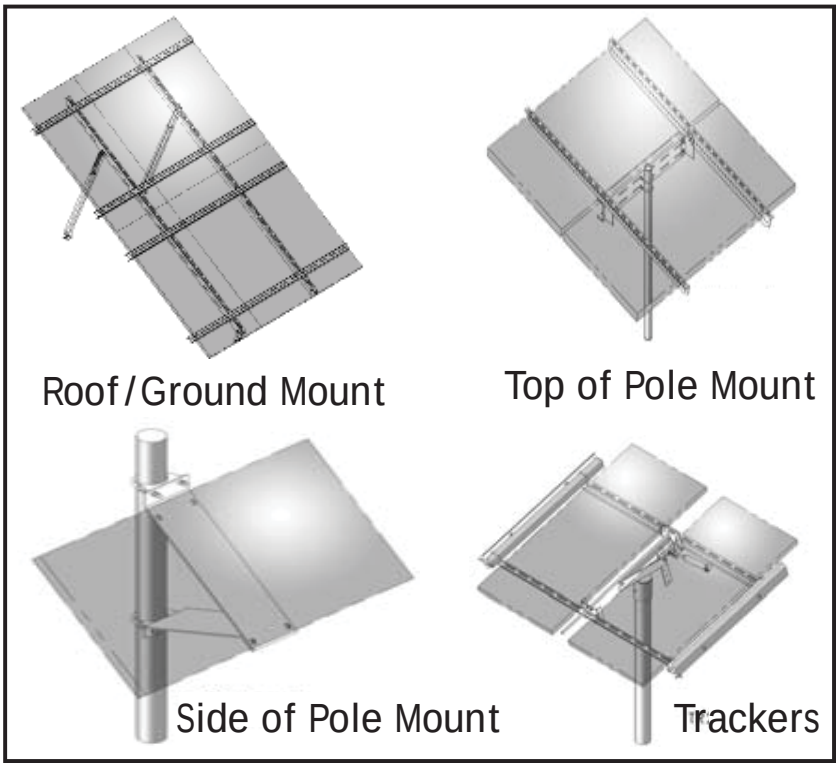
A5…

Unfortunately there is no per square foot "average" since the cost of a system actually depends on your daily energy usage and how many full sun hours you receive per day; and if you have other sources of electricity. To accurately size a system to meet your needs, you need to know how much energy you use per day. To find this amount, simply look at your monthly electric bill. Using this information, your authorized Kyocera Solar Dealer can design a system to meet your needs.

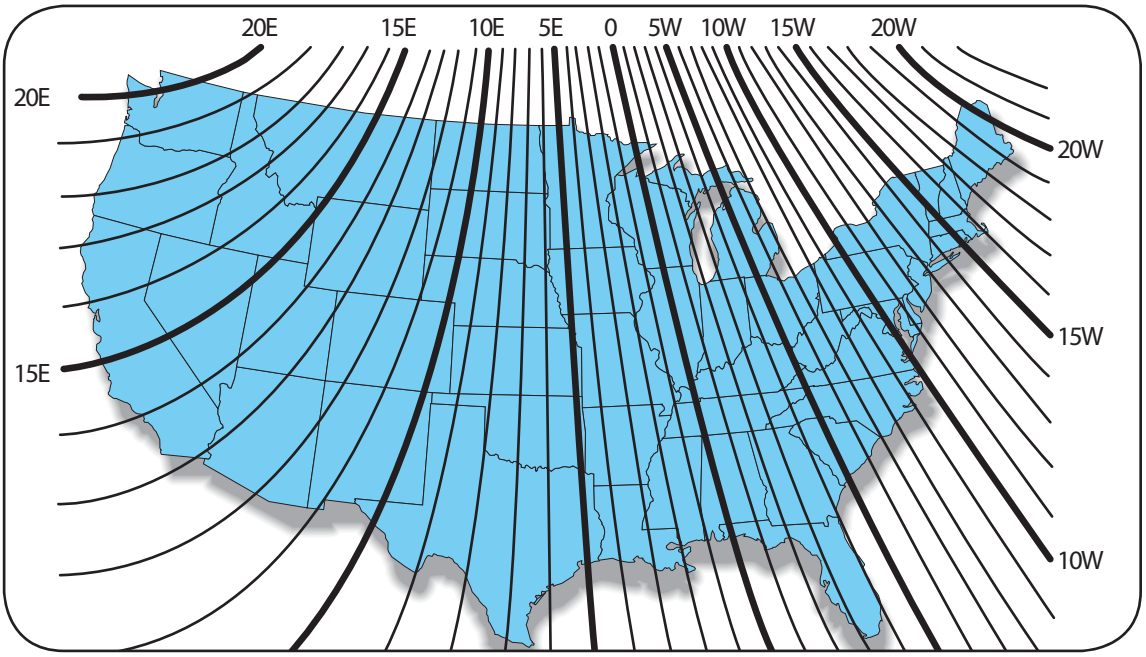
Q6…
What type of solar module mounting structure should I use?

A6…

There are four basic types of mount structures: roof/ground, top-of-pole, side-of-pole and tracking mounts, each having their own pros and cons. For example roof mount structures typically keep the wire run distances between the solar array and battery bank or grid-tie inverter to a minimum, which is good. But they may also require roof penetrations in multiple locations, and they require an expensive ground fault protection device to satisfy article 690-5 of the National Electrical Code-NEC. On the other hand,ground mounted solar arrays require fairly precise foundation setup,are more susceptible to theft/vandalism and excessive snow accumulation at the bottom of the array. Next are top-of-pole mounts which are relatively easy to install (you sink a 2-6 inch diameter SCH40 steel pole up to 4-6 feet in the ground with concrete).Make sure that the pole is plumb and mount the solar modules and rack on top of the pole. Top-of-pole mounts reduce the risk of theft/vandalism (as compared to a ground mount).They are also a better choice for cold climates because snow slides off easily. Side of pole mounts are easy to install, but are typically used for small numbers of solar modules (1-4) for remote lighting systems where there already is an existing pole to attach them to. Last but not least are the trackers,which increase the daily number of full sun hours and are usually used for solar water pumping applications. Trackers are extremely effective in the summer time when water is needed the most. In the northern U.S., typical home energy usage peaks in the winter when a tracker mount makes very little difference as compared to any type of fixed mount (roof, ground or top of-pole). In this situation,having more modules on a less expensive fixed mount will serve you better in the winter than fewer modules on a tracker. However, if you are in the southern U.S. and your energy usage peaks in the summer, then a tracker may be beneficial to match the time of your highest energy consumption with a tracking solar array's maximum energy output.



Q7…
Where should I mount the solar modules and what direction should I face them?



A7…

If your site is in the northern hemisphere you need to aim your solar modules to true south (the reverse is true for locations in the southern hemisphere) to maximize your daily energy output. For many locations there is quite a difference between magnetic south and true south, so please consult the declination map before you setup your mount structure. The solar modules should be tilted up from horizontal to get a better angle at the sun and help keep the modules clean by shedding rain or snow. For best year round power output with the least amount of maintenance, you should set the solar array facing true south at a tilt angle equal to your latitude with respect to the horizontal position. If you plan to adjust your solar array tilt angle seasonally, a good rule of thumb is:

- Latitude minus 15° in the summer
- Latitude in the spring/fall
- Latitude plus 15° in the winter

Most mount structures are available with a seasonal adjustment of the tilt angle from horizontal to 65°.To determine if your proposed array site will be shaded at any time of the day or year you should consider using the Solar Pathfinder.