



Key to Reading Your Solar-Electric Site Assessment Report:

PAGE ONE OF THE ASSESSMENT REPORT:




Site Description: This will describe and help the reader locate the exact site on the property where the site assessment measurements were taken

Potential System: This will describe the size, in terms of power output (watts), of the solar-electric array that the assessment report is based on. It may also estimate the length and width of the array, but this would vary depending on the type of solar-electric modules chosen by the homeowner or system installer. This is expressed in DC (direct current) watts because the solar-electric array produced direct current, and is converted to AC current by another part of the system (the Inverter) before it is supplied to the home and/or grid.

ZIP CODE: The Zip Code of the site assessment location is very important because the maximum available SUN energy available at any address is found in a database categorized by ZIP CODES. (Optionally, latitude and longitude of the site may be used.)

Estimated Installed Cost: This can vary widely based on the type of system installed, and the size of the system, and it's location on your property. Larger systems will cost less per watt than smaller systems. For a typical 5 kW, grid tied system, the following price guidelines may be used for rough estimating purposes in the year 2007. These prices may be substantially lower if rebates, tax credits, or grants are available in your area:

- Fixed Roof Mount: \$36,000 (\$7.25 per watt)
- Fixed Ground Mount: \$37,000 (\$7.40 per watt)
- One-Axis Tracked Ground Mount: \$47,500 (\$9.50 per watt)
- Two-Axis Tracked: \$55,000 (\$11.00 per watt)
- Battery Backed-up System: Add \$5,000 to \$10,000 to above prices.
(For system operability when the grid power is down)

		
5.2 kW fixed ground mount	5.4 kW roof mount	Two 3.4 kW two-axis tracked arrays
Installations & photos courtesy of Heat Shed, Inc. - www.heatshed.com .		

Rebates: Sometimes state governments, the federal government, and even local governments provide cash rebates to homeowners and businesses who install solar-electric systems. Occasionally manufacturers of solar-electric panels and related equipment will offer rebates, although this is less likely due to the high demand for the equipment.

Tax Credits: Sometimes state governments, the federal government, and even local governments allow for tax deductions and tax credits to homeowners and businesses who install solar-electric systems.

Grants: Sometimes private foundations provide cash grants to homeowners and businesses who install solar-electric systems.



Marc Edward LLC can help make you aware of incentives in your area, and you can find most of them yourself by visiting the *Database for State Incentives for Renewable & Efficiency* website: www.dsireusa.org

Cost to Client: Estimated cost of the installed solar-electric system to the client after all incentives.

Current Electric Rate: The cost (per kW-hr) of grid electricity at the site address. This can be determined from your electric bill. (Note: kW-hr, kWh, kW-hour and kilowatt-hour are all the same.) Residential electric rates in the U.S. range from about 5.1 to 18.3 cents per kW-hr with the average about 8.14 cents.

(Source: www.eia.doe.gov/cneaf/electricity/st_profiles/e_profiles_sum.html)

Est. Annual Electric Rate Hike: This is a guess, really. Since 2000, electric rates in the U.S. have risen an average of 6% per year. It is estimated that rate hikes will increase in size and frequency as the global energy situation takes on more and more urgency.

Est. Annual Solar Electricity Generated: This is an estimate of how much electric energy the solar-electric system would make each year. (Typical household in the U.S. use between 9,000 and 18,000 kW-hr per year. Large homes with central air conditioning and electric heat may use substantially more.) This is expressed in AC (alternating current) watts because alternating current is the form of electricity that the vast majority of homes and businesses use. The DC (direct current) produced by the solar-electric array must be converted to AC before it can be fed to the home or sold to the grid.

Avg CO₂ emissions per kW-hr grid electricity produced in the U.S.: Electricity generated with fossil fuels creates a tremendous amount of greenhouse gases, the most significant one being carbon dioxide (CO₂). Among fossil fuels used, coal produces the most greenhouse gases, while natural gas produces the least. The average amount of carbon dioxide produced by U.S. power plants is 1.34 lbs/kWh. (Note: a kWh, or kilowatt-hour, is the amount of ENERGY used when you run a 1000 watt appliance for one hour.)

Year: The age, in years, of the installed solar-electric system. Assumes that the system is installed during the same year as the site assessment was performed.

Electric Rate: The projected rate that the utility will charge for electricity bought from the grid in future years.

Cumulative Savings: The amount of money you can expect to save in electricity costs IF the *Estimated Annual Electric Rate Hike* guess (see above) turns out to be accurate.

Cumulative CO₂ Savings: The total amount of carbon dioxide (not to mention other pollutants) the solar-electric system will prevent from being created as the years go by.

PAGE TWO OF THE ASSESSMENT REPORT:

Declination: The deviation of *Magnetic North* from *True North* at the Site Assessment location. This has to be factored-in when interpreting the solar profile measured by the Solar Pathfinder instrument at the site to generate an accurate assessment. It is generally of no interest to the homeowner or business owner.

Latitude/Longitude: The location of the site on the earth in latitude & longitude coordinates. It is usually estimated based on the ZIP CODE provided by the client, but exact coordinates may be used if the homeowner knows them. Both ways are equal with respect to the quality or accuracy of the assessment report.

Weather Station: The nearest weather station where solar data is collected and stored in a national databank. This is the source of the solar data used in assessing your site(s).

Station/Site Distance: The distance from the assessed site to the Weather Station.

Array Type: Whether the assessment report is based on using a fixed, single-axis tracked, or two-axis tracked solar electric system. A single axis tracked system will typically produce 25-30 % more energy than a fixed system, while a two-axis tracked system may produce up to 35% more energy than a fixed system. Of course, tracked systems are more expensive to install. (Refer to *Estimated Installed Cost* on previous page.)



Tilt Angle: The tilt of the solar-electric array (in degrees) with respect to the ground (0°). For a fixed array, the optimum tilt angle is the same as the latitude of the site, and this is generally the tilt angle that fixed ground-mount systems are set at. For a roof mount array, the tilt angle is usually the same as the roof angle for aesthetic reasons. Tracked systems are always at the optimum tilt for the season and time of day. For the continental U.S., latitude ranges from about 25° in the south to about 48° in the north. Central Alaska has a latitude of about 66°.

Cost of Electricity: The current price of electricity (in cents per kWhr) from the electric company at the site location. (This can be found from an electric bill or by contacting the electric company.)

DC Rate: This is the power output of the *Potential System* (see previous page) directly off of the array, which is usually made up of many individual panels (aka: modules). This is measured in DC (direct current) watts because solar panels generate direct current. It is subsequently converted to alternating current (AC) by another part of the solar-electric system called the Inverter. The electric company’s electric grid supplies alternating current and that is what most homes and businesses use.

Derate Factor: Conducting the direct current from the solar array to the home or business, and then converting it into alternating current (AC) and transforming it to a voltage level that the home or business or grid can use involves processes that are not 100% efficient. So the power generated by the solar-electric array is higher than the power you end up with for use. The *Derate Factor* is an estimate of this inefficiency and it is used in the site assessment to estimate the actual usable power that will be generated by the solar-electric system. Basically, the usable AC power = (DC power) x (Derate factor). Typical derating factors for the various elements of a solar-electric system are shown in the following table:

Solar Electric Derating Factor Elements		
Component	Typical Derating Factor	Derating Factor Range
PV module nameplate DC rating vs. actual	.95	.80 – 1.05
Inverter and Transformer	.92	.88 - .96
Mismatch	.98	.97 - .995
Diodes and connections	.995	.99 - .997
DC wiring	.98	.97 - .99
AC wiring	.99	.98 - .993
Dirt/Debris on solar panels	.95	.30 - .995
System Down Time	.98	.00 - .995
Shading Factors	1.00	.00 – 1.00
Sun-Tracking	1.00	.95 – 1.00
Solar array age	1.00	.70 – 1.00
Typical Overall DC-to-AC Derating Factor:	.77	

Azimuth: For fixed (non-tracked) arrays, how close to true south the array is pointing. For true south, *azimuth* = 180°. Roof mounted arrays generally do not point exactly straight south unless you are lucky or the house was oriented as such because the homeowner or builder knew they wanted a solar-electric or solar hot-water system, or passive solar heating.

Unshaded % of Ideal Site: This column shows the percent of the Sun’s path that is unobstructed at your site, given a perfectly positioned array (azimuth = 180°, tilt = latitude). If your site was in the middle of a huge, open field these numbers would all be 100%. (Note: Ground mounted arrays are usually perfectly positioned. Tracked arrays are almost always perfectly positioned. Roof mounted arrays are frequently NOT perfectly positioned.)

Ideal Solar Rad w/o Shading: This column shows the number of hours per day that the Sun would be shining on your array if your site was completely unshaded (as in the middle of a huge, open field), given a perfectly positioned array (azimuth = 180°, tilt = latitude).



Actual Solar Rad w/ Shading: This column shows the number of hours per day that the Sun would be shining on your actual array based on actual shading conditions at the site and the actual array orientation (azimuth & tilt).

AC Power (KWH) w/o shading: This column shows the AC power your system would generate if your array was completely unshaded (as in the middle of a huge, open field), and perfectly positioned (azimuth = 180°, tilt = latitude).

Actual AC Power (KWH) w/ shading: This column shows the *actual* AC power your system should generate, based on actual shading conditions at the site and the actual array orientation (azimuth & tilt).

Actual Solar Savings: This column shows the *actual* dollar value of the electricity your solar-electric system would generate, based on the *Cost of Electricity* from the electric company at that location.

Effect: The percentage of the Sun's energy your array will be capturing as compared to a completely unshaded, perfectly positioned array.

Photo Image (left side of report): This is the actual photo taken at the site showing any obstructions.

Rendered Image (right side of report): This is the computer enhanced version of the photo image, which more clearly shows the site obstructions (opaque regions).