# How to Speak Solar

Solar terms might seem like a foreign language. Here are some common terms and definitions.

**Alternating Current (AC):** Alternating current is an electric current whose direction reverses cyclically, as opposed to direct current (DC), whose direction remains constant. AC is the form of electricity that is delivered to your home. Solar photovoltaic (PV) systems produce DC power, which must be converted to AC by an inverter.

**Array:** Any number of electrically connected photovoltaic (PV) modules providing a single electrical output.

**Azimuth:** Azimuth is the horizontal angular distance between the vertical plane containing a point in the sky and true south.

**Capacity Rating:** The rating given to a PV system by its manufacturer denoting the load the system is able to meet or supply when operating at full capacity. For a solar PV system, this will occur when the system is in direct sunlight with no shade.

**Conversion Efficiency:** The amount of the sun's energy that a solar cell can convert into electricity. The remainder is lost as heat or reflected light.

**Direct Current (DC):** Solar PV systems produce electricity in direct current (DC), which is defined as the continuous flow of electricity through a conductor. In DC, electricity always flows in the same direction, which distinguishes it from alternating current (AC). Solar PV systems produce DC power, which must be converted to AC by an inverter in order to power household appliances.

**Efficiency Rating:** A rating (also known as Design Factor) which compares a solar system's expected energy output with that of a baseline system. The efficiency rating takes into account the system's tilt, azimuth and shade obstruction to determine an efficiency level between 0 and 100%. Efficiency ratings for tracking systems can sometimes exceed 100% due to their high efficiency. For systems purchased by the customer, efficiency ratings below 75% will result in rebate reductions. For systems financed through a lease or PPA, efficiency ratings below 60% are ineligible for Connecticut Green Bank incentives.

**Electric Current:** The flow of electrical energy (electricity) in a conductor, measured in amperes. Current is expressed in AC or DC.

**Electrical Grid:** An integrated system of electricity distribution, usually covering a large area.

**Energy Audit:** A survey that shows how much energy is used in a home, which helps find ways to use less energy.

**Equipment Warranty:** Assurance provided by the manufacturer specific to the equipment comprising the solar system, namely the panels and inverters. Panels typically carry 10+ year parts warranties and 20+ year production warranties, while inverters range between 10-25 years.

**Expected Performance-Based Buydown (EPBB):** For CT customers who purchase their solar system; the EPBB incentive (also called a "rebate") is an upfront cost reduction based on major system design characteristics, such as equipment type, installation tilt, shade obstructions and orientation. Contractors will subtract the EPBB value from a customer's invoice and the rebate is paid directly to the Eligible Contractor, on behalf of the homeowner, upon system completion.

**Incentive:** See Expected Performance Based-Buydown for purchases and Performance-Based Incentive for solar leases and PPAs.

**Insolation:** The amount of solar energy that shines on a building or area, equivalent to energy and usually expressed in annual kilowatt-hours per square meter.

**Interconnection Agreement:** A legal document between the customer and their electric utility authorizing the connection of the customer's solar system to the utility's grid.

**Inverter:** A device that converts direct current (DC) electricity produced by a solar system into the alternating current (AC) electricity that can be used in a home or building. Some energy is lost when this conversion takes place. See Inverter Efficiency.

A microinverter converts direct current (DC) generated by a single solar module to alternating current (AC). There is typically one microinverter per module.

A string inverter converts direct current (DC) generated by an array of modules to alternating current (AC).

**Inverter Efficiency:** The AC power output of the inverter divided by the DC power input. Inverter efficiency is lowest when operating at low loads; thus, it is important to select inverter(s) of the proper size relative to the PV array. Grid tied inverters typically have a rated efficiency ranging between 92% and 96%.

**Kilowatt (kW):** A unit of electrical power equal to 1,000 Watts, which constitutes the basic unit of electrical demand. The Watt is a metric measurement of power (not energy) and is the rate (not the duration) at which electricity is used. 1,000 kW is equal to 1 megawatt (MW).

**Kilowatt-Hour (kWh):** A unit of electrical energy, equivalent to the use of 1 kilowatt of electricity for one full hour. Utilities measure customers' electric energy usage on the basis of kilowatt-hours, and electricity rates are most commonly expressed in cents per kilowatt-hour.

**Load:** The amount of power carried by a utility system or the amount of power consumed by an electric customer at a specific time.

**Megawatt (MW):** Unit of electric power equal to 1,000 kW, or 1 million Watts.

**Modules:** A module is the smallest protected assembly of interconnected PV cells. Applicable modules are typically rated between 250 Watts and over 350 Watts.

**National Electric Code (NEC):** Contains guidelines for all types of electrical installations. The 1984 and later editions of the NEC contact Article 690, "Solar Photovoltaic Systems" which should be followed when installing a PV system.

**Net Meter:** A device used to measure and record the amount of electricity used and generated by a consumer.

**Orientation:** A term used to describe the direction that the surface of a solar module faces. The two components of orientation are the tilt angle (the angle of inclination a module makes from the horizontal) and the azimuth (based on true South, not magnetic North/South).

**Performance-Based Incentive (PBI):** For customers who enter a solar leases or PPA; the PBI is paid to the System Owner (lease or finance company) based on actual system performance over the course of 6 years. The value of the PBI is built into the customer's lease or PPA price.

**Performance Data Monitor:** A metering device that stores data on energy production, usually in hourly or 15 minute intervals. This information is viewable by the customer, the contractor and the Connecticut Green Bank through an online portal.

**Photovoltaic (PV):** The technology that uses a semiconductor to convert light directly into electricity.

**Photovoltaic (PV) Panel:** Often used interchangeably with PV module (especially in one-module systems), but more accurately used to refer to a physically connected collection of modules (i.e., a laminate string of modules used to achieve a required voltage and current).

**Power Purchase Agreements (PPA):** A contract to purchase energy. PPAs are usually established between a power plant and a purchaser of electrical energy, such as a utility. A PPA may be a contract written between a homeowner that wants to use solar energy and a third-party developer who will install, maintain and own the PV system used to generate the electricity on the building's structure, then sell the solar energy produced by the system to the building owner at a pre-determined rate.

**Rebate:** See Expected Performance-Based Buydown.

**Renewable Energy Credits (RECs):** Renewable energy certificates (RECs) represent the environmental attributes of the power produced from renewable energy projects. If installing a solar system and taking advantage of a Connecticut Green Bank rebate, the Green Bank retains ownership of the RECs.

**Silicon:** A chemical element (Si) that is the most common semi-conductor material used to make solar PV cells.

**Soft Costs:** Non-hardware costs relate to PV systems, such as financing, permitting, installation, interconnection, and inspection.

**Solar Energy:** Electromagnetic energy transmitted from the sun (solar radiation). The amount that reaches the earth is equal to one billionth of the total solar energy generated, or the equivalent of about 420 trillion kilowatt-hours.

**Solar Irradiance:** Radiant energy emitted by the sun, particularly electromagnetic energy.

**Solar Pathfinder:** A device used in PV site assessment for charting the sun's path through the sky for all months of the year, calibrated by the hours of the day. Also provides other critical, detailed site data.

**Tilt:** The angle of inclination a module makes from the horizontal.

**Tracker or Tracking Array:** A number of PV modules mounted such that they track the movement of the sun across the sky to maximize energy production, either with a single-axis or dual-axis mechanism.

**Voltage:** The difference in electrical charge between two points in a circuit; expressed in volts.

**Warranty:** See Equipment Warranty and Workmanship Warranty

W**orkmanship Warranty:** Assurance specific to the labor and expertise of designing and constructing the solar system. Workmanship warranties vary in length, typically from 5-15 years, and the longer the warranty the greater assurance that the installer will stand behind the construction quality for a significant portion of the life of the system.

**Watt:** A unit of measurement of electric power, named after physics pioneer James Watt.

**Watt-hour (Wh):** A unit of energy measurement, equal to one Watt of power used for one hour.


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1. Solar Energy Systems: Guide for Pennsylvania Municipal Officials, http://www.pennfuture.org/sunshot/SunSHOT_resource_glossary.pdf
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