Glossary

W – watt. A unit of Power; the basic unit of measurement that we will use to analyze solar electric systems. It is important to understand that we will be discussing power in terms that relate to the generation of electricity. Electric power, like mechanical power, is the rate of doing work and is measured in watts e.g. the "wattage" of a light bulb vs. horse-power of a car or Btu's/hour of a furnace.

kW – kilowatt. A kW is a unit of electrical capacity equal to 1,000 watts. It is estimated that a typical residential home (without electric heating) can have a peak load as high as 8 kW.

MW – megawatt. A MW is a unit of electrical capacity equal to 1,000 kilowatts or 1,000,000 watts.

GW – gigawatt. A GW is a unit of electrical capacity equal to 1,000,000 kW.

TW – terrawatt. A TW is a unit of electrical capacity equal to 1,000,000,000 kW.

kWh – kilowatt-hour. A kWh is a unit of electrical energy (commonly referred to as electricity) equal to 1,000 watt-hours. According to the DOE, the average residential home consumes about 700 kWh/month.

MWh – megawatt-hour. A MWh is a unit of electrical energy equal to 1,000 kWh.

GWh – gigawatt-hour. A GWh is a unit of electrical energy equal to 1,000,000 kWh.

TWh – terrawatt-hour. A TWh is a unit of electrical energy equal to 1,000,000,000 kWh.

kW vs kWh –

There are two aspects to this topic. One can take the consumption perspective or the generation perspective. In either case, kW cannot be directly converted to kWh without knowing time.

Consumption:

If you use a 100W light bulb for one hour you would consume 100 Wh of electricity. If you only used the 100 W light bulb for half an hour you would use 50 Wh. If you used that bulb for 10 hours you would use 1,000 Wh or 1 kWh. For example: a 20W light bulb is left on for a full year, how much energy did it use?

.02 kW*24*365= .02 kW*8760= 175.2 kWh

Generation:

When examining solar PV (assuming efficiency is 100%), kW represents the power rating of the solar PV system while kWh represents how much electricity the system produces over time. For example: a 220 kW solar PV system experiences direct sunlight for 4 hours a day, how much energy will it produce in one year?

220 kW*4*365= 220 kW*1460= 321,200 kWh or 321.2 MWh

PV – Photovoltaic; the conversion of sunlight to electricity

Cell – Basic photovoltaic device that generates electricity when exposed to sunlight

Module – A complete, environmentally protected unit comprised of solar cells; the general building block of PV systems

Panel – A group of modules mechanically and/or electrically connected to one another

Array – An assembly of panels which generally consists of a support structure and foundation

Voltage – a measure of potential energy in Volts (V).

Current – the flow of electrons; measured in Amps (A). The relationship between current and voltage is similar to water flowing through a pipe. Current is the amount of water present while voltage is the pressure behind it.

DC – Direct current; such as a battery would produce

AC – Alternating current; found in our homes

Inverter – Equipment used to convert DC voltage to AC in order to match the grid

Monocrystalline – module made from a single silicon crystal structure; slightly improved efficiency and lifespan over polycrystalline

Polycrystalline – module made from made up of many silicon crystal lattices; lower cost than monocrystalline panels

Thin-film – use a thinner layer of PV material comprised of Amorphous Silicon(a-Si), Cadmium Telluride(CdTe), Copper Indium Gallium Selenide(CIGS), or Dye Sensitized Solar Cell (DSC)

RTO – Regional Transmission Organization e.g. PJM

EDC – Electric Distribution Company. Also known as an electric utility.

PUC – Public Utility Commission. PUC's regulate the EDCs and gas distribution companies, participates in the RTO planning process, and advocates for the state's interests before FERC. The PUC approves ratepayer-supported utility programs.

FERC – Federal Energy Regulatory Commission. FERC has jurisdiction over the interstate sale and transmission of electricity and natural gas, and regulates RTO's.

EPA – Environmental Protection Agency

DOE – Department of Energy

EPC – Engineering, Procurement, Construction. Part of the development team.

LSE – Load Serving Entity; entities that generate and send electricity to end-users and wholesale customers like a Utility e.g. a coal plant. Some electric companies can be both an EDC and an LSE.

Capacity - Power plant size or generating capability is measured in megawatts (MW).

Nameplate Capacity - The intended technical full–load sustained output of power plant equipment as indicated on a nameplate that is physically attached to the generator and is expressed in MW or kW.

Capacity Factor - Capacity factor is the ratio of the actual output of a power plant divided by the theoretical output of the plant if it had operated at full nameplate capacity the entire time.

Demand Response - Measures that consumers take to minimize their demand for energy. It includes curtailment of energy or the use of on-site generation of electricity at critical times.

Distributed Generation - Small-scale electricity production that is on-site or close to the primary users (demand) and is interconnected to the utility distribution system.

Ramp Rate – the rate of change in electrical output from a power plant (any type).

RPS – Renewable Portfolio Standard. An RPS is a state requirement that mandates the increased production of energy from renewable energy sources, such as wind, solar, biomass, and geothermal, to meet a specified goal. Twenty-nine states and the District of Columbia have RPS requirements.

SREC – Solar Renewable Energy Certificate. An SREC is a tradable certificate that represents the clean energy benefits of electricity generated from a solar PV energy system. An SREC is generated after 1000 kWhs (1 MWh) are produced by the solar system. The desired SREC supply is established by a state's RPS, and SREC prices are established by the competitive market.

Peakers - Among conventional generation technologies, peaking plants, such as gas turbines, are the least expensive to construct, the most expensive to operate, can adjust output the fastest, and are intended to run for just a few hours per day.