Renewable Energy Glossary of Terms

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This glossary was taken in part from the EPA and the Energy Information Administrations web site, and provides definitions of a number of important terms associated with power generation technologies and their environmental impacts, including definitions of specific pollutants, technologies, and the key terms related to the electric power marketplace.

INDEX

A B C D E F G H I K L M N O P Q R S T U W

A

Acid Rain:
Acid rain is a term used to describe several ways that acidic compounds fall out of the atmosphere, causing a variety of ground-level environmental effects. These effects include damage to forests and soils, fish and other living things, and human health. Acid rain also reduces how clearly we can see through the air, an effect called visibility reduction.

Sulfur dioxide and nitrogen oxides are the primary causes of acid rain. In the United States, about two-thirds of all sulfur dioxide and one-quarter of all nitrogen oxides come from electric power generation that relies on burning fossil fuels like coal. Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. These acidic compounds fall to the earth as acidic rain, fog, and snow, or as dry deposited gases and particles that can be blown to the ground by the wind. In fact, prevailing winds can blow the compounds that cause acid rain across state and national borders, and sometimes over hundreds of miles.

Aeration basin:
A basin where oxygen is supplied by mechanical agitation or pneumatic means to enhance the breakdown of wastes held in suspension.

Aerobic:
Life or biological processes that can occur only in the presence of oxygen.

Air-Conditioning & Refrigeration Institute (ARI) - 320, 325, 330:
ARI heat pump classifications: 320 refers to a water-source heat pump; 325 refers to a ground water-source heat pump; 330 refers to a ground source closed-loop heat pump.

Air Quality Maintenance Area:
Specific populated area where air quality is a problem for one or more pollutants.

Alcohol:
A general class of hydrocarbons that contain a hydroxyl group (OH). The term “alcohol” is often used interchangeably with the term “ethanol,” even though there are many types of alcohol. (See Butanol, Ethanol, Methanol.)

Alcohol Fuels:
Alcohol can be blended with gasoline for use as transportation fuel. It may be produced from a wide variety of organic feedstock. The common alcohol fuels are methanol and ethanol. Methanol may be produced from coal, natural gas, wood and organic waste. Ethanol is commonly made from agricultural plants, primarily corn, containing sugar.

Alternating Current (AC):
An electric current that reverses its direction at regularly recurring intervals, usually 50 or 60 times per second.

Alternative:
Under the National Environmental Policy Act, a comprehensive management strategy. When a federal agency is considering an action, the agency must develop and analyze a range of alternatives. The alternatives must show a reasonable range of actions, including a “no action” alternative.

Alternative fuel:
As defined in the Energy Policy Act of 1992 (EPACT):

- Methanol, denatured ethanol, etc, separately or in blends of at least 10 percent by volume with gasoline or other fuels
- Compressed natural gas
- Liquefied natural gas
- Liquefied propane gas
- Hydrogen
- Coal derived liquid fuels
- Fuels other than alcohols derived from biological materials
- Electricity
- Biodiesel
- Any other fuel determined to be substantially not petroleum and yielding potential energy security benefits and substantial environmental benefits.

Amorphous Silicon:
An alloy of silica and hydrogen, with a disordered, non-crystalline internal atomic arrangement, that can be deposited in thin-layers (a few micrometers in thickness) by a number of deposition methods to produce thin-film photovoltaic cells on glass, metal, or plastic substrates.

Anaerobic:
Life or biological processes that occur in the absence of oxygen.

Anaerobic digestion:
A biochemical process by which organic matter is decomposed by bacteria in the absence of oxygen, producing methane and other by products.

Annual Consumption:
Annual consumption refers to the amount of electricity used by a consumer in one year and is typically measured in kilowatt-hours (kWh). This information can be acquired from your electricity bill or by contacting your energy provider.

Annualized Growth Rates:
Calculated as follows: (xn / x1) 1/n , Where x is the value under consideration and n is the number of periods.

Arsenic:
Arsenic is a highly poisonous semi-metallic element. According to a 1999 study by the National Academy of Sciences, arsenic can cause bladder, lung, and skin cancer and may cause kidney and liver cancer. The study also found that arsenic harms the central and peripheral nervous systems, as well as heart and blood vessels, and causes serious skin problems. It also may cause birth defects and reproductive problems. These health impacts are caused when arsenic contaminates drinking water supplies. It enters water supplies either from natural deposits in the earth or from industrial and agricultural pollution.

Availability Factor:
A percentage representing the number of hours a generating unit is available to produce power (regardless of the amount of power) in a given period, compared to the number of hours in the period.

Back to Top

B

Background level:
The average amount of a substance present in the environment. Originally referring to naturally occurring phenomena. Used in toxic substance monitoring.

Backup rate:
A utility charge for providing occasional electricity service to replace on-site generation.

Backup electricity, backup services:
Power or services needed occasionally; for example, when on-site generation equipment fails.

Baffle chamber:
In incinerator design, a chamber designed to settle fly ash and coarse particulate matter by changing the direction and reducing the velocity of the combustion gases.

Baghouse:
A chamber containing fabric filter bags that remove particles from furnace stack exhaust gases. A baghouse is used to eliminate particles greater than 20 microns in diameter.

Bar screen:
A screen made of parallel bars set 3/4″ to 2″ apart used to filter out large objects.

Barrel of oil equivalent:
A unit of energy equal to the amount of energy contained in a barrel of crude oil. A barrel of oil equivalent is approximately 5.78 million Btu or 1,700 kWh. A barrel is a liquid measure equal to 42 gallons.

Baseload capacity:
The power output that generating equipment can continuously produce.

Baseload demand:
The minimum demand experienced by an electric utility, usually 30-40% of the utility's peak demand.

Best available control measures:
The most effective measures for controlling small or dispersed particulates from sources such as soot and ash from woodstoves and open burning of brush, timber, grasslands, or trash.

Best available control technology (BACT):
That combination of production processes, methods, systems, and techniques that will result in the lowest achievable level of emissions of air pollutants from a given facility. BACT is an emission limitation that the permitting authority determines on a case-by-case basis, taking into account energy, environmental, economic and other costs of control. BACT may include fuel cleaning or treatment or innovative fuel combustion techniques.

Best management practices (BMP):
A practice or combination of practices that a designated agency determines to be the most effective, practical means of reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

Bioaccumulants:
Substances in contaminated air, water, or food that increase in concentration in living organisms exposed to them because the substances are very slowly metabolized or excreted.

Bioassay:
A study of a living organism to measure the effect of a substance, factor, or condition.

Biochemical conversion process:
The use of living organisms or their products to convert organic material to fuels, chemicals or other products.

Biochemical oxygen demand (BOD):
A standard means of estimating the degree of water pollution, especially of water bodies that receive contamination from sewage and industrial waste. BOD is the amount of oxygen needed by bacteria and other microorganisms to decompose organic matter in water. The greater the BOD, the greater the degree of pollution. Biochemical oxygen demand is a process that occurs over a period of time and is commonly measured for a five-day period, referred to as BOD5.

Bioconcentration (Bioaccumulation):
The accumulation of a chemical in tissues of an organism to levels greater than in the environment in which the organism lives.

Biodegradable:
Capable of decomposing rapidly under natural conditions.

Biodiesel:
A biofuel produced through transesterification, a process in which organically-derived oils are combined with alcohol (ethanol or methanol) in the presence of a catalyst to form ethyl or methyl ester. The biomass-derived ethyl or methyl esters can be blended with conventional diesel fuel or used as a neat fuel (100% biodiesel). Biodiesel can be made from soybean or rapeseed oils, animal fats, waste vegetable oils or microalgae oils.

Biodiversity:
The relative abundance and variety of plant and animal species and ecosystems within particular habitats

Bioenergy (or Biomass energy):
Renewable energy produced from organic matter. The conversion of the complex carbohydrates in organic matter to energy. Organic matter may either be used directly as a fuel or processed into liquids or gases.

Biofuels:
Fuels made from biomass. Biofuels include ethanol, biodiesel and methanol.

Biogas:
A combustible gas derived from decomposing biological waste. Biogas normally consists of 50 to 60 percent methane.

Biological assessment:
A specific process required as part of an environmental assessment. The evaluation of the potential harmful effects of a proposed project on endangered or threatened and sensitive animal and plant species and their habitats.

Biological magnification:
The process by which substances such as pesticides or heavy metals become concentrated as they move up the food chain.

Biological oxidation:
Decomposition of organic materials by microorganisms.

Biomass:
Renewable organic matter such as agricultural crops and residue, wood and wood waste, animal waste, aquatic plants and organic components of municipal and industrial wastes.

Biomass fuel:
Liquid, solid or gaseous fuel produced by conversion of biomass.

Bioremediation:
The use of living organisms to clean up pollutants from soil or water.

Biosphere:
The portion of the Earth and its atmosphere that can support life.

Biotechnology:
Technology that use living organisms to produce products such as medicines, to improve plants or animals, or to produce microorganisms for bioremediation.

Biotic:
Pertaining to life or living organisms.

Biotic community:
A naturally occurring, interdependent community of plants and animals that live in the same environment.

Black Liquor (Pulping Liquor):
The alkaline spent liquor removed from the digesters in the process of chemically pulping wood. After evaporation, the liquor is burned as a fuel in a recovery furnace that permits the recovery of certain basic chemicals.

Block:
A repetition/replication of the Early, Mid and Late Serial Treatment plots and a Control plot. See Repetition/replication.

Board feet (BF):
Unit of measure for logs and lumber. One board foot is equivalent to a piece of wood 1 inch thick, 12 inches wide, and 12 inches long.

Boiler horsepower:
A measure of the maximum rate of heat energy output of a steam generator. One boiler horsepower equals 33,480 Btu/hr output in steam.

Boiler:
Any device used to burn biomass fuel to heat water for generating steam.

Bone Dry (BDU):
Having zero percent moisture content. Wood heated in an oven at a constant temperature of 212 degrees F or above until its weight stabilizes is considered bone dry or oven dry.

Bone dry ton (or "oven dry ton"):
The amount of wood that weighs 2,000 pounds at zero percent moisture content.

Bone dry unit (BDU):
A quantity of wood residue which weighs 2,400 pounds at zero percent moisture content.

Bottom ash:
Noncombustible ash that is left after solid fuel has been burned.

Bottoming cycle:
A cogeneration system in which steam is used first for process heat and then for electric power production.

British thermal unit (BTU):
A unit of heat energy equal to the heat needed to raise the temperature of one pound of water one degree Fahrenheit at one atmosphere pressure (sea level).

Bulk density:
Weight per unit of volume, usually specified in pounds per cubic foot.

Butane:
A gas derived from natural gas. Used as a component of gasoline. Used in liquefied petroleum gas (LPG) for domestic and industrial applications.

Butanol or butyl alcohol:
An alcohol with the chemical formula CH3 (CH2)3OH. It is formed during anaerobic fermentation using bacteria to convert the sugars to Butanol and carbon dioxide.

Back to Top

C

Carbon Dioxide:
A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential (GWP) of 1.

Carbon Monoxide:
Carbon monoxide is colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. Carbon monoxide interferes with blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects.

Capacity Factor:
The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full-power operation during the same period.

Capacity, Gross:
The full-load continuous rating of a generator, prime mover, or other electric equipment under specified conditions as designated by the manufacturer. It is usually indicated on a nameplate attached to the equipment.

Capacity, Net Summer:
See Net Summer Capacity.

Capital Cost:
The cost of field development and plant construction and the equipment required for the generation of electricity.

Cast Silicon:
Crystalline silicon obtained by pouring pure molten silicon into a vertical mold and adjusting the temperature gradient along the mold volume during cooling to obtain slow, vertically-advancing crystallization of the silicon. The polycrystalline ingot thus formed is composed of large, relatively parallel, interlocking crystals. The cast ingots are sawed into wafers for further fabrication into photovoltaic cells. Cast-silicon wafers and ribbon-silicon sheets fabricated into cells are usually referred to as polycrystalline photovoltaic cells.

Climate Change:
Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

Natural factors, such as changes in the sun's intensity or slow changes in the earth's orbit around the sun

Natural processes within the climate system (e.g. changes in ocean circulation)

Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.)

Coal:
Coal is formed from plant and animal matter that has been subjected to geologic heat and pressure, transformed over millions of years into hard black solids. Because coal is a readily available resource in the United States, coal power plants provide about half of the nation's electricity. However, coal-fired power plants generally cause more pollution per unit of electricity than any other fuel. Most coal plants are required to have several pollution control devices to reduce the amount of pollutants that are released into the air from burning the coal. These controls have played an important role in cleaning up air quality in many areas of the country.

Cogeneration:
See combined heat and power.

Combined Cycle:
An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. Such designs increase the efficiency of the electric generating unit.

Combined Heat and Power:
Combined heat and power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source. CHP is not a specific technology but an application of technologies to meet an energy user's needs. CHP systems achieve typical effective electric efficiencies of 50 to 80 percent — a dramatic improvement over the average efficiency of separate heat and power. Since CHP is highly efficient, it reduces traditional air pollutants and carbon dioxide, the leading greenhouse gas associated with climate change.

Commercial Energy Customer:
A commercial energy customer refers to non-industrial customers occupying retail space or office buildings.

Commercial Sector:
An energy-consuming sector that consists of service-providing facilities and equipment of: businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.

Competitive Markets:
Until recently, most consumers received generation, transmission, and distribution services from one local utility company. As a regulated monopoly, the utility was given an exclusive franchise to provide electricity to consumers in any particular community. Rates were set, and consumers had little choice but to pay that rate. In recent years, however, many states have restructured their electricity industry and are now allowing consumers to choose from among competing electricity suppliers.

In these states with retail competition, sellers of electricity obtain power by contracting with various generation sources and setting their own price. Consumers in these states have the opportunity to choose their energy provider and purchase products based on the price or type of power supplied to their home or business. Some consumers are exercising this choice and switching to accredited "green power" resources. In states that have not restructured their electricity markets, consumers interested in purchasing renewable energy now have the option to participate in green pricing programs offered by their local utility.

Concentrator:
A reflective or refractive device that focuses incident insolation (a measure of solar radiation) onto an area smaller than the reflective or refractive surface, resulting in increased insolation at the point of focus.

Conventional hydroelectric (hydropower) plant:
A plant in which all of the power is produced from natural stream flow as regulated by available storage.

Back to Top

D

Digester Gas:
Biogas that is produced using a digester which is an airtight vessel or enclosure in which bacteria decomposes biomass in water to produce biogas.

Direct Current (DC):
An electric current that flows in a constant direction. The magnitude of the current does not vary or has a slight variation.

Direct Current (DC):
An electric current that flows in a constant direction. The magnitude of the current does not vary or has a slight variation.

Distributed Generation (Distributed Energy Resources):
Refers to electricity provided by small, modular power generators (typically ranging in capacity from a few kilowatts to 50 megawatts) located at or near customer demand.

Dioxins:
Dioxins are man-made chemical compounds that enter the air through fuel and waste emissions, including motor vehicle exhaust fumes and garbage incineration. Skin rashes, liver damage, weight loss, and a reduction in the effectiveness of the immune system have all been attributed to human exposure to dioxins.

Back to Top

E

Electric power sector:
An energy-consuming sector that consists of electricity only and combined heat and power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public--i.e., North American Industry Classification System 22 plants.

Electricity Supplier:
As states restructure their electricity markets, an increasing number of customers will be able to choose from a range of energy suppliers who market different types of power products, including green power from renewable energy. Restructured local utilities offer electricity products generated exclusively from renewable resources or, more frequently, electricity produced from a combination of fossil and renewable resources. In states without restructured electricity markets, local utilities may offer green pricing programs, where customers may elect to have their utility generate a portion of their power from renewable sources.

Electric Utility:
A corporation, person, agency, authority, or other legal entity or instrumentality aligned with distribution facilities for delivery of electric energy for use primarily by the public. Included are investor-owned electric utilities, municipal and State utilities, Federal electric utilities, and rural electric cooperatives. A few entities that are tariff based and corporately aligned with companies that own distribution facilities are also included.
Note: Due to the issuance of FERC Order 888 that required traditional electric utilities to functionally unbundle their generation, transmission, and distribution operations, "electric utility" currently has inconsistent interpretations from State to State.

Electric Utility Restructuring:
The introduction of competition into at least the generation phase of electricity production, with a corresponding decrease in regulatory control.

Emissions:
Anthropogenic releases of gases to the atmosphere. In the context of global climate change, they consist of radiatively important greenhouse gases (e.g., the release of carbon dioxide during fuel combustion).

Energy Crops:
Crops grown specifically for their fuel value. These include food crops such as corn and sugarcane, and nonfood crops such as poplar trees and switchgrass. Currently, two energy crops are under development: short - rotation woody crops, which are fast - growing hardwood trees harvested in five to eight years, and herbaceous energy crops, such as perennial grasses, which are harvested annually after taking two to three years to reach full productivity.

Energy Efficiency:
Energy efficiency refers to products or systems using less energy to do the same or better job than conventional products or systems. Energy efficiency saves energy, saves money on utility bills, and helps protect the environment by reducing the amount of electricity that needs to be generated. When buying or replacing products or appliances for your home, look for the ENERGY STAR® label — the national symbol for energy efficiency.

Ethanol (also known as Ethyl Alcohol or Grain Alcohol, CH3-CH2OH):
A clear, colorless flammable oxygenated hydrocarbon with a boiling point of 173.5 degrees Fahrenheit in the anhydrous state. However it readily forms a binary azetrope with water, with a boiling point of 172.67 degrees Fahrenheit at a composition of 95.57 percent by weight ethanol. It is used in the United States as a gasoline octane enhancer and oxygenates (maximum 10 percent concentration). Ethanol can be used in higher concentrations (E85) in vehicles designed for its use. Ethanol is typically produced chemically from ethylene, or biologically from fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood. The lower heating value, equal to 76,000 Btu per gallon, is assumed for estimates in this report.

Evacuated Tube:
In a solar thermal collector, an absorber tube, which is contained in an evacuated glass cylinder, through which collector fluids flows?

Back to Top

F

Flat Plate Pumped:
A medium-temperature solar thermal collector that typically consists of a metal frame, glazing, absorbers (usually metal), and insulation and that uses a pump liquid as the heat-transfer medium: predominant use is in water heating applications.

Fossil Fuels:
Fossil fuels are the nation's principal source of electricity. The popularity of these fuels is largely due to their low costs. Fossil fuels come in three major forms-coal, oil, and natural gas. Because fossil fuels are a finite resource and cannot be replenished once they are extracted and burned, they are not considered renewable.

Fuel Cells:
One or more cells capable of generating an electrical current by converting the chemical energy of a fuel directly into electrical energy. Fuel cells differ from conventional electrical cells in that the active materials such as fuel and oxygen are not contained within the cell but are supplied from outside.

Fuelwood:
Wood and wood products, possibly including coppices, scrubs, branches, etc., bought or gathered, and used by direct combustion.

Back to Top

G

Generation (Electricity):
The process of producing electric energy from other forms of energy; also, the amount of electric energy produced, expressed in watt-hours (Wh).

Generation (Gross):
The total amount of electric energy produced by the generating units at a generating station or stations, measured at the generator terminals

Generation (Net):
Gross generation less the electric energy consumed at the generating station for station's use.

Geothermal Energy:
As used at electric power plants, hot water or steam extracted from geothermal reservoirs in the Earth's crust that is supplied to steam turbines at electric power plants that drive generators to produce electricity.

Geothermal Plant:
A plant in which a turbine is driven either from hot water or by natural steam that derives its energy from heat found in rocks or fluids at various depths beneath the surface of the earth. The fluids are extracted by drilling and/or pumping.

Giga:
One billion.

Global Climate Change:
Global climate change could result in sea level rises, changes to patterns of precipitation, increased variability in the weather, and a variety of other consequences. These changes threaten our health, agriculture, water resources, forests, wildlife, and coastal areas.

Green Power:
Electricity that is generated from renewable energy sources is often referred to as "green power." Green power products can include electricity generated exclusively from renewable resources or, more frequently, electricity produced from a combination of fossil and renewable resources. Also known as "blended" products, these products typically have lower prices than 100 percent renewable products. Customers who take advantage of these options usually pay a premium for having some or all of their electricity produced from renewable resources. To find out more about green power, visit EPA's Green Power Partnership Website.

Green Power Marketers:
Due to increased customer awareness of the environmental implications associated with power generation, a growing number of utilities and other types of energy service providers have begun offering green power products. The term "green power marketers" usually refers to energy providers operating in states that permit retail competition in the electricity markets. In states that do not allow this retail competition, many utilities have begun offering green power options under what are typically referred to as green pricing programs.

Green Power Purchasing:
Green power can be purchased nationwide from several sources. Green power marketers offer green power products to consumers in deregulated markets-such as New Jersey, Pennsylvania, and New England. In states that do not allow retail competition in the electricity markets, many utilities offer renewable energy products through green pricing programs.

In addition, all customers nationwide have the opportunity to buy renewable energy and stimulate the development of renewable generation sources through renewable energy certificates. Finally, customers can choose to install on-site renewable generation, such as solar panels.

Green Pricing:
Green pricing refers to an optional utility service that allows customers of traditional utilities support a greater level of utility investment in renewable energy by paying a premium on their electric bill to cover any above-market costs of acquiring renewable energy resources.

Grid:
The layout of an electrical distribution system.

Ground-level Ozone:
Ground-level ozone is formed by a chemical reaction between volatile organic compounds and oxides of nitrogen in the presence of sunlight. Ozone concentrations can reach unhealthful levels when the weather is hot and sunny with little or no wind. High concentrations of ozone near ground level are harmful to people, animals, crops, and other materials.

Back to Top

H

Hardwoods:
Usually broad-leaved and deciduous trees.

Haze:
Haze consists of sufficient smoke, dust, moisture, and vapor suspended in air to impair visibility. The term regional haze means haze that impairs visibility in all directions over a large area.

Heat Pump:
A year-round heating and air-conditioning system employing a refrigeration cycle. In a refrigeration cycle, a refrigerant is compressed (as a liquid) and expanded (as a vapor) to absorb and reject heat. The heat pump transfers heat to a space to be heated during the winter period and by reversing the operation extracts (absorbs) heat from the same space to be cooled during the summer period. The refrigerant within the heat pump in the heating mode absorbs the heat to be supplied to the space to be heated from an outside medium (air, ground or ground water) and in the cooling mode absorbs heat from the space to be cooled to be rejected to the outside medium.

Heat Pump (Air Source):
An air-source heat pump is the most common type of heat pump. The heat pump absorbs heat from the outside air and transfers the heat to the space to be heated in the heating mode. In the cooling mode the heat pump absorbs heat from the space to be cooled and rejects the heat to the outside air. In the heating mode when the outside air approaches 32o F or less, air-source heat pumps loose efficiency and generally require a back-up (resistance) heating system.

Heat Pump (efficiency):
The efficiency of a heat pump, that is, the electrical energy to operate it, is directly related to temperatures between which it operates. Geothermal heat pumps are more efficient than conventional heat pumps or air conditioners that use the outdoor air since the ground or ground water a few feet below the earth's surface remains relatively constant throughout the year. It is more efficient in the winter to draw heat from the relatively warm ground than from the atmosphere where the air temperature is much colder, and in summer transfer waste heat to the relatively cool ground than to hotter air. Geothermal heat pumps are generally more expensive ($2,000 $5,000) to install than outside air heat pumps. However, depending on the location geothermal heat pumps can reduce energy consumption (operating cost) and correspondingly, emissions by more than 20 percent compared to high efficiency outside air heat pumps. Geothermal heat pumps also use the waste heat from air-conditioning to provide free hot water heating in the summer.

Heat Pump (Geothermal):
A heat pump in which the refrigerant exchanges heat (in a heat exchanger) with a fluid circulating through an earth connection medium (ground or ground water). The fluid is contained in a variety of loop (pipe) configurations depending on the temperature of the ground and the ground area available. Loops may be installed horizontally or vertically in the ground or submersed in a body of water.

High-Temperature Collector:
A solar thermal collector designed to operate at a temperature of 180 degrees Fahrenheit or higher.

Hydroelectric Power (Large):
The process of generating electricity by harnessing the power of moving water is called hydroelectricity. Hydroelectric power (hydropower) is generated by forcing water that is flowing downstream, often from behind a dam, through a hydraulic turbine that is connected to a generator. The water exits the turbine and is returned to the stream or riverbed. Much of the hydroelectricity in the United States is generated at large facilities and in the Pacific Northwest, where it meets about two-thirds of the electricity demand. In the U. S., hydroelectricity contributes about 10 percent of the total electricity supply.

Back to Top

I

Incentives:
Subsidies and other Government actions where the Government's financial assistance is indirect.

Independent Power Producer (IPP):
A corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities for the generation of electricity for use primarily by the public, and that is not an electric utility.

Industrial Air Pollution:
This term refers to the emissions of the following pollutants: sulfur oxides, nitrogen oxides, mercury, and carbon dioxide. These air emissions contribute to such environmental concerns as urban smog; acid deposition; excessive nutrient loads to important bodies of water, such as the Chesapeake Bay; haze in national parks and wilderness areas; and global climate change.

Industrial Energy Customer:
Industrial energy customers include businesses involved in manufacturing or industrial processing.

Industrial Sector:
An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing (NAICS codes 31-33); agriculture, forestry, and fisheries (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); natural gas transmission (NAICS code 2212); and construction (NAICS code 23). Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities.

Internal Collector Storage (ICS):
A solar thermal collector in which incident solar radiation is absorbed by the storage medium.

Back to Top

K

Kilowatt (kW):
One thousand watts of electricity (See Watt).

Kilowatt-hour (kWh):
One thousand watt-hours.

Back to Top

L

Landfill Gas:
Gases that are generated by decomposition of organic material at landfill disposal sites. Landfill gas is approximately 50 percent methane.

Levelized Cost:
The present value of the total cost of building and operating a generating plant over its economic life, converted to equal annual payments. Costs are levelized in real dollars (i.e., adjusted to remove the impact of inflation).

Limited Liability Corporation (LLC):
A company that limits the liability of its participants to the assets they commit to the enterprise.

Line Losses:
The amount of energy lost during transmission and distribution of electricity, including unaccounted for uses.

Liquid Collector:
A medium-temperature solar thermal collector, employed predominantly in water heating, which uses pumped liquid as the heat-transfer medium.

Low-Temperature Collectors:
Metallic or nonmetallic solar thermal collectors that generally operate at temperatures below 110 degrees Fahrenheit and use pumped liquid or air as the heat transfer medium. They usually contain no glazing and no insulation, and they are often made of plastic or rubber, although some are made of metal.

Back to Top

M

Marginal Cost:
The change in cost associated with a unit change in quantity supplied or produced.

Medium-Temperature Collectors:
Solar thermal col-lectors designed to operate in the temperature range of 140 degrees to 180 degrees Fahrenheit, but that can also operate at a temperature as low as 110 degrees Fahrenheit. The collector typically consists of a metal frame, metal absorption panels with integral flow channels (attached tubing for liquid collectors or integral ducting for air collectors), and glazing and insulation on the sides and back.

Megawatt (MW):
One million watts of electricity (See Watt).

Mercury/Mercury Compounds:
Mercury is a toxic heavy metal that is a byproduct of thermo combustion of fossil fuels, especially coal. Mercury and compounds containing mercury can accumulate in the environment and are highly toxic to humans and animals if inhaled or swallowed. Exposure can permanently damage the brain, kidneys, and fetuses.

Methane (CH_4):
A hydrocarbon that is a greenhouse gas with a global warming potential most recently estimated at 23 times that of carbon dioxide (CO_2). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion. The global warming potential (GWP) is from the Intergovernmental Panel on Climate Change's (IPCC's) Third Assessment Report (TAR).

MTBE:
Methyl Tertiary Butyl Ether is a fuel oxygenate produced by reacting methanol with isobutylene.

MSW (Municipal Solid Waste):
Residential solid waste and some nonhazardous commercial, institutional, and industrial wastes.

Back to Top

N

Natural Gas:
Underground deposits of gases consisting of 50 to 90 percent methane (Ch3) and small amounts of heavier gaseous hydrocarbon compounds such as propane (C_3H_8) and butane (C_4H_{10}).

Net Metering:
Arrangement that permits a facility (using a meter that reads inflows and outflows of electricity) to sell any excess power it generates over its load requirement back to the electrical grid to offset consumption.

Net Photovoltaic Cell Shipment:
The difference between photovoltaic cell shipments and photovoltaic cell purchases.

Net Photovoltaic Module Shipment:
The difference between photovoltaic module shipments and photovoltaic module purchases.

Net summer capacity:
The maximum output, commonly expressed in megawatts (MW), that generating equipment can supply to system load, as demonstrated by a multi-hour test, at the time of summer peak demand (period of May 1 through October 31). This output reflects a reduction in capacity due to electricity use for station service or auxiliaries.

Nitrogen Oxides (NO_x):
Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere, nitrogen oxides can contribute to formation of photochemical ozone (smog), can impair visibility, and have health consequences; they are thus considered pollutants.

Nonutility Generation:
Electric generation by nonutility power producers to supply electric power for industrial, commercial, and military operations, or sales to electric utilities. See Nonutility Power Producer.

Nonutility Power Producer:
A corporation, person, agency, authority, or other legal entity or instrumentality that owns electric generating capacity and is not an electric utility. Nonutility power producers include qualifying cogenerators, qualifying small power producers, and other nonutility generators (including independent power producers) without a designated, franchised service area that do not file forms listed in the Code of Federal Regulations, Title 18, Part 141.

Nuclear Energy:
Nuclear energy originates from the splitting of uranium atoms in a process called fission. At the power plant, the fission process is used to generate heat for producing steam, which is used by a turbine to generate electricity. Because nuclear power plants do not burn fuel, they do not emit air pollutant emissions. All of the nuclear power plants in the United States collectively produce about 2,000 metric tons per year of radioactive waste. Abandoned uranium mines contaminated with high-level radioactive waste can continue to pose radioactive risks for as long as 250,000 years after closure. There are more than 60 nuclear power plants currently in operation in the U.S., which accounts for approximately 20 percent of the country's electricity production. No nuclear power plants have been built since 1996, mostly due to economic factors and environmental concerns.

Back to Top

O

Oil:
Oil, a liquid fossil fuel, is formed from layers of buried plants and animals that have been subjected to geologic heat and pressure over a long period of time. The energy that the plants and animals originally obtained from the sun is stored in the oil in the form of carbon. In addition to carbon, oil contains elements such as nitrogen, sulfur, mercury, lead, and arsenic. Oil is a nonrenewable resource because it cannot be replenished on a human time frame.

Operation and Maintenance (O&M) Cost:
Operating expenses are associated with operating a facility (i.e., supervising and engineering expenses). Maintenance expenses are that portion of expenses consisting of labor, materials, and other direct and indirect expenses incurred for preserving the operating efficiency or physical condition of utility plants that are used for power production, transmission, and distribution of energy.

Other Biomass:
This category of biomass energy includes: agricultural by products/crops (agricultural by products, straw); other biomass gas (digester gas, methane); other biomass liquids (fish oil, liquid acetonitrite, waste, tall oil, waste alcohol); other biomass solids (medical waste, solid by products; sludge waste and tires.

Back to Top

P

Paper Pellets:
Paper compressed and bound into uniform diameter pellets to be burned in a heating stove.

Parabolic Dish:
A high-temperature (above 180 degrees Fahrenheit) solar thermal concentrator, generally bowl-shaped, with two-axis tracking.

Parabolic Trough:
A high-temperature (above 180 degrees Fahrenheit) solar thermal concentrator with the capacity for tracking the sun using one axis of rotation.

Particulate Matter (PM):
Very small pieces of solid or liquid matter, such as particles of soot, dust, fumes, mists, or aerosols. The physical characteristics of particles, and how they combine with other particles, are part of the feedback mechanisms of the atmosphere.

Passive Solar:
A system in which solar energy alone is used for the transfer of thermal energy. Pumps, blowers, or other heat transfer devices that use energy other than solar are not used.

Peak Watt:
A manufacturer's unit indicating the amount of power a photovoltaic cell or module will produce at standard test conditions (normally 1,000 watts per square meter and 25 degrees Celsius).

Peat:
Peat consists of partially decomposed plant debris. It is considered an early stage in the development of coal. Peat is distinguished from lignite by the presence of free cellulose and a high moisture content (exceeding 70 percent). The heat content of air-dried peat (about 50 percent moisture) is about 9 million Btu per ton. Most U.S. peat is used as a soil conditioner. The first U.S. electric power plant fueled by peat began operation in Maine in 1990.

Photovoltaic (PV) Cell:
An electronic device consisting of layers of semiconductor materials fabricated to form a junction (adjacent layers of materials with different electronic characteristics) and electrical contacts and being capable of converting incident light directly into electricity (direct current).

Photovoltaic (PV) Module:
An integrated assembly of interconnected photovoltaic cells designed to deliver a selected level of working voltage and current at its output terminals, packaged for protection against environment degradation, and suited for incorporation in photovoltaic power systems.

Process Heating:
The direct process end use in which energy is used to raise the temperature of substances involved in the manufacturing process.

Production Tax Credit (PTC):
An inflation - adjusted 1.5 cents per kilowatt-hour payment for electricity produced using qualifying renewable energy sources.

Public Utility Regulatory Policies Act of 1978 (PURPA):
One part of the National Energy Act, PURPA contains measures designed to encourage the conservation of energy, more efficient use of resources, and equitable rates. Principal among these were suggested retail rate reforms and new incentives for production of electricity by cogenerators and users of renewable resources.

Pumped-storage hydroelectric plant:
A plant that usually generates electric energy during peak load periods by using water previously pumped into an elevated storage reservoir during off-peak periods when excess generating capacity is available to do so. When additional generating capacity is needed, the water can be released from the reservoir through a conduit to turbine generators located in a power plant at a lower level.

Back to Top

Q

Quadrillion Btu:
Equivalent to 10 to the 15th power Btu.

Qualifying Facility (QF):
A cogeneration or small power production facility that meets certain ownership, operating, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC) pursuant to the Public Utility Regulatory Policies Act of 1978 (PURPA). (See the Code of Federal Regulations, Title 18, Part 292.)

Back to Top

R

Renewable Energy:
The term renewable energy generally refers to electricity supplied from renewable energy sources, such as wind and solar power, geothermal, hydropower, and various forms of biomass. These energy sources are considered renewable sources because they are continuously replenished on the Earth.

Renewable Energy Resources:
Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Renewable Portfolio Standard (RPS):
A mandate requiring that renewable energy provide a certain percentage of total energy generation or consumption.

Retail Competition:
In states with retail competition, consumers have the opportunity to choose their energy provider and purchase products based on the price or on the source of power supplied to their home or business.

Residential Sector:
An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters.

Ribbon Silicon:
Single-crystal silicon derived by means of fabricating processes that produce sheets or ribbons of single-crystal silicon. These processes include edge-defined film-fed growth, dendritic web growth, and ribbon-to-ribbon growth.

Roundwood:
Wood cut specifically for use as a fuel.

Back to Top

S

Silicon:
A semiconductor material made from silica, purified for photovoltaic applications.

Single Crystal Silicon (Czochralski):
An extremely pure form of crystalline silicon produced by the Czochralski method of dipping a single crystal seed into a pool of molten silicon under high vacuum conditions and slowly withdrawing a solidifying single crystal boule rod of silicon. The boule is sawed into thin wafers and fabricated into single-crystal photovoltaic cells.

Sludge:
A dense, slushy, liquid-to-semifluid product that accumulates as an end result of an industrial or technological process designed to purify a substance. Industrial sludges are produced from the processing of energy-related raw materials, chemical products, water, mined ores, sewerage, and other natural and man-made products. Sludges can also form from natural processes, such as the run off produced by rain fall, and accumulate on the bottom of bogs, streams, lakes, and tidelands.

Small Hydro:
In addition to very large hydro plants in the West, the United States has many smaller hydro plants. Like large plants, small-scale hydroelectric systems capture the energy in flowing water and convert it to electricity. Although the potential for small hydroelectric systems depends on the availability of suitable water flow, these systems can provide cheap, clean, reliable electricity where the resource exists.

Smog:
Smog is the brownish haze that pollutes our air, particularly over cities in the summertime. Smog can make it difficult for some people to breathe and it greatly reduces how far we can see through the air. The primary component of smog is ozone, a gas that is created when nitrogen oxides react with other chemicals in the atmosphere, especially in strong sunlight.

Solar Energy:
The radiant energy of the sun, which can be converted into other forms of energy, such as heat or electricity.

Solar Thermal Collector:
A device designed to receive solar radiation and convert it into thermal energy. Normally, a solar thermal collector includes a frame, glazing, and an absorber, together with the appropriate insulation. The heat collected by the solar thermal collector may be used immediately or stored for later use.

Solar Thermal Collector, Special:
An evacuated tube collector or a concentrating (focusing) collector. Special collectors operate in the temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes).

Spent liquor:
The liquid residue left after an industrial process; can be a component of waste materials used as fuel.

Spent Sulfite Liquor:
The end product of pulp and paper manufacturing processes that contains lignins and has high moisture content; often re-used in recovery boilers. Similar to black liquor.

Subsidy:
Financial assistance granted by the Government to firms and individuals.

System Benefits Charge (SBC):
A non-bypassable fee on transmission interconnection; funds are allocated among public purposes, including the development and demonstration of renewable energy technologies.

Sulfur Dioxide:
High concentrations of sulfur dioxide affect breathing and may aggravate existing respiratory and cardiovascular disease. Sensitive populations include asthmatics, individuals with bronchitis or emphysema, children, and the elderly. Sulfur dioxide is also a primary contributor to acid rain, which causes acidification of lakes and streams and can damage trees, crops, historic buildings, and statues. In addition, sulfur compounds in the air contribute to visibility impairment in large parts of the country. This is especially noticeable in national parks. Sulfur dioxide is released primarily from burning fuels that contain sulfur (such as coal, oil, and diesel fuel). Stationary sources such as coal- and oil-fired power plants, steel mills, refineries, pulp and paper mills, and nonferrous smelters are the largest releasers.

Back to Top

T

Tall oil:
The oily mixture of rosin acids, fatty acids, and other materials obtained by acid treatment of the alkaline liquors from the digesting (pulping) of pine wood.

Thermosiphon System:
A solar collector system for water heating in which circulation of the collection fluid
through the storage loop is provided solely by the temperature and density difference between the hot and cold fluids.

Thin-Film Silicon:
A technology in which amorphous or polycrystalline material is used to make photovoltaic (PV) cells.

Transmission System (Electric):
An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers, or is delivered to other electric systems.

Transportation Sector:
An energy-consuming sector that consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of their primary use.

Turbine:
A machine for generating rotary mechanical power from the energy of a stream of fluid (such as water, steam, or hot gas). Turbines convert the kinetic energy of fluids to mechanical energy through the principles of impulse and reaction, or a mixture of the two.

Back to Top

U

Useful Thermal Output:
The thermal energy made available for use in any industrial or commercial process or used in any heating or cooling application, i.e., total thermal energy made available for processes and applications other than electrical generation.

Utility:
A utility is a municipal or private business that provides electricity to the public and is subject to governmental regulation.

Back to Top

W

Watt (Electric):
The electrical unit of power. The rate of energy transfer equivalent to 1 ampere of electric current flowing under a pressure of 1 volt at unity power factor.
Watt (Thermal): A unit of power in the metric system, expressed in terms of energy per second, equal to the work done at a rate of 1 joule per second.

Watt-Hour (Wh):
The electrical energy unit of measure equal to 1 watt of power supplied to, or taken from, an electric circuit steadily for 1 hour.

Wind Energy:
Energy present in wind motion that can be converted to mechanical energy for driving pumps, mills, and electric power generators. Wind pushes against sails, vanes, or blades radiating from a central rotating shaft.

Wind Power Plant:
A group of wind turbines interconnected to a common utility system through a system of transformers, distribution lines, and (usually) one substation. Operation, control, and maintenance functions are often centralized through a network of computerized monitoring systems, supplemented by visual inspection. This is a term commonly used in the United States. In Europe, it is called a generating station.

Wood/Wood Waste:
This category of biomass energy includes: black liquor; wood/wood waste liquids (red liquor, sludge wood, spent sulfite liquor); wood/wood waste solids (peat, paper pellets, railroad ties, utility poles, wood/wood waste).

Wood Energy:
Wood and wood products used as fuel, including round wood (cord wood), limb wood, wood chips, bark, sawdust, forest residues, charcoal, pulp waste, and spent pulping liquor.

Wood Pellets:
Sawdust compressed into uniform diameter pellets to be burned in a heating stove.

Back to Top

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