Chapter 11
Glossary of Land and Energy Resources Engineering

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Contents

Abstract Technical and legal terms commonly used by land pollution control engineers and energy engineers are introduced. This chapter covers mainly the glossary terms used in the following two books:

1. Natural Resources and Control Processes
2. Environmental and Natural Resources Engineering

The above two books form a miniseries in the field of natural resources management.

Keywords Natural resources engineering • Environmental engineering • Energy engineering • Glossary • Hydraulic fracturing • Radioactive waste management • Land pollution control • Landfill • Land treatment • Solid waste disposal • Electric power generation • Natural processes

Glossary of Land and Energy Resources Engineering

Abandoned vehicles It refers to any motor vehicles and trailers left on public or private property for an extended period of time and usually inoperable or in hazardous condition and with only scrap value (Washington, DC).

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Abandoned well It refers to a well that is no longer in use, whether dry, inoperable, or no longer productive.

Aboveground disposal It refers to the disposal of toxic or hazardous waste, such as low-level radioactive waste in engineered structures built such that all wastes are placed above final grade with no natural material cover. Aboveground disposal includes, but is not limited to, the use of aboveground vaults.

Absolute humidity The ratio of the mass of water vapor to the volume occupied by a mixture of water vapor and dry air.

Absorbed dose The amount of energy absorbed per unit mass in any kind of matter from any kind of ionizing radiation. Absorbed dose is measured in rads or grays.

Absorbent A material that extracts one or more substances from a fluid (gas or liquid) medium on contact and which changes physically and/or chemically in the process.

Absorber The component of a solar thermal collector that absorbs solar radiation and converts it to heat or, as in a solar photovoltaic device, the material that readily absorbs photons to generate charge carriers (free electrons or holes).

Absorption The passing of a substance or force into the body of another substance.

Absorption chiller A type of air-cooling device that uses absorption cooling to cool interior spaces.

Absorption coefficient In reference to a solar energy conversion devices, the degree to which a substance will absorb solar energy. In a solar photovoltaic device, the factor by which photons are absorbed as they travel a unit distance through a material.

Absorption cooling A process in which cooling of an interior space is accomplished by the evaporation of a volatile fluid, which is then absorbed in a strong solution, then desorbed under pressure by a heat source, and then recondensed at a temperature high enough that the heat of condensation can be rejected to a exterior space.

Absorption refrigeration A system in which a secondary fluid absorbs the refrigerant, releasing heat, then releases the refrigerant and reabsorbs the heat. Ammonia or water is used as the vapor in commercial absorption cycle systems, and water or lithium bromide is the absorber.

Absorptivity In a solar thermal system, the ratio of solar energy striking and absorbed by the absorber to the solar energy striking a black body (perfect absorber) at the same temperature. The absorptivity of a material is numerically equal to its emissivity.

Accent lighting Draws attention to special features or enhances the aesthetic qualities of an indoor or outdoor environment.

Accumulator A component of a heat pump that stores liquid and keeps it from flooding the compressor. The accumulator takes the strain off the compressor and improves the reliability of the system.

Accuracy The degree of agreement between a measurement and its true value. The accuracy of a data set is assessed by evaluating results from standards or spikes containing known quantities of an analyte.

Acid rain A term used to describe precipitation that has become acidic (low pH) due to the emission of sulfur oxides from fossil fuel burning power plants.

Action plan An action plan addresses assessment findings and root causes that have been identified in an audit or an assessment report. It is intended to set forth specific actions that the site will undertake to remedy deficiencies. The plan includes a timetable and funding requirements for implementation of the planned activities.

Active agricultural use It refers to lands used for agricultural purposes no less than two of the five calendar years.

Active cooling The use of mechanical heat pipes or pumps to transport heat by circulating heat-transfer fluids.

Active maintenance It refers to any significant activity needed during the period of institutional control to maintain a reasonable assurance that the performance objectives of the related state or federal environmental laws or regulations are met. Such active maintenance includes ongoing activities such as the pumping and treatment of water from a disposal unit or one-time measures such as repair or replacement of all or part of a disposal unit. Active maintenance does not include custodial activities such as fence repair, replacement or repair of monitoring equipment, revegetation, minor additions to soil cover, minor repair of disposal unit covers, and general disposal site upkeep such as mowing grass.

Active power The power (in watts) used by a device to produce useful work. Also called input power.

Active solar heater A solar water or space-heating system that uses pumps or fans to circulate the fluid (water or heat-transfer fluid like diluted antifreeze) from the solar collectors to a storage tank subsystem.

ACToR It is the USEPA's online warehouse of all publicly available chemical toxicity data, which can be used to find all publicly available data about potential chemical risks to human health and the environment. ACToR aggregates data from over 500 public sources on over 500,000 environmental chemicals searchable by chemical name, other identifiers, and chemical structure.

Adiabatic Without loss or gain of heat to a system. An adiabatic change is a change in volume and pressure of a parcel of gas without an exchange of heat between the parcel and its surroundings. In reference to a steam turbine, the adiabatic efficiency is the ratio of the work done per unit weight of steam, to the heat energy released, and theoretically capable of transformation into mechanical work during the adiabatic expansion of a unit weight of steam.

Adjustable speed drive An electronic device that controls the rotational speed of motor-driven equipment such as fans, pumps, and compressors. Speed control is achieved by adjusting the frequency of the voltage applied to the motor.

Adobe A building material made from clay, straw, and water, formed into blocks, and dried; used traditionally in the southwestern USA.

Advisory committee It refers to the advisory committee on siting and disposal method selection for permanent disposal facilities established pursuant to the appropriate state or federal environmental conservation laws or regulations.

Aerobic It refers to the life or processes that require, or are not destroyed by, the presence of oxygen.

Aerobic bacteria Microorganisms that require free oxygen, or air, to live and that which contribute to the decomposition of organic material in soil or composting systems.

Agricultural land It refers to a land on which agricultural animals, foods, feeds, fruits, Christmas trees, rubber trees, fiber crops, etc., are grown. This includes range land or land used as pasture.

Agronomic rate A rate of sludge application that is designed to (1) provide the amount of nitrogen needed by a crop or vegetation grown on the land and (2) minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the groundwater.

Air A mixture of gases that surrounds the Earth and forms its atmosphere, composed of, by volume, 20.95 % oxygen, 78.09 % nitrogen, 0.93 % argon, 0.039 % carbon dioxide, and small amounts of other gases. Air also contains a varible amount of water vapor, 0.4–1.0 % over entire atmosphere.

Air change A measure of the rate at which the air in an interior space is replaced by outside (or conditioned) air by ventilation and infiltration; usually measured in cubic feet per time interval (hour), divided by the volume of air in the room.

Air collector In solar heating systems, a type of solar collector in which air is heated in the collector.

Air conditioner A device for conditioning air in an interior space. A room air conditioner is a unit designed for installation in the wall or window of a room to deliver conditioned air without ducts. A unitary air conditioner is composed of one or more assemblies that usually include an evaporator or cooling coil, a compressor and condenser combination, and possibly a heating apparatus. A central air conditioner is designed to provide conditioned air from a central unit to a whole house with fans and ducts.

Air conditioning The control of the quality, quantity, and temperature humidity of the air in an interior space.

Air diffuser An air distribution outlet, typically located in the ceiling, which mixes conditioned air with room air.

Air infiltration measurement A building energy auditing technique used to determine and/or locate air leaks in a building shell or envelope.

Air pollution The presence of contaminants in the air in concentrations that prevent the normal dispersive ability of the air and that interfere with biological processes and human economics.

Air pollution control The use of devices to limit or prevent the release of pollution into the atmosphere.

Air quality standards The prescribed level of pollutants allowed in outside or indoor air as established by legislation.

Air register The component of a combustion device that regulates the amount of air entering the combustion chamber.

Air retarder/barrier A material or structural element that inhibits air flow into and out of a building's envelope or shell. This is a continuous sheet composed of polyethylene, polypropylene, or extruded polystyrene. The sheet is wrapped around the outside of a house during construction to reduce air infiltration and exfiltration, yet allow water to easily diffuse through it.

Air space The area between the layers of glazing (panes) of a window.

Airlock entry A building architectural element (vestibule) with two airtight doors that reduce the amount of air infiltration and exfiltration when the exterior most door is opened.

Air-source heat pump A type of heat pump that transfers heat from outdoor air to indoor air during the heating season and works in reverse during the cooling season.

Airtight drywall approach (ADA) A building construction technique used to create a continuous air retarder that uses the drywall, gaskets, and caulking. Gaskets are used rather than caulking to seal the drywall at the top and bottom. Although it is an effective energy-saving technique, it was designed to keep airborne moisture from damaging insulation and building materials within the wall cavity.

Air-to-air heat pump See air-source heat pump.

Air-to-water heat pump A type of heat pump that transfers heat in outdoor air to water for space or water heating.

Albedo The ratio of light reflected by a surface to the light falling on it.

Alcohol A group of organic compounds composed of carbon, hydrogen, and oxygen; a series of molecules composed of a hydrocarbon plus a hydroxyl group; includes methanol, ethanol, isopropyl alcohol, and others.

Algae Primitive plants, usually aquatic, capable of synthesizing their own food by photosynthesis.

Alluvial fan A cone-shaped deposit of alluvium made by a stream where it runs out onto a level plain.

Alluvium Sedimentary material deposited by flowing water such as a river.

Alpha radiation The least penetrating type of radiation. Alpha radiation can be stopped by a sheet of paper or the outer dead layer of skin.

Alternating current A type of electrical current, the direction of which is reversed at regular intervals or cycles; in the USA, the standard is 120 reversals or 60 cycles per second; typically abbreviated as AC.

Alternative fuels A popular term for "nonconventional" transportation fuels derived from natural gas (propane, compressed natural gas, methanol, etc.) or biomass materials (ethanol, methanol).

Alternator A generator producing alternating current by the rotation of its rotor and which is powered by a primary mover.

Ambient lighting Provides general illumination indoors for daily activities, and outdoors for safety and security.

Ambient air The air external to a building or device.

Ambient temperature The temperature of a medium, such as gas or liquid, which comes into contact with or surrounds an apparatus or building element.

Ammonia A colorless, pungent, gas (NH_3) that is extremely soluble in water may be used as a refrigerant; a fixed nitrogen form suitable as fertilizer.

Amorphous semiconductor A noncrystalline semiconductor material that has no long-range order.

Ampere A unit of measure for an electrical current; the amount of current that flows in a circuit at an electromotive force of one volt and at a resistance of one ohm. Abbreviated as amp.

Amp-hours A measure of the flow of current (in amperes) over one hour.

Anaerobic bacteria Microorganisms that live in oxygen-deprived environments.

Anaerobic digester A device for optimizing the anaerobic digestion of biomass and/or animal manure and possibly to recover biogas for energy production. Digester types include batch, complete mix, continuous flow (horizontal or plug flow, multiple tank, and vertical tank), and covered lagoon.

Anaerobic digestion (1) A complex process by which organic matter is decomposed by anaerobic bacteria. The decomposition process produces a gaseous by-product often called "biogas" primarily composed of methane, carbon dioxide, and hydrogen sulfide. (2) An aerobic biological process involving the fermentation of organic sludge waste by anaerobic hydrolytic microorganisms and the production of fatty acids, carbon dioxide (CO_2), and hydrogen (H_2). Short fatty acids are then converted into acetic acid (CH_3COOH), H_2, CO_2.

Anaerobic It refers to the life or process that occurs in, or is not destroyed by, the absence of oxygen.

Anaerobic lagoon A holding pond for livestock manure that is designed to anaerobically stabilize manure and may be designed to capture biogas, with the use of an impermeable, floating cover.

Analyte It refers to a substance or chemical constituent being analyzed and 3019 of the US Resource Conservation and Recovery Act (RCRA) and the regulations promulgated pursuant to these sections, including the US 40 CFR Parts 260 through 272.

Anemometer An instrument for measuring the force or velocity of wind; a wind gauge.

Angle of incidence In reference to solar energy systems, the angle at which direct sunlight strikes a surface, the angle between the direction of the sun and perpendicular to the surface. Sunlight with an incident angle of 90° tends to be absorbed, while lower angles tend to be reflected.

Angle of inclination In reference to solar energy systems, the angle that a solar collector is positioned above horizontal.

Angstrom unit A unit of length named for A. J. Angstome, a Swedish spectroscopist, used in measuring electromagnetic radiation equal to 0.000,000,01 cm, or 10^{-10}m.

Anhydrous ethanol One hundred percent alcohol, neat ethanol.

Annual fuel utilization efficiency (AFUE) The measure of seasonal or annual efficiency of a residential heating furnace or boiler. It takes into account the cyclic on/off operation and associated energy losses of the heating unit as it responds to changes in the load, which in turn is affected by changes in weather and occupant controls.

Annual load fraction That fraction of annual energy demand supplied by a solar system.

Annual pollutant loading rate (APLR) The maximum amount of a pollutant that can be applied to a unit area of land during a 365-day period. This term describes pollutant limits for sewage sludge that is given away or sold in a bag or other container for application to the land.

Annual solar savings The annual solar savings of a solar building is the energy savings attributable to a solar feature relative to the energy requirements of a nonsolar building.

Annual whole sludge application rate The maximum amount of sewage sludge on a dry weight basis that can be applied to a land application site during a 365-day (l year) period.

Anode The positive pole or electrode of an electrolytic cell, vacuum tube, etc. (see also sacrificial anode).

Anthracite (Coal) A hard, dense type of coal, which is hard to break, clean to handle, difficult to ignite, and burns with an intense flame and with the virtual absence of smoke because it contains a high percentage of fixed carbon and a low percentage of volatile matter.

Anthropogenic Referring to alterations in the environment due to the presence or activities of humans.

Antifreeze solution A fluid, such as methanol or ethylene glycol, added to vehicle engine coolant or used in solar heating system heat-transfer fluids, to protect the systems from freezing.

Antireflection coating A thin coating of a material applied to a photovoltaic cell surface that reduces the light reflection and increases light transmission.

Aperture An opening; in solar collectors, the area through which solar radiation is admitted and directed to the absorber.

Apparent day A solar day; an interval between successive transits of the sun's center across an observer's meridian; the time thus measured is not equal to clock time.

Apparent power (kVA) This is the voltage-ampere requirement of a device designed to convert electric energy to a nonelectrical form.

Appliance (1) A device for converting one form of energy or fuel into useful energy or work. (2) An instrument or apparatus.

Appliance energy efficiency ratings The ratings under which specified appliances convert energy sources into useful energy, as determined by procedures established by the US Department of Energy.

Aquiclude It refers to an impermeable body of rock that may absorb water slowly, but does not transmit it.

Aquifer A water-bearing unit of permeable rock or soil that will yield water in usable quantities to wells. *Confined aquifers* are bounded above and below by less permeable layers. Groundwater in a confined aquifer is under a pressure greater than the atmospheric pressure. *Unconfined aquifers* are bounded below by less permeable material but are not bounded above. The pressure on the groundwater at the surface of an unconfined aquifer is equal to that of the atmosphere.

Aquifer It refers to an underground geological formation, or group of formations, containing water, which is a source of groundwater for wells and springs.

Aquitard It is a geological formation that may contain groundwater but is not capable of transmitting significant quantities of it under normal hydraulic gradients.

Area of cropland An area of cropland that is not a single field and has been subdivided into several strips, and each strip represents an individual field unit.

Argon A colorless, odorless inert gas sometimes used in the spaces between the panes in energy-efficient windows. This gas is used because it will transfer less heat than air. Therefore, it provides additional protection against conduction and convection of heat over conventional double-pane windows.

Array (solar) Any number of solar photovoltaic modules or solar thermal collectors or reflectors connected together to provide electrical or thermal energy.

As low as reasonably achievable (ALARA) It takes into account the state of technology and the economics of improvements in relation to (1) benefits to the environment and public health and safety, (2) other societal and socioeconomic considerations, (3) the utilization of radioactive materials in the public interest, and (4) an approach to radiation protection that advocates controlling or managing exposures (both individual and collective) to the work force and the general public and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. As used in the US Department of Energy, ALARA is not a dose limit but, rather, a process that has as its objective the attainment of dose levels as far below the applicable limits of the order as practicable.

Ashes (1) Noncombustible residue from the burning of wood, coal, coke, and other combustible materials in homes, stores, institutions, and industrial establishments for the purpose of heating, cooking, and disposing of waste combustible material and, unless otherwise specified, does not include tin cans, scrap metal, and glass (Baltimore County, MD). (2) The residue from the burning of wood, coal, coke, or other combustible materials (Washington, DC). (3) The residue of the combustion of solid fuels (Bettendorf, IA). (4) They include noncombustible residue from the burning of wood, coal, and other combustible materials in homes, stores, institutions, and industrial establishments for the purpose of heating, cooking, and disposing of waste combustible material (Prince George's County, MD).

ASHRAE Abbreviation for the American Society of Heating, Refrigeration, and Air-Conditioning Engineers.

Assay It refers to a test for a specific chemical, microbe, or effect.

Assets It refers to all existing and all probable future economic benefits obtained or controlled by a particular entity.

ASTM Abbreviation for the American Society for Testing and Materials, which is responsible for the issue of many standard methods used in the energy industry.

Asynchronous generator A type of electric generator that produces alternating current that matches an existing power source.

Atmospheric pressure The pressure of the air at sea level; one standard atmosphere at zero degrees centigrade is equal to 14.695 lb per square inch (1.033 kg per square centimeter).

Atrium An interior court to which rooms open.

Attic The usually unfinished space above a ceiling and below a roof.

Attic fan A fan mounted on an attic wall used to exhaust warm attic air to the outside.

Attic vent A passive or mechanical device used to ventilate an attic space, primarily to reduce heat buildup and moisture condensation.

Audit (energy) The process of determining energy consumption, by various techniques, of a building or facility.

Automatic (or remote) meter reading system A system that records the consumption of electricity, gas, water, etc., and sends the data to a central data accumulation device.

Automatic damper A device that cuts off the flow of hot or cold air to or from a room as controlled by a thermostat.

Auxiliary energy or system Energy required to operate mechanical components of an energy system, or a source of energy or energy supply system to back up another.

Availability Describes the reliability of power plants. It refers to the number of hours that a power plant is available to produce power divided by the total hours in a set time period, usually a year.

Available heat The amount of heat energy that may be converted into useful energy from a fuel.

Average demand The demand on, or the power output of, an electrical system or any of its parts over an interval of time, as determined by the total number of kilowatt-hours divided by the units of time in the interval.

Average master file A method of calculating the average raw wastewater concentration for each pollutant of interest in a subcategory. The average master file was calculated using all available data collected in the landfills industry study.

Average wind speed (or velocity) The mean wind speed over a specified period of time.

Avoided cost The incremental cost to an electric power producer to generate or purchase a unit of electricity or capacity or both.

AWG The abbreviation for American wire gauge; the standard for gauging the size of wires (electrical conductors).

Awning An architectural element for shading windows and wall surfaces placed on the exterior of a building; can be fixed or movable.

Axial fans Fans in which the direction of the flow of the air from inlet to outlet remains unchanged; includes propeller, tubaxial, and vaneaxial type fans.

Axial flow compressor A type of air compressor in which air is compressed in a series of stages as it flows axially through a decreasing tubular area.

Axial flow turbine A turbine in which the flow of a steam or gas is essentially parallel to the rotor axis.

Azimuth (solar) The angle between true south and the point on the horizon directly below the sun.

Backdrafting The flow of air down a flue/chimney and into a house caused by low indoor air pressure that can occur when using several fans or fireplaces and/or if the house is very tight.

Background radiation Natural and man-made radiation such as cosmic radiation and radiation from naturally radioactive elements and from commercial sources and medical procedures.

Backup energy system A reserve appliance; for example, a standby generator for a home or commercial building.

Bacteria Single-celled organisms, free-living or parasitic, that break down the wastes and bodies of dead organisms, making their components available for reuse by other organisms.

Baffle A device, such as a steel plate, used to check, retard, or divert a flow of a material.

Bagasse The fibrous material remaining after the extraction of juice from sugarcane; often burned by sugar mills as a source of energy.

Bagged sewage sludge Sewage sludge that is sold or given away in a bag or other container (i.e., either an open or closed receptacle containing 1 metric ton or less of sewage sludge).

Baghouse An air pollution control device used to filter particulates from waste combustion gases; a chamber containing a bag filter.

Balance point An outdoor temperature, usually 20–45 °F, at which a heat pump's output equals the heating demand. Below the balance point, supplementary heat is needed.

Balance of system In a renewable energy system, refers to all components other than the mechanism used to harvest the resource (such as photovoltaic panels or a wind turbine). Balance-of-system costs can include design, land, site preparation, system installation, support structures, power conditioning, operation and maintenance, and storage.

Baling A means of reducing the volume of a material by compaction into a bale.

Ballast A device used to control the voltage in a fluorescent lamp.

Ballast efficacy factor The measure of the efficiency of fluorescent lamp ballasts. It is the relative light output divided by the power input.

Ballast factor The ratio of light output of a fluorescent lamp operated on a ballast to the light output of a lamp operated on a standard or reference ballast.

Band gap In a semiconductor, the energy difference between the highest valence band and the lowest conduction band.

Band gap energy The amount of energy (in electron volts) required to free an outer shell electron from its orbit about the nucleus to a free state and thus promote it from the valence to the conduction level.

Barrel (petroleum) 42 US gallons (306 lb of oil, or 5.78 million Btu).

Basal metabolism The amount of heat given off by a person at rest in a comfortable environment; approximately 50 Btu per hour (Btu/h).

Base power Power generated by a power generator that operates at a very high capacity factor.

Baseboard radiator A type of radiant heating system where the radiator is located along an exterior wall where the wall meets the floor.

Baseline flow Estimated air, water, or wastewater discharge flow rate for a selected facility in specific time.

Baseload capacity The power output of a power plant that can be continuously produced.

Baseload demand The minimum demand experienced by a power plant.

Baseload power plant A power plant that is normally operated to generate a base load and that usually operates at a constant load; examples include coal-fired and nuclear-fueled power plants.

Basement The conditioned or unconditioned space below the main living area or primary floor of a building.

BAT (best available technology) See best available technology (BAT).

Batch heater This simple passive solar hot water system consists of one or more storage tanks placed in an insulated box that has a glazed side facing the sun. A batch heater is mounted on the ground or on the roof (make sure your roof structure is strong enough to support it). Some batch heaters use "selective" surfaces on the tank(s). These surfaces absorb sun well but inhibit radiative loss. Also known as bread box systems or integral collector storage systems.

Batch process A process for carrying out a reaction in which the reactants are fed in discrete and successive charges.

Batt/blanket A flexible roll or strip of insulating material in widths suited to standard spacings of building structural members (studs and joists). They are made from glass or rock wool fibers. Blankets are continuous rolls. Batts are precut to four or eight foot lengths.

Battery An energy storage device composed of one or more electrolyte cells.

Battery energy storage Energy storage using electrochemical batteries. The three main applications for battery energy storage systems include spinning reserve at generating stations, load leveling at substations, and peak shaving on the customer side of the meter.

BCT (best conventional pollutant control technology) See best conventional pollutant control technology (BCT).

Beadwall A form of movable insulation that uses tiny polystyrene beads blown into the space between two window panes.

Beam radiation Solar radiation that is not scattered by dust or water droplets.

Bearing wall A wall that carries ceiling rafters or roof trusses.

Becquerel (Bq) A unit of radioactivity equal to one nuclear transformation per second.

Belowground disposal It refers to the disposal of toxic or hazardous waste, such as low-level radioactive waste, such that all wastes are placed totally below final grade in engineered structures which are located within the upper 30 m of the Earth's surface and are covered with natural material. Belowground disposal methods include, but are not limited to, buried vaults, lined augered holes, and earth-mounded bunkers.

Benefits charge The addition of a per unit tax on sales of electricity, with the revenue generated used for or to encourage investments in energy efficiency measures and/or renewable energy projects.

Best available technology (BAT) In the USA, it means the best available technology economically achievable, applicable to effluent limitations to be achieved by July 1, 1984, for industrial discharges to surface waters, as defined by Sec. 304(b)(2)(B) of the Clean Water Act (CWA).

Best conventional pollutant control technology (BCT) In the USA, it is applicable to discharges of conventional pollutants from existing industrial point sources, as defined by Sec. 304(b)(4) of the Clean Water Act (CWA).

Best management practice (BMP) A method that has been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint and point sources.

Best practicable control technology currently available (BPT) In the USA, it is applicable to effluent limitations to be achieved by July 1, 1977, for industrial discharges to surface waters, as defined by Sec. *304(b)(1)* of the Clean Water Act (CWA).

Beta radiation Electrons emitted from a nucleus during fission and nuclear decay. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

Bimetal Two metals of different coefficients of expansion welded together so that the piece will bend in one direction when heated, and in the other when cooled, and can be used to open or close electrical circuits, as in thermostats.

Bin method A method of predicting heating and/or cooling loads using instantaneous load calculation at different outdoor dry-bulb temperatures and multiplying the result by the number of hours of occurrence of each temperature.

Binary cycle Combination of two power plant turbine cycles utilizing two different working fluids for power production. The waste heat from the first turbine cycle provides the heat energy for the operation of the second turbine, thus providing higher overall system efficiencies.

Binary cycle geothermal plants Binary cycle systems can be used with liquids at temperatures less than 350°F (177°C). In these systems, the hot geothermal liquid vaporizes a secondary working fluid, which then drives a turbine.

Biochemical oxygen demand, five-day (BOD_5) The weight of oxygen taken up mainly as a result of the oxidation of the constituents of a sample of water by

biological action; expressed as the number of parts per million of oxygen taken up by the sample from water originally saturated with air, usually over a period of five days at 20° centigrade. A standard means of estimating the degree of contamination of water. See five-day biochemical oxygen demand (BOD_5).

Biocide It refers to any substance that kills or retards the growth of microorganisms.

Bioconversion The conversion of one form of energy into another by the action of plants or microorganisms. The conversion of biomass to ethanol, methanol, or methane.

Biodegradation It refers to the chemical breakdown of materials under natural conditions.

Bioenergy The conversion of the complex carbohydrates in organic material into energy.

Biogas (1) A combustible gas created by anaerobic decomposition of organic material, composed primarily of methane, carbon dioxide, and hydrogen sulfide and (2) a product from anaerobic digestion containing gases such as methane (CH_4), CO_2, and trace elements. Biogas can be used as a source of energy.

Biogasification or biomethanization The process of decomposing biomass with anaerobic bacteria to produce biogas.

Biomass As defined by the Energy Security Act (PL 96-294) of 1980, "any organic matter which is available on a renewable basis, including agricultural crops and agricultural wastes and residues, wood and wood wastes and residues, animal wastes, municipal wastes, and aquatic plants."

Biomass energy Energy produced by the conversion of biomass directly to heat or to a liquid or gas that can be converted to energy.

Biomass fuel Biomass converted directly to energy or converted to liquid or gaseous fuels such as ethanol, methanol, methane, and hydrogen.

Biomass gasification The conversion of biomass into a gas, by biogasification (see above) or thermal gasification, in which hydrogen is produced from high-temperature gasifying and low-temperature pyrolysis of biomass.

Biophotolysis The action of light on a biological system that results in the dissociation of a substrate, usually water, to produce hydrogen.

Biosolids Biosolids are solids, semisolids, or liquid materials, resulting from biological treatment of domestic sewage that has been sufficiently processed to permit these materials to be safely land applied. The term biosolids was introduced by the wastewater treatment industry in the early 1990s and has been recently adopted by the United States Environmental Protection Agency (US EPA) to distinguish high-quality, treated sewage sludge from raw sewage sludge and from sewage sludge containing large amounts of pollutants.

Blackbody An ideal substance that absorbs all radiation falling on it and reflecting nothing.

Blower The device in an air conditioner that distributes the filtered air from the return duct over the cooling coil/heat exchanger. This circulated air is cooled/

heated and then sent through the supply duct, past dampers, and through supply diffusers to the living/working space.

Blower door A device used by energy auditors to pressurize a building to locate places of air leakage and energy loss.

Blown in insulation (see also loose fill) An insulation product composed of loose fibers or fiber pellets that are blown into building cavities or attics using special pneumatic equipment.

Boiler A vessel or tank where heat produced from the combustion of fuels such as natural gas, fuel oil, or coal is used to generate hot water or steam for applications ranging from building space heating to electric power production or industrial process heat.

Boiler feedwater The water that is forced into a boiler to take the place of that which is evaporated in the generation of steam.

Boiler horsepower A unit of rate of water evaporation equal to the evaporation per hour of 34.5 lb (15.66 kg) of water at a temperature of 212°F (100°C) into steam at 212°F (100°C).

Boiler pressure The pressure of the steam or water in a boiler as measured; usually expressed in pounds per square inch gauge (psig).

Boiler rating The heating capacity of a steam boiler; expressed in Btu per hour (Btu/h), or horsepower, or pounds of steam per hour.

Bone (oven) dry In reference to solid biomass fuels, such as wood, having zero moisture content.

Bone dry unit A quantity of (solid) biomass fuel equal to 2400 lb bone dry.

Booster pump A pump for circulating the heat-transfer fluid in a hydronic heating system.

Boot In heating and cooling system distribution ductwork, the transformation pieces connecting horizontal round leaders to vertical rectangular stacks.

Boron The chemical element commonly used as the dopant in solar photovoltaic device or cell material.

Bottled gas A generic term for liquefied and pressurized gas, ordinarily butane, propane, or a mixture of the two, contained in a cylinder for domestic use.

Bottoming-cycle A means to increase the thermal efficiency of a steam electric generating system by converting some waste heat from the condenser into electricity. The heat engine in a bottoming cycle would be a condensing turbine similar in principle to a steam turbine but operating with a different working fluid at a much lower temperature and pressure.

BPT (best practicable control technology currently available) See the best practicable control technology currently available (BPT).

Brayton cycle A thermodynamic cycle using constant pressure, heat addition, and rejection, representing the idealized behavior of the working fluid in a gas turbine-type heat engine.

Bread box system This simple passive solar hot water system consists of one or more storage tanks placed in an insulated box that has a glazed side facing the sun. A bread box system is mounted on the ground or on the roof (make sure

your roof structure is strong enough to support it). Some systems use "selective" surfaces on the tank(s). These surfaces absorb sun well but inhibit radiative loss. Also known as batch heaters or integral collector storage systems.

Brine Water saturated or strongly impregnated with salt.

British thermal unit (Btu) The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit; equal to 252 cal.

Buffer zone It refers to a portion of the disposal site that is controlled by the licensee and that lies under the disposal units and between the disposal units and the boundary of the site.

Building debris or waste It includes any refuse or residue resulting from minor noncommercial repairs to a private dwelling made by the owner or occupant thereof himself (Bettendorf, IA), and (2) it includes any and all refuse or residue resulting directly from building construction, reconstruction, repair or demolition; from grading, shrubbing, or other incidental work in connection with any premises; or from replacement of building equipment or appliances (Bettendorf, IA).

Building energy ratio The space-conditioning load of a building.

Building envelope The structural elements (walls, roof, floor, foundation) of a building that encloses conditioned space; the building shell.

Building heat-loss factor A measure of the heating requirements of a building expressed in Btu per degree day.

Building orientation The relationship of a building to true south, as specified by the direction of its longest axis.

Building overall energy loss coefficient-area product The factor, when multiplied by the monthly degree days, that yields the monthly space-heating load.

Building overall heat-loss rate The overall rate of heat loss from a building by means of transmission plus infiltration, expressed in Btu per hour, per degree temperature difference between the inside and outside.

Bulb The transparent or opaque sphere in an electric light that the electric light transmits through.

Bulb turbine A type of hydroturbine in which the entire generator is mounted inside the water passageway as an integral unit with the turbine. These installations can offer significant reductions in the size of the powerhouse.

Bulk density The weight of a material per unit of volume compared to the weight of the same volume of water.

Bulk refuse or waste (1) Any waste articles more than eight feet (2.44 m) in length or more than fifty pounds (22.7 kg) in weight, tree trimmings and hedge trimmings over five inches (12.7 cm) in diameter or over four feet (1.22 m) in length, and tree roots or stumps larger than can be contained in a bushel basket (Bettendorf, IA) and (2) any large items of solid waste such as appliances, furniture, large auto parts, tree and branches, stumps, flotage, and the like (Washington, DC).

Bulk sewage sludge Sewage sludge that is not sold or given away in a bag or other container for application to the land.

Burner capacity The maximum heat output (in Btu per hour) released by a burner with a stable flame and satisfactory combustion.

Burning point The temperature at which a material ignites.

Bus (electrical) An electrical conductor that serves as a common connection for two or more electrical circuits; may be in the form of rigid bars or stranded conductors or cables.

Busbar The power conduit of an electric power plant; the starting point of the electric transmission system.

Busbar cost The cost of producing electricity up to the point of the power plant busbar.

Bypass An alternative path. In a heating duct or pipe, an alternative path for the flow of the heat-transfer fluid from one point to another, as determined by the opening or closing of control valves both in the primary line and the bypass line.

Cage The component of an electric motor composed of solid bars (of usually copper or aluminum) arranged in a circle and connected to continuous rings at each end. This cage fits inside the stator in an induction motor in channels between laminations, thin flat disks of steel in a ring configuration.

Calorie The amount of heat required to raise the temperature of a unit of water, at or near the temperature of maximum density, one degree Celsius (or centigrade [C]); expressed as a "small calorie" (the amount of heat required to raise the temperature of 1 g of water one degree C) or as a "large calorie" or "kilogram calorie" (the amount of heat required to raise one kilogram [1,000 g] of water one degree C); capitalization of the word calorie indicates a kilogram calorie.

Calorific value The heat liberated by the combustion of a unit quantity of a fuel under specific conditions; measured in calories.

Candela The luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency $540 \times 1{,}012$ Hz and that has a radiant intensity in that direction of 1/683 W per steradian.

Candle power The illuminating power of a standard candle employed as a unit for determining the illuminating quality of an illuminant.

Capability The maximum load that a generating unit, power plant, or other electrical apparatus can carry under specified conditions for a given period of time, without exceeding its approved limits of temperature and stress.

Capability margin The difference between net electrical system capability and system maximum load requirements (peak load); the margin of capability available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen loads.

Capacitance A measure of the electrical charge of a capacitor consisting of two plates separated by an insulating material.

Capacitor An electrical device that adjusts the leading current of an applied alternating current to balance the lag of the circuit to provide a high power factor.

Capacity The load that a power generation unit or other electrical apparatus or heating unit is rated by the manufacture to be able to meet or supply.

Capacity (condensing unit) The refrigerating effect in Btu/h produced by the difference in total enthalpy between a refrigerant liquid leaving the unit and the total enthalpy of the refrigerant vapor entering it. Generally measured in tons or Btu/h.

Capacity (effective, of a motor) The maximum load that a motor is capable of supplying.

Capacity (heating, of a material) The amount of heat energy needed to raise the temperature of a given mass of a substance by one degree Celsius. The heat required to raise the temperature of 1 kg of water by 1 °C is 4186 J.

Capacity factor The ratio of the average load on (or power output of) a generating unit or system to the capacity rating of the unit or system over a specified period of time.

CAPDET It refers to the computer-assisted procedure for the design and evaluation of wastewater treatment systems, which was developed by the US Army Corp. of Engineers (CAPDET), is intended to provide planning level cost estimates to analyze alternate design technologies for wastewater treatment systems.

Capital costs The amount of money needed to purchase equipment, buildings, tools, and other manufactured goods that can be used in production.

Captive A term used to describe a facility that only accepts wastes generated on site and/or by the landfill owner/operator at the facility.

Carbon dioxide A colorless, odorless noncombustible gas with the formula CO_2 that is present in the atmosphere. It is formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass), by respiration, which is a slow combustion in animals and plants, and by the gradual oxidation of organic matter in the soil.

Carbon monoxide A colorless, odorless but poisonous combustible gas with the formula CO. Carbon monoxide is produced in the incomplete combustion of carbon and carbon compounds such as fossil fuels (i.e., coal, petroleum) and their products (e.g., liquefied petroleum gas, gasoline) and biomass.

Carbon zinc cell battery A cell produces electric energy by the galvanic oxidation of carbon; commonly used in household appliances.

Carnot cycle An ideal heat engine (conceived by Sadi Carnot) in which the sequence of operations forming the working cycle consists of isothermal expansion, adiabatic expansion, isothermal compression, and adiabatic compression back to its initial state.

Casing It refers to the pipe cemented in the well to seal off formation fluids and to keep the hole from caving in.

Catalytic converter An air pollution control device that removes organic contaminants by oxidizing them into carbon dioxide and water through a chemical reaction using a catalysis, which is a substance that increases (or decreases) the rate of a chemical reaction without being changed itself; required in all automobiles sold in the United States and used in some types of heating appliances.

Categorical exclusion A proposed action that normally does not require an environmental assessment or an environmental impact statement and that the responsible environmental agency has determined does not individually or cumulatively have a significant effect on the human environment.

Cathedral ceiling/roof A type of ceiling and roof assembly that has no attic.

Cathode The negative pole or electrode of an electrolytic cell, vacuum tube, etc., where electrons enter (current leaves) the system; the opposite of an anode.

Cathode disconnect ballast An electromagnetic ballast that disconnects a lamp's electrode heating circuit once it has started; often called "low-frequency electronic" ballasts.

Cathodic protection A method of preventing oxidation of the exposed metal in structures by imposing between the structure and the ground a small electrical voltage.

Caulking A material used to seal areas of potential air leakage into or out of a building envelope.

Ceiling The downward facing structural element that is directly opposite the floor.

Ceiling concentration limits (CCL) The *ceiling concentration limits* are the maximum concentrations of the nine trace elements allowed in biosolids to be land applied. Sewage sludge exceeding the ceiling concentration limit for even one of the regulated pollutants is not classified as biosolids and, hence, cannot be land applied.

Ceiling fan A mechanical device used for air circulation and to provide cooling.

Cell (landfill) An area of a landfill that is separated from other areas by an impervious structure. Each cell has a separate leachate collection system or would require a separate leachate collection system if one were installed. Individual leachate collection systems that are combined at the surface are considered separate systems by this definition.

Cell (electrical) A component of an electrochemical battery. A "primary" cell consists of two dissimilar elements, known as "electrodes," immersed in a liquid or paste known as the "electrolyte." A direct current of 1–1.5 V will be produced by this cell. A "secondary" cell or accumulator is a similar design but is made useful by passing a direct current of correct strength through it in a certain direction. Each of these cells will produce 2 V; a 12 V car battery contains six cells.

Cellulase An enzyme complex, produced by fungi and bacteria, capable of decomposing cellulose into small fragments, primarily glucose.

Cellulose The fundamental constituent of all vegetative tissue; the most abundant material in the world.

Cellulose insulation A type of insulation composed of waste newspaper, cardboard, or other forms of waste paper.

Central heating system A system where heat is supplied to areas of a building from a single appliance through a network of ducts or pipes.

Central power plant A large power plant that generates power for distribution to multiple customers.

Central receiver solar power plants Also known as "power towers," these use fields of two-axis tracking mirrors known as heliostats. Each heliostat is individually positioned by a computer control system to reflect the sun's rays to a tower-mounted thermal receiver. The effect of many heliostats reflecting to a common point creates the combined energy of thousands of suns, which produces high-temperature thermal energy. In the receiver, molten nitrate salts absorb the heat energy. The hot salt is then used to boil water to steam, which is sent to a conventional steam turbine generator to produce electricity.

Certification It refers to a decision issued by the state government pursuant to the State Environmental Conservation Law to the effect that one or two proposed disposal sites and the disposal method or methods proposed for use at such site or sites are in conformance with the applicable provisions of the state or federal environmental laws or regulations.

Cetane number A measure of a fuel's (liquid) ease of self-ignition (CFR 122.2).

Char A by-product of low-temperature carbonization of a solid fuel.

Charcoal A material formed from the incomplete combustion or destructive distillation (carbonization) of organic material in a kiln or retort and having a high-energy density, being nearly pure carbon. (If produced from coal, it is coke.) Used for cooking, the manufacture of gunpowder and steel (notably in Brazil), as an absorbent and decolorizing agent, and in sugar refining and solvent recovery.

Charge carrier A free and mobile conduction electron or hole in a semiconductor.

Charge controller An electronic device that regulates the electrical charge stored in batteries so that unsafe, overcharge conditions for the batteries are avoided.

Chemical energy The energy liberated in a chemical reaction, as in the combustion of fuels.

Chemical oxygen demand (COD) It is a wastewater quality index that chemically determines the amount of oxygen demand in water or wastewater in accordance with the standard methods.

Chemical vapor deposition (CVD) A method of depositing thin semiconductor films used to make certain types of solar photovoltaic devices. With this method, a substrate is exposed to one or more vaporized compounds, one or more of which contain desirable constituents. A chemical reaction is initiated, at or near the substrate surface, to produce the desired material that will condense on the substrate.

Chiller A device for removing heat from a gas or liquid stream for air conditioning/cooling.

Chimney A masonry or metal stack that creates a draft to bring air to a fire and to carry the gaseous by-products of combustion safely away.

Chimney effect The tendency of heated air or gas to rise in a duct or other vertical passage, such as in a chimney, small enclosure, or building, due to its lower density compared to the surrounding air or gas.

Chlorofluorocarbon (CFC) A family of chemicals composed primarily of carbon, hydrogen, chlorine, and fluorine whose principal applications are as

refrigerants and industrial cleansers and whose principal drawback is the tendency to destroy the Earth's protective ozone layer.

Circuit A device, or system of devices, that allows electrical current to flow through it and allows voltage to occur across positive and negative terminals.

Circuit breaker A device used to interrupt or break an electrical circuit when an overload condition exists; usually installed in the positive circuit; used to protect electrical equipment.

Circuit lag As time increases from zero at the terminals of an inductor, the voltage comes to a particular value on the sine function curve ahead of the current. The voltage reaches its negative peak exactly 90° before the current reaches its negative peak; thus, the current lags behind by 90°.

Circulating fluidized bed A type of furnace or reactor in which the emission of sulfur compounds is lowered by the addition of crushed limestone in the fluidized bed, thus obviating the need for much of the expensive stack gas cleanup equipment. The particles are collected and recirculated, after passing through a conventional bed and cooled by boiler internals.

City waste collectors It refers to any person or firm employed by the city from time to time to collect and dispose of household waste, institutional waste, commercial waste, or building debris from within the confines of the city (Bettendorf, IA).

Class A, B, and C low-level wastes Waste classifications in the USA from the US Nuclear Regulatory Commission's 10 CFR Part 61 rule. Maximum concentration limits are set for specific isotopes. (1) Class A waste disposal is minimally restricted with respect to the form of the waste. (2) Class B waste must meet more rigorous requirements to ensure physical stability after disposal. (3) Greater concentration limits are set for the same isotopes in Class C waste, which also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

Class I sludge management facility Publicly owned treatment works (POTWs), required to have an approved pretreatment program under 40 *CFR* 403.8(a), including any POTW located in a state that has elected to assume local pretreatment program responsibilities under 40 *CFR* 403.10(e). In addition, the regional administrator or, in the case of approved state programs, the regional administrator in conjunction with the state director has the discretion to designate any treatment works treating domestic sewage (TWTDS) as a Class I sludge management facility.

Clean power generator A company or other organizational unit that produces electricity from sources that are thought to be environmentally cleaner than traditional sources. Clean, or green, power is usually defined as power from renewable energy that comes from wind, solar, biomass energy, etc. There are various definitions of clean resources. Some definitions include power produced from waste-to-energy and wood-fired plants that may still produce significant air emissions. Some states have defined certain local resources as clean that other states would not consider clean. For example, the State of Texas has defined

power from efficient natural gas-fired power plants as clean. Some northwest states include power from large hydropower projects as clean, although these projects damage fish populations. Various states have disclosure and labeling requirement for generation source and air emissions that assist customers in comparing electricity characteristics other than price. This allows customers to decide for themselves what they consider to be "clean." The federal government is also exploring this issue.

Clean water act (CWA) The US Federal Water Pollution Control Act Amendments of 1972, Public Law 92–500. It contians a number of provisions to restore and maintain the quality of the US water resources.

Cleavage of lateral epitaxial films for transfer (CLEFT) A process for making inexpensive gallium arsenide (GaAs) photovoltaic cells in which a thin film of GaAs is grown atop a thick, single-crystal GaAs (or other suitable material) substrate and then is cleaved from the substrate and incorporated into a cell, allowing the substrate to be reused to grow more thin-film GaAs.

Clerestory A window located high in a wall near the eaves that allows daylight into a building interior and may be used for ventilation and solar heat gain.

Climate The prevailing or average weather conditions of a geographic region.

Climate change A term used to describe short- and long-term effects on the Earth's climate as a result of human activities such as fossil fuel combustion and vegetation clearing and burning.

Close coupled An energy system in which the fuel production equipment is in close proximity, or connected, to the fuel using equipment.

Closed A facility or portion thereof that is currently not receiving or accepting wastes and has undergone final closure.

Closed cycle A system in which a working fluid is used over and over without introduction of new fluid, as in a hydronic heating system or mechanical refrigeration system.

Closed-loop biomass As defined by the Comprehensive National Energy Act of 1992 (or the Energy Policy Act): any organic matter from a plant which is planted for the exclusive purpose of being used to produce energy. This does not include wood or agricultural wastes or standing timber.

Closed-loop geothermal heat pump systems Closed-loop (also known as "indirect") systems circulate a solution of water and antifreeze through a series of sealed loops of piping. Once the heat has been transferred into or out of the solution, the solution is recirculated. The loops can be installed in the ground horizontally or vertically, or they can be placed in a body of water, such as a pond. See horizontal ground loop, vertical ground loop, slinky ground loop, and surface water loop for more information on the different types of closed-loop geothermal heat pump systems.

Closure period It refers to the period of time after the operation period during which facility closure is carried out and site closure and stabilization is completed.

Closure plan It refers to the plan for site closure and stabilization prepared as required by the state or federal environmental laws or regulations.

Coal One of the fuels formed in the ground from the remains of dead plants and animals. It takes millions of years to form fossil fuels. Coal is a black mineral material that burns. Other fossil fuels include oil, natural gas, etc.

Coalbed It refers to a geological layer or stratum of coal parallel to the rock stratification.

Coal-fired (Thermoelectric) power plant A power plant that produces electricity by the force of steam through a turbine that spins a generator. The steam is produced by burning the coal.

Codes Legal documents that regulate construction to protect the health, safety, and welfare of people. Codes establish minimum standards but do not guarantee efficiency or quality.

Coefficient of heat transmission (U-value) A value that describes the ability of a material to conduct heat. The number of Btu that flows through 1 square foot of material, in one hour. It is the reciprocal of the R-value (U-value = 1/R-value).

Coefficient of performance (COP) A ratio of the work or useful energy output of a system versus the amount of work or energy inputted into the system as determined by using the same energy equivalents for energy in and out. It is used as a measure of the steady-state performance or energy efficiency of heating, cooling, and refrigeration appliances. The COP is equal to the energy efficiency ratio (EER) divided by 3.412. The higher the COP, the more efficient the device.

Coefficient of utilization (CU) A term used for lighting appliances; the ratio of lumens received on a flat surface to the light output, in lumens, from a lamp; used to evaluate the effectiveness of luminaries in delivering light.

Cofiring The use of two or more different fuels (e.g., wood and coal) simultaneously in the same combustion chamber of a power plant.

Cogeneration The generation of electricity or shaft power by an energy conversion system and the concurrent use of rejected thermal energy from the conversion system as an auxiliary energy source.

Cogenerator A class of energy producer that produces both heat and electricity from a single fuel.

Coil As a component of a heating or cooling appliance, rows of tubing, or pipe with fins attached through which a heat-transfer fluid is circulated and to deliver heat or cooling energy to a building.

Coincidence factor The ratio of the coincident, maximum demand, or two or more loads to the sum of their noncoincident maximum demand for a given period; the reciprocal of the diversity factor and is always less than or equal to one.

Coincident demand The demand of a consumer of electricity at the time of a power supplier's peak system demand.

Cold night sky The low effective temperature of the sky on a clear night.

Collective dose equivalent The sum of the dose equivalents for all the individuals comprising a defined population. The per capita dose equivalent is the quotient

of the collective dose equivalent divided by the population. The unit of collective dose equivalent is person-rem or person-sievert.

Collective effective dose equivalent The sum of the effective dose equivalents for the individuals comprising a defined population. Units of measurement are person-rems or person-sieverts. The per capita effective dose equivalent is obtained by dividing the collective dose equivalent by the population. Units of measurement are rems or sieverts.

Collector The component of a solar energy heating system that collects solar radiation and that contains components to absorb solar radiation and transfer the heat to a heat-transfer fluid (air or liquid).

Collector efficiency The ratio of solar radiation captured and transferred to the collector (heat transfer) fluid.

Collector fluid The fluid, liquid (water or water/antifreeze solution), or air, used to absorb solar energy and transfer it for direct use, indirect heating of interior air or domestic water, and/or to a heat storage medium.

Collector tilt The angle that a solar collector is positioned from horizontal.

Color rendition How colors appear when illuminated by a light source. Color rendition is generally considered to be a more important lighting quality than color temperature. Most objects are not a single color, but a combination of many colors. Light sources that are deficient in certain colors may change the apparent color of an object. The color rendition index (CRI) is a 1–100 scale that measures a light source's ability to render colors the same way sunlight does. The top value of the CRI scale (100) is based on illumination by a 100-W incandescent light bulb. A light source with a CRI of 80 or higher is considered acceptable for most indoor residential applications.

Color rendition (rendering) index (CRI) A measure of light quality. The maximum CRI value of 100 is given to natural daylight and incandescent lighting. The closer a lamp's CRI rating is to 100, the better is its ability to show true colors to the human eye.

Color temperature The color of the light source. By convention, yellow-red colors (like the flames of a fire) are considered warm, and blue-green colors (like light from an overcast sky) are considered cool. Color temperature is measured in Kelvin (K) temperature. Confusingly, higher Kelvin temperatures (3,600–5,500 K) are what we consider cool and lower color temperatures (2,700–3,000 K) are considered warm. Cool light is preferred for visual tasks because it produces higher contrast than warm light. Warm light is preferred for living spaces because it is more flattering to skin tones and clothing. A color temperature of 2700–3600 K is generally recommended for most indoor general and task lighting applications.

Combined-cycle power plant A power plant that uses two thermodynamic cycles to achieve higher overall system efficiency; e.g., the heat from a gas-fired combustion turbine is used to generate steam for heating or to operate a steam turbine to generate additional electricity.

Combustible rubbish It includes miscellaneous burnable materials (Washington, DC).

Combustion The process of burning; the oxidation of a material by applying heat, which unites oxygen with a material or fuel.

Combustion air Air that provides the necessary oxygen for complete, clean combustion and maximum heating value.

Combustion chamber Any wholly or partially enclosed space in which combustion takes place.

Combustion gases The gaseous by-products of the combustion of a fuel.

Combustion power plant A power plant that generates power by combusting a fuel.

Combustion turbine A turbine that generates power from the combustion of a fuel.

Comfort zone A frequently used room or area that is maintained at a more comfortable level than the rest of the house; also known as a "warm room."

Commendable practice (self-assessment) A significant strength noted during the course of a self-assessment.

Comment or concern (self-assessment) A comment is a subjective opinion of the assessment team that may be used to improve any of the specific environmental monitoring program activities, noted in *Self-Assessments for Environmental Programs,* such as sample collection, preparation, logging, storage, and shipping; instrument and equipment calibration; data receipt and data entry; training requirements and records; and compliance with discharge permit requirements. Corrective action in response to a comment or concern is at the discretion of the cognizant staff.

Commercial building A building with more than 50% of its floor space used for commercial activities, which include stores, offices, schools, churches, libraries, museums, healthcare facilities, warehouses, and government buildings except those on military bases.

Commercial establishment (1) Any hotel, motel, apartment house, rooming house, or tourist court which contains three or more service units and any other building, business, or establishment of any nature or kind whatsoever other than a residential unit; and (2) any hotel, motel, apartment house, rooming house, or tourist court which contains three or more service units, and any other building, business, or establishment of any nature or kind whatsoever other than a residential unit (Miami, FL).

Commercial facility A facility that treats, disposes, or recycles/recovers the wastes of other facilities not under the same ownership as this facility. Commercial operations are usually made available for a fee or other remuneration. Commercial waste treatment, disposal, or recycling/recovery does not have to be the primary activity at a facility for an operation or unit to be considered "commercial."

Commercial garbage It includes all garbage produced by grocery stores; produce markets; restaurants; schools, public, private, or parochial; hospitals; or any commercial or other establishment that processes, sells, or services food or food products (Wichita, KS).

Commercial refuse It includes refuse from wholesale and retail stores, including but not limited to restaurants, florists, beauty shops, barbershops, doctor offices, variety stores, hardware stores, and other enterprises of this classification in the local government's zoning regulations (Baltimore County, MD).

Commercial sector Consists of businesses that are not engaged in transportation or manufacturing or other types of industrial activities. Standard Industrial Classification (SIC) codes for commercial establishments are 50 through 87, 89, and 91 through 97.

Commercial waste It includes garbage, rubbish, mixed refuse, and cool ashes originating in and around commercial establishments, industrial establishments, hotels, restaurants, cafeterias, grocery stores, and nonpublic institutions (Bettendorf, IA).

Commissioning The process by which a power plant, apparatus, or building is approved for operation based on observed or measured operation that meets design specifications.

Committed dose equivalent A measure of internal radiation. The predicted total dose equivalent to a tissue or organ over a fifty-year period after a known intake of a radionuclide into the body. It does not include contributions from sources of external penetrating radiation. Committed dose equivalent is measured in rems or sieverts.

Committed effective dose equivalent The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is measured in rems or sieverts.

Compact fluorescent A smaller version of standard fluorescent lamps which can directly replace standard incandescent lights. These lights consist of a gas-filled tube and a magnetic or electronic ballast.

Compactor collection vehicle It refers to any enclosed vehicles provided with special mechanical devices for conveying the refuse into the main compartment of the body and compressing the loaded materials (Washington, DC).

Complete mix digester A type of anaerobic digester that has a mechanical mixing system and where temperature and volume are controlled to maximize the anaerobic digestion process for biological waste treatment, methane production, and odor control.

Compliance findings Conditions that may not satisfy applicable environmental or safety and health regulations, US DOE Orders and memoranda, enforcement actions, agreements with regulatory agencies, or permit conditions.

Composting (1) The process of degrading organic material (biomass) by microorganisms in aerobic conditions. (2) It is a process involving collecting organic waste, such as food scraps and yard trimmings, and storing it under conditions designed to help it break down naturally. This resulting compost can then be used as a natural fertilizer (US EPA). (3) It is a controlled microbial degradation of organic waste, yielding a nuisance-free product of potential value as a soil conditioner (Washington, DC). (4) It is a biological process for biological

reduction, stabilization, and conversion of putrescible and other organic solid wastes to a non-putrescible manner (Boulder, CO).

Compound paraboloid collector A form of solar concentrating collector that does not track the sun.

Compressed air storage The storage of compressed air in a container for use to operate a prime mover for electricity generation.

Compressed natural gas (CNG) Natural gas (methane) that has been compressed to a higher pressure gaseous state by a compressor; used in CNG vehicles.

Compression chiller A cooling device that uses mechanical energy to produce chilled water.

Compressor A device used to compress air for mechanical or electrical power production and in air conditioners, heat pumps, and refrigerators to pressurize the refrigerant, enabling it to flow through the system.

Concentrating (solar) collector A solar collector that uses reflective surfaces to concentrate sunlight onto a small area, where it is absorbed and converted to heat or, in the case of solar photovoltaic (PV) devices, into electricity. Concentrators can increase the power flux of sunlight hundreds of times. The principal types of concentrating collectors include compound parabolic, parabolic trough, fixed reflector moving receiver, fixed receiver moving reflector, Fresnel lens, and central receiver. A PV concentrating module uses optical elements (Fresnel lens) to increase the amount of sunlight incident onto a PV cell. Concentrating PV modules/arrays must track the sun and use only the direct sunlight because the diffuse portion cannot be focused onto the PV cells. Concentrating collectors for home or small business solar water heating applications are usually parabolic troughs that concentrate the sun's energy on an absorber tube (called a receiver), which contains a heat-transfer fluid.

Concentrated animal feeding operations (CAFO) An agricultural operation that raises livestock within a restricted space, known as feedlot.

Condensate The liquid resulting when water vapor contacts a cool surface; also the liquid resulting when a vaporized working fluid (such as a refrigerant) is cooled or depressurized.

Condensation The process by which water in air changes from a vapor to a liquid due to a change in temperature or pressure; occurs when water vapor reaches its dew point (condensation point); also used to express the existence of liquid water on a surface.

Condenser The device in an air conditioner or heat pump in which the refrigerant condenses from a gas to a liquid when it is depressurized or cooled.

Condenser coil The device in an air conditioner or heat pump through which the refrigerant is circulated and releases heat to the surroundings when a fan blows outside air over the coils. This will return the hot vapor that entered the coil into a hot liquid upon exiting the coil.

Condensing furnace A type of heating appliance that extracts so much of the available heat content from a combusted fuel that the moisture in the combustion gases condenses before it leaves the furnace. Also this furnace circulates a liquid

to cool the furnace's heat exchanger. The heated liquid may either circulate through a liquid-to-air heat exchanger to warm room air, or it may circulate through a coil inside a separate indirect-fired water heater.

Condensing unit The component of a central air conditioner that is designed to remove heat absorbed by the refrigerant and transfer it outside the conditioned space.

Conditioned space The interior space of a building that is heated or cooled.

Conduction The transfer of heat through a material by the transfer of kinetic energy from particle to particle; the flow of heat between two materials of different temperatures that are in direct physical contact.

Conduction band An energy band in a semiconductor in which electrons can move freely in a solid, producing a net transport of charge.

Conductivity (thermal) This is a positive constant, k, that is a property of a substance and is used in the calculation of heat-transfer rates for materials. It is the amount of heat that flows through a specified area and thickness of a material over a specified period of time when there is a temperature difference of one degree between the surfaces of the material.

Conductor The material through which electricity is transmitted, such as an electrical wire, or transmission or distribution line.

Conduit A tubular material used to encase and protect one or more electrical conductors.

Confidence coefficient or factor The chance or probability, usually expressed as a percentage, that a confidence interval includes some defined parameter of a population. The confidence coefficients usually associated with confidence intervals are 90 %, 95 %, and 99 %.

Connected load The sum of the ratings of the electricity consuming apparatus connected to a generating system.

Connection charge An amount paid by a customer for being connected to an electricity supplier's transmission and distribution system.

Conservation To reduce or avoid the consumption of a resource or commodity.

Conservation cost adjustment A means of billing electric power consumers to pay for the costs of demand side management/energy conservation measures and programs (see also benefits charge).

Consistency The condition of showing steady conformity to practices. In the environmental monitoring program, approved procedures are in place in order to ensure that data collection activities are carried out in a consistent manner so that variability is minimized.

Constant dollars The value or purchasing power of a dollar in a specified year carried forward or backward.

Constant-speed wind turbines Wind turbines that operate at a constant rotor revolutions per minute (RPM) and are optimized for energy capture at a given rotor diameter at a particular speed in the wind power curve.

Constructed wetland It is a treatment method that uses plants (most commonly water hyacinth and duckweed) in a wetland environment to degrade organic materials.

Construction and demolition wastes They include the waste building materials and rubble, resulting from construction, remodeling, repair, and demolition operation on houses, commercial buildings, pavements, and other structures (Washington, DC).

Consumption charge The part of a power provider's charge based on actual energy consumed by the customer; the product of the kilowatt-hour rate and the total kilowatt-hours consumed.

Contact resistance The resistance between metallic contacts and the semiconductor.

Contaminated groundwater Water below the land surface in the zone of saturation which has been contaminated by landfill leachate or other sources of pollution, such as the wastewater from hydraulic fracturing operation. Contaminated groundwater occurs at landfills without liners or at facilities that have released contaminants from a process system. Groundwater may also become contaminated if the water table rises to a point where it infiltrates the landfill or the leachate collection system, or the hydraulic fracturing system, or others.

Contaminated storm water Storm water which comes in direct contact with the ground, or waste or waste storage/handling and treatment areas. Storm water which does not come into contact with the wastes is not subject to the government required limitations and standards.

Continuous fermentation A steady-state fermentation process.

Contrast The difference between the brightness of an object compared to that of its immediate background.

Convection The transfer of heat by means of air currents.

Conventional fuel The fossil fuels: coal, oil, and natural gas.

Conventional heat pump This type of heat pump is known as an air-to-air system.

Conventional pollutants Constituents of wastewater as determined by Sec. 304(a)(4) of the US Clean Water Act (CWA), including pollutants classified as biochemical oxygen demand, total suspended solids, oil and grease, fecal coliform, and pH.

Conventional power Power generation from sources such as petroleum, natural gas, or coal. In some cases, large-scale hydropower and nuclear power generation are considered conventional sources.

Conversion efficiency The amount of energy produced as a percentage of the amount of energy consumed.

Converter A device for transforming the quality and quantity of electrical energy; also an inverter.

Cooling capacity The quantity of heat that a cooling appliance is capable of removing from a room in one hour.

Cooling degree day A value used to estimate interior air-cooling requirements (load) calculated as the number of degrees per day (over a specified period) that

the daily average temperature is above 65°F (or some other, specified base temperature). The daily average temperature is the mean of the maximum and minimum temperatures recorded for a specific location for a 24-h period.

Cooling load That amount of cooling energy to be supplied (or heat and humidity removed) based on the sensible and latent loads.

Cooling pond A body of water used to cool the water that is circulated in an electric power plant.

Cooling tower A structure used to cool power plant water; water is pumped to the top of the tubular tower and sprayed out into the center, is cooled by evaporation as it falls, and then is either recycled within the plant or is discharged.

Coproducts The potentially useful by-products of ethanol fermentation process.

Cord (of wood) A stack of wood 4 ft by 4 ft by 8 ft (1.22 m × 1.22 m × 2.44 m).

Cosmic radiation High-energy subatomic particles from outer space that bombard the Earth's atmosphere. Cosmic radiation is part of natural background radiation.

Coulomb A unit for the quantity of electricity transported in 1 s by a current of 1 A.

Counterflow heat exchanger A heat exchanger in which two fluids flow in opposite directions for transfer heat energy from one to the other.

Counting error The variability caused by the inherent random nature of radioactive disintegration and by the detection process.

Covenants Restrictions on the use of a property.

Crawlspace The unoccupied, and usually unfinished and unconditioned, space between the floor, foundation walls, and the slab or ground of a building.

Creosote A liquid by-product of wood combustion (or distillation) that condenses on the internal surfaces of vents and chimneys, which if not removed regularly can corrode the surfaces and fuel a chimney fire.

Critical compression pressure The highest possible pressure in a fuel-air mixture before spontaneous ignition occurs.

Crop group Individual farm fields that are managed in the same manner, with the similar yield goals, are called a *crop group*

Crop management The management involves crop group identification, crop nitrogen deficit determination, crop nitrogen fertilizer rate calculation, crop yield optimization.

Crop nitrogen deficit (CND) Crop nitrogen deficit (CND) equals to anticipated crop nitrogen fertilizer rate (CNFR) minus all past PAN sources (PAN-past) and current planned non-biosolids PAN sources (PAN-plan), in the unit of lb N/acre. Previous biosolids carry-over nitrogen is included in this calculation.

Crop nitrogen fertilizer rate (CNFR) CNFR is a rate (lb N/acre) = (Yield) (UNFR), where UNFR is the unit nitrogen fertilizer rate (lb N/unit crop yield) and Yield is the crop harvested or crop yield (bu/acre or ton/acre)

Crop year The basic time management unit is often called the *crop year* or *planting season*. The *crop year* is defined as the year in which a crop receiving the biosolids/manure treatment is harvested. For example, fall applications of biosolids/manure in 2000 intended to provide nutrients for a crop to be harvested in 2001 are earmarked for *crop year* 2001. Likewise, biosolids/manure applied

immediately prior to planting winter wheat in October 2000 should be identified as fertilizer intended for *crop year* 2001 because the wheat will be harvested in the summer of 2001.

Crop yield It is the crop harvested in the unit of bu/acre or ton/acre.

Crystalline silicon photovoltaic cell A type of photovoltaic cell made from a single crystal or a polycrystalline slice of silicon. Crystalline silicon cells can be joined together to form a module (or panel).

Cube law In reference to wind energy, for any given instant, the power available in the wind is proportional to the cube of the wind velocity; when wind speed doubles, the power availability increases eight times.

Cubic foot or cubic meter (of natural gas) A unit of volume equal to 1 cubic foot or 1 cubic meter at a pressure base of 14.73 lb standard per square inch absolute (101,560 N standard per square meter absolute) and a temperature base of 60°F (15.55°C).

Cumulative pollutant loading rate (CPLR) CPLR equals to the total amount of pollutant that can be applied to a site in its lifetime by all bulk biosolids applications meeting CCL. It is the maximum amount of an inorganic pollutant that can be applied to an area of land. This term applies to bulk sewage sludge that is land applied.

Curie (Ci) (1) A unit of radioactivity equal to 37 billion (3.7×10^{10}) nuclear transformations per second; (2) amount of radioactive material which disintegrates at the rate of 37 billion atoms per second.

Current (electrical) The flow of electrical energy (electricity) in a conductor, measured in amperes.

Current cost estimate It refers to the most recent of the cost estimates prepared in accordance with the state or federal environmental laws or regulations.

Current dollars (1) The value or purchasing power of a dollar that has not been reduced to a common basis of constant purchasing power, but instead reflects anticipated future inflation; when used in computations, the assumed inflation rate must be stated. (2) It refers to the dollar value in the year a cost estimate is prepared, as opposed to a historical or future dollar value.

Customer charge An amount to be paid for energy periodically by a customer without regard to demand or energy consumption.

Customer class Categories of energy consumers, as defined by consumption or demand levels, patterns, and conditions, and generally included residential, commercial, industrial, agricultural.

Cut-in-speed The lowest wind speed at which a wind turbine begins producing usable power.

Cut-out-speed The highest wind speed at which a wind turbine stops producing power.

Cycle In alternating current, the current goes from zero potential or voltage to a maximum in one direction, back to zero, and then to a maximum potential or voltage in the other direction. The number of complete cycles per second

determines the current frequency; in the USA, the standard for alternating current is 60 cycles.

Cycling losses The loss of heat as the water circulates through a water heater tank and inlet and outlet pipes.

Cyclone burner A furnace/combustion chamber in which finely ground fuel is blown in spirals in the combustion chamber to maximize combustion efficiency.

Czochralski process A method of growing large size, high-quality semiconductor crystal by slowly lifting a seed crystal from a molten bath of the material under careful cooling conditions.

Dam A structure for impeding and controlling the flow of water in a water course and which increases the water elevation to create the hydraulic head. The reservoir creates, in effect, stored energy.

Damper A movable plate used to control air flow; in a wood stove or fireplace, used to control the amount and direction of air going to the fire.

Darrieus (wind) machine A type of vertical-axis wind machine that has long, thin blades in the shape of loops connected to the top and bottom of the axle; often called an "eggbeater windmill."

Daylighting The use of direct, diffuse, or reflected sunlight to provide supplemental lighting for building interiors.

Dead animals They include those that die naturally or from disease or are accidentally killed (Washington, DC).

Decay (radioactive) Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons or by spontaneous fission.

Decentralized (energy) system Energy systems supply individual, or small groups, of energy loads.

Declination The angular position of the sun at solar noon with respect to the plane of the equator.

Declining block rate An electricity supplier rate structure in which the per unit price of electricity decreases as the amount of energy increases. Normally only available to very large consumers.

Decommissioning The process of removing a power plant, apparatus, equipment, building, or facility from operation.

Decomposition The process of breaking down organic material; reduction of the net energy level and change in physical and chemical composition of organic material.

De-energize(d) To disconnect a transmission and/or distribution line; a power line that is not carrying a current; to open a circuit.

Deep discharge Discharging a battery to 20% or less of its full charge capacity.

Deep well injection A process for disposal of wastewater or hydraulic fracking liquid into a deep well such that a porous, permeable formation of a larger area and thickness is available at sufficient depth to ensure continued, permanent storage.

Deficiency (self-assessment) A condition that does not meet or cannot be documented to meet applicable requirements.

Degree day A unit for measuring the extent that the outdoor daily average temperature (the mean of the maximum and minimum daily dry-bulb temperatures) falls below (in the case of heating, see Heating Degree Day) or falls above (in the case of cooling, see Cooling Degree Day) an assumed base temperature, normally taken as 65°F, unless otherwise stated. One degree day is counted for each degree below (for heating) or above (in the case of cooling) the base, for each calendar day on which the temperature goes below or above the base.

Degree hour The product of 1 h, and usually the number of degrees Fahrenheit the hourly mean temperature is above a base point (usually 65°F); used in roughly estimating or measuring the cooling load in cases where processes heat, heat from building occupants, and humidity are relatively unimportant compared to the dry-bulb temperature.

Dehumidifier A device that cools air by removing moisture from it.

Demand The rate at which electricity is delivered to or by a system, part of a system, or piece of equipment expressed in kilowatts, kilovolt-amperes, or other suitable unit, at a given instant or averaged over a specified period of time.

Demand (tankless) water heater A type of water heater that has no storage tank, thus eliminating storage tank standby losses. Cold water travels through a pipe into the unit, and either a gas burner or an electric element heats the water only when needed.

Demand charge A charge for the maximum rate at which energy is used during peak hours of a billing period. That part of a power provider service charged for on the basis of the possible demand as distinguished from the energy actually consumed.

Demand power See peak power

Demand(ed) factor The ratio of the maximum demand on an electricity-generating and distribution system to the total connected load on the system; usually expressed as a percentage.

Demand-side management (DSM) The process of managing the consumption of energy, generally to optimize available and planned generation resources.

Dendrite A slender threadlike spike of pure crystalline material, such as silicon.

Dendritic web technique A method for making sheets of polycrystalline silicon in which silicon dendrites are slowly withdrawn from a melt of silicon whereupon a web of silicon forms between the dendrites and solidifies as it rises from the melt and cools.

Denitrification It is process that converts nitrate into atmospheric nitrogen using microorganisms known as denitrifiers.

Dependable capacity The load-carrying ability of an electric power plant during a specific time interval and period when related to the characteristics of the load to be/being supplied; determined by capability, operating power factor, and the portion of the load the station is to supply.

Derating The production of energy by a system or appliance at a level less than its design or nominal capacity.

Deregulation The process of changing regulatory policies and laws to increase competition among suppliers of commodities and services. The process of deregulating the electric power industry was initiated by the Energy Policy Act of 1992 (see also restructuring).

Derived concentration guide (DCG) The concentration of a radionuclide in air and water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 mrem (1 mSv).

Desiccant A material used to desiccate (dry) or dehumidify air.

Desiccant cooling To condition/cool air by desiccation.

Desiccation The process of removing moisture; involves evaporation.

Design cooling load The amount of conditioned air to be supplied by a cooling system; usually the maximum amount to be delivered based on a specified number of cooling degree days or design temperature.

Design heating load The amount of heated air, or heating capacity, to be supplied by a heating system; usually the maximum amount to be delivered based on a specified number of heating degree days or design outside temperature.

Design life Period of time a system or appliance (or component of) is expected to function at its nominal or design capacity without major repair.

Design temperature The temperature that a system is designed to maintain (inside) or operate against (outside) under the most extreme conditions.

Design tip speed ratio For a wind turbine, the ratio of the speed of the tip of a turbine blade for which the power coefficient is at maximum.

Design voltage The nominal voltage for which a conductor or electrical appliance is designed; the reference voltage for identification and not necessarily the precise voltage at which it operates.

Designated use Simple narrative description of water quality expectations or water quality goals. A designated use is a legally recognized description of a desired use of the water body, such as (1) support of communities of aquatic life, (2) body contact recreation, (3) fish consumption, and (4) public drinking water supply. These are uses that the state or authorized tribe wants the water body to be healthy enough to fully support. The US Clean Water Act requires that waterbodies attain or maintain the water quality needed to support designated uses.

Desuperheater An energy-saving device in a heat pump that, during the cooling cycle, recycles some of the waste heat from the house to heat domestic water.

Detection limit or level The smallest amount of a substance that can be distinguished in a sample by a given measurement procedure at a given confidence level.

Dew point The temperature to which air must be cooled, at constant pressure and water vapor content, in order for saturation or condensation to occur; the

temperature at which the saturation pressure is the same as the existing vapor pressure; also called saturation point.

Difference of potential The difference in electrical pressure (voltage) between any two points in an electrical system or between any point in an electrical system and the Earth.

Differential thermostat A type of automatic thermostat (used on solar heating systems) that responds to temperature differences (between collectors and the storage components) so as to regulate the functioning of appliances (to switch transfer fluid pumps on and off).

Diffuse solar radiation Sunlight scattered by atmospheric particles and gases so that it arrives at the Earth's surface from all directions and cannot be focused.

Diffusion The movement of individual molecules through a material; permeation of water vapor through a material.

Diffusion length The mean distance a free electron or hole moves before recombining with another hole or electron.

Digester (anaerobic) A device in which organic material is biochemically decomposed (digested) by anaerobic bacteria to treat the material and/or to produce biogas.

Dimmer A light control device that allows light levels to be manually adjusted. A dimmer can save energy by reducing the amount of power delivered to the light while consuming very little themselves.

Diode An electronic device that allows current to flow in one direction only.

Dip tube A tube inside a domestic water heater that distributes the cold water from the cold water supply line into the lower area of the water heater where heating occurs.

Direct access The ability of an electric power consumer to purchase electricity from a supplier of their choice without being physically inhibited by the owner of the electric distribution and transmission system to which the consumer is connected to (see also open access).

Direct beam radiation Solar radiation that arrives in a straight line from the sun.

Direct current A type of electricity transmission and distribution by which electricity flows in one direction through the conductor; usually relatively low voltage and high current; typically abbreviated as dc.

Direct discharger A facility that discharges or may discharge treated or untreated wastewaters into the receiving waters.

Direct solar water heater These systems use water as the fluid that is circulated through the collector to the storage tank. Also known as "open-loop" systems.

Direct vent heater A type of combustion heating system in which combustion air is drawn directly from outside and the products of combustion are vented directly outside. These features are beneficial in tight, energy-efficient homes because they will not depressurize a home and cause air infiltration and backdrafting of other combustion appliances.

Direct water heater A type of water heater in which heated water is stored within the tank. Hot water is released from the top of the tank when a hot water faucet is

turned. This water is replaced with cold water that flows into the tank and down to just above the bottom plate under which are the burners.

Direct gain The process by which sunlight directly enters a building through the windows and is absorbed and stored in massive floors or walls.

Discount rate The interest rate at which the Federal Reserve System stands ready to lend reserves to commercial banks. The rate is proposed by the 12 Federal Reserve banks and determined with the approval of the Board of Governors.

Discounting A method of financial and economic analysis used to determine present and future values of investments or expenses.

Dispatchability The ability to dispatch power.

Dispatching To schedule and control the generation and delivery of electric power.

Dispersion (groundwater) The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through sediments.

Displacement power A source of power (electricity) that can displace power from another source so that source's power can be transmitted to more distant loads.

Disposal (1) It refers to the isolation of radioactive wastes from the biosphere inhabited by humans and containing their food chains by emplacement in land disposal facilities. (2) It refers to the processing of solid wastes by sanitary landfill, by incineration, by composting, by grinding, or any other equivalent sanitary method (Boulder, CO).

Disposal area or site (1) Any site, location, tract of land, area, building, structure, or premises used or intended to be used for partial or total solid waste disposal (Washington, DC); (2) any land used for the disposal of solid wastes, including, but not limited to, dumps, landfills, sanitary landfills, and composting plants, but does not include a landfill site which is not used by the public either directly or through a service and which is used by the owner or tenant thereof to dispose of sawdust, bark, soil, rock, building demolition material or non-putrescible industrial waste products resulting from the process of manufacturing (Marion County, OR); and (3) any site, location, or tract of land permitted by the local government to be used for refuse disposal (Sonoma County, CA).

Disposal site or site It refers to that portion of a land disposal facility which is used for disposal of waste. It consists of disposal units and a buffer zone.

Disposal unit It refers to a discrete structure of the disposal site into which waste is placed for disposal. Disposal units include, but are not limited to, vaults, concrete modules, and the cavities of underground mined repositories.

Dissolution It refers to a space or cavity in or between rocks, formed by the solution of part of the rock material.

Distressed watershed It is a watershed which has aquatic life and health that is impaired by nutrients (nitrogen and phosphorus) from agricultural land uses, such as land application. Threats to public health, drinking water supplies, recreation, and public safety are also taken into consideration if a watershed is designated as a distressed watershed.

Distributed generation A term used by the power industry to describe localized or on-site power generation.

Distribution The process of distributing electricity; usually defines that portion of a power provider's power lines between a power provider's power pole and transformer and a customer's point of connection/meter.

Distribution line One or more circuits of a distribution system on the same line or poles or supporting structures usually operating at a lower voltage relative to the transmission line.

Distribution system That portion of an electricity supply system used to deliver electricity from points on the transmission system to consumers.

Diversity factor The ratio of the sum of the noncoincidental maximum demands of two or more loads to their coincidental maximum demands for the same period.

DOE-2.1 A computer software program that simulates energy consumption of commercial buildings; used for design and auditing purposes.

Dome (geodesic) An architectural design invented by Buckminster Fuller with a regular polygonal structure based on radial symmetry.

Domestic hot water Water heated for residential washing, bathing, etc.

Domestic refuse It includes all those types which normally originate in the residential household or apartment house (Washington, DC).

Domestic septage Either a liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receive only domestic sewage. This does not include septage, resulting from treatment of wastewater with a commercial or industrial component.

Donor In a solar photovoltaic device, an n-type dopant, such as phosphorus, that puts an additional electron into an energy level very near the conduction band; this electron is easily exited into the conduction band where it increases the electrical conductivity over than of an undoped semiconductor.

Dopant A chemical element (impurity) added in small amounts to an otherwise pure semiconductor material to modify the electrical properties of the material. An n-dopant introduces more electrons. A p-dopant creates electron vacancies (holes).

Doping The addition of dopants to a semiconductor.

Dose It refers to that quantity of ionizing radiation in rems absorbed, per unit mass, by any body tissue. Reference to a dose during a specific period of time means the total quantity of radiation so absorbed during such period.

Dosimeter A portable device for measuring the total accumulated exposure to ionizing radiation.

Double wall heat exchanger A heat exchanger in a solar water heating system that has two distinct walls between the heat-transfer fluid and the domestic water, to ensure that there is no mixing of the two.

Double-pane or glazed window A type of window having two layers (panes or glazing) of glass separated by an air space. Each layer of glass and surrounding

air space reradiates and traps some of the heat that passes through, thereby increasing the windows resistance to heat loss (R-value).

Downgradient The direction of water flow from a reference point to a selected point of interest.

Downwind wind turbine A horizontal axis wind turbine in which the rotor is downwind of the tower.

Draft A column of burning combustion gases that are so hot and strong that the heat is lost up the chimney before it can be transferred to the house. A draft brings air to the fire to help keep it burning.

Draft diverter A door-like device located at the mouth of a fireplace chimney flue for controlling the direction and flow of the draft in the fireplace as well as the amount of oxygen that the fire receives.

Draft hood A device built into or installed above a combustion appliance to assure the escape of combustion by-products, to prevent backdrafting of the appliance, or to neutralize the effects of the stack action of the chimney or vent on the operation of the appliance.

Drag Resistance caused by friction in the direction opposite to that of movement (i.e., motion) of components such as wind turbine blades.

Drainback (solar) systems A closed-loop solar heating system in which the heat-transfer fluid in the collector loop drains into a tank or reservoir whenever the booster pump stops to protect the collector loop from freezing.

Draindown (solar) systems An open-loop solar heating system in which the heat-transfer fluid from the collector loop and the piping drains whenever freezing conditions occur.

Drained Free Liquids Aqueous wastes drained from waste containers (e.g., drums, etc.) prior to landfilling. Landfills which accept containerized waste may generate this type of wastewater.

Dry bulb temperature The temperature of the air as measured by a standard thermometer.

Dry steam geothermal plants Conventional turbine generators are used with the dry-steam resources. The steam is used directly, eliminating the need for boilers and boiler fuel that characterizes other steam-power-generating technologies. This technology is limited because dry-steam hydrothermal resources are extremely rare. The Geysers, in California, is the nation's only dry-steam field.

DSSTox It refers to a public forum for publishing downloadable, structure-searchable, standardized chemical structure files associated with toxicity data.

Dual duct system An air-conditioning system that has two ducts, one is heated and the other is cooled, so that air of the correct temperature is provided by mixing varying amounts of air from each duct.

Dual fuel (or flex fuel) vehicle A vehicle with an engine capable of operating on two different types of fuels.

Duct fan An axial flow fan mounted in a section of duct to move conditioned air.

Duct(s) The round or rectangular tube(s), generally constructed of sheet metal, fiberglass board, or a flexible plastic-and-wire composite, located within a wall, floor, and ceiling that distributes heated or cooled air in buildings.

Duty cycle The duration and periodicity of the operation of a device.

Dynamic head The pressure equivalent of the velocity of a fluid.

Dynamo A machine for converting mechanical energy into electrical energy by magnetoelectric induction; may be used as a motor.

Dynamometer An apparatus for measuring force or power, especially the power developed by a motor.

Dyne The absolute centimeter-gram-second unit of force; force that will impart to a free mass of one gram an acceleration of one centimeter per second.

Earth berm A mound of dirt next to exterior walls to provide wind protection and insulation.

Earth cooling tube A long, underground metal or plastic pipe through which air is drawn. As air travels through the pipe, it gives up some of its heat to the soil and enters the house as cooler air.

Earth-sheltered houses Houses that have earth berms around exterior walls.

Earth-coupled ground source (geothermal) heat pump A type of heat pump that uses sealed horizontal or vertical pipes, buried in the ground, as heat exchangers through which a fluid is circulated to transfer heat.

Earth-ship A registered trademark name for houses built with tires, aluminum cans, and earth.

Easement An incorporated right, liberty, privilege, or use of another entity's property, distinct from ownership, without profit or compensation; a right-of-way.

Eccentric A device for converting continuous circular motion into reciprocating rectilinear motion.

Economizer A heat exchanger for recovering heat from flue gases for heating water or air.

Edge-defined film-fed growth (EFG) A method for making sheets of polycrystalline silicon (for solar photovoltaic devices) in which molten silicon is drawn upward by capillary action through a mold.

Effective capacity The maximum load that a device is capable of carrying.

Efficacy The amount of energy service or useful energy delivered per unit of energy input. Often used in reference to lighting systems, where the visible light output of a luminary is relative to power input; expressed in lumens per watt; the higher the efficacy value, the higher the energy efficiency.

Efficiency Under the first law of thermodynamics, efficiency is the ratio of work or energy output to work or energy input and cannot exceed 100%. Efficiency under the second law of thermodynamics is determined by the ratio of the theoretical minimum energy that is required to accomplish a task relative to the energy actually consumed to accomplish the task. Generally, the measured efficiency of a device, as defined by the first law, will be higher than that defined by the second law.

Efficiency (appliance) ratings A measure of the efficiency of an appliance's energy efficiency.

Effluent Any treated or untreated air emission or liquid discharge, including storm water runoff, at an environmental agency specified site or facility.

Effluent limitation Any restriction, including schedules of compliance, established by a state or the federal administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean (CWA Sections 30 1(b) and 3 04(b)).

Effluent monitoring Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants.

Eggbeater windmill See Darrieus (wind) machine.

Elasticity of demand The ratio of the percentage change in the quantity of a good or service demanded to the percentage change in the price.

Electric circuit The path followed by electrons from a generation source, through an electrical system, and returning to the source.

Electric energy The amount of work accomplished by electrical power, usually measured in kilowatt-hours (kWh). One kWh is 1000 W and is equal to 3413 Btu.

Electric furnace An air heater in which air is blown over electric resistance heating coils.

Electric power plant A facility or piece of equipment that produces electricity.

Electric power sector Those privately or publicly owned establishments that generate, transmit, distribute, or sell electricity.

Electric power transmission The transmission of electricity through power lines.

Electric rate The unit price and quantity to which it applies as specified in a rate schedule or contract.

Electric rate schedule A statement of the electric rate(s), terms, and conditions for electricity sale or supply.

Electric resistance heating A type of heating system where heat, resulting when electric current flows through an "element" or conductor, such as Nichrome, which has a high resistance, is radiated to a room.

Electric system The physically connected generation, transmission, and distribution facilities and components operated as a unit.

Electric system loss The total amount of electric energy loss in an electric system between the generation source and points of delivery.

Electric utility A corporation, person, agency, authority, or other legal entities that own and/or operate facilities for the generation, transmission, distribution, or sale of electricity primarily for use by the public. Also known as a power provider.

Electric vehicles A battery-powered electrically driven vehicle.

Electrical charge A condition that results from an imbalance between the number of protons and the number of electrons in a substance.

Electrical energy The energy of moving electrons.

Electrical system All the conductors and electricity using devices that are connected to a source of electromotive force (or generator).

Electrical system energy losses A measure of the amount of energy lost during the generation, transmission, and distribution of electricity.

Electricity generation The process of producing electricity by transforming other forms or sources of energy into electrical energy; measured in kilowatt-hours.

Electricity grid A common term referring to an electricity transmission and distribution system.

Electricity industry restructuring The process of changing the structure of the electric power industry from one of guaranteed monopoly over service territories, as established by the Public Utility Holding Company Act of 1935, to one of open competition between power suppliers for customers in any area.

Electrochemical cell A device containing two conducting electrodes, one positive and the other negative, made of dissimilar materials (usually metals) that are immersed in a chemical solution (electrolyte) that transmits positive ions from the negative to the positive electrode and thus forms an electrical charge. One or more cells constitute a battery.

Electrode A conductor that is brought in conducting contact with a ground.

Electrodeposition Electrolytic process in which a metal is deposited at the cathode from a solution of its ions.

Electrolysis A chemical change in a substance that results from the passage of an electric current through an electrolyte. The production of commercial hydrogen by separating the elements of water, hydrogen, and oxygen, by charging the water with an electrical current.

Electrolyte A nonmetallic (liquid or solid) conductor that carries current by the movement of ions (instead of electrons) with the liberation of matter at the electrodes of an electrochemical cell.

Electromagnetic energy Energy generated from an electromagnetic field produced by an electric current flowing through a superconducting wire kept at a specific low temperature.

Electromagnetic field (EMF) The electrical and magnetic fields created by the presence or flow of electricity in an electrical conductor or electricity consuming appliance or motor.

Electromotive force The amount of energy derived from an electrical source per unit quantity of electricity passing through the source.

Electron An elementary particle of an atom with a negative electrical charge and a mass of 1/1,837 of a proton; electrons surround the positively charged nucleus of an atom and determine the chemical properties of an atom.

Electron volt The amount of kinetic energy gained by an electron when accelerated through an electric potential difference of 1 V; equivalent to 1.603×10^{-12}; a unit of energy or work; abbreviated as eV.

Electronic ballast A device that uses electronic components to regulate the voltage of fluorescent lamps.

Electrostatic precipitator A device used to remove particulate matter from the waste gases of a combustion power plant.

Ellipsoidal reflector lamp A lamp where the light beam is focused 2 in. ahead of the lamp reducing the amount of light trapped in the fixture.

Emission A substance or pollutant emitted as a result of a process.

Emission factor A measure of the average amount of a specified pollutant or material emitted for a specific type of fuel or process.

Emissivity The ratio of the radiant energy (heat) leaving (being emitted by) a surface to that of a black body at the same temperature and with the same area; expressed as a number between 0 and 1.

Enclosure The housing around a motor that supports the active parts and protects them. They come in different varieties (open, protected) depending on the degree of protection required.

End use The purpose for which useful energy or work is consumed.

Endothermic A heat-absorbing reaction or a reaction that requires heat.

Energize(d) To send electricity through an electricity transmission and distribution network; a conductor or power line that is carrying current.

Energy The capability of doing work; different forms of energy can be converted to other forms, but the total amount of energy remains the same.

Energy audit A survey that shows how much energy you use in your house or apartment. It will help you find ways to use less energy.

Energy charge That part of an electricity bill that is based on the amount of electrical energy consumed or supplied.

Energy contribution potential Recombination occurring in the emitter region of a photovoltaic cell.

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 5 to 8 years, and herbaceous energy crops, such as perennial grasses, which are harvested annually after taking 2 to 3 years to reach full productivity.

Energy density The ratio of available energy per pound; usually used to compare storage batteries.

Energy efficiency ratio (EER) The measure of the instantaneous energy efficiency of room air conditioners; the cooling capacity in Btu/hr divided by the watts of power consumed at a specific outdoor temperature (usually 95°F).

Energy-efficient mortgages A type of home mortgage that takes into account the energy savings of a home that has cost-effective energy-saving improvements that will reduce energy costs, thereby allowing the homeowner to more income to the mortgage payment. A borrower can qualify for a larger loan amount than otherwise would be possible.

Energy end-use sectors Major energy-consuming sectors of the economy. The commercial sector includes commercial buildings and private companies. The industrial sector includes manufacturers and processors. The residential sector includes private homes. The transportation sector includes automobiles, trucks, rail, ships, and aircraft.

Energy factor (EF) The measure of overall efficiency for a variety of appliances. For water heaters, the energy factor is based on three factors: (1) the recovery efficiency, or how efficiently the heat from the energy source is transferred to the water; (2) standby losses, or the percentage of heat lost per hour from the stored water compared to the content of the water, and (3) cycling losses. For dishwashers, the energy factor is defined as the number of cycles per kWh of input power. For clothes washers, the energy factor is defined as the cubic foot capacity per kWh of input power per cycle. For clothes dryers, the energy factor is defined as the number of pounds of clothes dried per kWh of power consumed.

Energy guide labels The labels placed on appliances to enable consumers to compare appliance energy efficiency and energy consumption under specified test conditions as required by the Federal Trade Commission.

Energy intensity The relative extent that energy is required for a process.

Energy Policy Act of 1992 (EPAct) A comprehensive legislative package in the USA that mandates and encourages energy efficiency standards, alternative fuel use, and the development of renewable energy technologies. Public Law 102–486, October 24, 1992. Also authorized the Federal Energy Regulatory Commission (FERC) to order the owners of electric power transmission lines to transmit or "wheel" power for power generators including electric power providers, federal power marketing authorities, and exempt wholesale generators.

Energy security act of 1980 The US Legislation authorizing a US biomass and alcohol fuel program and that authorized loan guarantees and price guarantees and purchase agreements for alcohol fuel production.

Energy service company (ESCO) A company that specializes in undertaking energy efficiency measures under a contractual arrangement, whereby the ESCO shares the value of energy savings with their customer.

Energy storage The process of storing, or converting, energy from one form to another for later use; storage devices and systems include batteries, conventional and pumped storage hydroelectric, flywheels, compressed gas, and thermal mass.

Engineered barrier It refers to a man-made structure or device that is intended to improve the land disposal facility's ability to meet the performance objectives in the state or federal environmental laws or regulations.

Enhanced work Planning A process that evaluates and improves the program by which work is identified, planned, approved, controlled, and executed. The key elements are line management ownership, a graded approach to work management based on risk and complexity, worker involvement beginning at the earliest phases of work management, organizationally diverse teams, and organized, institution-wide communication.

Enthalpy A thermodynamic property of a substance, defined as the sum of its internal energy plus the pressure of the substance times its volume, divided by the mechanical equivalent of heat. The total heat content of air; the sum of the enthalpies of dry air and water vapor, per unit weight of dry air; measured in Btu per pound (or calories per kilogram).

Entrained bed gasifier A gasifier in which the feedstock (fuel) is suspended by the movement of gas to move it through the gasifier.

Entropy A measure of the unavailable or unusable energy in a system; energy that cannot be converted to another form.

Environment All the natural and living things around us. The earth, air, weather, plants, and animals all make up our environment.

Environmental assessment An evaluation that provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

Environmental impact statement A detailed statement that includes the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, and alternatives to the proposed action.

Environmental management system The systematic application of business management practices to environmental issues, including defining the organizational structure, planning for activities, identifying responsibilities, and defining practices, procedures, processes, and resources.

Environmental monitoring The collection and analysis of samples or the direct measurement of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

Environmental surveillance The collection and analysis of samples or the direct measurement of air, water, soil, foodstuff, and biota in order to determine compliance with applicable standards and permit requirements.

Epitaxial growth In reference to solar photovoltaic devices, the growth of one crystal on the surface of another crystal. The growth of the deposited crystal is oriented by the lattice structure of the original crystal.

Equinox The two times of the year when the sun crosses the equator and night and day are of equal length; usually occurs on March 21st (spring equinox) and September 23 (fall equinox).

Erg A unit of work done by the force of one dyne acting through a distance of one centimeter.

Erg One-billionth (1E-09) of the energy released by a 100-W bulb in 1 s.

Ethanol or ethyl alcohol (C_2H_5OH) A colorless liquid that is the product of fermentation used in alcoholic beverages, industrial processes, and as a fuel additive. Also known as grain alcohol.

Ethyl tertiary butyl ether (ETBE) A chemical compound produced in a reaction between ethanol and isobutylene (a petroleum-derived by-product of the refining process). ETBE has characteristics superior to other ethers: low volatility, low water solubility, high octane value, and a large reduction in carbon monoxide and hydrocarbon emissions.

Eutectic A mixture of substances that has a melting point lower than that of any mixture of the same substances in other proportions.

Eutectic salts Salt mixtures with potential applications as solar thermal energy storage materials.

Eutrophication (1) Enrichment of an aquatic ecosystem with nutrients (nitrogen, phosphorus) that accelerate biological productivity (growth of algae and weeds) and an undesirable accumulation of algal biomass. (2) The condition of a waterbody (particularly a lake or river) where molecular oxygen levels have been depleted due to high nutrient levels and algal blooms. When eutrophication occurs, all organisms relying on molecular oxygen to survive will die.

Evacuated-tube collector A collector is the mechanism in which fluid (e.g., water or diluted antifreeze) is heated by the sun in a solar hot water system. Evacuated-tube collectors are made up of rows of parallel, transparent glass tubes. Each tube consists of a glass outer tube and an inner tube, or absorber. The absorber is covered with a selective coating that absorbs solar energy well but inhibits radiative heat loss. The air is withdrawn ("evacuated") from the space between the tubes to form a vacuum, which eliminates conductive and convective heat loss. Evacuated-tube collectors are used for active solar hot water systems.

Evaporation The conversion of a liquid to a vapor (gas), usually by means of heat.

Evaporative cooling The physical process by which a liquid or solid is transformed into the gaseous state. For this process, a mechanical device uses the outside air's heat to evaporate water that is held by pads inside the cooler. The heat is drawn out of the air through this process, and the cooled air is blown into the home by the cooler's fan.

Evaporator coil The inner coil in a heat pump that, during the cooling mode, absorbs heat from the inside air and boils the liquid refrigerant to a vapor, which cools the house.

Evapotranspiration The combined total precipitation returned to the air through direct evaporation and by transpiration of vegetation.

Exceptional quality sewage sludge Sewage sludge that meets the most stringent limits for the three sludge quality parameters. In gauging sewage sludge quality, US EPA determined that three main parameters of concern should be considered: (1) pollutant levels, (2) the relative presence or absence of pathogenic organisms, such as salmonella and E-Coli bacteria, enteric viruses, or viable helminth ova and (3) the degree of attractiveness of the sewage sludge to vectors, such as flies, rats, and mosquitoes, that could potentially come in contact with pathogenic organisms and spread disease. Given these three variables, there can be a number of possible sewage sludge qualities. The term exceptional quality (EQ), which does not appear in the Part 503 regulation, is used to describe sewage sludge that meets the highest quality for all three of these Sewage sludge quality parameters (i.e., ceiling concentrations and pollutant concentrations in 503.13 for metals, one of the Class A pathogen reduction alternatives and one of the sewage sludge processing vector attraction reduction options 1 through 8).

Excitation The power required to energize the magnetic field of a generator.

Exempt wholesale generator An unregulated subsidiary of a power provider that is allowed to generate and sell wholesale power as an independent energy producer and is exempt from the US Public Utility Holding Company Act of 1935.

Existing grade It refers to the various elevations of the surface of the land as it actually exists upon the site (Chesterfield Township, MI).

Existing source Any facility from which there is or may be a discharge of pollutants, the construction of which is commenced before the publication of the proposed regulations prescribing a standard of performance under current environmental laws or regulations.

Exothermic A reaction or process that produces heat; a combustion reaction.

Expanded polystyrene A type of insulation that is molded or expanded to produce coarse, closed cells containing air. The rigid cellular structure provides thermal and acoustical insulation, strength with low weight, and coverage with few heat-loss paths. Often used to insulate the interior of masonry basement walls.

Expansion tank A tank used in a closed-loop solar heating system that provides space for the expansion of the heat-transfer fluid in the pressurized collector loop.

Expansion valve The device that reduces the pressure of liquid refrigerant, thereby cooling it before it enters the evaporator coil in a heat pump.

Explosive material It refers to any chemical compound, mixture, or device, which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.

ExpoCastDB It refers to a database that consolidates observational human exposure data and links with toxicity data, environmental fate data, and chemical manufacture information.

Exposure The subjection of a target (usually living tissue) to radiation.

External combustion engine An engine in which fuel is burned (or heat is applied) to the outside of a cylinder; a Stirling engine.

Externality The environmental, social, and economic impacts of producing a good or service that are not directly reflected in the market price of the good or service.

Extruded polystyrene A type of insulation material with fine, closed cells, containing a mixture of air and refrigerant gas. This insulation has a high R-value, good moisture resistance, and high structural strength compared to other rigid insulation materials.

Facility All contiguous property owned, operated, leased, or under the control of the same person or entity.

Fallout Radioactive materials mixed into the Earth's atmosphere. Fallout constantly precipitates onto the Earth.

Fan A device that moves and/or circulates air and provides ventilation for a room or a building.

Fan coil A heat exchanger coil in which a fluid such as water is circulated, and a fan blows air over the coil to distribute heat or cool air to the different rooms.

Fan velocity pressure The pressure corresponding to the outlet velocity of a fan; the kinetic energy per unit volume of flowing air.

Farad A unit of electrical capacitance; the capacitance of a capacitor between the plates of which there appears a difference of 1 V when it is charged by one coulomb of electricity.

Farm field The farm field is the basic management unit used for all farm nutrient management, as defined as "the fundamental unit used for cropping agricultural products."

Feather In a wind energy conversion system, to pitch the turbine blades so as to reduce their lift capacity as a method of shutting down the turbine during high wind speeds.

Feed crop Crops produced primarily for consumption by animals. These include, but are not limited to, corn and grass. For a crop to be considered a feed crop, it has to be produced for consumption by animals (e.g., grass grown to prevent erosion or to stabilize an area is not considered a feed crop).

Feeder A power line for supplying electricity within a specified area.

Feedstock A raw material that can be converted to one or more products.

Fenestration The arrangement, proportion, and design of windows in a building.

Fermentation The decomposition of organic material to alcohol, methane, etc., by organisms, such as yeast or bacteria, usually in the absence of oxygen.

Fiber crop Crops, such as flax and cotton, that were included in Part 503 because products from these crops (e.g., cotton seed oil) may be consumed by humans.

Fiberglass insulation A type of insulation, composed of small diameter pink, yellow, or white glass fibers, formed into blankets or used in loose-fill and blown-in applications.

Filament A coil of tungsten wire suspended in a vacuum or inert gas-filled bulb. When heated by electricity the tungsten "filament" glows.

Fill factor The ratio of a photovoltaic cell's actual power to its power if both current and voltage were at their maxima. A key characteristic in evaluating cell performance.

Filter (air) A device that removes contaminants, by mechanical filtration, from the fresh air stream before the air enters the living space. Filters can be installed as part of a heating/cooling system through which air flows for the purpose of removing particulates before or after the air enters the mechanical components.

Fin A thin sheet of material (metal) of a heat exchanger that conducts heat to a fluid.

Finding A US Department of Energy compliance term. A finding is a statement of fact concerning a condition in the environmental, safety, and health program that was investigated during an appraisal. Findings include best management practice findings, compliance findings, and noteworthy practices. A finding may be a simple statement of proficiency or a description of deficiency (i.e., a variance from procedures or criteria).

Finish Both a noun and a verb to describe the exterior surface of building elements (walls, floors, ceilings, etc.) and furniture, and the process of applying it.

Finish grade It refers to those earth elevations established and delineated on the plot plan that will result upon completion of the proposed operation for which the permit is issued (Chesterfield Township, MI).

Fire classification Classifications of fires developed by the National Fire Protection Association.

Fireplace A wood or gas burning appliance that is primarily used to provide ambiance to a room. Conventional, masonry fireplaces without energy-saving features, often take more heat from a space than they put into it.

Fireplace insert A wood or gas burning heating appliance that fits into the opening or protrudes on to the hearth of a conventional fireplace.

Fire-rating The ability of a building construction assembly (partition, wall, floor, etc.) to resist the passage of fire. The rating is expressed in hours.

Firewall A wall to prevent the spread of fire; usually made of noncombustible material.

Firing rate The amount of BTUs/hour or kWs produced by a heating system from the burning of a fuel.

First law of thermodynamics States that energy cannot be created or destroyed but only changed from one form to another. First law efficiency measures the fraction of energy supplied to a device or process that it delivers in its output. Also called the law of conservation of energy.

Fiscal year (FY) The US Government's 12-month financial year, from October to September, of the following calendar year; e.g., FY 1998 extends from October 1, 1997 to September 30, 1988.

Fission The act or process of splitting into parts. A nuclear reaction in which an atomic nucleus splits into fragments, i.e., fission products, usually fragments of comparable mass, with the evolution of approximately 100 million to several hundred million electron volts of energy.

Five-day biochemical oxygen demand (BOD_5) (1) It refers to a measure of the biochemical decomposition of organic matter in a water sample. It is determined by measuring the dissolved oxygen consumed by microorganisms to oxidize the organic contaminants in a water sample under standard laboratory conditions of five days and 70 °C. BOD_5 is not related to the oxygen requirements in chemical combustion. (2) It is a wastewater quality index that biochemically determines the amount of oxygen required for microorganisms to degrade a given substance within a five-day period.

Flame spread classification A measure of the surface burning characteristics of a material.

Flame spread rating A measure of the relative flame spread, and smoke development, from a material being tested. The flame spread rating is a single number comparing the flame spread of a material with red oak, arbitrarily given the number 100 and asbestos cement board with a flame spread of 0. Building codes require a maximum flame spread of 25 for insulation installed in exposed locations.

Flashing Metal, usually galvanized sheet metal, used to provide protection against infiltration of precipitation into a roof or exterior wall; usually placed around roof penetrations such as chimneys.

Flashpoint The minimum temperature at which sufficient vapor is released by a liquid or solid (fuel) to form a flammable vapor-air mixture at atmospheric pressure.

Flash-steam geothermal plants When the temperature of the hydrothermal liquids is over 350°F (177°C), flash-steam technology is generally employed. In these systems, most of the liquid is flashed to steam. The steam is separated from the remaining liquid and used to drive a turbine generator. While the water is returned to the geothermal reservoir, the economics of most hydrothermal flash plants are improved by using a dual-flash cycle, which separates the steam at two different pressures. The dual-flash cycle produces 20–30 % more power than a single-flash system at the same fluid flow.

Flat plate solar photovoltaic module An arrangement of photovoltaic cells or material mounted on a rigid flat surface with the cells exposed freely to incoming sunlight.

Flat plate solar thermal/heating collectors Large, flat boxes with glass covers and dark-colored metal plates inside that absorb and transfer solar energy to a heat-transfer fluid. This is the most common type of collector used in solar hot water systems for homes or small businesses.

Flat roof A slightly sloped roof, usually with a tar and gravel cover. Most commercial buildings use this kind of roof.

Flat-black paint Non-glossy paint with a relatively high absorption.

Float-zone process In reference to solar photovoltaic cell manufacture, a method of growing a large size, high-quality crystal whereby coils heat a polycrystalline ingot placed atop a single-crystal seed. As the coils are slowly raised, the molten interface beneath the coils becomes a single crystal.

Floor The upward-facing structure of a building.

Floor space The interior area of a building, calculated in square feet or meters.

Flow condition In reference to solar thermal collectors, the condition where the heat-transfer fluid is flowing through the collector loop under normal operating conditions.

Flow restrictor A water and energy conserving device that limits the amount of water that a faucet or shower head can deliver.

Flowback water It refers to (1) the water and excess proppant (propping agent) flow up through the wellbore to the surface, after the hydraulic fracturing procedure is completed and pressure is released, and the direction of fluid flow reverses, and (2) the water that returns to the surface, after the hydraulic fracturing procedure is completed and pressure is released, and the direction of fluid flow reverses, is commonly referred to as "flowback."

Flue The structure (in a residential heating appliance, industrial furnace, or power plant) into which combustion gases flow and are contained until they are emitted to the atmosphere.

Flue gas The gas resulting from the combustion of a fuel that is emitted to the flue.

Fluffing The practice of installing blow-in, loose-fill insulation at a lower density than is recommended to meet a specified R-value.

Fluid leakoff It refers to the process by which injected fracturing fluid migrates from the created fractures to other areas within the hydrocarbon-containing formation.

Fluidized bed combustion (FBC) A type of furnace or reactor in which fuel particles are combusted while suspended in a stream of hot gas.

Fluorescent light The conversion of electric power to visible light by using an electric charge to excite gaseous atoms in a glass tube. These atoms emit ultraviolet radiation that is absorbed by a phosphor coating on the walls of the lamp tube. The phosphor coating produces visible light.

Fly ash The fine particulate matter entrained in the flue gases of a combustion power plant.

Flywheel effect The damping of interior temperature fluctuations by massive construction.

Foam (insulation) A high R-value insulation product usually made from urethane that can be injected into wall cavities, or sprayed onto roofs or floors, where it expands and sets quickly.

Foam board A plastic foam insulation product, pressed or extruded into boardlike forms, used as sheathing and insulation for interior basement or crawl space walls or beneath a basement slab; can also be used for exterior applications inside or outside foundations, crawl spaces, and slab-on-grade foundation walls.

Foam core panels A type of structural, insulated product with foam insulation contained between two facings of drywall, or structural wood composition boards such as plywood, waferboard, and oriented strand board.

Food crop Crops consumed by humans. These include, but are not limited to, fruits, grains, vegetables, and tobacco.

Food waste (garbage) It includes animal and vegetable waste resulting from the storage, handling, preparation, cooking, or serving of foods (Washington, DC).

Foot candle A unit of illuminance; 1 fc = 1 lm per square foot = 10.764 lm per square meter.

Foot pound The amount of work done in raising one pound one foot. 1 ft-pound = 0.138255 kg-m = 1.35582 J.

Force The push or pull that alters the motion of a moving body or moves a stationary body; the unit of force is the dyne or poundal; force is equal to mass time velocity divided by time.

Forced air system or furnace A type of heating system in which heated air is blown by a fan through air channels or ducts to rooms.

Forced ventilation A type of building ventilation system that uses fans or blowers to provide fresh air to rooms when the forces of air pressure and gravity are not enough to circulate air through a building.

Forest land Tract of land thick with trees and underbrush.

Formaldehyde A chemical used as a preservative and in bonding agents. It is found in household products such as plywood, furniture, carpets, and some types of foam insulation. It is also a by-product of combustion and is a strong-smelling, colorless gas that is an eye irritant and can cause sneezing, coughing, and other health problems.

Formation It means a geological formation is a body of earth material with distinctive and characteristic properties and a degree of homogeneity in its physical properties.

Fossil fuels Fuels formed in the ground from the remains of dead plants and animals. It takes millions of years to form fossil fuels. Oil, natural gas, and coal are fossil fuels.

Foundation The supportive structure of a building.

Fractional horse power motor An electric motor rated at less than one horse power (hp).

Frame (window) The outer casing of a window that sits in a designated opening of a structure and holds the window panes in place.

Framing The structural materials and elements used to construct a wall.

Francis turbine A type of hydropower turbine that contains a runner that has water passages through it formed by curved vanes or blades. As the water passes through the runner and over the curved surfaces, it causes rotation of the runner. The rotational motion is transmitted by a shaft to a generator.

Freon A registered trademark for a chlorofluorocarbon (CFC) gas that is highly stable and that has been historically used as a refrigerant.

Frequency The number of cycles through which an alternating current passes per second; in the USA the standard for electricity generation is 60 cycles per second (60 Hz).

Fresnel lens An optical device for concentrating light that is made of concentric rings that are faced at different angles so that light falling on any ring is focused to the same point.

Friction head The energy lost from the movement of a fluid in a conduit (pipe) due to the disturbances created by the contact of the moving fluid with the surfaces of the conduit or the additional pressure that a pump must provide to overcome the resistance to fluid flow created by or in a conduit.

Fuel Any material that can be burned to make energy.

Fuel cell An electrochemical device that converts chemical energy directly into electricity.

Fuel efficiency The ratio of heat produced by a fuel for doing work to the available heat in the fuel.

Fuel grade alcohol Usually refers to ethanol to 160 to 200 proof.

Fuel oil Any liquid petroleum product burned for the generation of heat in a furnace or firebox or for the generation of power in an engine. Domestic (residential) heating fuels are classed as Nos. 1, 2, 3 and industrial fuels as Nos. 4, 5, and 6.

Fuel rate The amount of fuel necessary to generate one kilowatt-hour of electricity.

Full sun The amount of power density in sunlight received at the Earth's surface at noon on a clear day (about 1000 W/square meter).

Fungi Plantlike organisms with cells with distinct nuclei surrounded by nuclear membranes, incapable of photosynthesis. Fungi are decomposers of waste organisms and exist as yeast, mold, or mildew.

Furling The process of forcing, either manually or automatically, a wind turbine's blades out of the direction of the wind in order to stop the blades from turning.

Furnace (residential) A combustion heating appliance in which heat is captured from the burning of a fuel for distribution, comprised mainly of a combustion chamber and heat exchanger.

Fuse A safety device consisting of a short length of relatively fine wire, mounted in a holder or contained in a cartridge and connected as part of an electrical circuit. If the circuit source current exceeds a predetermined value, the fuse wire melts (i.e., the fuse "blows") breaking the circuit and preventing damage to the circuit protected by the fuse.

Gallium arsenide A compound used to make certain types of solar photovoltaic cells.

Gamma isotopic (also gamma scan) An analytical method by which the quantity of several gamma ray-emitting radioactive isotopes may be determined simultaneously. Typical nuclear fuel cycle isotopes determined by this method include but are not limited to Co-60, Zr-95, Ru-106, Ag-1l0m, Sb-125, Cs-134, Cs-137, and Eu-154. Naturally occurring isotopes for which samples also often are analyzed are Be-7, K-40, Ra-224, and Ra-226.

Gamma radiation A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding such as lead, concrete, or steel to be stopped.

Garbage (1) A refuse accumulation of animal, fruit, or vegetable matter that attends the preparation, use, cooking, dealing in, and storage of edibles, and any other matter, of any nature whatsoever, which is subject to decay, putrefaction, and generation of noxious or offensive gases or odors or which, during or after decay, may serve as breeding or feeding material for flies or other germ-carrying insects (Dade County, FL); (2) all organic waste or residue of animal, fruit, vegetable, or food material from kitchens and dining rooms or from the preparation or dealing in or storage of meats, fowl, fruits, grains, or vegetables (Wichita, KS); (3) animal and vegetable waste resulting from the handling, preparation, cooking, and consumption of foods, exclusive of recognized industrial by-products and human or animal feces (Baltimore County, MD); (4) animal and vegetable waste resulting from the handling, preparation, cooking, and consumption of foods, exclusive of recognized industrial by-products from canneries and other food processing industries, and human or animal feces (Prince George's County, MD); (5) putrescible animal and vegetable waste resulting from the storage, handling, preparation, cooking, and consumption of food (Los Alamos County, NM); (6) all putrescible waste, except sewage and body wastes, including waste that attends the preparation; use; cooking; dealing in or storage of meat, fish, fowl, fruit, and vegetables; and all cans, boxes, cartons, papers, or other objects which have food or other organic materials of any nature in or adhering thereto; and shall include all such wastes or accumulation of vegetable matter of residences, restaurants, hotels, and places where food is prepared for human consumption. The term "garbage" does not include

recognized industrial by-products (Beaverton, OR); (7) all putrescible animal or vegetable waste resulting from the preparation, cooking, and serving of food or the storage and sale of produce (Boulder, CO); (8) all putrescible animal or vegetable wastes resulting from handling, preparation, cooking, and consumption of food in any private dwelling house, multiple dwelling, hotel restaurant, building, or institution (Bettendorf, IA); (9) all rejected food wastes including every waste accumulation of animal, fruit, or vegetable matter used or intended for food or that attends the preparation, use, cooking, dealing in, or storing of meat, fish, fowl, fruit, or vegetables (Bluffton, IN); (10) every refuse accumulation of animal, fruit, or vegetable matter that attends the preparation, use, cooking, and dealing in, or storage or edibles, and any other matter, of any nature whatsoever, which is subject to decay, putrefaction, and the generation of noxious or offensive gases or odors or which, during or after decay, may serve as breeding or feeding material for flies or other germ-carrying insects (Miami, FL); and (11) all putrescible wastes and all animal or vegetable refuse or residue that shall result in the preparation or care for, or treatment of, foodstuffs intended to be used as food, and includes all putrescible wastes having resulted from the preparation or handling of food for human consumption, or any decayed or unsound meat, fish, fruit, or vegetable (Sonoma County, CA).

Garbage can (1) Any plastic or galvanized metal container of the type commonly sold as a garbage can, of a capacity not less than twenty gallons (76 L) and not to exceed thirty gallons (114 L), having two handles upon the sides thereof, or a bail by which it may be lifted, and a tight-fitting metal or plastic top with handle, and so constructed as to permit the free discharge of its contents (Miami, FL); and (2) any galvanized metal or durable plastic container of the type commonly sold as a garbage can, of a capacity not less than twenty gallons and not to exceed thirty gallons, having two handles upon the sides thereof or a bail by which it may be lifted and a tight-fitting metal or plastic top with handle, and so constructed as to permit the free discharge of its contents.

Garden trash (1) All accumulations of leaves, grass, or shrubbery cuttings and other refuse attending the care of lawns, shrubbery vines, and trees (Miami, FL), and (2) all accumulations of leaves, grass or shrubbery cuttings, and other refuse attending the care of lawns, shrubbery, vines, and trees.

Gas condensate A liquid which has condensed in the landfill gas collection system or the hydraulic fracking system during the extraction of gas from within the operations. Gases such as methane and carbon dioxide are generated due to microbial activity within the operational sites and must be removed to avoid hazardous conditions.

Gas turbine A type of turbine in which combusted, pressurized gas is directed against a series of blades connected to a shaft, which forces the shaft to turn to produce mechanical energy.

Gasification The process in which a solid fuel is converted into a gas; also known as pyrolytic distillation or pyrolysis. Production of a clean fuel gas makes a wide variety of power options available.

Gasifier A device for converting a solid fuel to a gaseous fuel.

Gasket/seal A seal used to prevent the leakage of fluids and also maintain the pressure in an enclosure.

Gasohol A registered trademark of an agency of the State of Nebraska, for an automotive fuel containing a blend of 10% ethanol and 90% gasoline.

Gasoline A refined petroleum product suitable for use as a fuel in internal combustion engines.

Gauss The unit of magnetic field intensity equal to 1 dyn per unit pole.

Generator A device for converting mechanical energy to electrical energy.

Geologic unit It refers to the geologic media in which an underground mined repository is constructed.

Geopressurized brines These brines are hot (300°F to 400°F) (149° C to 204°C) pressurized waters that contain dissolved methane and lie at depths of 10,000 ft (3,048 m) to more than 20,000 ft (6,096 m) below the Earth's surface. The best-known geopressured reservoirs lie along the Texas and Louisiana Gulf Coast. At least three types of energy could be obtained: thermal energy from high-temperature fluids, hydraulic energy from the high pressure, and chemical energy from burning the dissolved methane gas.

Geothermal energy Energy produced by the internal heat of the earth; geothermal heat sources include hydrothermal convective systems, pressurized water reservoirs, hot dry rocks, manual gradients, and magma. Geothermal energy can be used directly for heating or to produce electric power.

Geothermal heat pump A type of heat pump that uses the ground, groundwater, or ponds as a heat source and heat sink rather than outside air. Ground or water temperatures are more constant and are warmer in winter and cooler in summer than air temperatures. Geothermal heat pumps operate more efficiently than "conventional" or "air-source" heat pumps.

Geothermal power station An electricity-generating facility that uses geothermal energy.

Gigawatt (GW) A unit of power equal to 1 billion watts; 1 million kilowatts or 1,000 MW.

Gin pole A pole used to assist in raising a tower.

Glare The excessive brightness from a direct light source that makes it difficult to see what one wishes to see. A bright object in front of a dark background usually will cause glare. Bright lights reflecting off a television or computer screen or even a printed page produces glare. Intense light sources—such as bright incandescent lamps—are likely to produce more direct glare than large fluorescent lamps. However, glare is primarily the result of relative placement of light sources and the objects being viewed.

Glauber's salt A salt, sodium sulfate decahydrate, which melts at 90°F; a component of eutectic salts that can be used for storing heat.

Glazing A term used for the transparent or translucent material in a window. This material (i.e., glass, plastic films, and coated glass) is used for admitting solar energy and light through windows.

Glazing Transparent or translucent material (glass or plastic) used to admit light and/or to reduce heat loss; used for building windows, skylights, or greenhouses or for covering the aperture of a solar collector.

Global insolation (or solar radiation) The total diffuse and direct insolation on a horizontal surface, averaged over a specified period of time.

Global warming A popular term used to describe the increase in average global temperatures due to the greenhouse effect.

Governor A device used to regulate motor speed or, in a wind energy conversion system, to control the rotational speed of the rotor.

Gradient Change in value of one variable with respect to another variable, especially vertical or horizontal distance.

Grain alcohol Ethanol.

Green certificates Green certificates represent the environmental attributes of power produced from renewable resources. By separating the environmental attributes from the power, clean power generators are able to sell the electricity they produce to power providers at a competitive market value. The additional revenue generated by the sale of the green certificates covers the above-market costs associated with producing power made from renewable energy sources. Also known as green tags, renewable energy certificates, or tradable renewable certificates.

Green power A popular term for energy produced from clean, renewable energy resources.

Green pricing A practice engaged in by some regulated utilities (i.e., power providers) where electricity produced from clean, renewable resources is sold at a higher cost than that produced from fossil or nuclear power plants, supposedly because some buyers are willing to pay a premium for clean power.

Greenhouse effect A popular term used to describe the heating effect due to the trapping of long wave (length) radiation by greenhouse gases produced from natural and human sources.

Greenhouse gases Those gases, such as water vapor, carbon dioxide, tropospheric ozone, methane, and low-level ozone that are transparent to solar radiation, but opaque to long wave radiation, and which contribute to the greenhouse effect.

Greenwood Freshly cut, unseasoned, wood.

Greywater Waste water from a household source other than a toilet. This water can be used for landscape irrigation depending upon the source of the greywater.

Grid A common term referring to an electricity transmission and distribution system.

Grid-connected system Independent power systems that are connected to an electricity transmission and distribution system (referred to as the electricity grid) such that the systems can draw on the grid's reserve capacity in times of need and feed electricity back into the grid during times of excess production.

Gross calorific value The heat produced by combusting a specific quantity and volume of fuel in an oxygen-bomb colorimeter under specific conditions.

Gross generation The total amount of electricity produced by a power plant.

Ground A device used to protect the user of any electrical system or appliance from shock.

Ground loop In geothermal heat pump systems, a series of fluid-filled plastic pipes buried in the shallow ground or placed in a body of water, near a building. The fluid within the pipes is used to transfer heat between the building and the shallow ground (or water) in order to heat and cool the building.

Ground reflection Solar radiation reflected from the ground onto a solar collector.

Groundwater (1) It refers to the supply of freshwater found beneath the Earth's surface, usually in aquifers, which supply wells and springs. It provides a major source of drinking water. (2) The body of water that is retained in the saturated zone which tends to move by hydraulic gradient to lower levels. (3) Subsurface water in the pore spaces of soil and geologic units.

Ground-source heat pump (See geothermal systems)

Guarantee It refers to a contractual undertaking to answer for the debt of another.

Guarantor It refers to the party providing a guarantee.

Guy wire Cable use to secure a wind turbine tower to the ground in a safe, stable manner.

Half-life The time in which half the atoms of a radionuclide disintegrate into another nuclear form. The half-life may vary from a fraction of a second to thousands of years.

Harmonic(s) A sinusoidal quantity having a frequency that is an integral multiple of the frequency of a periodic quantity to which it is related.

Hazardous and special waste It includes hazardous solid and liquid wastes, including but not limited to highly flammable materials, explosives, pathological wastes, and radioactive materials (Baltimore County, MD).

Hazardous refuse or solid waste (1) It includes any refuse which would, in handling, constitute a danger to city employees or to city property (Bettendorf, IA); (2) it includes soil waste that may be itself or in combination with other solid wastes, be infectious, explosive, poisonous, caustic or toxic, or otherwise dangerous or injurious to human, plant, or animal life (Marion County, OR); and (3) it refers to those wastes that can cause serious injury or disease during the normal storage, collection, and disposal cycle, including but not limited to explosives, pathological and infectious wastes, radioactive materials, and dangerous chemicals (Washington, DC).

Hazardous substance spill An accidental spillage of hazardous substances on land or surface water.

Hazardous waste (1) Any waste, including wastewater, sludge, or solids, defined as hazardous under the federal government's RCRA, TSCA, or any state environmental laws or regulations. (2) A waste or combination of wastes that because of quantity, concentration, or physical, chemical, or infectious characteristics may (2a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or (2b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Head A unit of pressure for a fluid, which is commonly used in water pumping and hydropower to express height a pump must lift water, or the distance waterfalls.

Heat A form of thermal energy resulting from combustion, chemical reaction, friction, or movement of electricity. As a thermodynamic condition, heat, at a constant pressure, is equal to internal or intrinsic energy plus pressure times volume.

Heat absorbing window glass A type of window glass that contains special tints that cause the window to absorb as much as 45 % of incoming solar energy to reduce heat gain in an interior space. Part of the absorbed heat will continue to be passed through the window by conduction and reradiation.

Heat balance Energy output from a system that equals energy input.

Heat content The amount of heat in a quantity of matter at a specific temperature and pressure.

Heat engine A device that produces mechanical energy directly from two heat reservoirs of different temperatures. A machine that converts thermal energy to mechanical energy, such as a steam engine or turbine.

Heat exchanger A device used to transfer heat from a fluid (liquid or gas) to another fluid where the two fluids are physically separated.

Heat gain The amount of heat introduced to a space from all heat-producing sources, such as building occupants, lights, and appliances, and from the environment, mainly solar energy.

Heat loss The heat that flows from the building interior, through the building envelope to the outside environment.

Heat pipe A device that transfers heat by the continuous evaporation and condensation of an internal fluid.

Heat pump An electricity-powered device that extracts available heat from one area (the heat source) and transfers it to another (the heat sink) to either heat or cool an interior space or to extract heat energy from a fluid.

Heat pump water heaters A water heater that uses electricity to move heat from one place to another instead of generating heat directly.

Heat rate The ratio of fuel energy input as heat per unit of net work output; a measure of a power plant thermal efficiency, generally expressed as Btu per net kilowatt-hour.

Heat recovery ventilator A device that captures the heat from the exhaust air from a building and transfers it to the supply/fresh air entering the building to preheat the air and increase overall heating efficiency.

Heat register The grilled opening into a room by which the amount of warm air from a furnace can be directed or controlled; may include a damper.

Heat sink A structure or media that absorbs heat.

Heat source A structure or media from which heat can be absorbed or extracted.

Heat storage A device or media that absorbs heat for storage for later use.

Heat storage capacity The amount of heat that a material can absorb and store.

Heat transfer The flow of heat from one area to another by conduction, convection, and/or radiation. Heat flows naturally from a warmer to a cooler material or space.

Heat transfer fluid A gas or liquid used to move heat energy from one place to another; a refrigerant.

Heat transmission coefficient Any coefficient used to calculate heat transmission by conduction, convection, or radiation through materials or structures.

Heating capacity (also specific heat) The quantity of heat necessary to raise the temperature of a specific mass of a substance by one degree.

Heating degree day(s) (HDD) The number of degrees per day that the daily average temperature (the mean of the maximum and minimum recorded temperatures) is below a base temperature, usually 65°F, unless otherwise specified; used to determine indoor space-heating requirements and heating system sizing. Total HDD is the cumulative total for the year/heating season. The higher the HDD for a location, the colder the daily average temperature(s).

Heating fuel units Standardized weights or volumes for heating fuels.

Heating fuels Any gaseous, liquid, or solid fuel used for indoor space heating.

Heating load The rate of heat flow required to maintain a specific indoor temperature; usually measured in Btu per hour.

Heating season The coldest months of the year; months where average daily temperatures fall below 65°F (18.33°C), creating demand for indoor space heating.

Heating seasonal performance factor (HSPF) The measure of seasonal or annual efficiency of a heat pump operating in the heating mode. It takes into account the variations in temperature that can occur within a season and is the average number of Btu of heat delivered for every watt-hour of electricity used by the heat pump over a heating season.

Heating value The amount of heat produced from the complete combustion of a unit of fuel. The higher (or gross) heating value is that when all products of combustion are cooled to the precombustion temperature, water vapor formed during combustion is condensed, and necessary corrections have been made. Lower (or net) heating value is obtained by subtracting from the gross heating value the latent heat of vaporization of the water vapor formed by the combustion of the hydrogen in the fuel.

Heating, ventilation, and air-conditioning (HVAC) system All the components of the appliance used to condition interior air of a building.

Heavy metals Trace elements are found in low concentrations in biosolids. The trace elements of interest in biosolids are those commonly referred to as "heavy metals." Some of these trace elements (e.g., copper, molybdenum, and zinc) are nutrients needed for plant growth in low concentrations, but all of these elements can be toxic to humans, animals, or plants at high concentrations. Possible hazards associated with a buildup of trace elements in the soil include their potential to cause phytotoxicity (i.e., injury to plants) or to increase the concentration of potentially hazardous substances in the food chain. Federal and

state regulations have established standards for the following nine trace elements: arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), and zinc (Zn).

Heliochemical process The utilization of solar energy through photosynthesis.

Heliodon A device used to simulate the angle of the sun for assessing shading potentials of building structures or landscape features.

Heliostat A device that tracks the movement of the sun; used to orient solar concentrating systems.

Heliothermal Any process that uses solar radiation to produce useful heat.

Heliothermic Site planning that accounts for natural solar heating and cooling processes and their relationship to building shape, orientation, and siting.

Heliothermometer An instrument for measuring solar radiation.

Heliotropic Any device (or plant) that follows the sun's apparent movement across the sky.

Hemispherical bowl technology A solar energy concentrating technology that uses a linear receiver that tracks the focal area of a reflector or array of reflectors.

HERO It refers to a database that includes more than 300,000 scientific articles from the peer-reviewed literature used by USEPA to develop its Integrated Science Assessments (ISA) that feed into the NAAQS review. It also includes references and data from the Integrated Risk Information System (IRIS), a database that supports critical agency policymaking for chemical regulation! Risk assessment—a study which characterizes the nature and magnitude of health risks to humans and the ecosystem from pollutants and chemicals in the environment.

Hertz A measure of the number of cycles or wavelengths of electrical energy per second; US electricity supply has a standard frequency of 60 Hz.

Heterojunction A region of electrical contact between two different materials.

Higher heating value (HHV) The maximum heating value of a fuel sample, which includes the calorific value of the fuel (bone dry) and the latent heat of vaporization of the water in the fuel (see moisture content and net (lower) heating value below).

High-intensity discharge lamp A lamp that consists of a sealed arc tube inside a glass envelope or outer jacket. The inner arc tube is filled with elements that emit light when ionized by electric current. A ballast is required to provide the proper starting voltage and to regulate current during operation.

High-level waste (HLW) The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, which contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation.

High-pressure sodium lamp A type of high-intensity discharge (HID) lamp that uses sodium under high pressure as the primary light-producing element. These high-efficiency lights produce a golden white color and are used for interior

industrial applications, such as in warehouses and manufacturing, and for security, street, and area lighting.

Hole The vacancy where an electron would normally exist in a solid; behaves like a positively charged particle.

Home energy rating systems (HERS) A nationally recognized energy rating program that gives builders, mortgage lenders, secondary lending markets, homeowners, sellers, and buyers a precise evaluation of energy losing deficiencies in homes. Builders can use this system to gauge the energy quality in their home and also to have a star rating on their home to compare to other similarly built homes.

Homojunction The region between an n-layer and a p-layer in a single material, photovoltaic cell.

Horizontal drilling It is drilling a portion of a well horizontally to expose more of the formation surface area to the wellbore.

Horizontal ground loop In this type of closed-loop geothermal heat pump installation, the fluid-filled plastic heat exchanger pipes are laid out in a plane parallel to the ground surface. The most common layouts either use two pipes, one buried at six feet and the other at four feet or two pipes placed side-by-side at five feet in the ground in a two-foot wide trench. The trenches must be at least four feet deep. Horizontal ground loops are generally most cost-effective for residential installations, particularly for new construction where sufficient land is available. Also see closed-loop geothermal heat pump systems.

Horizontal-axis wind turbines Turbines in which the axis of the rotor's rotation is parallel to the wind stream and the ground.

Horsepower (hp) A unit of rate of operation. Electrical hp, a measure of time rate of mechanical energy output; usually applied to electric motors as the maximum output; 1 electrical hp is equal to 0.746 kW or 2545 Btu per hour. Shaft hp, a measure of the actual mechanical energy per unit time delivered to a turning shaft; 1 shaft Hp is equal to 1 electrical Hp or 550 ft pounds per second. Boiler Hp, a measure to the maximum rate to heat output of a steam generator; 1 boiler Hp is equal to 33,480 Btu per hour steam output. 1 hp = 0.7457 kW.

Horsepower hour (hph) One horsepower provided over one hour; equal to 0.745 kW-hour or 2545 Btu. 1 hph = 0.7457 kW-hour.

Hot air furnace A heating unit where heat is distributed by means of convection or fans.

Hot dry rock A geothermal energy resource that consists of high-temperature rocks above 300°F (150°C) that may be fractured and have little or no water. To extract the heat, the rock must first be fractured, and then water is injected into the rock and pumped out to extract the heat. In the western United States, as much as 95,000 square miles (246,050 square km) have hot dry rock potential.

Hot water heating systems (See hydronic)

Household waste It includes garbage, rubbish, mixed refuse, and cool ashes originating in and around private dwellings, multiple dwellings, living quarters, or dining facilities located in schools, colleges, or universities (Bettendorf, IA).

HPVIS It refers to a database that provides access to health and environmental effects information obtained through the high production volume (HPV) challenge.

Hub height The height above the ground that a horizontal axis wind turbine's hub is located.

Humidifier A device used to maintain a specified humidity in a conditioned space.

Humidity A measure of the moisture content of air; may be expressed as absolute, mixing ratio, saturation deficit, relative, or specific.

Hybrid system A renewable energy system that includes two different types of technologies that produce the same type of energy; e.g., a wind turbine and a solar photovoltaic array combined to meet a power demand.

Hydraulic conductivity The ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium; the ratio describing the rate at which water can move through a permeable medium.

Hydraulic fracturing It refers to a process which uses high pressure to pump fluid and often carries proppants into subsurface rock formations in order to improve flow into a wellbore.

Hydraulic fracturing water lifecycle It refers to the lifecycle of water in the hydraulic fracturing process, encompassing the acquisition of water, chemical mixing of the fracturing fluid, injection of the fluid into the formation, the production and management of flowback and produced water, and the ultimate treatment and disposal of hydraulic fracturing wastewaters.

Hydroelectric power plant A power plant that produces electricity by the force of water falling through a hydroturbine that spins a generator.

Hydrogen A chemical element that can be used as a fuel since it has a very high energy content.

Hydrogenated amorphous silicon Amorphous silicon with a small amount of incorporated hydrogen. The hydrogen neutralizes dangling bonds in the amorphous silicon, allowing charge carriers to flow more freely.

Hydrogeologic unit It refers to any soil or rock unit or zone which, by virtue of its porosity and permeability, or lack thereof, has a distinct influence on the storage or movement of groundwater.

Hydronic heating systems A type of heating system where water is heated in a boiler and either moves by natural convection or is pumped to heat exchangers or radiators in rooms; radiant floor systems have a grid of tubing laid out in the floor for distributing heat. The temperature in each room is controlled by regulating the flow of hot water through the radiators or tubing.

Hydrothermal fluids These fluids can be either water or steam trapped in fractured or porous rocks; they are found from several hundred feet to several miles below the Earth's surface. The temperatures vary from about 90°F to 680°F (32°C to 360°C) but roughly 2/3 range in temperature from 150°F to 250°F (65.5°C to 121.1°C). The latter are the easiest to access and, therefore, the only forms being used commercially.

Ignite To heat a gaseous mixture to the temperature at which combustion takes place.

Ignition point The minimum temperature at which combustion of a solid or fluid can occur.

Illuminance A measure of the amount of light incident on a surface; measured in foot-candles or Lux.

Illumination The distribution of light on a horizontal surface. The purpose of all lighting is to produce illumination.

Impaired water body A water body that does not meet the criteria that support its designated use.

Impoundment A body of water confined by a dam, dike, floodgate, or other artificial barrier.

Impulse turbine A turbine that is driven by high velocity jets of water or steam from a nozzle directed to vanes or buckets attached to a wheel. (A Pelton wheel is an impulse hydroturbine).

Inactive A facility or portion thereof that is currently not treating, disposing, or recycling/recovering wastes or process liquids.

Inadvertent intruder It refers to a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, or other pursuits in which the person might unknowingly be exposed to radiation from the low-level radioactive waste.

Inadvertent intrusion It refers to the act of occupying the disposal site after closure and engaging in normal activities, such as agriculture, dwelling construction, or other pursuits in which a person might unknowingly be exposed to radiation from the low-level radioactive waste.

Incandescent These lights use an electrically heated filament to produce light in a vacuum or inert gas-filled bulb.

Incident solar radiation The amount of solar radiation striking a surface per unit of time and area.

Incineration (1) A process involving destruction by combustion, in which heat, not less than twelve hundred degrees Fahrenheit (649°C), is applied to all classes of waste material, within a properly designed plant (Baltimore County, MD); (2) a process involving destruction by combustion, in which heat, not less than 1,200°F (649°C), is applied to all classes of waste material, within a properly designed plant approved by the local government (Prince George's County, MD); and (3) a physicochemical process involving the controlled burning of combustible solid wastes with or without accompanying noncombustible wastes with the use of auxiliary fuel when necessary (Boulder, CO).

Incinerator (1) Any equipment, device, or contrivance and all appurtenances thereof used for the destruction by burning of solid, semisolid liquid, or gaseous combustible wastes (Washington, DC). (2) A combustion device specifically designed for the reduction by burning of solid, semisolid, or liquid combustible wastes (Marion County, OR).

Incinerator residue It includes solid materials remaining after reduction in an incinerator (Washington, DC).

Independent power producer A company or individual that is not directly regulated as a power provider. These entities produce power for their own use and/or sell it to regulated power providers.

Indicator organism An indicator organism (e.g., fecal coliform) is a nonpathogenic organism whose presence implies the presence of pathogenic organisms. Indicator organisms are selected to be conservative estimates of the potential for pathogenicity.

Indirect discharger A facility that discharges or may discharge wastewaters into a publicly owned treatment works (POTW).

Indirect solar gain system A passive solar heating system in which the sun warms a heat storage element and the heat is distributed to the interior space by convection, conduction, and radiation.

Indirect solar water heater These systems circulate fluids other than water (such as diluted antifreeze) through the collector. The collected heat is transferred to the household water supply using a heat exchanger. Also known as "closed-loop" systems.

Individual field unit An *area of cropland* that has been *subdivided* into several strips is not a single field. Rather, each strip represents an *individual field unit*.

Induction The production of an electric current in a conductor by the variation of a magnetic field in its vicinity.

Induction generator A device that converts the mechanical energy of rotation into electricity based on electromagnetic induction. An electric voltage (electromotive force) is induced in a conducting loop (or coil) when there is a change in the number of magnetic field lines (or magnetic flux) passing through the loop. When the loop is closed by connecting the ends through an external load, the induced voltage will cause an electric current to flow through the loop and load. Thus, rotational energy is converted into electrical energy.

Induction motor A motor in which a three-phase (or any multiphase) alternating current (i.e., the working current) is supplied to iron-cored coils (or windings) within the stator. As a result, a rotating magnetic field is set up, which induces a magnetizing current in the rotor coils (or windings). Interaction of the magnetic field produced in this manner with the rotating field causes rotational motion to occur.

Industrial (solid) waste or refuse (1) Any and all residue resulting directly from industrial or manufacturing operations; it shall not include waste originating from commercial operations of an industrial establishment, nor shall it include waste resulting from the commercial operations of persons, firms, or corporations engaged in the construction of buildings, the repairs of streets or buildings, demolition, or excavation. Residue or waste resulting from tree or landscaping services shall also be excluded (Bettendorf, IA). (2) Any solid wastes which result from industrial processes and manufacturing operations such as factories, processing plants, repair and cleaning establishments, refineries, and rendering

plants (Washington, DC). (3) The waste products of canneries; slaughterhouses or packing plants; condemned food products; agricultural waste products; wastes and debris from brick, concrete block, roofing shingle or tile plants; and debris and wastes accumulated from land clearing, excavating, building, rebuilding, and altering of buildings, structures, roads, streets, sidewalks, or parkways; and any waste materials which, because of their volume or nature, do not lend themselves to collection and incineration co-mingled with ordinary garbage and trash, or which, because of their nature or surrounding circumstances, should be, for reasons of safety or health, disposed of oftener than the city collection service schedule provided for this ordinance (Miami, FL). (4) Any solid waste materials from factories processing plants and other manufacturing enterprises, including but not limited to putrescible garbage from food processing plants and slaughterhouses, condemned foods, building rubbish, and cinders from power plants and manufacturing refuse (Baltimore County, MD). (5) Any waste products of canneries; slaughterhouses or packing plants; condemned food products; agricultural waste products; wastes and debris from brick, concrete block, roofing shingle or tile plants; and debris and wastes accumulated from land clearing, excavating, building, rebuilding, and altering of buildings, structures, roads, streets, sidewalks or parkways, and any waste materials which, because of their volume or nature, do not lend themselves to collection and incineration co-mingled with ordinary garbage and trash or which, because of their nature or surrounding circumstances, should be, for reasons of safety or health, disposed of more often than the county collection service schedule provided for (Dade County, FL).

Industrial process heat The thermal energy used in an industrial process.

Inert gas A gas that does not react with other substances; e.g., argon or krypton; sealed between two sheets of glazing to decrease the U-value (increase the R-value) of windows.

Infrared radiation Electromagnetic radiation whose wavelengths lie in the range from 0.75 to 1,000 μm; invisible long wavelength radiation (heat) capable of producing a thermal or photovoltaic effect, though less effective than visible light.

Insolation The solar power density incident on a surface of stated area and orientation, usually expressed as watts per square meter or Btu per square foot per hour.

Installed capacity The total capacity of electrical generation devices in a power station or system.

Instantaneous efficiency (of a solar collector) The amount of energy absorbed (or converted) by a solar collector (or photovoltaic cell or module) over a 15-min period.

Institutional control period (1) It refers to a period of time after closure of the land disposal facility during which the state maintains control of access to the site and carries out a program including environmental monitoring, periodic surveillance, and minor custodial care. (2) It refers to a period of time after the

post-closure period during which the state maintains control of access to the site and carries out a program including environmental monitoring, periodic surveillance, and minor custodial care.

Institutional control plan It refers to the plan for institutional control prepared as required by the state or federal environmental laws or regulations.

Institutional waste It includes garbage, rubbish, mixed refuse, and cool ashes originating in and around tax-exempt hospitals and public, charitable, philanthropic, or religious institutions conducted for the benefit of the public or a recognized section of the public. Institutions not covered by the foregoing definition shall be considered commercial establishments (Bettendorf, IA).

Insulation Materials that prevent or slow down the movement of heat.

Insulation blanket A precut layer of insulation applied around a water heater storage tank to reduce standby heat loss from the tank.

Insulator A device or material with a high resistance to electricity flow.

Integral collector storage system This simple passive solar hot water system consists of one or more storage tanks placed in an insulated box that has a glazed side facing the sun. An integral collector storage system is mounted on the ground or on the roof (make sure your roof structure is strong enough to support it). Some systems use "selective" surfaces on the tank(s). These surfaces absorb sun well but inhibit radiative loss. Also known as bread box systems or batch heaters.

Integrated heating systems A type of heating appliance that performs more than one function, for example, space and water heating.

Integrated resource plan (IRP) A plan developed by an electric power provider, sometimes as required by a public regulatory commission or agency, that defines the short- and long-term capacity additions (supply side) and demand side management programs that it will undertake to meet projected energy demands.

Integrated safety management system (ISMS). The Integrated Safety Management System (ISMS) describes the programs, policies, and procedures used by the facility and the US DOE to ensure that the facility establishes a safe workplace for the employees, the public, and the environment. The guiding principles of ISMS are line management responsibility for safety, clear roles and responsibilities, competence commensurate with responsibilities, balanced priorities, identification of safety standards and requirements, hazard controls, and operations authorization.

Interconnection A connection or link between power systems that enables them to draw on each other's reserve capacity in time of need.

Interim status (1) The status of any currently existing facility that becomes subject to the requirement to have a RCRA permit because of a new statutory or regulatory amendment to RCRA. (2) In the USA, the status of any currently existing facility that becomes subject to the requirement to have a RCRA permit because of a new statutory or regulatory amendment to RCRA.

Intermittent generators Power plants, whose output depends on a factor(s) that cannot be controlled by the power generator because they utilize intermittent resources such as solar energy or the wind.

Internal combustion electric power plant The generation of electric power by a heat engine which converts part of the heat generated by combustion of the fuel into mechanical motion to operate an electric generator.

Internal gain The heat produced by sources of heat in a building (occupants, appliances, lighting, etc.).

Internal mass Materials with high thermal energy storage capacity contained in or part of a building's walls, floors, or freestanding elements.

Internal radiation Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or man-made radionuclides in body tissues.

Internal rate of return A widely used rate of return for performing economic analysis. This method solves for the interest rate that equates the equivalent worth of an alternative's cash receipts or savings to the equivalent worth of cash expenditures, including investments. The resultant interest rate is termed the internal rate of return (IRR).

Interruptible load Energy loads that can be shut off or disconnected at the supplier's discretion or as determined by a contractual agreement between the supplier and the customer.

Interstitial The (annular) space between the inner and outer tank walls in a double-walled storage tank.

Intracompany A facility that treats, disposes, or recycles/recovers wastes generated by off-site facilities under the same corporate ownership. The facility may also treat on-site generated wastes. If any waste from other facilities not under the same corporate ownership is accepted for a fee, the facility is considered commercial.

Intrinsic layer A layer of semiconductor material (as used in a solar photovoltaic device) whose properties are essentially those of the pure, undoped, material.

Intruder barrier It refers to an engineered structure or a sufficient depth of cover over the low-level radioactive waste or disposal units that inhibit contact with the waste and help to ensure that radiation exposures to an inadvertent intruder will meet the performance objectives of the state of federal environmental laws or regulations.

Inverter A device that converts direct current electricity (from, e.g., a solar photovoltaic module or array) to alternating current for use directly to operate appliances or to supply power to an electricity grid.

Investment tax credit A tax credit granted for specific types of investments.

Investor owned utility (IOU) A power provider owned by stockholders or other investors; sometimes referred to as a private power provider, in contrast to a public power provider that is owned by a government agency or cooperative.

Ion (1) An electrically charged atom or group of atoms that has lost or gained electrons; a loss makes the resulting particle positively charged; a gain makes the

particle negatively charged. (2) An atom or group of atoms with an electric charge.

Ion exchange The reversible exchange of ions contained in solution with other ions that are part of the ion-exchange material.

Ionizer A device that removes airborne particles from breathable air. Negative ions are produced and give up their negative charge to the particles. These new negative particles are then attracted to the positive particles surrounding them. This accumulation process continues until the particles become heavy enough to fall to the ground.

IRIS It refers to a human health assessment program that evaluates risk information on effects that may result from exposure to environmental contaminants.

Irradiance The direct, diffuse, and reflected solar radiation that strikes a surface.

Isolated solar gain system A type of passive solar heating system where heat is collected in one area for use in another.

Isotope Different forms of the same chemical element that are distinguished by having the same number of protons but a different number of neutrons in the nucleus. An element can have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium, with one, two, and three neutrons in the nucleus, respectively.

I-Type semiconductor A semiconductor material that is left intrinsic or undoped so that the concentration of charge carriers is characteristic of the material itself rather than of added impurities.

I-V Curve A graphical plot or representation of the current and voltage output of a solar photovoltaic cell or module as a load on the device is increased from short-circuit (no load) condition to the open-circuit condition; used to characterize cell/module performance.

Jacket The enclosure on a water heater, furnace, or boiler.

Joist A structural, load-carrying building member with an open web system that supports floors and roofs utilizing wood or specific steels and is designed as a simple span member.

Joule A metric unit of energy or work; the energy produced by a force of one Newton operating through a distance of one meter; 1 J per second equals 1 W or 0.737 ft pounds; 1 Btu equals 1055 J.

Joule's law The rate of heat production by a steady current in any part of an electrical circuit that is proportional to the resistance and to the square of the current, or the internal energy of an ideal gas depends only on its temperature.

Junction A region of transition between semiconductor layers, such as a p/n junction, which goes from a region that has a high concentration of acceptors (p-type) to one that has a high concentration of donors (n-type).

Kame delta A conical hill or short irregular ridge of gravel or sand deposited in contact with glacier ice.

Kaplan turbine A type of turbine that has two blades whose pitch is adjustable. The turbine may have gates to control the angle of the fluid flow into the blades.

Kerosene A type of heating fuel derived by refining crude oil that has a boiling range at atmospheric pressure from 400°F to 550°F.

Key finding (self-assessment) A direct and significant violation of a Department of Energy regulatory or other applicable guidance or procedural requirement or a recurring pattern of observed deficiencies that could result in such a violation. A finding is a deficiency that requires corrective action.

Kilovolt-ampere (kVa) A unit of apparent power, equal to 1000 V-amperes; the mathematical product of the volts and amperes in an electrical circuit.

Kilowatt (kW) A standard unit of electrical power equal to one thousand watts or to the energy consumption at a rate of 1000 J per second.

Kilowatt-hour A unit or measure of electricity supply or consumption of 1000 W over the period of one hour; equivalent to 3412 Btu.

Kinetic energy Energy available as a result of motion that varies directly in proportion to an object's mass and the square of its velocity.

Kneewall A wall usually about 3–4 ft high located that is placed in the attic of a home, anchored with plates between the attic floor joists and the roof joist. Sheathing can be attached to these walls to enclose an attic space.

Lacustrine sediments A sedimentary deposit consisting of material pertaining to, produced by, or formed in a lake or lakes.

Lagoon In wastewater treatment or livestock facilities, a shallow pond used to store wastewater where sunlight and biological activity decompose the waste. There are three major types of lagoons: anaerobic, aerobic, and facultative.

Lamp A light source composed of a metal base, a glass tube filled with an inert gas or a vapor, and base pins to attach to a fixture.

Land application Land application is defined as the spreading, spraying, injection, or incorporation of liquid or semiliquid organic substances, such as sewage sludge, biosolids, livestock manure, compost, septage, legumes, and other types of liquid organic waste, onto or below the surface of the land to take advantage of the soil-enhancing qualities of the organic substances. These organic substances are land applied to improve the structure of the soil. It is also applied as a fertilizer to supply nutrients to crops and other vegetation grown in the soil. The liquid or semiliquid organic substances are commonly applied to agricultural land (including pasture and range land), forests, reclamation sites, public contact sites (e.g., parks, turf farms, highway median strips, golf courses), lawns, and home gardens.

Land application site An area of land on which sewage sludge is applied to condition the soil or to fertilize crops or vegetation grown in the soil.

Land disposal facility (1) It includes, but is not limited to, underground mined repositories and the land, buildings, and equipment which are intended to be used for aboveground disposal of low-level radioactive waste: (1a) it is not classified as high-level radioactive waste, spent nuclear fuel, or by-product material as defined in the state or federal environmental laws or regulations. By-product material as defined in the US Atomic Energy Act is uranium or thorium tailings and waste; (1b) it is classified as low-level radioactive waste

consistent with federal/state law and in accordance with the US Nuclear Regulatory Commission (NRC) or the International Atomic Energy Agency (IAEA); and (2) it refers to the land, buildings, and equipment which are intended to be used for the disposal of low-level radioactive waste into the subsurface of the land.

Land disposal restrictions (LDR) Regulations promulgated by the US EPA (and by the state environmental agency) governing the land disposal of hazardous wastes. The wastes must be treated using the best demonstrated available technology or must meet certain treatment standards before being disposed.

Land reclamation An action to remove pollutants from a contaminated land in order to reclaim the land for useful domestic, commercial, industrial, recreational, or agricultural applications.

Land restoration An action to remove pollutants from a contaminated land in order to restore the land's original unpolluted conditions.

Land treatment A wastewater treatment process involving the sprinkling of wastewater to vegetated soils that are slow to moderate in permeability (clay loams to sandy loams) and treatment of wastewater as it travels through the soil matrix by filtration, adsorption, ion exchange, precipitation, microbial action, and by plant uptake. An optional underdrainage system consisting of a network of drainage pipe buried below the surface may serve to recover the effluent, to control groundwater, or to minimize trespass of leachate onto adjoining property by horizontal subsurface flow.

Landfill (1) An area of land or an excavation in which wastes are placed for permanent disposal, which is not a land application or land treatment unit, surface impoundment, underground injection well, waste pile, salt dome formation, a salt bed formation, an underground mine, or a cave and (2) A disposal site operated by means of compacting and covering solid wastes at specific designated intervals, but not each operating day (Marion County, OR).

Landfill-generated wastewaters Wastewater generated by landfill activities and collected for treatment, discharge, or reuse include leachate, contaminated groundwater, storm water runoff, landfill gas condensate, truck/equipment washwater, drained-free liquids, floor washings, and recovering pumping wells.

Landfill: subtitle C See subtitle C landfill

Landfill: subtitle D See subtitle D landfill

Landscaping Features and vegetation on the outside of or surrounding a building for aesthetics and energy conservation.

Langley A unit or measure of solar radiation; 1 cal per square centimeter or 3.69 Btu per square foot.

Large volume receptacle It includes refuse receptacles of 4 cubic yards (3.06 cubic meters) of greater capacity furnished and maintained by the county which shall be subject to special collection fees as provided in the county government's ordinance (Los Alamos County, NM).

Latent cooling load The load created by moisture in the air, including from outside air infiltration and that from indoor sources such as occupants, plants, cooking, showering, etc.

Latent heat The change in heat content that occurs with a change in phase and without change in temperature.

Latent heat of vaporization The quantity of heat produced to change a unit weight of a liquid to vapor with no change in temperature.

Lattice The regular periodic arrangement of atoms or molecules in a crystal of semiconductor material.

Law(s) of thermodynamics The first law states that energy cannot be created or destroyed; the second law states that when a free exchange of heat occurs between two materials, the heat always moves from the warmer to the cooler material.

Leachate Leachate is a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste. Leachate is typically collected from a liner system above which waste is placed for disposal. Leachate may also be collected through the use of slurry walls, trenches, or other containment systems.

Leachate collection system The purpose of a leachate collection system is to collect leachate for treatment or alternative disposal and to reduce the depths of leachate buildup or level of saturation over the low permeability liner.

Lead acid battery An electrochemical battery that uses lead and lead oxide for electrodes and sulfuric acid for the electrolyte.

Leading edge In reference to a wind energy conversion system, the area of a turbine blade surface that first comes into contact with the wind.

Leaking electricity Related to standby power, leaking electricity is the power needed for electrical equipment to remain ready for use while in a dormant mode or operation. Electricity is still used by many electrical devices, such as TVs, stereos, and computers, even when you think they are turned "off."

Lethe A measure of air purity that is equal to one complete air change (in an interior space).

Letter of credit It is a written instrument whereby the issuer will honor drafts or other demands for payment upon compliance with the conditions specified in the letter.

Levelized life-cycle cost A total life-cycle cost divided into equal amounts.

License It refers to a license to operate a low-level radioactive waste land disposal facility or other environmental facility issued pursuant to the state of federal environmental laws or regulations.

Licensed waste collector It refers to any person, firm, or corporation who has obtained a license as specified herein from the city to collect or transport, for a consideration, bulk refuse, household waste, commercial waste, industrial waste, building waste, or building debris, regardless of the place of origin, over the streets of the city (Bettendorf, IA).

Life-cycle cost The sum of all the costs both recurring and nonrecurring, related to a product, structure, system, or service during its life span or specified time period.

Lift The force that pulls a wind turbine blade, as opposed to drag.

Light quality A description of how well people in a lighted space can see to do visual tasks and how visually comfortable they feel in that space.

Light trapping The trapping of light inside a semiconductor material by refracting and reflecting the light at critical angles; trapped light will travel further in the material, greatly increasing the probability of absorption and hence of producing charge carriers.

Light-induced defects Defects, such as dangling bonds, induced in an amorphous silicon semiconductor upon initial exposure to light.

Limit of liability It is the total amount an insurer is obligated to pay, under an insurance policy, for remediation of failures and/or for personal injury or property damage to third parties caused by the operation of the land disposal facility.

Line loss (or drop) Electrical energy lost due to inherent inefficiencies in an electrical transmission and distribution system under specific conditions.

Liner (landfill) The liner is a low permeability material or combination of materials placed at the base of a landfill to reduce the discharge to the underlying or surrounding hydrogeologic environment. The liner is designed as a barrier to intercept leachate and to direct it to a leachate collection.

Liquid manure A manure from animals that contains dry matter less than 5 %.

Liquid-based solar heating system A solar heating system that uses a liquid as the heat-transfer fluid.

Liquid-to-air heat exchanger A heat exchanger that transfers the heat contained in a liquid heat-transfer fluid to air.

Liquid-to-liquid heat exchanger A heat exchanger that transfers heat contained in a liquid heat-transfer fluid to another liquid.

Lithium-sulfur battery A battery that uses lithium in the negative electrode and a metal sulfide in the positive electrode, and the electrolyte is molten salt; can store large amounts of energy per unit weight.

Live steam Steam available directly from a boiler under full pressure.

Load The power required to run a defined circuit or system, such as a refrigerator, building, or an entire electricity distribution system.

Load analysis Assessing and quantifying the discrete components that comprise a load. This analysis often includes time of day or season as a variable.

Load duration curve A curve that displays load values on the horizontal axis in descending order of magnitude against the percent of time (on the vertical axis) that the load values are exceeded.

Load factor The ratio of average energy demand (load) to maximum demand (peak load) during a specific period.

Load forecast An estimate of power demand at some future period.

Load leveling The deferment of certain loads to limit electrical power demand or the production of energy during off-peak periods for storage and use during peak demand periods.

Load management To influence the demand on a power source.

Load profile or shape A curve on a chart showing power (kW) supplied (on the horizontal axis) plotted against time of occurrence (on the vertical axis) to illustrate the variance in a load in a specified time period.

Load shedding Turning off or disconnecting loads to limit peak demand.

Load shifting A load management objective that moves loads from on-peak periods to off-peak periods.

Local solar time A system of astronomical time in which the sun crosses the true north-south meridian at 12 noon and which differs from local time according to longitude, time zone, and equation of time.

Log law In reference to a wind energy conversion system, the wind speed profile in which wind speeds increase with the logarithmic of the height of the wind turbine above the ground.

Long ton A unit that equals 20 long hundredweight or 2,240 lb. Used mainly in England. 1 long ton = 1,016 kg.

Long-term average (LTA) For purposes of the effluent guidelines, average pollutant levels achieved over a period of time by a facility, subcategory, or technology option. LTAs were used in developing the limitations and standards in the proposed landfill regulation.

Long-wave radiation Infrared or radiant heat.

Loose fill insulation Insulation made from rockwool fibers, fiberglass, cellulose fiber, vermiculite, or perlite minerals and composed of loose fibers or granules can be applied by pouring directly from the bag or with a blower.

Loss of load probability (LOLP) A measure of the probability that a system demand will exceed capacity during a given period; often expressed as the estimated number of days over a long period, frequently 10 years or the life of the system.

Losses (energy) A general term applied to the energy that is converted to a form that cannot be effectively used (lost) during the operation of an energy-producing, energy-conducting, or energy-consuming system.

Low Btu gas A fuel gas with a heating value between 90 and 200 Btu per cubic foot.

Low flush toilet A toilet that uses less water than a standard one during flushing, for the purpose of conserving water resources.

Low-E coatings and (window) films A coating applied to the surface of the glazing of a window to reduce heat transfer through the window.

Low-emissivity windows and (window) films Energy-efficient windows that have a coating or film applied to the surface of the glass to reduce heat transfer through the window.

Lower (net) heating value The lower or net heat of combustion for a fuel that assumes that all products of combustion are in a gaseous state (see net heating value below).

Lower limit of detection (LLD) The lowest limit of a given parameter an instrument is capable of detecting. A measurement of analytical sensitivity.

Low-flow solar water heating systems The flow rate in these systems is 1/8 to 1/5, the rate of most solar water heating systems. The low-flow systems take advantage of stratification in the storage tank and theoretically allows for the use of smaller diameter piping to and from the collector and a smaller pump.

Low-level radioactive waste It refers to those low-level radioactive wastes that are acceptable for disposal in a land disposal facility pursuant to the provisions of the appropriate state or federal environmental laws or regulations.

Low-level waste (LLW) Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or uranium mill tailings (see Classes A, B, and C low-level waste).

Low-pressure sodium lamp A type of lamp that produces light from sodium gas contained in a bulb operating at a partial pressure of 0.13 to 1.3 Pa. The yellow light and large size make them applicable to lighting streets and parking lots.

Lumen An empirical measure of the quantity of light. It is based upon the spectral sensitivity of the photosensors in the human eye under high (daytime) light levels. Photometrically it is the luminous flux emitted with a solid angle (1 sr) by a point source having a uniform luminous intensity of 1 cd. As reference, a 100-W incandescent lamp emits about 1600 lm.

Lumens/watt (lpw) A measure of the efficacy (efficiency) of lamps. It indicates the amount of light (lumens) emitted by the lamp for each unit of electrical power (watts) used.

Luminaire A complete lighting unit consisting of a lamp(s), housing, and connection to the power circuit.

Luminance The physical measure of the subjective sensation of brightness; measured in lumens.

Lux The unit of illuminance equivalent to 1l m per square meter.

Magma Molten or partially molten rock at temperatures ranging from 1260°F to 2880°F (700°C to 1600°C). Some magma bodies are believed to exist at drillable depths within the Earth's crust, although practical technologies for harnessing magma energy have not been developed. If ever utilized, magma represents a potentially enormous resource.

Magnetic ballast A type of florescent light ballast that uses a magnetic core to regulate the voltage of a florescent lamp.

Major natural phenomena It refers to rarely occurring natural events such as tornadoes, hurricanes, floods, wildfires, volcanism, and earthquakes.

Makeup air Air brought into a building from outside to replace exhaust air.

Manual J The standard method for calculating residential cooling loads developed by the Air-Conditioning and Refrigeration Institute (ARI) and the Air Conditioning Contractors of America (ACCA) based largely on the American Society

of Heating, Refrigeration, and Air-Conditioning Engineer's (ASHRAE) "Handbook of Fundamentals."

Manure Any wastes discharged from livestock and other animals.

Marginal cost The cost of producing one additional unit of a product.

Masonry Material such as brick, rock, or stone.

Masonry stove A type of heating appliance similar to a fireplace, but much more efficient and clean burning. They are made of masonry and have long channels through which combustion gases give up their heat to the heavy mass of the stove, which releases the heat slowly into a room. Often called Russian or Finnish fireplaces.

Mass burn facility A type of municipal solid waste (MSW) incineration facility in which MSW is burned with only minor presorting to remove oversize, hazardous, or explosive materials. Mass burn facilities can be large, with capacities of 3,000 t (2.7 million kg) of MSW per day or more. They can be scaled down to handle the waste from smaller communities, and modular plants with capacities as low as 25 t (22.7 thousand kg) per day have been built. Mass burn technologies represent over 75 % of all the MSW-to-energy facilities constructed in the United States to date. The major components of a mass burn facility include refuse receiving and handling, combustion and steam generation, flue gas cleaning, power generation (optional), condenser cooling water, residue ash hauling, and landfilling.

Mass wasting It refers to the movement of rock or soil material under the influence of gravity either as the movement of the products of weathering down a slope or as a mass movement of rock or soil along joint planes or bedding planes. Mass wasting includes but is not limited to creep, mud flows, earth flow, soil flow, rock avalanche, landslide, land-slip, and slumping.

Maximally exposed individual A hypothetical person who remains in an uncontrolled area who would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

MCF An abbreviation for one thousand cubic feet of natural gas with a heat content of 1,000,000 Btus or 10 therms.

Mean The average value of a series of measurements.

Mean grade It refers to the arithmetic average of elevations of points on the plot plan that will result upon completion of the proposed operation for which the permit is issued (Chesterfield Township, MI).

Mean power output (of a wind turbine) The average power output of a wind energy conversion system at a given mean wind speed based on a Raleigh frequency distribution.

Mean wind speed The arithmetic wind speed over a specified time period and height above the ground (the majority of US National Weather Service anemometers are at 20 ft (6.1 m)).

Mechanical integrity It means an injection well has mechanical integrity if (1) there is no significant leak in the casing, tubing, or packer (internal

mechanical integrity) and (2) there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection wellbore (external mechanical integrity).

Mechanical systems Those elements of building used to control the interior climate.

Median wind speed The wind speed with 50% probability of occurring.

Medium Btu gas Fuel gas with a heating value of between 200 and 300 Btu per cubic foot.

Medium pressure For valves and fittings, it implies that they are suitable for working pressures between 125 and 175 lb per square inch (861,845–1,206,583 N per square meter).

Megawatt One thousand kilowatts or 1 million watts; standard measure of electric power plant generating capacity.

Megawatt-hour One thousand kilowatt-hours or 1 million watt-hours.

Mercury vapor lamp A high-intensity discharge lamp that uses mercury as the primary light-producing element. Includes clear, phosphor-coated, and self-ballasted lamps.

Mesophilic It is a state in an anaerobic reactor, such anaerobic digester or composting unit, where/when the temperature remains between 35–40°C.

Mesotrophic The term describes reservoirs and lakes that contain moderate quantities of nutrients and are moderately productive in terms of aquatic animal and plant life.

Met An approximate unit of heat produced by a resting person, equal to about 18.5 Btu per square foot per hour.

Metal halide lamp A high-intensity discharge lamp type that uses mercury and several halide additives as light-producing elements. These lights have the best color rendition index (CRI) of the high-intensity discharge lamps. They can be used for commercial interior lighting or for stadium lights.

Methane A colorless, odorless, tasteless gas composed of one molecule of carbon and four of hydrogen, which is highly flammable. It is the main constituent of "natural gas" that is formed naturally by methanogenic, anaerobic bacteria or can be manufactured, and which is used as a fuel and for manufacturing chemicals.

Methanol (CH_3OH; methyl alcohol or wood alcohol) A clear, colorless, very mobile liquid that is flammable and poisonous; used as a fuel and fuel additive and to produce chemicals.

Methyl tertiary butyl ether (MTBE) An ether compound used as a gasoline blending component to raise the oxygen content of gasoline. MTBE is made by combining isobutylene (from various refining and chemical processes) and methanol (usually made from natural gas).

Metric ton (Tonne) A unit of mass equal to 1,000 kg or 2,204.6 lb.

Microclimate The local climate of specific place or habitat, as influenced by landscape features.

Microcurie It refers to one one-millionth (0.000001) of a curie.

Microgroove A small groove scribed into the surface of a solar photovoltaic cell which is filled with metal for contacts.

Micrometer One millionth of a meter (10^{-6} m).

Mill A common monetary measure equal to one-thousandth of a dollar or a tenth of a cent.

Millicurie It refers to one one-thousandth (0.001) of a curie.

Millirem (mrem) (1) It refers to one one-thousandth (0.001) of a rem. (2) It is a unit of radiation dose equivalent that is equal to one one-thousandth of a rem. An individual member of the public can receive up to 500 millirems per year according to the US DOE standards. This limit does not include radiation received for medical treatment or the 100 to 360 mrem that people receive annually from background radiation.

Mineralization Most nitrogen exists in biosolids/manure as organic-N, principally contained in proteins, nucleic acids, amines, and other cellular material. These complex molecules must be broken apart through biological degradation for nitrogen to become available to crops. The conversion of organic-N to inorganic-N forms is called *mineralization*

Minimize to the extent reasonably achievable It means to reduce to the least quantity or degree which can reasonably be attained, taking into account (1) the state of technology, (2) the benefits to be gained from any possible further reduction, and (3) the impacts of the measures or efforts required to achieve any possible further reduction.

Minimum detectable concentration (MDC) Depending on the sample medium, the smallest amount or concentration of a radioactive or nonradioactive analyte that can be reliably detected using a specific analytical method. Calculations of the minimum detectable concentrations are based on the lower limit of detection.

Minority carrier A current carrier, either an electron or a hole, which is in the minority in a specific layer of a semiconductor material; the diffusion of minority carriers under the action of the cell junction voltage is the current in a photovoltaic device.

Minority carrier lifetime The average time a minority carrier exists before recombination.

Mixed low-level radioactive and hazardous waste It refers to waste that satisfies the definition of low-level radioactive waste in the appropriate state or federal environmental laws or regulations that either (1) is listed as a hazardous waste in the environmental laws or (2) causes the low-level radioactive waste to exhibit any of the hazardous waste characteristics identified in the environmental laws or regulations.

Mixed waste A waste that is both radioactive and hazardous. Also referred to as radioactive mixed waste (RMW).

Mixing valve A valve operated by a thermostat that can be installed in solar water heating systems to mix cold water with water from the collector loop to maintain a safe water temperature.

Mobile container It includes any metal 14 gauge steel garbage and waste container with the following minimum specifications: 77–3/8 in. long, 30 in. wide, and 46 in. high (197 cm L × 76 cm W × 117 cm H) at the back edge, tapering down to 41 in. (104 cm) at loading edge, and shall be mounted on four rubber wheels with roller bearings and/or metal slides. Said mobile container shall be capable of fitting hydraulic attachments for unloading. Said container shall be flyproof, ratproof, and leakproof and shall be fitted with 14 gauge steel-constructed covers (Miami, FL).

Model It refers to a conceptual description and the associated mathematical, graphical, and/or analogous representation of a system, subsystem, component, or condition that is used to predict changes from a baseline state as a function of internal and/or external stimuli and as a function of time and space.

Modified degree-day method A method used to estimate building heating loads by assuming that heat loss and gain is proportional to the equivalent heat-loss coefficient for the building envelope.

Module The smallest self-contained, environmentally protected structure housing interconnected photovoltaic cells and providing a single dc electrical output; also called a panel.

Moisture content The water content of a substance (a solid fuel) as measured under specified conditions being the dry basis, which equals the weight of the wet sample minus the weight of a (bone) dry sample divided by the weight of the dry sample times 100 (to get percent), and the wet basis, which is equal to the weight of the wet sample minus the weight of the dry sample divided by the weight of the wet sample times 100.

Moisture control The process of controlling indoor moisture levels and condensation.

Monitoring It means observing and making measurements to provide data to evaluate the performance and characteristics of the disposal site.

Monoculture The planting, cultivation, and harvesting of a single species of crop in a specified area.

Monolithic Fabricated as a single structure.

Motor A machine supplied with external energy that is converted into force and/or motion.

Motor speed The number of revolutions that the motor turns in a given time period (i.e., revolutions per minute, rpm).

Movable insulation A device that reduces heat loss at night and during cloudy periods and heat gain during the day in warm weather. A movable insulator could be an insulative shade, shutter panel, or curtain.

MTBE See methyl tertiary butyl ether (MTBE).

Multijunction device A high-efficiency photovoltaic device containing two or more cell junctions, each of which is optimized for a particular part of the solar spectrum.

Multi-zone system A building heating, ventilation, and/or air-conditioning system that distributes conditioned air to individual zones or rooms.

Municipal solid waste (MSW) (1) Waste material from households and businesses in a community that is not regulated as hazardous. (2) It is more commonly known as trash or garbage, which consists of the everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. This comes from our homes, schools, hospitals, and businesses (US EPA) (see garbage, trash).

Municipal waste As defined in the Energy Security Act (P.L. 96-294; 1980) as "any organic matter, including sewage, sewage sludge, and industrial or commercial waste, and mixtures of such matter and inorganic refuse from any publicly or privately operated municipal waste collection or similar disposal system, or from similar waste flows (other than such flows which constitute agricultural wastes or residues, or wood wastes or residues from wood harvesting activities or production of forest products)."

Municipal waste to energy project (or plant) A facility that produces fuel or energy from municipal solid waste.

Nacelle The cover for the gear box, drive train, generator, and other components of a wind turbine.

Name plate A metal tag attached to a machine or appliance that contains information such as brand name, serial number, voltage, power ratings under specified conditions, and other manufacturer supplied data.

Nanocurie It refers to one one-billionth (0.000000001) of a curie.

Narrative criteria Nonnumeric descriptions of desirable or undesirable water quality conditions.

National electrical code (NEC) The NEC is a set of regulations that have contributed to making the electrical systems in the United States one of the safest in the world. The intent of the NEC is to ensure safe electrical systems are designed and installed. The National Fire Protection Association has sponsored the NEC since 1911. The NEC changes as technology evolves and component sophistication increases. The NEC is updated every three years. Following the NEC is required in most locations.

National pollution discharge elimination system (NDPES) A US federal environmental law that regulates the quantity of waste entering navigable waters and point sources. It was first introduced by the US EPA in the Clean Water Act of 1977. Most of the industrial effluents and some agricultural effluents (such as livestock waste operation effluents) are required to have NPDES which permits to discharge to a receiving water. State legislation defines the specific operations that require NPDES permit.

National rural electric cooperative association (NRECA) This is a national organization dedicated to representing the interests of cooperative electric power providers and the consumers they serve. Members come from the 46 states that have an electric distribution cooperative.

Natural characteristics It refers to the elements which comprise the physical and biological environment, including the ecology, geochemistry, geology, hydrology,

meteorology and climate, and seismology. These elements also include natural resources with agricultural, cultural, economic, recreational, and scenic values.

Natural cooling Space cooling achieved by shading, natural (unassisted, as opposed to forced) ventilation, conduction control, radiation, and evaporation; also called passive cooling.

Natural draft Draft that is caused by temperature differences in the air.

Natural gas A hydrocarbon gas obtained from underground sources, often in association with petroleum and coal deposits. It generally contains a high percentage of methane, varying amounts of ethane, and inert gases; used as a heating fuel.

Natural gas-fired (thermoelectric) power plant A power plant that produces electricity by the force of steam through a turbine that spins a generator. The steam is produced by burning the natural gas.

Natural gas or gas It refers to a naturally occurring mixture of hydrocarbon and non-hydrocarbon gases in porous formations beneath the Earth's surface, often in association with petroleum. The principal constituent is methane.

Natural gas steam reforming production A two-step process where in the first step, natural gas is exposed to a high-temperature steam to produce hydrogen, carbon monoxide, and carbon dioxide. The second step is to convert the carbon monoxide with steam to produce additional hydrogen and carbon dioxide.

Natural ventilation Ventilation that is created by the differences in the distribution of air pressures around a building. Air moves from areas of high pressure to areas of low pressure with gravity and wind pressure affecting the airflow. The placement and control of doors and windows alters natural ventilation patterns.

Naturally occurring radioactive materials (NORM) It refers to all radioactive elements found in the environment, including long-lived radioactive elements such as uranium, thorium, and potassium and any of their decay products, such as radium and radon.

N-Dodecane/tributyl phosphate An organic solution composed of 30 % tributyl phosphate (TBP) dissolved in n-dodecane used to first separate the uranium and plutonium from the fission products in the dissolved fuel and then to separate the uranium from the plutonium.

Net (lower) heating value (NHV) The potential energy available in a fuel as received, taking into account the energy loss in evaporating and superheating the water in the fuel. Equal to the higher heating value minus 1,050 W where W is the weight of the water formed from the hydrogen in the fuel and 1,050 is the latent heat of vaporization of water, in Btu, at 77°F.

Net energy production (or balance) The amount of useful energy produced by a system less the amount of energy required to produce the fuel.

Net generation Equal to gross generation less electricity consumption of a power plant.

Net metering The practice of using a single meter to measure consumption and generation of electricity by a small generation facility (such as a house with a

wind or solar photovoltaic system). The net energy produced or consumed is purchased from or sold to the power provider, respectively.

Net present value The value of a personal portfolio, product, or investment after depreciation and interest on debt capital are subtracted from operating income. It can also be thought of as the equivalent worth of all cash flows relative to a base point called the present.

Neutron An electrically neutral subatomic particle in the baryon family with a mass 1839 times that of an electron, stable when bound in an atomic nucleus, and having a mean lifetime of approximately 16. 6 min as a free particle.

New source As defined in the US 40 CFR 122.2, 122.29, and 403.3 (k), a new source is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced (1) for purposes of compliance with New Source Performance Standards (NSPS), after the promulgation of such standards being proposed today under Clean Water Act (CWA) section 306, or (2) for the purposes of compliance with pretreatment standards for new sources (PSNS), after the publication of proposed standards under CWA section 307 (c), if such standards are thereafter promulgated in accordance with that section.

New source performance standards See NSPS.

Nitrification It is a process of converting ammonium nitrogen (NH_4^+) into nitrate (NO_3^{2-}) with an intermediate step of producing nitrite (NO_2^-). Nitrification can be accomplished biologically by nitrogen-fixing bacteria (nitrifiers) or accomplished chemically by oxidizing chemicals.

Nitrogen dioxide (NO_2) This compound of nitrogen and oxygen is formed by the oxidation of nitric oxide (NO) which is produced by the combustion of solid fuels.

Nitrogen oxides (NOx) The products of all combustion processes formed by the combination of nitrogen and oxygen.

Nocturnal cooling The effect of cooling by the radiation of heat from a building to the night sky.

Nominal capacity The approximate energy-producing capacity of a power plant, under specified conditions, usually during periods of highest load.

Nominal price The price paid for goods or services at the time of a transaction; a price that has not been adjusted to account for inflation.

Noncombustible refuse (1) Miscellaneous refuse materials that are unburnable at ordinary incinerator temperatures (1,300–2,000°F or 704–1,093°C) (Washington, DC). (2) Refuse materials that are unburnable at ordinary incinerator temperature (800–1,800°F or 427–982°C) such as metals, mineral matter, large quantities of glass or crockery, metal furniture auto bodies or parts, and other similar material or refuse not usual to housekeeping or to operation of stores or offices (Dade County, FL). (3) Refuse materials that are unburnable at ordinary incinerator temperatures (800–1,800°F; 427–982°C) such as metals, mineral matter, large quantities of glass or crockery, metal furniture, auto bodies or parts, and other similar material or refuse not usual to housekeeping or to operation of stores or offices (Miami, FL).

Nonconventional pollutants Pollutants that are neither conventional pollutants nor priority pollutants listed at the US 40 CFR Part 401.

Nonpoint source Diffuse pollution source; a source without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by storm water. Common nonpoint sources are agriculture, forestry, urban areas, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

Non-putrescible materials It includes waste discards, dry rubbish, cardboard, wood, lumber, paper products, brick, concrete, steel shavings, metal, plastics, leather, manufactured materials not including oil, petroleum products, paint, liquid chemicals, or paint sludges (Chesterfield Township, MI).

Nonrenewable fuels Fuels that cannot be easily made or "renewed," such as oil, natural gas, and coal.

Nonutility generator/power producer A class of power generator that is not a regulated power provider and that has generating plants for the purpose of supplying electric power required in the conduct of their industrial and commercial operations.

Non-water quality environmental impact Deleterious aspects of control and treatment technologies applicable to point source category wastes, including, but not limited to, air pollution, noise, radiation, sludge and solid waste generation, and energy usage.

Normal recovery capacity A characteristic applied to domestic water heaters that is the amount of gallons raised 100°F per hour (or minute) under a specified thermal efficiency.

Notice of violation A letter of notice from a regional water engineer in response to an instance of significant noncompliance with a NPDES/SPDES permit. Generally, an official notification from a regulatory agency of noncompliance with permit requirements.

NSPS New Source Performance Standards, applicable to new sources of direct dischargers whose construction is begun after the publication of the proposed effluent regulations under Clean Water Act (CWA) section.

N-type semiconductor A semiconductor produced by doping an intrinsic semiconductor with an electron-donor impurity (e.g., phosphorous in silicon).

Nuclear energy Energy that comes from splitting atoms of radioactive materials, such as uranium, and which produces radioactive wastes.

Nuclear power plant A power plant that produces electricity by the force of nuclear power-generated steam through a turbine system that spins a generator. Specifically water is heated through the controlled splitting of uranium atoms in the reactor core and turns to steam. Pumps force the water through the reactor at top speed, maximizing steam production. Steam drives the turbines that turn the generator that makes electricity. Cooling water from the river condenses the steam back into the water. The river water is either discharged directly back to the river or cooled in the cooling towers and reused in the plant.

Nucleus The positively charged central region of an atom, made up of protons and neutrons and containing almost all of the mass of the atom.

Numeric criteria Numeric descriptions of desirable or undesirable water quality conditions.

Nutrients Nutrients are elements required for plant growth that provide biosolids with most of their economic value. These include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sodium (Na), sulfur (S), boron (B), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn).

Observation (self-assessment) A weakness that, if not corrected, could result in a deficiency. An observation may result if an explicit procedural nonconformance is noted, but the nonconformance is an isolated incident or of minor significance. An observation requires corrective action.

Occupancy sensor An optical, ultrasonic, or infrared sensor that turns room lights on when they detect a person's presence and off after the space is vacated.

Occupied space The space within a building or structure that is normally occupied by people and that may be conditioned (heated, cooled, and/or ventilated).

Ocean energy systems Energy conversion technologies that harness the energy in tides, waves, and thermal gradients in the oceans.

Ocean thermal energy conversion (OTEC) The process or technologies for producing energy by harnessing the temperature differences (thermal gradients) between ocean surface waters and that of ocean depths. Warm surface water is pumped through an evaporator containing a working fluid in a closed Rankine-cycle system. The vaporized fluid drives a turbine/generator. Cold water from deep below the surface is used to condense the working fluid. Open-cycle OTEC technologies use ocean water itself as the working fluid. Closed-cycle OTEC systems circulate a working fluid in a closed loop. A working 10 kW, closed-cycle prototype was developed by the Pacific International Center for High Technology Research in Hawaii with US Department of Energy funding, but was not commercialized.

Offal It includes waste animal matter from butcher and slaughter or packing houses (Baltimore County, MD).

Off-peak The period of low energy demand, as opposed to maximum, or peak, demand.

Off-site Outside the boundaries of a facility.

Ohms A measure of the electrical resistance of a material equal to the resistance of a circuit in which the potential difference of 1 V produces a current of 1 A.

Ohm's law In a given electrical circuit, the amount of current in amperes (i) is equal to the pressure in volts (V) divided by the resistance, in ohms (R).

Oil (fuel) A product of crude oil that is used for space heating, diesel engines, and electrical generation.

Oil spill An accidental spillage of oil on land or surface water.

One sun The maximum value of natural solar insolation.

One-axis tracking A system capable of rotating about one axis.

On-peak energy Energy supplied during periods of relatively high system demands as specified by the supplier.

On-site The same or geographically contiguous property, which may be divided by a public or private right-of-way, provided the entrance and exit between the properties is at a crossroads intersection, and access is by crossing as opposed to going along the right-of-way. Noncontiguous properties owned by the same company or locality but connected by a right-of-way, which it controls, and to which the public does not have access, are also considered on-site properties.

On-site generation Generation of energy at the location where all or most of it will be used.

Open access The ability to send or wheel electric power to a customer over a transmission and distribution system that is not owned by the power generator (seller).

Open dump (1) Any land public or privately owned, other than a sanitary landfill, on which there is deposit and accumulation, either temporary or permanent, of any kind of organic or inorganic refuse, including but not limited to waste materials, waste products, waste paper, garbage, empty cans, broken glass, rags, and all other kinds of organic or inorganic refuse, but excluding scrap for use in manufacturing processes on the premises, or non-putrescible waste materials resulting from such processes, or resulting from the construction or elimination of facilities for such processes (Baltimore County, MD). (2) Any land publicly or privately owned, other than a sanitary landfill, on which there is deposit and accumulation, either temporary or permanent, of any kind of organic or inorganic refuse (Prince George's County, MD). (3) An area on which there is an accumulation of solid waste from one or more sources without proper cover materials (Washington, DC).

Open-circuit voltage The maximum possible voltage across a photovoltaic cell; the voltage across the cell in sunlight when no current is flowing.

Open-ended It refers to an instrument or anything which must be automatically renewed at the end of its given term.

Open-loop geothermal heat pump system Open-loop (also known as "direct") systems circulate water drawn from a ground or surface water source. Once the heat has been transferred into or out of the water, the water is returned to a well or surface discharge (instead of being recirculated through the system). This option is practical where there is an adequate supply of relatively clean water, and all local codes and regulations regarding groundwater discharge are met.

Operating cycle The processes that a work input/output system undergoes and in which the initial and final states are identical.

Operation period It refers to the period of time from the initial receipt of waste at the land disposal facility until the closure period begins.

Organic chemicals, plastics, and synthetic fibers (OCPSF) It refers to the organic chemicals, plastics, and synthetic fibers manufacturing point source category under the US 40 CFR Part 414.

Orientation The alignment of a building along a given axis to face a specific geographical direction. The alignment of a solar collector, in number of degrees east or west of true south.

Outage A discontinuance of electric power supply.

Outfall The end of a drain or pipe that carries wastewater or other effluents into a ditch, pond, or river.

Outgassing The process by which materials expel or release gases.

Outside air Air that is taken from the outdoors.

Outside coil The heat-transfer (exchanger) component of a heat pump, located outdoors, from which heat is collected in the heating mode or expelled in the cooling mode.

Overhang A building element that shades windows, walls, and doors from direct solar radiation and protects these elements from precipitation.

Overload To exceed the design capacity of a device.

Ovonic A device that converts heat or sunlight directly to electricity, invented by Stanford Ovshinsky, which has a unique glass composition that changes from an electrically nonconducting state to a semiconducting state.

Oxygenates Gasoline fuel additives such as ethanol, ETBE, or MTBE that add extra oxygen to gasoline to reduce carbon monoxide pollution produced by vehicles.

P/N A semiconductor (photovoltaic) device structure in which the junction is formed between a p-type layer and an n-type layer.

Packing factor The ratio of solar collector array area to actual land area.

Pane (window) The area of glass that fits in the window frame.

Panel (solar) A term generally applied to individual solar collectors and typically to solar photovoltaic collectors or modules.

Panel radiator A mainly flat surface for transmitting radiant energy.

Panemone A drag-type wind machine that can react to wind from any direction.

Parabolic aluminized reflector lamp A type of lamp having a lens of heavy durable glass that focuses the light. They have longer lifetimes with less lumen depreciation than standard incandescent lamps.

Parabolic dish A solar energy conversion device that has a bowl-shaped dish covered with a highly reflective surface that tracks the sun and concentrates sunlight on a fixed absorber, thereby achieving high temperatures, for process heating or to operate a heat (Stirling) engine to produce power or electricity.

Parabolic trough A solar energy conversion device that uses a trough covered with a highly reflective surface to focus sunlight onto a linear absorber containing a working fluid that can be used for medium temperature space or process heat or to operate a steam turbine for power or electricity generation.

Parallel A configuration of an electrical circuit in which the voltage is the same across the terminals. The positive reference direction for each resistor current is down through the resistor with the same voltage across each resistor.

Parallel connection A way of joining photovoltaic cells or modules by connecting positive leads together and negative leads together; such a configuration increases the current, but not the voltage.

Parameter Any of a set of physical properties whose values determine the characteristics or behavior of something (e.g.,, temperature, pressure, density of air). In relation to environmental monitoring, a monitoring parameter is a constituent of interest. Statistically, the term "parameter" is a calculated quantity, such as a mean or variance, which describes a statistical population.

Parent corporation It refers to a corporation which directly owns at least 50% of the voting stock of a corporation that is the land disposal facility permittee. The latter corporation is a subsidiary of the parent corporation.

Particulates (1) The fine liquid or solid particles contained in combustion gases. The quantity and size of particulates emitted by cars, power and industrial plants, wood stoves, etc., are regulated by the US Environmental Protection Agency. (2) Solid particles and liquid droplets small enough to become airborne.

Pass through A pollutant is determined to "pass through" a POTW when the average percentage removed by an efficiently operated POTW is less than the percentage removed by the industry's direct dischargers that are using the BAT technology.

Passivation A chemical reaction that eliminates the detrimental effect of electrically reactive atoms on a photovoltaic cell's surface.

Passive solar (building) design A building design that uses structural elements of a building to heat and cool a building, without the use of mechanical equipment, which requires careful consideration of the local climate and solar energy resource, building orientation, and landscape features, to name a few. The principal elements include proper building orientation, proper window sizing and placement and design of window overhangs to reduce summer heat gain and ensure winter heat gain, and proper sizing of thermal energy storage mass (e.g., a Trombe wall or masonry tiles). The heat is distributed primarily by natural convection and radiation, though fans can also be used to circulate room air or ensure proper ventilation.

Passive solar heater A solar water or space-heating system in which solar energy is collected and/or moved by natural convection without using pumps or fans. Passive systems are typically integral collector/storage (ICS or batch collectors) or thermosiphon systems. The major advantage of these systems is that they do not use controls, pumps, sensors, or other mechanical parts, so little or no maintenance is required over the lifetime of the system.

Passive solar home A house built using passive solar design techniques.

Passive/natural cooling To allow or augment the natural movement of cooler air from exterior, shaded areas of a building through or around a building.

Pasture Land on which animals feed directly on feed crops such as legumes, grasses, or grain stubble.

Pathogens Pathogens are disease-causing microorganisms that include bacteria, viruses, protozoa, and parasitic worms. Pathogens can present a public health hazard if they are transferred to food crops grown on land to which biosolids are applied, contained in runoff to surface waters from land application sites, or transported away from the site by vectors such as insects, rodents, and birds.

Payback period The amount of time required before the savings resulting from your system equal the system cost.

Pay-in amount It refers to the amount of each payment required to be paid to a trust in each consecutive payment.

Pay-in period It refers to the period of time from the establishment of a trust until it is fully funded.

Payment bond It refers to a surety bond under which the surety company is obligated to pay a sum of money upon the occurrence of a specified event.

Peak clipping/shaving The process of implementing measures to reduce peak power demands on a system.

Peak demand/load The maximum energy demand or load in a specified time period.

Peak power Power generated that operates at a very low capacity factor; generally used to meet short-lived and variable high-demand periods.

Peak shifting The process of moving existing loads to off-peak periods.

Peak sun hours The equivalent number of hours per day when solar irradiance averages 1 kW/m^2. For example, six peak sun hours means that the energy received during total daylight hours equals the energy that would have been received had the irradiance for six hours been 1 kW/m^2.

Peak watt A unit used to rate the performance of a solar photovoltaic (PV) cells, modules, or arrays; the maximum nominal output of a PV device, in watts (Wp) under standardized test conditions, usually 1000 W per square meter of sunlight with other conditions, such as temperature specified.

Peak wind speed The maximum instantaneous wind speed (or velocity) that occurs within a specific period of time or interval.

Peaking capacity Power generation equipment or system capacity to meet peak power demands.

Peaking hydropower A hydropower plant that is operated at maximum allowable capacity for part of the day and is either shut down for the remainder of the time or operated at minimal capacity level.

Pellet stove A space-heating device that burns pellets; are more efficient, clean burning, and easier to operate relative to conventional cord wood-burning appliances.

Pellets Solid fuels made from primarily wood sawdust that is compacted under high pressure to form small (about the size of rabbit feed) pellets for use in a pellet stove.

Pelton turbine A type of impulse hydropower turbine where water passes through nozzles and strikes cups arranged on the periphery of a runner, or wheel, which causes the runner to rotate, producing mechanical energy. The runner is fixed on a shaft, and the rotational motion of the turbine is transmitted by the shaft to a generator. Generally used for high head, low-flow applications.

Penal sum It refers to the face amount of a surety bond.

Penstock A component of a hydropower plant; a pipe that delivers water to the turbine.

Perfluorocarbon tracer gas technique (PFT) An air infiltration measurement technique developed by the Brookhaven National Laboratory to measure changes over time (one week to five months) when determining a building's air infiltration rate. This test cannot locate exact points of infiltration, but it does reveal long-term infiltration problems.

Performance bond It refers to a surety bond under which the surety is obligated to pay a sum of money or perform a specified activity at the occurrence of a specified event.

Performance ratings Solar collector thermal performance ratings based on collector efficiencies, usually expressed in Btu per hour for solar collectors under standard test or operating conditions for solar radiation intensity, inlet working fluid temperatures, and ambient temperatures.

Perimeter heating A term applied to warm-air heating systems that deliver heated air to rooms by means of registers or baseboards located along exterior walls.

Permeance A unit of measurement for the ability of a material to retard the diffusion of water vapor at 73.4° F (23°C). A perm, short for permeance, is the number of grains of water vapor that pass through a square foot of material per hour at a differential vapor pressure equal to one inch of mercury.

Person A legal term which means any individual; public, private, or government corporation; joint stock company; industry; partnership; copartnership; firm; association; trust; estate; public or private institution; group; government agency, department or bureau of the state, or political subdivision thereof; and any legal subsidiary, successor, representative, agent, or agency of the foregoing, or any other legal entity whatsoever.

Personal injury (1) It refers to injury to the body, sickness, or disease, including death, resulting from any of these. (2) It refers to bodily injury as that term is given meaning by applicable state or federal laws. However, this term usually does not include those liabilities which, consistent with standard industry practices, are excluded from coverage in liability policies for bodily injury.

Person-rem The sum of the individual radiation dose equivalents received by members of a certain group or population. It may be calculated by multiplying the average dose per person by the number of persons exposed. For example, a thousand people each exposed to one millirem would have a collective dose of one person-rem.

pH It is a measure of the degree of acidity or alkalinity of a substance, such as water, wastewater, sludge, biosolids, or soil. The pH of biosolids is often raised with alkaline materials to reduce pathogen content and attraction of disease-spreading organisms (vectors). High pH (greater than 11) kills virtually all pathogens and reduces the solubility, biological availability, and mobility of most metals. Lime also increases the gaseous loss (volatilization) of the ammonia form of nitrogen (ammonia-N), thus reducing the N-fertilizer value of biosolids.

Phantom load Any appliance that consumes power even when it is turned off. Examples of phantom loads include appliances with electronic clocks or timers,

appliances with remote controls, and appliances with wall cubes (a small box that plugs into an AC outlet to power appliances).

Phase Alternating current is carried by conductors and a ground to residential, commercial, or industrial consumers. The waveform of the phase power appears as a single continuous sine wave at the system frequency whose amplitude is the rated voltage of the power.

Phase change The process of changing from one physical state (solid, liquid, or gas) to another, with a necessary or coincidental input or release of energy.

Phase-change material A material that can be used to store thermal energy as latent heat. Various types of materials have been and are being investigated such as inorganic salts, eutectic compounds, and paraffins, for a variety of applications, including solar energy storage (solar energy heats and melts the material during the day, and at night it releases the stored heat and reverts to a solid state).

Photobiological hydrogen production A hydrogen production process that process uses algae. Under certain conditions, the pigments in certain types of algae absorb solar energy. An enzyme in the cell acts as a catalyst to split water molecules. Some of the bacteria produces hydrogen after they grow on a substrate.

Photocurrent An electric current induced by radiant energy.

Photoelectric cell A device for measuring light intensity that works by converting light falling on, or reach it, to electricity and then measuring the current; used in photometers.

Photoelectrochemical cell A type of photovoltaic device in which the electricity induced in the cell is used immediately within the cell to produce a chemical, such as hydrogen, which can then be withdrawn for use.

Photoelectrolysis hydrogen production The production of hydrogen using a photoelectrochemical cell.

Photogalvanic processes The production of electrical current from light.

Photon A particle of light that acts as an individual unit of energy.

Photovoltaic (conversion) efficiency The ratio of the electric power produced by a photovoltaic device to the power of the sunlight incident on the device.

Photovoltaic (PV; solar) array A group of solar photovoltaic modules connected together.

Photovoltaic (solar) cell Treated semiconductor material that converts solar irradiance to electricity.

Photovoltaic (solar) module or panel A solar photovoltaic product that generally consists of groups of PV cells electrically connected together to produce a specified power output under standard test conditions, mounted on a substrate, sealed with an encapsulant, and covered with a protective glazing. Maybe further mounted on an aluminum frame. A junction box, on the back or underside of the module, is used to allow for connecting the module circuit conductors to external conductors.

Photovoltaic (solar) system A complete PV power system composed of the module (or array) and balance-of-system (BOS) components including the

array supports, electrical conductors/wiring, fuses, safety disconnects, and grounds, charge controllers, inverters, battery storage, etc.

Photovoltaic device A solid-state electrical device that converts light directly into current electricity of voltage-current characteristics that are a function of the characteristics of the light source and the materials in and design of the device. Solar photovoltaic devices are made of various semiconductor materials including silicon, cadmium sulfide, cadmium telluride, and gallium arsenide and in single crystalline, multi-crystalline, or amorphous forms.

Photovoltaic peak watt See peak watt.

Photovoltaic-thermal (PV/T) systems A solar energy system that produces electricity with a PV module and collects thermal energy from the module for heating.

Physical vapor deposition A method of depositing thin semiconductor photovoltaic films. With this method, physical processes, such as thermal evaporation or bombardment of ions, are used to deposit elemental semiconductor material on a substrate.

Phytoremediation A land restoration method involving the use of plants for removal of heavy metals, toxic organics, and other pollutants from soil.

P-I-N A semiconductor (photovoltaic) device structure that layers an intrinsic semiconductor between a p-type semiconductor and an n-type semiconductor; this structure is most often used with amorphous silicon PV devices.

Pitch control A method of controlling a wind turbine's speed by varying the orientation, or pitch, of the blades and thereby altering its aerodynamics and efficiency.

Plant available nitrogen (PAN) Only a portion of the total nitrogen present in biosolids/manure is available for plant uptake. This *plant available nitrogen (PAN)* is the actual amount of N in the biosolids/manure that is available to crops during a specified period.

Planting and harvesting periods The cycle of crop *planting and harvesting periods*, not the calendar year, dictates the timing of biosolids and manure land application activities. Winter wheat and perennial forage grasses are examples of crops that may be established and harvested in different calendar years.

Planting season The basic time management unit is often called the *crop year* or *planting season*. The *crop year* is defined as the year in which a crop receiving the biosolids/manure treatment is harvested.

Play It refers to a set of oil or gas accumulations sharing similar geologic and geographic properties, such as source rock, hydrocarbon type, and migration pathways.

Plenum The space between a hanging ceiling and the floor above or roof; usually contains HVAC ducts, electrical wiring, fire suppression system piping, etc.

Plug flow digester A type of anaerobic digester that has a horizontal tank in which a constant volume of material is added and forces material in the tank to move through the tank and be digested.

Plume The distribution of a pollutant in air or water after being released from a source.

Point source (1) Any discernable, confined, and discrete conveyance from which pollutants are or may be discharged. (2) A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution, such as a pipe, ditch, ship, ore pit, or factory smokestack.

Point-contact cell A high-efficiency silicon photovoltaic concentrator cell that employs light trapping techniques and point-diffused contacts on the rear surface for current collection.

Poisonous materials It includes poison grain, insecticides, or insecticide containers or other similar materials (Beaverton, OR).

Pollutant A contaminant in a concentration or amount that adversely alters the physical, chemical, or biological properties of the natural environment.

Pollutant concentration limits (PCL) *Pollutant concentration limits* are the maximum concentrations of heavy metals for biosolids whose trace element pollutant additions do not require tracking (i.e., calculation of CPLR (cumulative pollutant loading rate)). PCL are the most stringent pollutant limits included in US Federal Regulation Part 503 for land application. Biosolids meeting pollutant concentration limits are subject to fewer requirements than biosolids meeting ceiling concentration limits.

Pollutants of interest Pollutants commonly found in landfill-generated wastewaters. For the purposes of a specific environmental or energy project, a pollutant of interest is a pollutant that is detected three or more times above a treatable level at an environmental facility and must be present at more than one facility.

Polycrystalline A semiconductor (photovoltaic) material composed of variously oriented, small, individual crystals.

Polyethylene A registered trademark for plastic sheeting material that can be used as a vapor retarder. This plastic is used to make grocery bags. It is a long chain of carbon atoms with 2 hydrogen atoms attached to each carbon atom.

Polystyrene (See foam insulation)

Porous media A solid that contains pores; normally, it refers to interconnected pores that can transmit the flow of fluids. (The term refers to the aquifer geology when discussing sites for CAES.)

Portfolio standard The requirement that an electric power provider generate or purchase a specified percentage of the power it supplies/sells from renewable energy resources and thereby guarantee a market for electricity generated from renewable energy resources.

Post-closure period It refers to the period of time after completion of closure and before the beginning of the institutional control period during which the permittee maintains control of the land disposal facility and carries out a program of monitoring and maintenance as required by this part to ensure that the land disposal facility is stable and ready for institutional control.

Potable water Water that is suitable for drinking, as defined by local health officials.

Potential energy Energy available due to position.

POTW (Publicly owned treatment works) See publicly owned treatment works.

Pound of steam It is one pound (0.454 kg) of water in vapor phase; It is NOT steam pressure, which is expressed as pounds per square inch (psi).

Power Energy that is capable or available for doing work; the time rate at which work is performed, measured in horsepower, watts, or Btu per hour. Electric power is the product of electric current and electromotive force.

Power (output) curve A plot of a wind energy conversion device's power output versus wind speed.

Power (solar) tower A term used to describe solar thermal, central receiver, power systems, where an array of reflectors focus sunlight onto a central receiver and absorber mounted on a tower.

Power coefficient The ratio of power produced by a wind energy conversion device to the power in a reference area of the free wind stream.

Power conditioning The process of modifying the characteristics of electrical power (e.g., inverting dc to ac).

Power density The amount of power per unit area of a free wind stream.

Power factor (PF) The ratio of actual power being used in a circuit, expressed in watts or kilowatts, to the power that is apparently being drawn from a power source, expressed in volt-amperes or kilovolt-amperes.

Power generation mix The proportion of electricity distributed by a power provider that is generated from available sources such as coal, natural gas, petroleum, nuclear, hydropower, wind, or geothermal.

Power plant A facility which is used for generation of electricity by using wind energy (wind power plant), hydraulic energy (hydroelectric power plant and tidal power plant), coal energy (coal-fired power plant), natural gas energy (natural gas-fired power plant), solar energy (solar power plant), refuse-derived fuel (RDF power plant), or nuclear energy (nuclear power plant).

Power provider A company or other organizational units that sell and distribute electrical power (e.g., private or public electrical utility), either to other distribution and wholesale businesses or to end users. Sometimes power providers also generate the power they sell.

Power towers See central receiver solar power plants.

Power transmission line An electrical conductor/cable that carries electricity from a generator to other locations for distribution.

Precision The degree of reproducibility of a measurement under a given set of conditions. Precision in a data set is assessed by evaluating results from duplicate field or analytical samples.

Pre-closure plan It refers to the period from the effective date of a permit issued by the state environmental agency for the land disposal facility until facility closure activities have begun. This period includes the construction phase and operation period.

Preheater (solar) A solar heating system that preheats water or air that is then heated more by another heating appliance.

Premises It includes a building, with any fences, walls, sheds, garages, or other accessory buildings appurtenant to such building, and the area of land

surrounding the building and actually or by legal construction forming one enclosure in which such building is located.

Preparer Either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

Present value The amount of money required to secure a specified cash flow at a future date at a specified return.

Pressure drop The loss in static pressure of a fluid (liquid or gas) in a system due to friction from obstructions in pipes, from valves, fittings, regulators, burners, etc., or by a breech or rupture of the system.

Pressurization testing A technique used by energy auditors, using a blower door, to locate areas of air infiltration by exaggerating the defects in the building shell. This test only measures air infiltration at the time of the test. It does not take into account changes in atmospheric pressure, weather, wind velocity, or any activities the occupants conduct that may affect air infiltration rates over a period of time.

Pretreatment standards for existing sources of indirect discharges (PSES) See PSES.

Pretreatment standards for new sources of indirect discharges (PSNS) See PSNS.

Primary air The air that is supplied to the combustion chamber of a furnace.

Primary public water supply aquifer It refers to a highly productive water-bearing formation identified by the department consisting of unconsolidated (non-bedrock) geologic deposits, which (1) receives substantial recharge from the overlying land surface and (2) is presently utilized as a major source of water for public water supply.

Prime mover Any machine capable of producing power to do work.

Principal aquifer It means unconsolidated (non-bedrock) geologic deposits identified by the state or federal government (1) receive substantial recharge from the overlying land surface, (2) are known to be highly productive or whose geology suggests a potentially abundant source of water, and (3) are not presently used as a major source of water for public water supply.

Priority pollutant One hundred twenty-six compounds that are a subset of the 65 toxic pollutants and classes of pollutants outlined in the US Section 307 of the Clean Water Act (CWA). The priority pollutants are specified in the US Natural Resources Defense Council (NRDC) settlement agreement.

Private waste collector It refers to any person, firm, or corporation who collects bulk refuse, household waste, building waste, or building debris from premises owned or occupied by him within the corporation limits of the city and transports said wastes over the streets of the city (Bettendorf, IA).

Process heat Thermal energy that is used in agricultural and industrial operations.

Produced water It means the mixture of water containing both the returned fracturing fluid and natural formation water is produced along with the natural gas and moves back through the wellhead with the gas.

Producer gas Low or medium Btu content gas, composed mainly of carbon monoxide, nitrogen(N_2), and hydrogen(H_2) made by the gasification of wood or coal.

Products of combustion The elements and compounds that result from the combustion of a fuel.

Proglacial lake A lake occupying a basin in front of a glacier; generally in direct contact with the ice.

Programmable thermostat A type of thermostat that allows the user to program into the devices' memory a preset schedule of times (when certain temperatures occur) to turn on HVAC equipment.

Projected area The net south-facing glazing area projected on a vertical plane. Also, the solid area covered at any instant by a wind turbine's blades from the perspective of the direction of the wind stream (as opposed to the swept area).

Propane A hydrocarbon gas, C_3H_8, occurring in crude oil, natural gas, and refinery cracking gas. It is used as a fuel, a solvent, and a refrigerant. Propane liquefies under pressure and is the major component of liquefied petroleum gas (LPG).

Propeller (hydro) turbine A turbine that has a runner with attached blades similar to a propeller used to drive a ship. As water passes over the curved propeller blades, it causes rotation of the shaft.

Proppant (propping agent) It refers to a granular substance (such as sand grains, aluminum pellets, or other material) that is carried in suspension by the fracturing fluid and keeps the cracks open when fracturing fluid is withdrawn after a fracture treatment.

Prospective case study It refers to an investigation (1) which is conducted at the sites where hydraulic fracturing will occur after the research is initiated, (2) which allows sampling and characterization of the site prior to, and after, water extraction, drilling, hydraulic fracturing fluid injection, flowback, and gas production, and which collects data during prospective case studies, allowing US EPA to evaluate changes in water quality over time and to assess the fate and transport of chemical contaminants.

Proton A stable, positively charged subatomic particle in the baryon family with a mass of 1836 times that of an electron.

Proximate analysis A commonly used analysis for reporting fuel properties; may be on a dry (moisture free) basis, as "fired," or on an ash- and moisture-free basis. Fractions usually reported include volatile matter, fixed carbon, moisture, ash, and heating value (higher heating value).

PSES Pretreatment standards for existing sources of indirect discharges, under the US Sec. 307(b) of the Clean Water Act (CWA).

Pseudo-monitoring point A theoretical monitoring location rather than an actual physical location; a calculation based on analytical test results of samples obtained from other associated, tributary monitored locations. It is classified as a "pseudo" monitoring point because samples are not actually physically collected at that location.

PSNS Pretreatment standards for new sources of indirect discharges, applicable to new sources whose construction has begun after the publication of proposed standards under Clean Water Act (CWA) section 307 (c), if such standards are thereafter promulgated in accordance with that section.

Psychrometer An instrument for measuring relative humidity by means of wet and dry-bulb temperatures.

Psychrometrics The analysis of atmospheric conditions, particularly moisture in the air.

Psychrophilic It is a state in an anaerobic reactor, such as anaerobic digester or composting unit where/when the temperature remains below 20°C.

P-type semiconductor A semiconductor in which holes carry the current; produced by doping an intrinsic semiconductor with an electron acceptor impurity (e.g., boron in silicon).

Public contact site Land with a high potential for contact by the public, including public parks, ball fields, cemeteries, nurseries, turf farms, and golf courses.

Public disposal It refers to the disposal of garbage and rubbish which has been removed from premises used, owned, or leased by one or more persons, firms, corporations, or associations and transported to other premises and disposed either with or without the payment of a fee (Bluffton, IN).

Public utilities regulatory policy act (PURPA) of 1978 A US law that requires electric utilities to purchase electricity produced from qualifying power producers that use renewable energy resources or are cogenerators. Power providers are required to purchase power at a rate equal to the avoided cost of generating the power themselves (see avoided costs and qualifying facility).

Public utility holding company act (PUHCA) of 1935 A US law to protect consumers and investors. It placed geographic restrictions on mergers and limitations on diversification into nonutility lines of business and takeovers of electric and gas utilities and also established regulated monopoly markets or service territories for utilities.

Public utility or services commissions (PUC or PSC) These are state government agencies in the USA responsible for the regulation of public utilities within a state or region. A state legislature oversees the PUC by reviewing changes to power generator laws, rules, and regulations and approving the PUC's budget. The commission usually has five commissioners appointed by the governor or legislature. PUCs typically regulate electric, natural gas, water, sewer, telephone services, trucks, buses, and taxicabs within the commission's operating region. The PUC tries to balance the interests of consumers, environmentalists, utilities, and stockholders. The PUC makes sure a region's citizens are supplied with adequate, safe power provider service at reasonable rates.

Public water system It refers to a system for providing the public with water for human consumption (through pipes or other constructed conveyances) that has at least 15 service connections or regularly serves at least 25 individuals.

Publicly owned treatment works (POTW) Any device or system, owned by a state or municipality, used in the treatment (including recycling and

reclamation) of municipal sewage or industrial wastes of a liquid nature that is owned by a state or municipality. This includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Pulse-width modulated (PWM) wave inverter A type of power inverter that produces a high-quality (nearly sinusoidal) voltage at minimum current harmonics.

Pumped storage facility A type of power-generating facility that pumps water to a storage reservoir during off-peak periods and uses the stored water (by allowing it to fall through a hydroturbine) to generate power during peak periods. The pumping energy is typically supplied by lower cost base power capacity, and the peaking power capacity is of greater value, even though there is a net loss of power in the process.

Putrescible materials or wastes (1) It includes garbage, produce, food products, fruit, vegetables, chemicals, oil, petroleum products, paints, liquid chemicals, and paint sludge (Chesterfield Township, MI), and (2) they include wastes that are capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors, gases, and similar objectionable conditions. Kitchen's wastes, offal, and dead animals are examples of putrescible components of solid waste (Washington, DC).

Pyranometer A device used to measure total incident solar radiation (direct beam, diffuse, and reflected radiation) per unit time per unit area.

Pyrheliometer A device that measures the intensity of direct beam solar radiation.

Pyrolysis The transformation on a compound or material into one or more substances by heat alone (without oxidation). Often called destructive distillation. Pyrolysis of biomass is the thermal degradation of the material in the absence of reacting gases and occurs prior to or simultaneously with gasification reactions in a gasifier. Pyrolysis products consist of gases, liquids, and char generally. The liquid fraction of pyrolisized biomass consists of an insoluble viscous tar and pyroligneous acids (acetic acid, methanol, acetone, esters, aldehydes, and furfural). The distribution of pyrolysis products varies depending on the feedstock composition, heating rate, temperature, and pressure.

Pyrophoric It refers to, when referring to a liquid, any liquid that ignites spontaneously in dry or moist air at or below 130°F (54.4°C). A pyrophoric solid is any solid material, other than one classified as an explosive, which, under normal conditions, is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.

Quad One quadrillion Btu. (1,000,000,000,000,000 Btu)

Qualifying facility A category of electric power producer established under the US Public Utility Regulatory Policy Act (PURPA) of 1978, which includes small-power producers (SPP) who use renewable sources of energy such as biomass, geothermal, hydroelectricity, solar (thermal and photovoltaic), and wind or

cogenerators who produce both heat and electricity using any type of fuel. PURPA requires utilities to purchase electricity from these power producers at a rate approved by a state utility regulatory agency under federal guidelines. PURPA also requires power providers to sell electricity to these producers. Some states have developed their own programs for SPPs and utilities.

Quality factor The extent of tissue damage caused by different types of radiation of the same energy. The greater the damage, the higher the quality factor. More specifically, the factor by which absorbed doses are multiplied to obtain a quantity that indicates the degree of biological damage produced by ionizing radiation (see radiation dose). The factor is dependent upon radiation type (alpha, beta, gamma, or x-ray) and exposure (internal or external).

Rad Radiation-absorbed dose. One hundred ergs of energy absorbed per gram.

Radiant barrier A thin, reflective foil sheet that exhibits low radiant energy transmission and under certain conditions can block radiant heat transfer; installed in attics to reduce heat flow through a roof assembly into the living space.

Radiant ceiling panels Ceiling panels that contain electric resistance heating elements embedded within them to provide radiant heat to a room.

Radiant energy Energy that transmits away from its source in all directions.

Radiant floor A type of radiant heating system where the building floor contains channels or tubes through which hot fluids such as air or water are circulated. The whole floor is evenly heated. Thus, the room heats from the bottom up. Radiant floor heating eliminates the draft and dust problems associated with forced air heating systems.

Radiant heating system A heating system where heat is supplied (radiated) into a room by means of heated surfaces, such as electric resistance elements, hot water (hydronic) radiators, etc.

Radiation (1) The transfer of heat through matter or space by means of electromagnetic waves. (2) The process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

Radiation dose The amount of energy from any kind of ionizing radiation: (1) absorbed dose, (2) collective dose equivalent, (3) collective effective dose equivalent, (4) committed dose equivalent, and (5) committed effective dose equivalent.

Radiative cooling The process of cooling by which a heat-absorbing media absorb heat from one source and radiate the heat away.

Radiator A room heat delivery (or exchanger) component of a hydronic (hot water or steam) heating system; hot water or steam is delivered to it by natural convection or by a pump from a boiler.

Radiator vent A device that releases pressure within a radiator when the pressure inside exceeds the operating limits of the vent.

Radioactive waste Materials left over from making nuclear energy. Radioactive waste can kill or harm living organisms, animals and plants if it is not stored safely.

Radioactivity A property possessed by some elements (such as uranium) whereby alpha, beta, or gamma rays are spontaneously emitted.

Radioisotope A radioactive isotope of a specified element. Carbon-14 is a radioisotope of carbon. Tritium is a radioisotope of hydrogen (see isotope).

Radionuclide A radioactive nuclide. Radionuclides are variations (isotopes) of elements. They have the same number of protons and electrons but different numbers of neutrons, resulting in different atomic masses. There are several hundred known nuclides, both man-made and naturally occurring.

Radon A naturally occurring radioactive gas found in the USA in nearly all types of soil, rock, and water. It can migrate into most buildings. Studies have linked high concentrations of radon to lung cancer.

Rafter A construction element used for ceiling support.

Rammed earth A construction material made by compressing earth in a form; used traditionally in many areas of the world and widely throughout North Africa and the Middle East.

Range land Open land with indigenous vegetation.

Rankine cycle The thermodynamic cycle that is an ideal standard for comparing performance of heat engines, steam power plants, steam turbines, and heat pump systems that use a condensable vapor as the working fluid; efficiency is measured as work done divided by sensible heat supplied.

Rate schedule A mechanism used by electric utilities to determine prices for electricity; typically defines rates according to amounts of power demanded/consumed during specific time periods.

Rated life The length of time that a product or appliance is expected to meet a certain level of performance under nominal operating conditions; in a luminaire, the period after which the lumen depreciation and lamp failure is at 70 % of its initial value.

Rated power The power output of a device under specific or nominal operating conditions.

Rayleigh frequency distribution A mathematical representation of the frequency or ratio that specific wind speeds occur within a specified time interval.

RCRA The Resource Conservation and Recovery Act of 1976 (RCRA) (42 U.S.C. Section 6901) which regulates the generation, treatment, storage, disposal, or recycling of solid and hazardous wastes.

Reactive power The electrical power that oscillates between the magnetic field of an inductor and the electrical field of a capacitor. Reactive power is never converted to nonelectrical power. Calculated as the square root of the difference between the square of the kilovolt-amperes and the square of the kilowatts. Expressed as reactive volt-amperes.

Real price The unit price of a good or service estimated from some base year in order to provide a consistent means of comparison.

Receiver The component of a central receiver solar thermal system where reflected solar energy is absorbed and converted to thermal energy.

Recirculated air Air that is returned from a heated or cooled space, reconditioned and/or cleaned, and returned to the space.

Recirculation systems A type of solar heating system that circulates warm water from storage through the collectors and exposes piping whenever freezing conditions occur, obviously a not very efficient system when operating in this mode.

Reclamation site Drastically disturbed land, such as strip mines and construction sites, which is reclaimed using sewage sludge.

Recovery It means removing from a disposal unit waste that has been permanently disposed in a land disposal facility.

Rectifier An electrical device for converting alternating current to direct current. The chamber in a cooling device where water is separated from the working fluid (e.g., ammonia).

Recuperator A heat exchanger in which heat is recovered from the products of combustion.

Recurrent costs Costs that are repetitive and occur when an organization produces similar goods or services on a continuing basis.

Recycling (1) The process of converting materials that are no longer useful as designed or intended into a new product. (2) It refers to the recovery of useful materials, such as paper, glass, plastic, and metals, from the trash to be used in making new products, reducing the amount of virgin raw materials needed (US EPA).

Redox (reduction-oxidation) reaction It is a chemical reaction involving transfer of electrons from one element to another.

Reflectance The amount (percent) of light that is reflected by a surface relative to the amount that strikes it.

Reflective coatings Materials with various qualities that are applied to glass windows before installation. These coatings reduce radiant heat transfer through the window and also reflect outside heat and a portion of the incoming solar energy, thus reducing heat gain. The most common type has a sputtered coating on the inside of a window unit. The other type is a durable "hard-coat" glass with a coating, baked into the glass surface.

Reflective glass A window glass that has been coated with a reflective film and is useful in controlling solar heat gain during the summer.

Reflective insulation (see also radiant barrier) An aluminum foil-fabricated insulator with backings applied to provide a series of closed air spaces with highly reflective surfaces.

Reflective window films A material applied to window panes that controls heat gain and loss, reduces glare, minimizes fabric fading, and provides privacy. These films are retrofitted on existing windows.

Reflector lamps A type of incandescent lamp with an interior coating of aluminum that reflects light to the front of the bulb. They are designed to spread light over specific areas.

Refraction The change in direction of a ray of light when it passes through one media to another with differing optical densities.

Refrigerant The compound (working fluid) used in air conditioners, heat pumps, and refrigerators to transfer heat into or out of an interior space. This fluid boils at a very low temperature, enabling it to evaporate and absorb heat.

Refrigeration The process of the absorption of heat from one location and its transfer to another for rejection or recuperation.

Refrigeration capacity A measure of the effective cooling capacity of a refrigerator, expressed in Btu per hour or in tons, where one (1) ton of capacity is equal to the heat required to melt 2,000 lb of ice in 24 h or 12,000 Btu per hour.

Refrigeration cycle The complete cycle of stages (evaporation and condensation) of refrigeration or of the refrigerant.

Refuse container It is a metal or nonabsorbent and fire-resistant container, which shall be equipped with a tightly fitting n ~ tal or nonabsorbent and fire-resistant cover or lid, but shall not include incinerators other than those herein defined, or ash pits (Boulder, CO).

Refuse disposal site It refers to any location designated by the city where any approved final treatment utilization, processing, or depository of solid wastes occurs (Boulder, CO).

Refuse hauler It refers to any person engaged in the business of collecting, storing, and transporting refuse in the city and who is licensed thereof by the city (Boulder, CO).

Refuse or solid waste (1) All solid wastes (Bettendorf, IA); (2) all waste materials, combustible or noncombustible, from all public and private establishments and residences, other than sewage (Baltimore County, MD); (3) all putrescible and non-putrescible solid wastes (except body wastes) including any and all garbage, rejected or waste food, offal, swill, ashes, slop, rubbish, and waste or unwholesome material of every kind and character (Los Alamos County, NM); (4) all solid wastes (Beaverton, OR); (5) all solid wastes, garbage, and rubbish, whether combustible or noncombustible, including rubble (Boulder, CO); (6) solid waste that includes both garbage and rubbish (Sonoma County, CA); and (7) all putrescible and non-putrescible solid wastes, except body wastes, and including abandoned vehicles, food waste (garbage), rubbish, ashes, incinerator residue, street cleanings, tree debris, and solid market and industrial wastes (Washington, DC). Also see solid waste.

Refuse-derived fuel (RDF) A solid fuel produced by shredding municipal solid waste (MSW). Noncombustible materials such as glass and metals are generally removed prior to making RDF. The residual material is sold as is or compressed into pellets, bricks, or logs. RDF processing facilities are typically located near a source of MSW, while the RDF combustion facility can be located elsewhere. Existing RDF facilities process between 100 and 3,000 t per day.

Refuse-derived fuel (thermoelectric) power plant A power plant that produces electricity by the force of steam through a turbine that spins a generator. The steam is produced by burning the refuse-derived fuel (RDF).

Regenerative cooling A type of cooling system that uses a charging and discharging cycle with a thermal or latent heat storage subsystem.

Regenerative heating The process of using heat that is rejected in one part of a cycle for another function or in another part of the cycle.

Relamping The replacement of a nonfunctional or ineffective lamp with a new, more efficient lamp.

Relative humidity A measure of the percent of moisture actually in the air compared with what would be in it if it were fully saturated at that temperature. When the air is fully saturated, its relative humidity is 100%.

Reliability This is the concept of how long a device or process can operate properly without needing maintenance or replacement.

Rem (1) It refers to a unit of dose equivalent for any type of ionizing radiation absorbed by the body tissue in terms of its estimated biological effect relative to an exposure of one roentgen of x-rays or gamma rays. The dose equivalent in rems is numerically equal to the absorbed dose in rads multiplied by the quality factor, distribution factor, and any other necessary modifying factors. (2) An acronym for roentgen equivalent man. A unit of radiation exposure that indicates the potential effect of radiation on human cells.

Remediation An action, process, or method for remediating/correcting the environment (usually land and groundwater).

Remediation of failures It refers to land disposal facility repair and environmental cleanup and restoration of the land disposal facility and other affected areas including but not limited to activities undertaken to eliminate, remove, abate, control, or monitor actual or potential health and environmental hazards.

Remote-handled waste At the facility, waste that has an external surface dose rate that exceeds 100 millirem per hour or a high level of alpha and/or beta surface contamination.

Renewable energy Energy derived from resources that are regenerative or for all practical purposes cannot be depleted. Types of renewable energy resources include moving water (hydro, tidal, and wave power), thermal gradients in ocean water, biomass, geothermal energy, solar energy, and wind energy. Municipal solid waste (MSW) is also considered to be a renewable energy resource.

Residential unit It includes any structure or shelter or any part thereof used, or constructed for use, as a residence for one family.

Residential well It refers to a pumping well that serves one home or is maintained by a private owner.

Residue It includes the solid materials remaining after burning, comprising ash, metal, glass, ceramics, and unburned organic substances (Washington, DC).

Resistance The inherent characteristic of a material to inhibit the transfer of energy. In electrical conductors, electrical resistance results in the generation of heat. Electrical resistance is measured in ohms. The heat-transfer resistance properties of insulation products are quantified as the R-value.

Resistance heating A type of heating system that provides heat from the resistance of an electrical current flowing through a conductor.

Resistive voltage drop The voltage developed across a cell by the current flow through the resistance of the cell.

Resistor An electrical device that resists electric current flow.

Resource conservation and recovery act See RCRA.

Resource recovery The process of converting municipal solid waste to energy and/or recovering materials for recycling.

Restructuring The process of changing the structure of the electric power industry from one of guaranteed monopoly over service territories, as established by the Public Utility Holding Company Act of 1935, to one of open competition between power suppliers for customers in any area.

Retail wheeling A term for the process of transmitting electricity over transmission lines not owned by the supplier of the electricity to a retail customer of the supplier. With retail wheeling, an electricity consumer can secure their own supply of electricity from a broker or directly from the generating source. The power is then wheeled at a fixed rate or at a regulated "nondiscriminatory" rate set by a utility commission.

Retrieval It refers to the recovery of waste in an intact container.

Retrofit The process of modifying a building's structure.

Retrospective case study It refers to (1) a study of sites that have had active hydraulic fracturing practices, with a focus on sites with reported instances of drinking water resource contamination or other impacts in areas where hydraulic fracturing has already occurred, or (2) a study that uses existing data and possibly field sampling, modeling, and/or parallel laboratory investigations to determine whether reported impacts are due to existing, ongoing hydraulic fracturing activities.

Return air Air that is returned to a heating or cooling appliance from a heated or cooled space.

Return duct The central heating or cooling system contains a fan that gets its air supply through these ducts, which ideally should be installed in every room of the house. The air from a room will move toward the lower pressure of the return duct.

Reverse thermosiphoning When heat seeks to flow from a warm area (e.g., heated space) to a cooler area, such as a solar air collector at night without a reverse flow damper.

Reversing valve A component of a heat pump that reverses the refrigerant's direction of flow, allowing the heat pump to switch from cooling to heating or heating to cooling.

R-factor See R-value.

Ribbon (photovoltaic) cells A type of solar photovoltaic device made in a continuous process of pulling material from a molten bath of photovoltaic material, such as silicon, to form a thin sheet of material.

Rigid insulation board An insulation product made of a fibrous material or plastic foams, pressed or extruded into boardlike forms. It provides thermal and acoustical insulation strength with low weight and coverage with few heat-loss paths.

Rock bin A container that holds rock used as the thermal mass to store solar energy in a solar heating system.

Rock wool A type of insulation made from virgin basalt, an igneous rock, and spun into loose fill or a batt. It is fire resistant and helps with soundproofing.

Roof A building element that provides protection against the sun, wind, and precipitation.

Roof pond A solar energy collection device consisting of containers of water located on a roof that absorbs solar energy during the day so that the heat can be used at night or that cools a building by evaporation at night.

Roof ventilator A stationary or rotating vent used to ventilate attics or cathedral ceilings; usually made of galvanized steel or polypropylene.

Rotor An electric generator consists of an armature and a field structure. The armature carries the wire loop, coil, or other windings in which the voltage is induced, whereas the field structure produces the magnetic field. In small generators, the armature is usually the rotating component (rotor) surrounded by the stationary field structure (stator). In large generators in commercial electric power plants, the situation is reversed.

Rubbish (1) All solid waste other than garbage, offal, and ashes from homes, hotels, stores, institutions, markets, and other establishments (Prince George's County, MD). (2) All refuse accumulations of paper, excelsior, rags or wooden or paper boxes or containers, sweepings, and all other accumulations of a nature other than garbage, which are usual to housekeeping and to the operation of stores, offices, and other business places, and also any bottles, cans, or other containers which, due to their ability to retain water, may serve as breeding places for mosquitoes or other water-breeding insects; rubbish shall not include noncombustible refuse, as defined above (Dade County, FL). (3) All refuse other than garbage (tin cans, bottles, ashes, paper, pasteboard, cardboard or wooden boxes, brush, weeds, leaves and cuttings from trees, lawns, shrubs, and garden, or other waste materials provided in the normal course of living) (Beaverton, OR). (4) All cardboard, plastic, metal or glass containers, waste paper, rags, sweepings, small pieces of wood, excelsior, rubber, leather, leaves, lawn cuttings, tree trimmings and hedge trimmings not over five inches (12.7 cm) in diameter nor over four feet (1.22 m) in length, tree roots or stumps small enough to be contained in a bushel basket, articles not more than eight feet (2.44 m) in length nor more than fifty pounds (22.7 kg) in weight, and small rocks and similar waste materials that ordinarily accumulate around a home, business, or industry. It shall not include garbage, ashes, bulk refuse, dead animals, hazardous refuse, industrial waste, or building waste (Bettendorf, IA). (5) All ashes, cans, metalware, broken glass, crockery, dirt sweepings, boxes, wood, grass, weeds, or litter or any kind (Bluffton, IN). (6) All non-putrescible waste materials such as paper, cartons, rags, boxes, excelsior, rubber, leather, tree branches, tin cans, bottles, scrap automotive bodies and other metallic junk, mineral matter and street sweepings, crockery, discarded furniture, dirt, ashes, and all other refuse not included in the term garbage (Los Alamos County, NM). (7) Solid

waste that includes non-putrescible wastes, including, but not limited to, unusable, unwanted, or discarded material and debris resulting from normal community or business activities or materials which by their presence may injuriously affect the health, safety, and comfort of persons or may depreciate property values in its vicinity or both (Sonoma County, CA). (8) All non-putrescible solid wastes, consisting of both combustible and noncombustible wastes, including, but not limited to, paper, ashes, cardboard, tin cans, yard clippings, wood, glass, rags, discarded clothes or wearing apparel of any kind, or any other discarded object or thing, not exceeding three feet (0.91 m) in length (Boulder, CO). (9) All solid waste, other than garbage, offal, and ashes, from homes, hotels, stores, institutions, markets, and other establishments; further classified as combustible and noncombustible (Baltimore County, MD). (10) All refuse accumulations of paper, excelsior, rags, or wooden or paper boxes or containers, sweepings, and all other accumulations of a nature other than garbage, which are usual to housekeeping and to the operation of stores, offices, and other business places, and also any bottles, cans, or other containers which, due to their ability to retain water, may serve as breeding places for mosquitoes or other water-breeding insects; rubbish shall not include noncombustible refuse (Miami, FL). (11) All non-putrescible solid wastes, including ashes, consisting of both combustible and noncombustible wastes, such as paper, cardboard, tin cans, yard rubbish, wood, glass, bedding, crockery, or litter of any kind (Washington, DC). and (12) all refuse such as paper, tin cans, bottles, glass containers, rags, ashes, lawn trimmings, tree trimmings, tree branches, limbs, tree trunks and stumps, and waste materials from premises including that produced from remodeling or construction, paper sacks, boxes, packing materials and like materials from dwellings, and business, commercial, or industrial establishments and the offices thereof, except the following: (12a) garbage; (12b) sewage; (12c) dirt, rock, and concrete or masonry materials; (12d) accumulations from mud traps and settling basins; (12e) dead animals or animal excrement; and (12f) salvage materials (Wichita, KS).

Rubble It includes large brush wood, large cardboard boxes or parts thereof, large and/or heavy yard trimmings, discarded fence posts, crates, motor vehicle tires, junk motor vehicle bodies or parts thereof, scrap metal, bed springs, water heaters, and discarded similar object or thing which cannot conveniently be cut into sizes less than three feet (0.91 m) in length (Boulder, CO).

Run-of-river hydropower A type of hydroelectric facility that uses the river flow with very little alteration and little or no impoundment of the water.

Rural electrification administration (REA) An agency of the US Dept. of Agriculture that makes loans to states and territories in the USA for rural electrification and the furnishing of electric energy to persons in rural areas who do not receive central station service. It also furnishes and improves electric and telephone service in rural areas, assists electric borrowers to implement energy conservation programs and on-grid and off-grid renewable energy systems, and studies the condition and progress of rural electrification.

R-Value A measure of the capacity of a material to resist heat transfer. The R-value is the reciprocal of the conductivity of a material (U-value). The larger the R-value of a material, the greater is its insulating properties.

Sacrificial anode A metal rod placed in a water heater tank to protect the tank from corrosion. Anodes of aluminum, magnesium, or zinc are the more frequently metals. The anode creates a galvanic cell in which magnesium or zinc will be corroded more quickly than the metal of the tank, giving the tank a negative charge and preventing corrosion.

Safety disconnect An electronic (automatic or manual) switch that disconnects one circuit from another circuit. These are used to isolate power generation or storage equipment from conditions such as voltage spikes or surges, thus avoiding potential damage to equipment.

Salt gradient solar ponds Consist of three main layers. The top layer is near ambient and has low salt content. The bottom layer is hot, typically 160 °F–212 °F (71 °C–100 °C), and is very salty. The important gradient zone separates these zones. The gradient zone acts as a transparent insulator, permitting the sunlight to be trapped in the hot bottom layer (from which useful heat is withdrawn). This is because the salt gradient, which increases the brine density with depth and counteracts the buoyancy effect of the warmer water below (which would otherwise rise to the surface and lose its heat to the air). An organic Rankine-cycle engine is used to convert the thermal energy to electricity.

Salvage materials It includes waste paper, scrap materials, building materials, or any other type of waste material that has a value to the producer, owner, or occupant of the premises upon which it is produced or stored over and above the actual cost of collection and disposal (Wichita, KS).

Salvaging It refers to the controlled removal of reusable materials (Bluffton, IN).

Sanitary landfill (1) An active portion of the landfill site where refuse is being dumped, compacted, arid covered (Boulder, CO); (2) any planned and systematic method of refuse disposal whereby the waste material is placed in the earth in layers and then compacted and covered with earth or other approved cover material at the end of each day's operation (Prince George's County, MD); (3) a planned and systematic method of refuse disposal by burying (Baltimore County, MD); (4) a method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of suitable cover at the conclusion of each day's operation or at more frequent intervals as necessary (Bluffton, IN); (5) any disposal site operated by means of compacting and covering solid wastes at specific designated intervals, but not each operating day (Marion County, OR).

Scavenging It is the uncontrolled picking or sorting of solid wastes either before, during, or following collection (Washington, DC).

Scribing The cutting of a grid pattern of grooves in a semiconductor material, generally for the purpose of making interconnections.

Sealed combustion heating system A heating system that uses only outside air for combustion and vents combustion gases directly to the outdoors. These systems are less likely to backdraft and to negatively affect indoor air quality.

Seasonal energy efficiency ratio (SEER) A measure of seasonal or annual efficiency of a central air conditioner or air-conditioning heat pump. It takes into account the variations in temperature that can occur within a season and is the average number of Btu of cooling delivered for every watt-hour of electricity used by the heat pump over a cooling season.

Seasonal performance factor (SPF) Ratio of useful energy output of a device to the energy input, averaged over an entire heating season.

Seasoned wood Wood, used for fuel, which has been air-dried so that it contains 15–20% moisture content (wet basis).

Second law efficiency The ratio of the minimum amount of work or energy required to perform a task to the amount actually used.

Second law of thermodynamics This law states that no device can completely and continuously transform all of the energy supplied to it into useful energy.

Seebeck effect The generation of an electric current, when two conductors of different metals are joined at their ends to form a circuit, with the two junctions kept at different temperatures.

Selectable load Any device, such as lights, televisions, and power tools, which is plugged into your central power source and used only intermittently.

Selective absorber A solar absorber surface that has high absorbance at wavelengths corresponding to that of the solar spectrum and low emittance in the infrared range.

Selective surface coating A material with high absorbance and low emittance properties applied to or on solar absorber surfaces.

Self-assessment Self-assessments are appraisals conducted by the facility to identify and correct any existing deficiencies in the environmental monitoring program. Under a facility's environmental monitoring procedure *Self-Assessments for Environmental Programs*, information obtained from an appraisal is categorized as follows: (1) key finding, (2) observation, (3) comment or concern, (4) commendable practice, and (5) deficiency.

Semiconductor Any material that has a limited capacity for conducting an electric current. Certain semiconductors, including silicon, gallium arsenide, copper indium diselenide, and cadmium telluride, are uniquely suited to the photovoltaic conversion process.

Semisolid manure A manure from animals that contains 5–10 % dry matter.

Sensible cooling effect The difference between the total cooling effect and the dehumidifying effect.

Sensible cooling load The interior heat gain due to heat conduction, convection, and radiation from the exterior into the interior and from occupants and appliances.

Sensible heat The heat absorbed or released when a substance undergoes a change in temperature.

Sensible heat storage A heat storage system that uses a heat storage medium and where the additional or removal of heat results in a change in temperature.

Septage Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system or holding tank when the system is cleaned or maintained.

Septic tank absorption bed system It is a traditional on-site wastewater treatment system involving the use of a buried septic tank followed by a soil absorption bed. The anaerobic septic tank removes the scums, grease, oil, and settleable solids and anaerobically digests the solid pollutants. The absorption bed consists of many porous distribution pipes buried underground and is supported by graded gravels or similar synthetic aggregates for uniform distribution and leaching the septic tank effluent to the sandy soil where soil microorganisms remove organic pollutants.

Series A configuration of an electrical circuit in which the positive lead is connected to the negative lead of another energy-producing, energy-conducting, or energy-consuming device. The voltages of each device are additive, whereas the current is not.

Series connection A way of joining photovoltaic cells by connecting positive leads to negative leads; such a configuration increases the voltage.

Series resistance Parasitic resistance to current flow in a cell due to mechanisms such as resistance from the bulk of the semiconductor material, metallic contacts, and interconnections.

Service unit It includes any four sleeping rooms or a fraction thereof, where no cooking privileges are provided, located in any commercial establishment.

Setback thermostat A thermostat that can be set to automatically lower temperatures in an unoccupied house and raise them again before the occupant returns.

Sewage sludge The solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage, scum, and solids removed during primary, secondary, or advanced wastewater treatment processes. The definition of sewage sludge also includes a material derived from sewage sludge (i.e., sewage sludge whose quality is changed either through further treatment or through mixing with other materials).

Shading coefficient A measure of window glazing performance that is the ratio of the total solar heat gain through a specific window to the total solar heat gain through a single sheet of double-strength glass under the same set of conditions; expressed as a number between 0 and 1.

Shale It refers to a fine-grained sedimentary rock that is composed mostly of consolidated clay or mud and is the most frequently occurring sedimentary rock.

Shallow land burial It refers to emplacement of low-level radioactive waste in or within the upper 30 m of the surface of the Earth in trenches, holes, or other excavations: (1) in which only soil provides (1a) structural integrity, (1b) a

barrier to migration of low-level radioactive waste from or subsurface water into such excavation, or (1c) a barrier to entry of surface water to such excavation; or (2) in a manner that fails to allow for monitoring and control of releases of radioactivity during the institutional control period.

Sheathing A construction element used to cover the exterior of wall framing and roof trusses.

Short circuit An electric current taking a shorter or different path than intended.

Short circuit current The current flowing freely through an external circuit that has no load or resistance; the maximum current possible.

Shunt load An electrical load used to safely use excess-generated power when not needed for its primary uses. A shunt load in a residential photovoltaic system might be domestic water heating, such that when power is not needed for typical building loads, such as operating lights or running HVAC system fans and pumps, it still provides value and is used in a constructive, safe manner.

Shutter An interior or exterior movable panel that operates on hinges or slides into place, used to protect windows or provide privacy.

Siding A construction element applied to the outermost surface of an exterior wall.

Sievert A unit of dose equivalent from the International System of Units (Systeme Internationale). Equal to one joule per kilogram.

Sigma heat The sum of sensible heat and latent heat in a substance above a base temperature, typically 32°F (0°C).

Silicon A chemical element, of atomic number 14, that is semimetallic and an excellent semiconductor material used in solar photovoltaic devices; commonly found in sand.

Simple CS (caulk and seal) A technique for insulating and sealing exterior walls that reduces vapor diffusion through air leakage points by installing precut blocks of rigid foam insulation over floor joists, sheet subfloor, and top plates before drywall is installed.

Sine wave The type of alternative current generated by alternating current generators, rotary inverters, and solid-state inverters.

Single glaze or pane One layer of glass in a window frame. It has very little insulating value (R-1) and provides only a thin barrier to the outside and can account for considerable heat loss and gain.

Single-crystal material In reference to solar photovoltaic devices, a material that is composed of a single crystal or a few large crystals.

Single-package system A year-round heating and air-conditioning system that has all the components completely encased in one unit outside the home. Proper matching of components can mean more energy-efficient operation compared to components purchased separately.

Single-phase A generator with a single armature coil, which may have many turns, and the alternating current output consists of a succession of cycles.

Site closure and stabilization or closure It refers to those actions that are taken upon completion of operations that prepare the disposal site for custodial care

and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

Site remediation An action, process, or method for remediating/correcting the land and groundwater.

Sizing The process of designing a solar system to meet a specified load given the solar resource and the nominal or rated energy output of the solar energy collection or conversion device.

Skylight A window located on the roof of a structure to provide interior building spaces with natural daylight, warmth, and ventilation.

Slab A concrete pad that sits on gravel or crushed rock, well-compacted soil either level with the ground or above the ground.

Slab on grade A slab floor that sits directly on top of the surrounding ground.

SlinkyTM ground loop In this type of closed-loop, horizontal geothermal heat pump installation, the fluid-filled plastic heat exchanger pipes are coiled like a SlinkyTM to allow more pipe in a shorter trench. This type of installation cuts down installation costs and makes horizontal installation possible in areas where it would not be with conventional horizontal applications. Also see closed-loop geothermal heat pump systems.

Slumping It refers to a landsliding characterized by movement of a generally independent mass of rock or earth along a slip surface and about an axis parallel to the slope rim which it descends and by backward tilting of the mass with respect to that slope so that the slump surface often exhibits a reversed slope facing uphill.

Smart window A term used to describe a technologically advanced window system that contains glazing that can change or switch its optical qualities when a low voltage electrical signal is applied to it or in response to changes in heat or light.

Sodium lights A type of high-intensity discharge light that has the most lumens per watt of any light source.

Soffit A panel which covers the underside of a roof overhang, cantilever, or mansard.

Soil It refers to all unconsolidated earthy material overlying bedrock.

Solar access or rights The legal issues related to protecting or ensuring access to sunlight to operate a solar energy system or use solar energy for heating and cooling.

Solar air heater A type of solar thermal system where air is heated in a collector and either transferred directly to the interior space or to a storage medium, such as a rock bin.

Solar altitude angle The angle between a line from a point on the Earth's surface to the center of the solar disk and a line extending horizontally from the point.

Solar array A group of solar collectors or solar modules connected together.

Solar azimuth The angle between the sun's apparent position in the sky and true south, as measured on a horizontal plane.

Solar cell A solar photovoltaic device with a specified area.

Solar collector A device used to collect, absorb, and transfer solar energy to a working fluid. Flat plate collectors are the most common type of collectors used for solar water or pool heating systems. In the case of a photovoltaics system, the solar collector could be crystalline silicon panels or thin-film roof shingles, for example.

Solar constant The average amount of solar radiation that reaches the Earth's upper atmosphere on a surface perpendicular to the sun's rays; equal to 1353 W per square meter or 492 Btu per square foot.

Solar cooling The use of solar thermal energy or solar electricity to power a cooling appliance. There are five basic types of solar cooling technologies: absorption cooling, which can use solar thermal energy to vaporize the refrigerant; desiccant cooling, which can use solar thermal energy to regenerate (dry) the desiccant; vapor compression cooling, which can use solar thermal energy to operate a Rankine-cycle heat engine; and evaporative coolers ("swamp" coolers) and heat pumps and air conditioners that can be powered by solar photovoltaic systems.

Solar declination The apparent angle of the sun north or south of the Earth's equatorial plane. The Earth's rotation on its axis causes a daily change in the declination.

Solar distillation The process of distilling (purifying) water using solar energy. Water can be placed in an airtight solar collector with a sloped glazing material, and as it heats and evaporates, distilled water condenses on the collector glazing and runs down where it can be collected in a tray.

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

Solar energy collector See solar collector.

Solar energy industries association (SEIA) A national trade association of solar energy equipment manufacturers, retailers, suppliers, installers, and consultants.

Solar energy research institute (SERI) A federally funded institute, created by the Solar Energy Research, Development, and Demonstration Act of 1974, that conducted research and development of solar energy technologies. It became the National Renewable Energy Laboratory (NREL) in 1991.

Solar film A window glazing coating, usually tinted bronze or gray, used to reduce building cooling loads, glare, and fabric fading.

Solar fraction The percentage of a building's seasonal energy requirements that can be met by a solar energy device(s) or system(s).

Solar furnace A device that achieves very high temperatures by the use of reflectors to focus and concentrate sunlight onto a small receiver.

Solar gain The amount of energy that a building absorbs due to solar energy striking its exterior and conducting to the interior or passing through windows and being absorbed by materials in the building.

Solar irradiation The amount of solar radiation, both direct and diffuse, received at any location.

Solar mass A term for materials used to absorb and store solar energy.

Solar module (panel) A solar photovoltaic device that produces a specified power output under defined test conditions, usually composed of groups of solar cells connected in series, in parallel, or in series-parallel combinations.

Solar noon The time of the day, at a specific location, when the sun reaches its highest, apparent point in the sky; equal to true or due, geographic south.

Solar one A solar thermal electric central receiver power plant ("power tower") located in Barstow, California, and completed in 1981. The Solar One had a design capacity of 10,000 peak kilowatts and was composed of a receiver located on the top of a tower surrounded by a field of reflectors. The concentrated sunlight created steam to drive a steam turbine and electric generator located on the ground.

Solar panel See photovoltaic module.

Solar pond A body of water that contains brackish (highly saline) water that forms layers of differing salinity (stratifies) that absorb and trap solar energy. Solar ponds can be used to provide heat for industrial or agricultural processes, building heating, and cooling and to generate electricity.

Solar power plant A power plant that produces electricity by the solar energy transmitted by the photovoltaic modules on solar panels.

Solar power satellite A solar power station investigated by NASA that entailed a satellite in geosynchronous orbit that would consist of a very large array of solar photovoltaic modules that would convert solar-generated electricity to microwaves and beam them to a fixed point on the Earth.

Solar radiation A general term for the visible and near-visible (ultraviolet and near-infrared) electromagnetic radiation that is emitted by the sun. It has a spectral, or wavelength, distribution that corresponds to different energy levels; short wavelength radiation has a higher energy than long wavelength radiation.

Solar simulator An apparatus that replicates the solar spectrum and is used for testing solar energy conversion devices.

Solar space heater A solar energy system designed to provide heat to individual rooms in a building.

Solar spectrum The total distribution of electromagnetic radiation emanating from the sun. The different regions of the solar spectrum are described by their wavelength range. The visible region extends from about 390 to 780 nm (a nanometer is one billionth of one meter). About 99% of solar radiation is contained in a wavelength region from 300 nm (ultraviolet) to 3000 nm (near-infrared). The combined radiation in the wavelength region from 280 nm to 4000 nm is called the broadband, or total, solar radiation.

Solar thermal electric systems Solar energy conversion technologies that convert solar energy to electricity, by heating a working fluid to power a turbine that drives a generator. Examples of these systems include central receiver systems, parabolic dish, and solar trough.

Solar thermal parabolic dishes A solar thermal technology that uses a modular mirror system that approximates a parabola and incorporates two-axis tracking

to focus the sunlight onto receivers located at the focal point of each dish. The mirror system typically is made from a number of mirror facets, either glass or polymer mirror, or can consist of a single-stretched membrane using a polymer mirror. The concentrated sunlight may be used directly by a Stirling, Rankine, or Brayton cycle heat engine at the focal point of the receiver or to heat a working fluid that is piped to a central engine. The primary applications include remote electrification, water pumping, and grid-connected generation.

Solar thermal systems Solar energy systems that collect or absorb solar energy for useful purposes. Can be used to generate high-temperature heat (for electricity production and/or process heat), medium temperature heat (for process and space/water heating and electricity generation), and low-temperature heat (for water and space heating and cooling).

Solar time The period marked by successive crossing of the earth's meridian by the sun; the hour angle of the sun at a point of observance (apparent time) is corrected to true (solar) time by taking into account the variation in the earth's orbit and rate of rotation. Solar time and local standard time are usually different for any specific location.

Solar transmittance The amount of solar energy that passes through a glazing material, expressed as a percentage.

Solar trough systems (see also parabolic trough, above) A type of solar thermal system where sunlight is concentrated by a curved reflector onto a pipe containing a working fluid that can be used to process heat or to produce electricity. The world's largest solar thermal electric power plants use solar trough technology. They are located in California and have a combined electricity-generating capacity of 240,000 kW.

Solar two Solar Two is a retrofit of the Solar One project (see above). It is demonstrating the technical feasibility and power potential of a solar power tower using advanced molten-salt technology to store energy. Solar Two retains several of the main components of Solar One, including the receiver tower, turbine, generator, and the 1818 heliostats.

Solarium A glazed structure, such as greenhouse or "sunspace."

Solenoid An electromechanical device composed of a coil of wire wound around a cylinder containing a bar or plunger, that when a current is applied to the coil, the electromotive force causes the plunger to move; a series of coils or wires used to produce a magnetic field.

Solenoid valve An automatic valve that is opened or closed by an electromagnet.

Solid fuels Any fuel that is in solid form, such as wood, peat, lignite, coal, and manufactured fuels such as pulverized coal, coke, charcoal, briquettes, pellets, etc.

Solid manure A manure from animals that contains dry matter greater than 15 %.

Solid waste management unit (SWMU) Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released.

Solid waste or refuse (1) All putrescible and non-putrescible wastes, whether in solid or liquid form, except liquid carried industrial wastes or sewage or sewage hauled as an incidental part of a septic tank or cesspool cleaning service, but including garbage, rubbish, ashes, sewage sludge, street refuse, industrial wastes, swill, demolition and construction wastes, abandoned vehicles or parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semisolid wastes, dead animals, and other discarded solid materials (Marion County, OR); (2) all garbage, rubbish, garden trash, noncombustible refuse, and industrial wastes (Dade County, FL); (2) all putrescible and non-putrescible solid wastes, except body wastes, and including abandoned vehicles, food waste (garbage), rubbish, ashes, incinerator residue, street cleanings, tree debris, and solid market and industrial wastes (Washington, DC); (3) all waste materials, combustible or noncombustible, from all public and private establishments and residences, including trash, garbage, rubbish, offal, industrial refuse, and commercial refuse, but not the body excrements (Prince George's County, MD).

Solidity In reference to a wind energy conversion device, the ratio of rotor blade surface area to the frontal, swept area that the rotor passes through.

Solstice The two times of the year when the sun is apparently farthest north and south of the Earth's equator, usually occurring on or around June 21 (summer solstice in northern hemisphere, winter solstice for southern hemisphere) and December 21 (winter solstice in northern hemisphere, summer solstice for the southern hemisphere).

Solutioning It refers to the chemical process by which rock material passes into solution.

Source water It refers to a water from surface or groundwater sources from which operators may withdraw it themselves or may purchase it from suppliers.

Space heater A movable or fixed heater used to heat individual rooms.

Spacer (window) Strips of material used to separate multiple panes of glass within the windows.

Specific heat The amount of heat required to raise a unit mass of a substance through one degree, expressed as a ratio of the amount of heat required to raise an equal mass of water through the same range.

Specific heat capacity The quantity of heat required to change the temperature of one unit weight of a material by one degree.

Specific humidity The weight of water vapor, per unit weight of dry air.

Specific volume The volume of a unit weight of a substance at a specific temperature and pressure.

Spectral energy distribution A curve illustrating the variation or spectral irradiance with wavelength.

Spectral irradiance The monochromatic irradiance of a surface per unit bandwidth at a particular wavelength, usually expressed in watts per square meter-nanometer bandwidth.

Spectral reflectance The ratio of energy reflected from a surface in a given waveband to the energy incident in that waveband.

Spectrally selective coatings A type of window glazing films used to block the infrared (heat) portion of the solar spectrum but admit a higher portion of visible light.

Spectrum See solar spectrum above.

Spent fuel Nuclear fuel that has been used in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

Septic tank filtration system It is an alternative on-site wastewater treatment system involving the use of a buried septic tank followed by an underground sand filtration and/or a trickling filtration module. In areas where problem soil conditions preclude the use of subsurface trenches or seepage absorption beds, or mounds, then the underground sand filtration and/or trickling filtration can be installed to treat the septic tank effluent. The anaerobic septic tank removes the scums, grease, oil, and settleable solids and anaerobically digests the solid pollutants. The underground sand filtration and/or trickling filtration units further treat the septic tank effluent for subsequent surface water discharge if permitted by local sanitary code. This treatment method is useful for land restoration and lake restoration. The filtration effluent is usually disinfected before surface discharge. The use of aerobic trickling filter and anaerobic trickling filter for nitrogen removal has been demonstrated.

Septic tank mound system It is an alternative on-site wastewater treatment system involving the use of a buried septic tank followed by an aboveground soil mound. In areas where problem soil conditions preclude the use of subsurface trenches or seepage absorption beds, then mounds can be installed to raise the absorption field above ground, provide treatment, and distribute the wastewater to the underlying soil over a wide area in a uniform manner. The anaerobic septic tank removes the scums, grease, oil, and settleable solids and anaerobically digests the solid pollutants. The mound consists of many porous distribution pipes buried aboveground and is supported by graded gravels or similar synthetic aggregates for uniform distribution and leaching the septic tank effluent to the aboveground sandy soil where soil microorganisms remove organic pollutants.

Spill A spill or release is defined as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or otherwise disposing of substances from the ordinary containers employed in the normal course of storage, transfer, processing, or use."

Spillway A passage for surplus water to flow over or around a dam.

Spinning reserve Electric power provider capacity on line and running at low power in excess of actual load.

Split spectrum photovoltaic cell A photovoltaic device where incident sunlight is split into different spectral regions, with an optical apparatus, that are directed to individual photovoltaic cells that are optimized for converting that spectrum to electricity.

Split system air conditioner An air-conditioning system that comes in two to five pieces: one piece contains the compressor, condenser, and a fan and the others

have an evaporator and a fan. The condenser, installed outside the house, connects to several evaporators, one in each room to be cooled, mounted inside the house. Each evaporator is individually controlled, allowing different rooms or zones to be cooled to varying degrees.

Spray pyrolysis A deposition process whereby heat is used to break molecules into elemental sources that are then spray deposited on a substrate.

Spreader stocker A type of furnace in which fuel is spread, automatically or mechanically, across the furnace grate.

Sputtering A process used to apply photovoltaic semiconductor material to a substrate by a physical vapor deposition process where high-energy ions are used to bombard elemental sources of semiconductor material, which eject vapors of atoms that are then deposited in thin layers on a substrate.

Square wave inverter A type of inverter that produces square wave output; consists of a DC source, four switches, and the load. The switches are power semiconductors that can carry a large current and withstand a high-voltage rating. The switches are turned on and off at a correct sequence, at a certain frequency. The square wave inverter is the simplest and the least expensive to purchase, but it produces the lowest quality of power.

Squirrel cage motor This is another name for an induction motor. The motors consist of a rotor inside a stator. The rotor has laminated, thin flat steel disks, stacked with channels along the length. If the casting composed of bars and attached end rings were viewed without the laminations, the casting would appear similar to a squirrel cage.

Stability It refers to structural integrity.

Stack A smokestack or flue for exhausting the products of combustion from a combustion appliance.

Stack (heat) loss Sensible and latent heat contained in combustion gases and vapor emitted to the atmosphere.

Staebler-Wronski effect The tendency of the sunlight to electricity conversion efficiency of amorphous silicon photovoltaic devices to degrade (drop) upon initial exposure to light.

Stagnation temperature A condition that can occur in a solar collector if the working fluid does not circulate when the sun is shining on the collector.

Stakeholder Individual or organization that has a stake in the outcome of the watershed plan.

Stall In reference to a wind turbine, a condition when the rotor stops turning.

Stand-alone generator A power source/generator that operates independently of or is not connected to an electric transmission and distribution network; used to meet a load(s) physically close to the generator.

Stand-alone inverter An inverter that operates independent of or is not connected to an electric transmission and distribution network.

Stand-alone system A system that operates independent of or is not connected to an electric transmission and distribution network.

Standard air Air with a weight of 0.075 lb per cubic foot (1.2 kg/m^3) with an equivalent density of dry air at a temperature of 86°F (30°C) and standard barometric pressure of 29.92 in. of mercury (760 mmHg).

Standard conditions In refrigeration, an evaporating temperature of 5°F (−15°C), a condensing temperature of 86°F (30°C), liquid temperature before expansion of 77°F (25°C), and suction temperature of 12°F (−11.1°C).

Standard container Any watertight can with a close-fitting cover, side bail handles, and having a capacity of thirty-two gallons (121 l) or less.

Standard cubic foot A column of gas at standard conditions of standard temperature (32°F or 0°C) and standard pressure (one atmosphere or 760 mmHg). 1 ft^3 = 0.02832 m^3.

Standard deviation An indication of the dispersion of a set of results around their average.

Standard industrial classification (SIC) code Standardized codes used to classify businesses by the type of activity they engage in.

Standby heat loses A term used to describe heat energy lost from a water heater tank.

Standby power For the consumer, this is the electricity that is used by your TVs, stereos, and other electronic devices that use remote controls. When you press "off" to turn off your device, minimal power (dormant mode) is still being used to maintain the internal electronics in a ready, quick-response mode. This way, your device can be turned on with your remote control and be immediately ready to operate.

Starting surge Power, often above an appliance's rated wattage, required to bring any appliance with a motor up to operating speed.

Starting torque The torque at the bottom of a speed (rpm) versus torque curve. The torque developed by the motor is a percentage of the full-load or rated torque. At this torque, the rotational speed of the motor as a percentage of synchronous speed is zero. This torque is what is available to initially get the load moving and begin its acceleration.

Static pressure The force per unit area acting on the surface of a solid boundary parallel to the flow.

Steam Water in vapor form; used as the working fluid in steam turbines and heating systems.

Steam boiler A type of furnace in which fuel is burned and the heat is used to produce steam.

Steam turbine A device that converts high-pressure steam, produced in a boiler, into mechanical energy that can then be used to produce electricity by forcing blades in a cylinder to rotate and turn a generator shaft.

Stirling engine A heat engine of the reciprocating (piston) where the working gas and a heat source are independent. The working gas is compressed in one region of the engine and transferred to another region where it is expanded. The expanded gas is then returned to the first region for recompression. The working gas thus moves back and forth in a closed cycle.

Stoichiometric ratio The ratio of chemical substances necessary for a reaction to occur completely.

Stoichiometry Chemical reactions, typically associated with combustion processes; the balancing of chemical reactions by providing the exact proportions of reactant compounds to ensure a complete reaction; all the reactants are used up to produce a single set of products.

Storage capacity The amount of energy an energy storage device or system can store.

Storage hydropower A hydropower facility that stores water in a reservoir during high-inflow periods to augment water during low-inflow periods. Storage projects allow the flow releases and power production to be more flexible and dependable. Many hydropower project operations use a combination of approaches.

Storage tank The tank of a water heater.

Storage water heater A water heater that releases hot water from the top of the tank when a hot water tap is opened. To replace that hot water, cold water enters the bottom of the tank to ensure a full tank.

Storm door An exterior door that protects the primary door.

Storm windows Glass, plastic panels, or plastic sheets that reduce air infiltration and some heat loss when attached to either the interior or exterior of existing windows.

Stranded investment (costs and benefits) An investment in a power plant or demand side management measures or programs that become uneconomical due to increased competition in the electric power market. For example, an electric power plant may produce power that is more costly than what the market rate for electricity is, and the power plant owner may have to close the plant, even though the capital and financing costs of building the plant have not been recovered through prior sales of electricity from the plant. This is considered a stranded cost. Stranded benefits are those power provider investments in measures or programs considered to benefit consumers by reducing energy consumption and/or providing environmental benefits that have to be curtailed due to increased competition and lower profit margins.

Street refuse It includes material picked up by manual or mechanical sweeping of alleys, streets and sidewalks, litter from public litter receptacles, and dirt removed from catch basins (Washington, DC).

Stud A popular term used for a length of wood or steel used in or for wall framing.

Subsidence It refers to a local mass movement that involves principally the gradual downward settling or sinking of the solid earth's surface with little or no horizontal motion and that does not occur along a free surface (not the result of a landslide or fracture of a slope).

Substation An electrical installation containing power conversion (and sometimes generation) equipment, such as transformers, compensators, and circuit breakers.

Substrate The physical material upon which a photovoltaic cell is applied.

Subsurface It refers to an earth material (as rock) near but not exposed at the surface of the ground.

Subtitle C landfill A landfill permitted to accept hazardous wastes under the Sections 3001

Subtitle D landfill A landfill permitted to accept only nonhazardous wastes under Sections 4001 through 4010 of the US Resource Conservation and Recovery Act (RCRA) and the regulations promulgated pursuant to these sections, including the US 40 CFR Parts 257 and 258.

Sun path diagram A circular projection of the sky vault onto a flat diagram used to determine solar positions and shading effects of landscape features on a solar energy system.

Sun tempered building A building that is elongated in the east-west direction, with the majority of the windows on the south side. The area of the windows is generally limited to about 7 % of the total floor area. A sun-tempered design has no added thermal mass beyond what is already in the framing, wall board, and so on. Insulation levels are generally high.

Sunspace A room that faces south (in the northern hemisphere) or a small structure attached to the south side of a house.

Super insulated houses A type of house that has massive amounts of insulation, airtight construction, and controlled ventilation without sacrificing comfort, health, or aesthetics.

Super solid waste management unit (SSWMU) Individual solid waste management units that have been grouped and ranked into larger units—super solid waste management units—because some individual units are contiguous or so close together as to make monitoring of separate units impractical.

Super window A popular term for highly insulating window with a heat loss so low; it performs better than an insulated wall in winter, since the sunlight that it admits is greater than its heat loss over a 24-h period.

Superconducting magnetic energy storage (SMES) SMES technology uses the superconducting characteristics of low-temperature materials to produce intense magnetic fields to store energy. SMES has been proposed as a storage option to support large-scale use of photovoltaics and wind as a means to smooth out fluctuations in power generation.

Superconductivity The abrupt and large increase in electrical conductivity exhibited by some metals as the temperature approaches absolute zero.

Supplementary heat A heat source, such as a space heater, used to provide more heat than that provided by a primary heating source.

Supply duct The duct(s) of a forced air heating/cooling system through which heated or cooled air is supplied to rooms by the action of the fan of the central heating or cooling unit.

Supply side Technologies that pertain to the generation of electricity.

Surety bond It refers to an arrangement by which a surety company assumes liability for the specified obligations of a principal, if the principal fails to pay or perform as required by the permit.

Surface facilities It refers to the auxiliary buildings and equipment located on the surface of the land above an underground mined repository.

Surface impoundment A natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), used to temporarily or permanently treat, store, or dispose of waste, usually in the liquid form. Surface impoundments do not include areas constructed to hold containers of wastes. Other common names for surface impoundments include ponds, pits, lagoons, finishing ponds, settling ponds, surge ponds, seepage ponds, and clarification ponds.

Surface water (1) Water that is exposed to the atmospheric conditions of temperature, pressure, and chemical composition at the surface of the Earth. (2) All water forms naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.); (3) the water whose top surface is exposed to the atmosphere including a flowing body as well as a pond and a lake (Bluffton, IN).

Surface water loop In this type of closed-loop geothermal heat pump installation, the fluid-filled plastic heat exchanger pipes are coiled into circles and submerged at least eight feet below the surface of a body of surface water, such as a pond or lake. The coils should only be placed in a water source that meets minimum volume, depth, and quality criteria. Also see closed-loop geothermal heat pump systems.

Surveillance (1) It refers to the observation of the disposal site for purposes of visual detection of need for maintenance, custodial care, evidence of intrusion, and compliance with federal and state statutory, regulatory, license, and permit requirements; and (2) the act of monitoring or observing a process or activity to verify conformance with specified requirements.

Swamp cooler A popular term used for an evaporative cooling device.

Swept area In reference to a wind energy conversion device, the area through which the rotor blades spin, as seen when directly facing the center of the rotor blades.

Synchronous generator An electrical generator that runs at a constant speed and draws its excitation from a power source external or independent of the load or transmission network it is supplying.

Synchronous inverter An electrical inverter that inverts direct current electricity to alternating current electricity and that uses another alternating current source, such as an electric power transmission and distribution network (grid), for voltage and frequency reference to provide power in phase and at the same frequency as the external power source.

Synchronous motor A type of motor designed to operate precisely at the synchronous speed with no slip in the full-load speeds (rpm).

System mix The proportion of electricity distributed by a power provider that is generated from available sources such as coal, natural gas, petroleum, nuclear, hydropower, wind, or geothermal.

Tankless water heater A water heater that heats water before it is directly distributed for end use as required; a demand water heater.

Task lighting Any light source designed specifically to direct light a task or work performed by a person or machine.

Temperature coefficient (of a solar photovoltaic cell) The amount that the voltage, current, and/or power output of a solar cell changes due to a change in the cell temperature.

Temperature humidity index An index that combines sensible temperature and air humidity to arrive at a number that closely responds to the effective temperature; used to relate temperature and humidity to levels of comfort.

Temperature zones Individual rooms or zones in a building where temperature is controlled separately from other rooms or zones.

Temperature/pressure relief valve A component of a water heating system that opens at a designated temperature or pressure to prevent a possible tank, radiator, or delivery pipe rupture.

Tempering valve A valve used to mix heated water with cold in a heating system to provide a desired water temperature for end use.

Tennessee valley authority (TVA) A federal agency established in 1933 to develop the Tennessee River Valley region of the southeastern USA and which is now the nation's largest power producer.

Termite shield A construction element that inhibits termites from entering building foundations and walls.

Therm A unit of heat containing 100,000 Btu.

Thermal balance point The point or outdoor temperature where the heating capacity of a heat pump matches the heating requirements of a building.

Thermal capacitance The ability of a material to absorb and store heat for use later.

Thermal efficiency A measure of the efficiency of converting a fuel to energy and useful work; useful work and energy output divided by higher heating value of input fuel times 100 (for percent).

Thermal energy The energy developed through the use of heat energy.

Thermal energy storage The storage of heat energy during power provider off-peak times at night, for use during the next day without incurring daytime peak electric rates.

Thermal envelope houses An architectural design (also known as the double envelope house), sometimes called a "house-within-a-house," that employs a double envelope with a continuous airspace of at least 6–12 in. (15.24–30.48 cm) in the north wall, south wall, roof, and floor, achieved by building inner and outer walls, a crawl space or subbasement below the floor, and a shallow attic space below the weather roof. The east and west walls are single, conventional walls. A buffer zone of solar-heated, circulating air warms the inner envelope of the house. The south-facing airspace may double as a sunspace or greenhouse.

Thermal mass Materials that store heat.

Thermal resistance (R-value) This designates the resistance of a material to heat conduction. The greater the R-value, the larger the number.

Thermal storage walls (masonry or water) A thermal storage wall is a south-facing wall that is glazed on the outside. Solar heat strikes the glazing and is absorbed into the wall, which conducts the heat into the room over time. The walls are at least 8 in thick. Generally, the thicker the wall, the less the indoor temperature fluctuates.

Thermocouple A device consisting of two dissimilar conductors with their ends connected together. When the two junctions are at different temperatures, a small voltage is generated.

Thermodynamic cycle An idealized process in which a working fluid (water, air, ammonia, etc.) successively changes its state (from a liquid to a gas and back to a liquid) for the purpose of producing useful work or energy, or transferring energy.

Thermodynamics A study of the transformation of energy from one form to another and its practical application (see law(s) of thermodynamics above).

Thermoelectric conversion The conversion of heat into electricity by the use of thermocouples.

Thermography A building energy auditing technique for locating areas of low insulation in a building envelope by means of a thermographic scanner.

Thermoluminescent dosimeter (TLD) A device that luminesces upon heating after being exposed to radiation. The amount of light emitted is proportional to the amount of radiation to which the luminescent material has been exposed.

Thermophilic It is a state in an anaerobic reactor, such as anaerobic digester or composting unit, where/when the temperature remains between 51°C and 57°C.

Thermophotovoltaic cell A device where sunlight concentrated onto an absorber heats it to a high temperature, and the thermal radiation emitted by the absorber is used as the energy source for a photovoltaic cell that is designed to maximize conversion efficiency at the wavelength of the thermal radiation.

Thermopile A large number of thermocouples connected in series.

Thermosiphon The natural, convective movement of air or water due to differences in temperature. In solar passive design, a thermosiphon collector can be constructed and attached to a house to deliver heat to the home by the continuous pattern of the convective loop (or thermosiphon).

Thermosiphon System This passive solar hot water system consists of and relies on warm water rising, a phenomenon known as natural convection, to circulate water through the collectors and to the tank. In this type of installation, the tank must be above the collector. As water in the collector heats, it becomes lighter and rises naturally into the tank above. Meanwhile, cooler water in the tank flows down pipes to the bottom of the collector, causing circulation throughout the system. The storage tank is attached to the top of the collector so that thermosiphoning can occur.

Thermostat A device used to control temperatures; used to control the operation of heating and cooling devices by turning the device on or off when a specified temperature is reached.

Thin-film A layer of semiconductor material, such as copper indium diselenide or gallium arsenide, a few microns, or less in thickness, used to make solar photovoltaic cells.

Third party It refers to a party who is not the permittee, a parent corporation of the permittee, or a subsidiary of the permittee.

Threatened waterbody A waterbody that is meeting standards but exhibits a declining trend in water quality such that it will likely exceed standards.

Three-phase current Alternating current in which three separate pulses are present, identical in frequency and voltage, but separated 120° in phase.

Tidal power The power available from the rise and fall of ocean tides. A tidal power plant works on the principal of a dam or barrage that captures water in a basin at the peak of a tidal flow and then directs the water through a hydroelectric turbine as the tide ebbs.

Tidal power plant One kind of hydroelectric power plant that produces electricity by the force of water falling through a hydroturbine that spins a generator. A dam or barrage that captures water in a basin at the peak of a tidal flow and then directs the water through a hydroelectric turbine as the tide ebbs.

Tight sands It refers to a geological formation consisting of a matrix of typically impermeable, nonporous tight sands.

Tilt angle (of a solar collector or module) The angle at which a solar collector or module is set to face the sun relative to a horizontal position. The tilt angle can be set or adjusted to maximize seasonal or annual energy collection.

Time-of-use (TOU) rates The pricing of electricity based on the estimated cost of electricity during a particular time block. Time-of-use rates are usually divided into three or four time blocks per twenty-four hour period (on-peak, mid-peak, off-peak, and sometimes super off-peak) and by seasons of the year (summer and winter). Real-time pricing differs from TOU rates in that it is based on actual (as opposed to forecasted) prices which may fluctuate many times a day and are weather-sensitive, rather than varying with a fixed schedule.

Timer A device that can be set to automatically turn appliances (such as lights, water sprinklers, heaters, instruments, etc.) off and on at set times.

Tip speed ratio In reference to a wind energy conversion device's blades, the difference between the rotational speed of the tip of the blade and the actual velocity of the wind.

Ton (of air conditioning) A unit of air-cooling capacity; 12,000 Btu per hour.

Topping-cycle A means to increase the thermal efficiency of a steam electric generating system by increasing temperatures and interposing a device, such as a gas turbine, between the heat source and the conventional steam-turbine generator to convert some of the additional heat energy into electricity.

Torque (motor) The turning or twisting force generated by an electrical motor in order for it to operate.

Total nitrogen It is the summation of *ammonium nitrogen* (NH_4^+-N), *nitrate nitrogen* (NO_3^--N), nitrite nitrogen (NO_2^--N), and *organic nitrogen* (organic-N). Usually nitrite nitrogen is in negligible amount. Crops directly utilize nitrogen in its inorganic forms, principally nitrate-N and ammonium-N.

Total dissolved solids (TDS) It refers to all material that passes the standard glass river filter; also called total filterable residue. Term is used to reflect salinity.

Total harmonic distortion The measure of closeness in shape between a waveform and its fundamental component.

Total heat The sum of the sensible and latent heat in a substance or fluid above a base point, usually 32°F.

Total incident radiation The total radiation incident on a specific surface area over a time interval.

Total internal reflection The trapping of light by refraction and reflection at critical angles inside a semiconductor device so that it cannot escape the device and must be eventually absorbed by the semiconductor.

Total Kjeldahl nitrogen (TKN) TKN is the summation of *ammonium nitrogen* (NH_4^+-N) and *organic nitrogen* (organic-N).

Total maximum daily load (TMDL) The amount, or load, of a specific pollutant that a waterbody can assimilate and still meet the water quality standard for its designated use. For impaired waterbodies, the TMDL reduces the overall load by allocating the load among current pollutant loads (from point and nonpoint sources), background or natural loads, a margin of safety, and sometimes an allocation for future growth.

Total solids (TS) Total solids (TS) include suspended and dissolved solids and are usually expressed as the concentration present in biosolids. TS depend on the type of wastewater process and biosolids' treatment prior to land application. Typical solid contents of various biosolids are liquid (2–12 %), dewatered (12–30 %), and dried or composted (50 %).

ToxCastDB It refers to a database (1) that links biological, metabolic, and cellular pathway data to gene and in vitro assay data for the chemicals screened in the ToxCast HTS assays; (2) that includes human disease and species homology information, which correlate with ToxCast assays that affect specific genetic loci; and (3) that is designed to make it possible to infer the types of human disease associated with exposure to these chemicals.

Toxic pollutants Pollutants declared "toxic" under the Section 307(a)(1) of the US Clean Water Act (CWA).

ToxRefDB It refers to a database that collects in vivo animal studies on chemical exposures.

Trace elements Trace elements are found in low concentrations in biosolids. The trace elements of interest in biosolids are those commonly referred to as "heavy metals".

Tracking solar array A solar energy array that follows the path of the sun to maximize the solar radiation incident on the PV surface. The two most common orientations are (1) one axis where the array tracks the sun east to west and

(2) two-axis tracking where the array points directly at the sun at all times. Tracking arrays use both the direct and diffuse sunlight. Two-axis tracking arrays capture the maximum possible daily energy.

Trailing edge The part of a wind energy conversion device blade, or airfoil, that is the last to contact the wind.

Transfer station It refers to any loading site where solid waste is transferred from one vehicle to another for transfer to a permanent refuse disposal site (Boulder, CO).

Transformer An electromagnetic device that changes the voltage of alternating current electricity. It consists of an induction coil having a primary and secondary winding and a closed iron core.

Transmission The process of sending or moving electricity from one point to another; usually defines that part of an electric power provider's electric power lines from the power plant buss to the last transformer before the customer's connection.

Transmission and distribution losses The losses that result from inherent resistance in electrical conductors and transformation inefficiencies in distribution transformers in a transmission and distribution network.

Transmission lines Transmit high-voltage electricity from the transformer to the electric distribution system.

Transuranic waste It refers to radioactive waste containing alpha-emitting radionuclides of atomic number 93 or higher (including neptunium, plutonium, americium, and curium)

Trash It includes rubbish and ashes (Prince George's County, MD).

Traveling grate A furnace grate that moves fuel through the combustion chamber.

Treatment works Federally owned, publicly owned, or privately owned device or system used to treat (including recycle or reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Treatment works treating domestic sewage A POTW or other sewage sludge or wastewater treatment system or device, regardless of ownership used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge.

Trellis An architectural feature used to shade exterior walls; usually made of a lattice of metal or wood; often covered by vines to provide additional summertime shading.

Trickle (solar) collector A type of solar thermal collector in which a heat-transfer fluid drips out of header pipe at the top of the collector and runs down the collector absorber and into a tray at the bottom where it drains to a storage tank.

Triple pane (window) This represents three layers of glazing in a window with an airspace between the middle glass and the exterior and interior panes.

Trombe wall A wall with high thermal mass used to store solar energy passively in a solar home. The wall absorbs solar energy and transfers it to the space behind the wall by means of radiation and by convection currents moving through spaces under, in front of, and on top of the wall.

Truck/equipment washwater Wastewater generated during either truck or equipment washes at a landfill site or a hydraulic fracking site, or others. During routine maintenance or repair operations, trucks and/or equipment used within the environmental or industrial operational site (e.g., loaders, compactors, or dump trucks) are washed, and the resultant washwaters are collected for treatment.

True power The actual power rating that is developed by a motor before losses occur.

True south The direction at any point on the Earth that is geographically in the northern hemisphere, facing toward the South Pole of the Earth. Essentially a line extending from the point on the horizon to the highest point that the sun reaches on any day (solar noon) in the sky.

Tube (fluorescent light) A fluorescent lamp that has a tubular shape.

Tube-in-plate absorber A type of solar thermal collector where the heat-transfer fluid flows through tubes formed in the absorber plate.

Tube-type collector A type of solar thermal collector that has tubes (pipes) that the heat-transfer fluid flows through that are connected to a flat absorber plate.

Tungsten halogen lamp A type of incandescent lamp that contains a halogen gas in the bulb, which reduces the filament evaporation rate increasing the lamp life. The high operating temperature and need for special fixtures limits their use to commercial applications and for use in projector lamps and spotlights.

Turbidity It refers to a cloudy condition in water due to suspended silt or organic matter.

Turbine A device for converting the flow of a fluid (air, steam, water, or hot gases) into mechanical motion.

Turn down ratio The ratio of a boiler's or gasifier's maximum output to its minimum output.

Two-axis tracking A solar array tracking system capable of rotating independently about two axes (e.g., vertical and horizontal).

Two-tank solar system A solar thermal system that has one tank for storing solar-heated water to preheat the water in a conventional water heater. U.S.C. (Section 1251), as amended by the Clean Water Act of 1977 (Pub. L. 95-217).

Ultimate analysis A procedure for determining the primary elements in a substance (carbon, hydrogen, oxygen, nitrogen, sulfur, and ash).

Ultraviolet Electromagnetic radiation in the wavelength range of 4–400 nm.

Underground home A house built into the ground or slope of a hill or which has most or all exterior surfaces covered with earth.

Underground injection well (UIC) It refers to a steel- and concrete-encased shaft into which hazardous waste, mining effluent, radioactive water, industrial effluent, municipal waste, or carbon dioxide is deposited underground by force and under pressure.

Underground mined repository It refers to a land disposal facility in which low-level radioactive waste is placed within the earth at a depth greater than 30 m below the surface of the Earth.

Underground source of drinking water (USDW) It refers to an aquifer currently being used as a source of drinking water or capable of supplying a public water system. USDWs have a TDS content of 10,000 mg per liter or less and are not exempted aquifers.

Unglazed solar collector A solar thermal collector that has an absorber that does not have a glazed covering. Solar swimming pool heater systems usually use unglazed collectors because they circulate relatively large volumes of water through the collector and capture nearly 80% of the solar energy available.

Unit nitrogen fertilizer rate (UNFR) UNFR is a rate in lb N per unit crop yield, where the unit can either bushel or ton. (Note: 1 bu (US bushel) = 1.2444 ft^3; 1 British bushel = 1.2843 ft^3; 1 t (British ton) = 2,000 lb; 1 T (metric ton) = 1,000 kg)

Unitary air conditioner An air conditioner consisting of one or more assemblies that move, clean, cool, and dehumidify air.

Unvented heater A combustion heating appliance that vents the combustion by-products directly into the heated space. The latest models have oxygen sensors that shut off the unit when the oxygen level in the room falls below a safe level.

Upgradient Referring to the flow of water or air, "upgradient" is analogous to upstream. Upgradient is a point that is "before" an area of study that is used as a baseline for comparison with downstream data. See Gradient and Downgradient.

Useful heat Heat stored above room temperature (in a solar heating system).

Utility A regulated entity which exhibits the characteristics of a natural monopoly (also referred to as a power provider). For the purposes of electric industry restructuring, "utility" refers to the regulated, vertically integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system which serves retail customers.

U-Value (see coefficient of heat transmission) The reciprocal of R-value. The lower the number, the greater the heat-transfer resistance (insulating) characteristics of the material.

Vacuum evaporation The deposition of thin films of semiconductor material by the evaporation of elemental sources in a vacuum.

Vadose zone It is the zone between land surface and the water table within which (1) the moisture content is less than saturation (except in the capillary fringe); (2) pressure is less than atmospheric; (3) soil pore space also typically contains air or other gases; and (4) the capillary fringe is included in the vadose zone.

Valence band The highest energy band in a semiconductor that can be filled with electrons.

Vapor retarder A material that retards the movement of water vapor through a building element (walls, ceilings) and prevents insulation and structural wood

from becoming damp and metals from corroding. Often applied to insulation batts or separately in the form of treated papers, plastic sheets, and metallic foils.

Variability factor The daily variability factor is the ratio of the estimated 99th percentile of the distribution of daily values divided by the expected value, median or mean, of the distribution of the daily data. The monthly variability factor is the estimated 95th percentile of the distribution of the monthly averages of the data divided by the expected value of the monthly averages.

Variable-speed wind turbines Turbines in which the rotor speed increases and decreases with changing wind speed, producing electricity with a variable frequency.

Vector attraction Characteristics (e.g., odor) that attract birds, insects, and other animals that are capable of transmitting infectious agents.

Vectors Vectors include rodents, birds, insects that can transport pathogens away from the land application site.

Vent A component of a heating or ventilation appliance used to conduct fresh air into, or waste air or combustion gases out of, an appliance or interior space.

Vent damper A device mounted in the vent connector that closes the vent when the heating unit is not firing. This traps heat inside the heating system and house rather than letting it draft up and out the vent system.

Vent pipe A tube in which combustion gases from a combustion appliance are vented out of the appliance to the outdoors.

Vented heater A type of combustion heating appliance in which the combustion gases are vented to the outside, either with a fan (forced) or by natural convection.

Ventilation The process of moving air (changing) into and out of an interior space either by natural or mechanically induced (forced) means.

Ventilation air That portion of supply air that is drawn from outside, plus any recirculated air that has been treated to maintain a desired air quality.

Vertical ground loop In this type of closed-loop geothermal heat pump installation, the fluid-filled plastic heat exchanger pipes are laid out in a plane perpendicular to the ground surface. For a vertical system, holes (approximately four inches in diameter) are drilled about 20 ft (6.1 m) apart and 100–400 ft (30.48–121.92 m) deep. Into these holes go two pipes that are connected at the bottom with a U-bend to form a loop. The vertical loops are connected with horizontal pipe (i.e., manifold), placed in trenches, and connected to the heat pump in the building. Large commercial buildings and schools often use vertical systems because the land area required for horizontal ground loops would be prohibitive. Vertical loops are also used where the soil is too shallow for trenching, or for existing buildings, as they minimize the disturbance to landscaping. Also see closed-loop geothermal heat pump systems.

Vertical-axis wind turbine (VAWT) A type of wind turbine in which the axis of rotation is perpendicular to the wind stream and the ground.

Visible light transmittance The amount of visible light that passes through the glazing material of a window, expressed as a percentage.

Visible radiation The visible portion of the electromagnetic spectrum with wavelengths from 0.4 to 0.76 μm.

Volatile solids (VS) Volatile solids (VS) provide an estimate of the readily decomposable organic matter in biosolids and are usually expressed as a percentage of total solids. VS are an important determinant of potential odor problems at land application sites.

Volatilization It is a phase change process that converts constituents from liquid, semiliquid, or solid form into gaseous form. The most common volatilization experienced is ammonia volatilization or the conversion of ammonium nitrogen to ammonia nitrogen. This is problematic for agricultural operations because plant's nitrogen is lost for plant uptake.

Volt A unit of electrical force equal to that amount of electromotive force that will cause a steady current of one ampere to flow through a resistance of one ohm.

Voltage The amount of electromotive force, measured in volts, that exists between two points.

Volt-ampere A unit of electrical measurement equal to the product of a volt and an ampere.

Wafer A thin sheet of semiconductor (photovoltaic material) made by cutting it from a single crystal or ingot.

Wall A vertical structural element that holds up a roof, encloses part or all of a room, or stands by itself to hold back soil.

Wall orientation The geographical direction that the primary or largest exterior wall of a building faces.

Waste (1) It includes useless, unwanted, or discarded materials resulting from normal community activities and may be solids, liquids, and gases (Washington, DC), and (2) it includes garbage, rubbish, garden trash, noncombustible refuse, and industrial wastes (Miami, FL).

Water jacket A heat exchanger element enclosed in a boiler. Water is circulated with a pump through the jacket where it picks up heat from the combustion chamber after which the heated water circulates to heat distribution devices. A water jacket is also an enclosed water-filled chamber in a tankless coiled water heater. When a faucet is turned on, water flows into the water heater heat exchanger. The water in the chamber is heated and transfers heat to the cooler water in the heat exchanger and is sent through the hot water outlet to the appropriate faucet.

Water quality standards Standards that set the goals, pollution limits, and protection requirements for each waterbody. These standards are composed of designated (beneficial) uses, numeric and narrative criteria, and anti-degradation policies and procedures.

Water source heat pump A type of (geothermal) heat pump that uses well (ground) or surface water as a heat source. Water has a more stable seasonal temperature than air, thus making for a more efficient heat source.

Water table The upper surface in a body of groundwater; the surface in an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure.

Water turbine A turbine that uses water pressure to rotate its blades; the primary types are the Pelton wheel, for high heads (pressure); the Francis turbine, for low to medium heads; and the Kaplan for a wide range of heads. Primarily used to power an electric generator.

Water wall An interior wall made of water-filled containers for absorbing and storing solar energy.

Water wheel A wheel that is designed to use the weight and/or force of moving water to turn it, primarily to operate machinery or grind grain.

Watershed (1) A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place; land area that drains to a common waterway, such as a stream, lake, estuary, wetland, or ultimately the ocean. (2) The area contained within a drainage divide above a specified point on a stream.

Watershed approach A flexible framework for managing water resource quality and quantity within specified drainage area or watershed. This approach includes stakeholder involvement and management actions supported by sound science and appropriate technology.

Watershed plan A document that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to development and implementation of the plan.

Watt The rate of energy transfer equivalent to one ampere under an electrical pressure of one volt. One watt equals 1/746 hp or one joule per second. It is the product of voltage and current (amperage).

Watt-hour A unit of electricity consumption of one watt over the period of one hour.

Wattmeter A device for measuring power consumption.

Wave form The shape of the phase power at a certain frequency and amplitude.

Wave power The concept of capturing and converting the energy available in the motion of ocean waves to energy.

Wavelength The distance between similar points on successive waves.

Weatherization Caulking and weatherstripping to reduce air infiltration and exfiltration into/out of a building.

Weatherstripping A material used to seal gaps around windows and exterior doors.

Wheeling The process of transmitting electricity over one or more separately owned electric transmission and distribution systems (see wholesale and retail wheeling).

Whole house fan A mechanical/electrical device used to pull air out of an interior space; usually located in the highest location of a building, in the ceiling, and venting to the attic or directly to the outside.

Wholesale wheeling The wheeling of electric power in amounts and at prices that generally have been negotiated in long-term contracts between the power provider and a distributor or very large power customer.

Wind energy Energy available from the movement of the wind across a landscape caused by the heating of the atmosphere, earth, and oceans by the sun.

Wind energy conversion system (WECS) or device An apparatus for converting the energy available in the wind to mechanical energy that can be used to power machinery (grain mills, water pumps) and to operate an electrical generator.

Wind generator A wind energy conversion system (WECS) designed to produce electricity.

Wind power plant A group of wind turbines interconnected to a common power provider 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.

Wind resource assessment The process of characterizing the wind resource, and its energy potential, for a specific site or geographical area.

Wind rose A diagram that indicates the average percentage of time that the wind blows from different directions, on a monthly or annual basis.

Wind speed The rate of flow of the wind undisturbed by obstacles.

Wind speed duration curve A graph that indicates the distribution of wind speeds as a function of the cumulative number of hours that the wind speed exceeds a given wind speed in a year.

Wind speed frequency curve A curve that indicates the number of hours per year that specific wind speeds occur.

Wind speed profile A profile of how the wind speed changes with height above the surface of the ground or water.

Wind turbine A term used for a wind energy conversion device that produces electricity; typically having one, two, or three blades.

Wind turbine-rated capacity The amount of power a wind turbine can produce at its rated wind speed, e.g., 100 kW at 20 mph (32.186 km/h). The rated wind speed generally corresponds to the point at which the conversion efficiency is near its maximum. Because of the variability of the wind, the amount of energy a wind turbine actually produces is a function of the capacity factor (e.g., a wind turbine produces 20–35 % of its rated capacity over a year).

Wind velocity The wind speed and direction in an undisturbed flow.

Windmill A wind energy conversion system (WECS) that is used to grind grain and that typically has a high-solidity rotor; commonly used to refer to all types of WECS.

Window A generic term for a glazed opening that allows daylight to enter into a building and can be opened for ventilation.

Windpower curve A graph representing the relationship between the power available from the wind and the wind speed. The power from the wind increases proportionally with the cube of the wind speed.

Windpower profile The change in the power available in the wind due to changes in the wind speed or velocity profile; the windpower profile is proportional to the cube of the wind speed profile.

Wingwall A building structural element that is built onto a building's exterior along the inner edges of all the windows and extending from the ground to the eaves. Wingwalls help ventilate rooms that have only one exterior wall which leads to poor cross ventilation. Wingwalls cause fluctuations in the natural wind direction to create moderate pressure differences across the windows. They are only effective on the windward side of the building.

Wire (electrical) A generic term for an electrical conductor.

Wood stove A wood-burning appliance for space and/or water heating and/or cooking.

Working fluid A fluid used to absorb and transfer heat energy.

Wound rotor motors A type of motor that has a rotor with electrical windings connected through slip rings to the external power circuit. An external resistance controller in the rotor circuit allows the performance of the motor to be tailored to the needs of the system and to be changed with relative ease to accommodate system changes or to vary the speed of the motor.

X-Ray Penetrating electromagnetic radiations having wave lengths shorter than those of visible light. They are usually produced by bombarding a metallic target with fast electrons in a high vacuum. In nuclear reactions, it is customary to refer to photons originating in the nucleus as gamma rays and those originating in the extranuclear part of the atom as x-rays. These rays are sometimes called roentgen rays after their discoverer, W.C. Roentgen.

Yard rubbish It includes prunings, grass clippings, weeds, leaves, and general yard and garden wastes (Washington, DC).

Yaw The rotation of a horizontal axis wind turbine around its tower or vertical axis.

Yield It is the crop harvested in the unit of bu/acre or ton/acre.

Yurt An octagonal-shaped shelter that originated in Mongolia and traditionally made from leather or canvas for easy transportation.

Zero discharge No discharge of pollutants to waters of a country or to a POTW. Also included in this definition is alternative discharge or disposal of pollutants by way of evaporation, deep-well injection, off-site transfer, and land application

Zone An area within the interior space of a building, such as an individual room(s), to be cooled, heated, or ventilated. A zone has its own thermostat to control the flow of conditioned air into the space.

Zoning The combining of rooms in a structure according to similar heating and cooling patterns. Zoning requires using more than one thermostat to control heating, cooling, and ventilation equipment.

References

1. Oil and Gas Mineral Services (2010) Oil and gas terminology. Retrieved 20 Jan 2011, from http://www.mineralweb.com/Iibrary/oil-and-gas-terms
2. US EPA (2011) Terms of environment: glossary, abbreviations and acronyms. US Environmental Protection Agency, Washington, DC.http://www.epa.gov/OCEPAterms/ aterms. html
3. Harris DC (2003) Quantitative chemical analysis, 6th edn. W. H. Freeman and Company, New York
4. Geology Dictionary (2011) Aquiclude. http://www.alcwin.org/DictionaryOf_Geology_Description-136-A.htm
5. Agnes M (1999) Webster's new world college dictionary, 4th edn. Macmillan, Cleveland, OH
6. NYS Department of Environmental Conservation (2011) Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program (revised draft). Well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus Shale and other low-permeability gas reservoirs. NYS Department of Environmental Conservation, Albany, NY. ftp://ftp.dec.state.ny.us/dmn/download/ OGdSG EISFu ll.pdf
7. US EPA (2011) Glossary of underground injection control terms. US Environmental Protection Agency, Washington, DC. http://www.epa.gov/rswater/uic/glossary.htm#ltds
8. USDOE (2009) Modern shale gas development in the US: a primer. US Department of Energy, Ground Water Protection Council, Washington, DC. http://www.netl.doe.gov/technologies/oil-gas/publications/EPreports/Shale_Gas_Primer_2009.Pdf
9. USDOI (2015) Bureau of ocean energy management, regulation and enforcement: offshore minerals management glossary. US Department of the Interior, Washington, DC. http://www.mms.gov/glossary/d. Htm
10. US EPA (2011) Definition of a public water system. US Environmental Protection Agency, Washington, DC. http://water.epa.gov/infrastructu re/drinkingwater/pws/pwsdef2.cfm
11. Merriam-Webster's Dictionary (2011) Subsurface. http://wwwmerriam-webster.com/dictionary/subsurface
12. Society of Petroleum Engineers (2011) SPE E&P Glossary. http://www.spe.org/glossary/wiki/doku.php/welcome#terms_of_use
13. US EPA (2011) Expocast. US Environmental Protection Agency, Washington, DC. http://www.epa.gov/ncct/expocast/
14. US EPA (2011) The HERO database. US Environmental Protection Agency, Washington, DC. http://hero.epa.gov/
15. Judson R, Richard A, Dix D, Houck K, Elloumi F, Martin M, Cathey T, Transue TR, Spencer R, Wolf M (2008) ACTOR - Aggregated computational toxicology resource. Toxicol Appl Pharmacol 233:7–13
16. Martin MT, Judson RS, Reif DM, Kavlock RJ, Dix DJ (2009) Profiling chemicals based on chronic toxicity results from the U.S. EPA ToxRef database. Environ Health Perspect 117 (3):392–399
17. U.S. Environmental Protection Agency (2011) The HERO database. http://actor.epa.gov/actor/faces/ToxCastDB/Home.jsp
18. IGSHPA (2009) Closed-loop/geothermal heat pump systems. International Ground Source Heat Pump Association, and Oklahoma State University, Stillwater, OK
19. Hiller C (2000) Grouting for vertical geothermal heat pump systems. Electric Power Research Institute, International Ground Source Heat Pump Association, and Oklahoma State University, Stillwater, OK
20. IGSHPA (1988) Closed-loop/ground-source heat pump systems: installation guide. International Ground Source Heat Pump Association, and Oklahoma State University, Stillwater, OK
21. IGSHPA (1989) Soil and rock classification for the design o ground-coupled heat pump systems: field manual. International Ground Source Heat Pump Association, and Oklahoma State University, Stillwater, OK

22. IGSHPA (2009) Ground source heat pump residential and light commercial design and installation guide. International Ground Source Heat Pump Association, and Oklahoma State University, Stillwater, OK
23. Wang LK (1974) Environmental engineering glossary. Calspan Corporation, Buffalo, NY, p 439
24. Wang MHS, Wang LK (2014) Glossary ad conversion factors for water resources engineers. In: Wang LK, Yang CT (eds) Modern water resources engineering. Humana Press, New York, pp 759–851
25. Wang MHS, Wang LK (2015) Environmental water engineering glossary. In: Yang CT, Wang LK (eds) Advances in water resources engineering. Springer Science + Business Media, New York, pp 471–556
26. US EPA (1998) Development document for proposed effluent limitations guidelines and standards for the landfills point source category. US Environmental Protection Agency, Washington, DC
27. US EPA (2011) Plan to study the potential impacts of hydraulic fracturing on drinking water resources. US Environmental Protection Agency, Washington, DC
28. CDC (2015) Glossary of Terms & Processes. State of California Department of Conservation. Sacramento, CA. www.conservation.ca.gov/index/pages/glossary-frk.aspx
29. Wang LK, Pereira NC (1980) Solid waste processing and resource recovery. Humana Press, Totowa, NJ, p 480
30. Wang LK, Shammas NK, Evanylo GK, Wang MHS (2014) Engineering management of agricultural land application for watershed protection. In: Wang LK, Yang CT (eds) Modern water resources engineering. Humana Press, New York, pp 571–642
31. Allaby MA (1977) Dictionary of the environment. Van Nostrand Reinhold Co., New York