

Glossary¹

Absorption: The process of taking up and internalizing of a substance by another substance through chemical or molecular action (e.g. a gas absorbed by a liquid).

Acid Rain (acid precipitation or acid deposition): Precipitation containing harmful amounts of nitric and sulfuric acids formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. Acid rain can take the form of wet precipitation (rain, snow, or fog) or dry precipitation (absorbed gaseous and particulate matter, aerosol particles or dust).

Adsorption: The process of adhesion of the molecules of a gas, liquid or dissolved substance (in a condensed form) to a surface.

Alternative Fuels: Non-fossil and non-nuclear fuels such as windpower, solar energy, and biofuels.

Amortization Period: The period of time over which a capital cost is recovered through a depreciation process.

Aquifer: A subsurface waterbearing rock structure or stratum.

Ash: Post-combustion impurities consisting of silica, iron, alumina, and other noncombustible matter that are contained in coal.

Barrel: A volumetric unit of measure for crude oil and petroleum products equivalent to 42 U.S. gallons.

Baseload: The minimum amount of electric power delivered or required over a given period of time at a steady rate on an around-the-clock basis.

Binary Cycle Power Plant Technology:

Biomass Gas: A medium Btu gas containing methane and carbon dioxide, resulting from the action of micro-organisms on organic materials such as a landfill.

Biomass: Organic non-fossil material of biological origin constituting a renewable energy source.

Boiler: A device for generating steam for power, processing, or heating purposes or for producing hot water for heating purposes or hot water supply. Heat from an external combustion source is transmitted to a working fluid contained within the tubes in the boiler shell. This fluid is delivered to an end-use at a desired pressure, temperature, and quality.

Btu (British Thermal Unit): A standard unit of measure equal to the quantity of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit at or near 39.2 degrees Fahrenheit.

¹ Definitions in this glossary are based on terminology used in the following sources:

Considine, D. M. 1977. *Energy Technology Handbook*. McGraw-Hill Book Company. New York, NY.

Energy Information Administration. US Department of Energy. July 1998. *Annual Energy Review*, 1997. DOE/EIA-0384(97). Washington, D.C. 20585.

Energy Information Administration. US Department of Energy: Definitions of EIA terminology for the electricity, renewable energy and nuclear energy can be found on the web site: www.eia.doe.gov/cneaf. Definitions for EIA fossil fuel terminology can be found in any of the EIA *Monthly Energy Review* publications.

Fulkerson, W., and D. B. Reister. 1989. *Energy Technology R&D: What Could Make a Difference?* Vols 1-3. ORNL-6541/V2/P2, Oak Ridge National Laboratory, Oak Ridge, TN.

International Energy Agency (IEA). 1994. *IEA/OECD Scoping Study: Energy and Environmental Technologies to Respond to Global Climate Change Concerns*. Organization for Economic Cooperation and Development (OECD/IEA), Paris, France.

National Science Board. 1998. *Science and Engineering Indicators – 1998*. (NSB 98-1). US Government Printing Office. Washington, DC.

Carbon Dioxide Sequestration and Utilization: Long term storage of carbon dioxide as a component of some other material, such as soil or biomass, in the deep ocean, or geological formations such as terrestrial aquifers or depleted oil or gas wells.

Carbon dioxide: A gas with one carbon and two oxygen atoms (CO₂) that is a combustion byproduct and the principal greenhouse gas.

Carbon Emissions (Anthropogenic): Releases of carbon to the atmosphere as part of compounds that arise from man-made processes such as energy use or agriculture.

Catalysis (Biocatalysis): The chemical or biological process whereby the presence of an external compound, a catalyst, serves as an agent to cause a chemical reaction to occur or to improve reaction performance without altering the external compound.

Climate Change: Regional or global-scale changes in historical climate patterns arising from natural and/or man-made causes that produce an increasing mean global surface temperature. The man-made contributions are often called the greenhouse effect.

Climate Change Mitigation: Actions which are adopted to reduce the effects of anthropogenic activities on the global climate.

Coal: A generic term applied to carbonaceous rocks that were formed by the partial or complete decomposition of vegetation. These stratified carbonaceous rocks are either solid or brittle and are highly combustible.

Anthracite: A hard, black lustrous coal, often referred to as hard coal, containing a high percentage of fixed carbon and a low percentage of volatile matter.

Bituminous Coal: The most common coal. It is dense and black (often with well-defined bands of bright and dull material). Its moisture content usually is less than 20 percent. It is used for generating electricity, making coke, and space heating.

Lignite: A brownish-black coal of low quality (i.e., low heat content per unit) with high inherent moisture and volatile matter (used almost exclusively for electric power generation). It is also referred to as brown coal.

Subbituminous Coal: Subbituminous coal, or black lignite, is dull black and generally contains 20 to 30 percent moisture. The heat content of subbituminous coal ranges from 16 to 24 million Btu per ton as received and averages about 18 million Btu per ton. Subbituminous coal, mined in the western coalfields, is used for generating electricity and space heating.

Cogeneration: The simultaneous production of electrical energy and another form of useful thermal energy (such as heat or steam) from the same fuel source, often used for industrial, commercial, heating, or cooling purposes.

Coke (Petroleum): see Petroleum

Combined Cycle: A multi-stage electric generating technology in which electricity is produced first from one or more conventional gas (combustion) turbines and then from steam turbines, although typically about two-thirds of the total power is generated in the gas turbine portion of the plant. A variety of fuels can supply the gas turbine stages, after which waste heat exiting the gas turbines is routed to a conventional boiler or a heat recovery steam generator for use by a steam turbine to produce additional electricity.

Integrated Gasification Combined Cycle (IGCC): IGCC is a coal-fired, combined cycle electric power generation technology with post-combustion emission controls. The four major processes in an IGCC facility are: 1) converting coal into a fuel gas, 2) cleaning the fuel gas, 3) using the clean fuel gas to fire a gas turbine generator and using the hot turbine exhaust to make steam that drives a steam turbine generator, and 4) treating waste streams generated. Gasification of coal allows pollutant carriers to be removed from the fuel before its combustion in the power plant. Emissions of sulfur and nitrogen oxides and particulates from IGCC facilities are projected to be significantly lower than for existing technologies.

Combustion: A rapid oxidation reaction between a fuel and oxygen that produces heat (the chemical energy content of a fuel is converted to heat energy).

Commercial Sector: The commercial sector is generally defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores, and health, social, and educational institutions.

Conservation (Energy): The reduction of energy consumed to provide an energy service (heat, light, mechanical drive or other forms of work) by efforts to improve the efficiency of the energy conversion process.

Consumption (Fuel): The amount of fuel used for gross generation, providing standby service, start-up and/or flame stabilization.

Conduction: Transfer of heat from one mass to another through a temperature difference between the masses.

Convection: Motion in a fluid or plastic material due to some portions being buoyant because of their higher temperature. Convection is a means of transferring heat through mass flow rather than through simple thermal conduction.

Conversion Losses: A portion of the energy content of a fuel that is lost or is not useable to provide energy services due to operation of the energy conversion process.

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

Crude oil: see Petroleum

Current (Electric): A flow of electrons in an electrical conductor (electricity strength or rate of movement is measured in amperes).

Decarbonization: Removal of carbon from fossil fuel energy systems. Decarbonization can occur prior to combustion by chemical separation processes, or after combustion via separation of flue gases.

Decentralized Energy Technologies: Energy production, transfer, conversion or end-use devices that are widely dispersed and operate independent of a large-scale networked energy system such as a regional electric power grid.

Demand-Side Management: The planning, implementation, and monitoring of utility activities designed to encourage consumers to modify patterns of electricity usage including the timing and level of electricity demand. It refers only to energy and load-shape modifying activities that are undertaken in response to utility-administered programs.

Distribution System: The portion of an energy (e.g. electricity) system that is dedicated to delivering useful, low voltage energy to end users.

District Heating: The system by which multiple locations are supplied with energy services from a centralized energy conversion source and a system of distribution channels used by an energy carrier for service delivery.

Electric Plant (Physical): A facility containing prime movers, electric generators, and auxiliary equipment for converting mechanical, chemical, and/or fission energy into electric energy.

Electric Utility Restructuring: A term to describe the introduction of competition into at least the generation phase of electricity production, with a corresponding decrease in regulatory control. Restructuring may also modify or eliminate other traditional aspects of investor-owned utilities, including their exclusive franchise to serve a given geographical area, assured rates of return, and vertical integration of the production process.

Electric Utility: A corporation, person, agency, authority, or other legal entity or instrumentality that owns and/or operates facilities for the generation, transmission, distribution, or sale of electric energy primarily for use by the public. Electric utilities do not include facilities that qualify as cogenerators or small power producers.

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

Electrolysis: The decomposition of a chemical compound in solution into ions by the action of passing an electric current through the solution.

Electrostatic Precipitator: A number of vertical, parallel metal plates utilizing the mutual attraction of opposite electric charges to remove dust or ash particles or liquid droplets suspended in a gas.

Emission: The release or discharge of a substance into the environment; generally refers to the release of waste products (Solids, liquids, or gases) into the air, water, or soil.

Emissions Trading: A system of managing harmful emissions whereby a regulatory agency specifies an overall level of pollution that will be tolerated (a cap) and then uses allowances to develop a market to allocate the pollution among sources of pollution under the cap. Total emissions cannot exceed the cap. Emissions permits or allowances become the currency of the market, as pollution sources are free to buy, sell, or otherwise trade permits based on their own marginal costs of control and the price of the permits.

Energy Efficiency: The amount of input energy required per unit of output energy service provided by an energy-consuming device; also, efforts or activities that aim at reducing the energy used by specific end-use devices and systems, typically without affecting the services provided. Examples include high-efficiency appliances, efficient lighting programs, high-efficiency heating, ventilating and air conditioning (HVAC) systems or control modifications, efficient building design, advanced electric motor drives, and heat recovery systems.

Energy Industries: Industries that supply primary energy or energy services in bulk form, namely, the coal, oil, natural gas, and electric power industries.

Energy Intensity: The amount of output energy service provided by an energy conversion system per unit input energy the inverse of energy efficiency.

Energy Management: The use of computer-based controllers to determine the operation characteristics of energy-using equipment and processes so that actual use results in the maximum energy efficiency that is practical.

Energy Source: The primary source that provides the raw material that is converted to useable energy (work) through chemical, mechanical, or other means. Energy sources include coal, petroleum and petroleum products, gas, water, uranium, wind, sunlight, geothermal, and other sources.

Energy System: Physically connected energy production (e.g. generation), transmission, and distribution facilities operated as an integrated unit.

Energy: The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy). Energy has several forms (e.g. thermal, mechanical, nuclear and electric), some of which are easily convertible and can be changed to another form useful for work. Heat energy is usually measured in British thermal units (Btus) while electrical energy is usually measured in kilowatt-hours (kWh).

Externalities: Benefits or costs generated as the result of an economic activity, that do not accrue directly to the parties involved in the activity. For example, environmental externalities are benefits or costs that manifest themselves through changes in the physical or biological environment regardless of the relationship of the parties to the environmental regime impacted.

Fermentation: The change which takes place when a saccharine solution is exposed to the action of any of several fungi known as yeast which converts the sugar to alcohol and carbonic acid (the breakdown of complex molecules in an organic compound caused by the action of a ferment such as yeast, bacteria or enzymes).

Fissile Material: Material that can be caused to undergo atomic fission when bombarded by neutrons. The most important fissionable materials are uranium-235, plutonium-239, and uranium-233.

Fission: The process whereby an atomic nucleus of suitable material is split into (generally) two nuclei of lighter elements with the release of substantial amounts of energy and two or more neutrons.

Flue Gas Streams: A tube or stack to contain the passage of hot gases, air and smoke as in the exhaust products from combustion.

Flue Gas: The exhaust gases from a combustion facility in the stack that discharges them to the atmosphere. These gases often contain sulfur, which can be removed by a desulfurization scrubber, and particulates, which can be removed using specialized collectors like electrostatic precipitators, mechanical collectors (cyclones), fabric filters (baghouses), and wet scrubbers.

Fluidized Bed Gasifier: A system which extracts the volatile components of a solid feedstock (e.g. coal or biomass) by controlled, rapid heating without agglomerating the feedstock using a temperature-staged, grated reactor bed through which gases are passed to percolate up through the solid feedstock.

Flywheels: A device to store energy in a heavy, rotating mass (wheel). The heavy wheel can be attached to a machine to regulate its speed or variation in motion.

Fossil Fuel: Naturally occurring combustible hydrocarbon compounds, such as petroleum, coal, and natural gas.

Fuel: Any substance that can be burned to produce heat; also, materials that can be fissioned in a chain reaction to produce heat.

Fuel Cell: Any of several galvanic energy conversion devices that convert the chemical energy of a fuel directly into electrical energy in the presence of an oxidant. Examples of fuel cells include solid oxide (SOFC), solid polymer (SPFC) and molten carbonate (MCFC) technologies.

Fuel Cycle: The linked sequential stages through which a fuel passes from primary energy extraction through final conversion into a useful energy service (work).

Fusion (Controlled Thermonuclear): The nuclear reaction whereby the nuclei of light isotopes, like hydrogen, are joined (fused) to form heavier elements, releasing large amounts of energy.

Gas Turbine: Rotating machinery where liquid or gaseous fuel is burned to produce electric power and heat. Hot combustion gases are passed to the turbine and where they expand to drive the generator and are then used to run the compressor. Gas turbines typically consist of an axial-flow air compressor; one or more combustion chambers and a turbine drive section connected to a generator.

Gas: A fuel burned under boilers and by internal combustion engines. These include natural, manufactured and waste gas.

Gaseous Diffusion Process: The enrichment process whereby the concentration of the uranium-235 (U-235) isotope contained in natural uranium is increased to a level suitable for use in nuclear power plants.

Gasification (Combined Cycle): A multi-stage process for producing electricity from a fuel using both the expansion of gas in gas turbogenerators and expansion of steam in steam turbogenerators. In this process, the fuel is first partially oxidized with air at elevated pressure, converting the fuel to a raw fuel gas. In subsequent stages, the fuel gas is cleaned, and then first burned in a combustor and expanded in a gas turbine. Finally, the turbine exhaust gases are used to raise steam in a steam boiler, which drives a steam generator.

Gasohol: A blend of finished motor gasoline (leaded or unleaded) and alcohol (generally ethanol but sometimes methanol) in which 10 percent or more of the product is alcohol.

Generating Unit: Any combination of physically connected generator(s), reactor(s), boiler(s), combustion turbine(s), or other prime mover(s) operated together to produce electric power.

Generator: A machine that converts mechanical energy into electrical energy.

Genetically Engineered Microorganisms:

Geothermal Energy: Heat recovered energy from deep within the earth for power generation, process heating or district heating using a subsurface closed loop working fluid system and surface power generation plant.

Green Pricing: In the case of renewable electricity, green pricing represents a market solution to the various problems associated with regulatory valuation of the non-market benefits of renewables. Green pricing programs allow electricity customers to express their willingness to pay for renewable energy development through direct payments on their monthly utility bills.

Greenhouse Effect: The increasing mean global surface temperature of the Earth caused by high concentrations of certain gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons). The greenhouse effect allows solar radiation to penetrate, but absorbs the infrared radiation returning to space.

Heat Exchangers: A device for transfer of heat from an area of higher temperature to one of lower temperature.

Heat Recovery: The process of capturing heat that normally would be wasted and delivering it to a device or process where it can be used.

Heating Value: The average number of British thermal units per unit of weight or volume of a fuel (e.g. Btus per cubic foot of natural gas) as determined from tests of fuel samples.

Heavy Oil: The fuel oils remaining after the lighter oils have been distilled during the refining process. Except for start-up and flame stabilization, virtually all petroleum used in steam plants is heavy oil.

Heavy Water: Water containing a significantly greater proportion of heavy hydrogen (deuterium) atoms to ordinary hydrogen atoms than is found in ordinary (light) water. Heavy water is used as a moderator in some reactors because it slows neutrons effectively and also has a low cross-section for absorption of neutrons.

Hot Dry Rock: Heat energy residing in impermeable, crystalline rock.

Hybrid Vehicle Systems: Vehicles that are powered by a combination of electric energy (using batteries or fuel cells) and heat energy (using some form of combustion engines).

Hydrocarbon Fuels: Any substance containing only hydrogen and carbon that is a fuel. Combustible material....combustion—a process of oxidation of a substance that produces heat and sometimes light. Burn...to consume with fire. To expel the volatile parts and reduce to non-combustible residue.

Hydroelectric Plant: An electricity-generating facility in which the turbine generators are driven by falling water.

Hydrogen: An in flammable, colorless, odorless, gaseous chemical element the lightest of all known substances.

Hydropower: The production of electricity by the action of moving water falling on a turbine generator.

Hydrothermal Energy: Energy stored as heat in water.

Independent Power Producer (IPP): A wholesale electricity producer that is unaffiliated with franchised utilities in the area in which the IPP is selling power and that lacks significant marketing power. IPPs do not possess transmission facilities that are essential to their customers and do not sell power in any retail service territory where they have a franchise.

Industrial sector: The industrial sector is generally defined as manufacturing, construction, mining, agriculture, fishing and forestry establishments; they are classified as part of US Standard Industrial Classification (SIC) codes 01-39.

Insolation (solar): The amount of radiation from the sun received at the surface of the earth in a particular geographic location or region.

Ions: An electrically charged atom or group of atoms. Such loss or gain of electrons occurs during chemical reactions in which electrons are transferred from one atom to another; by the action of matter on x-rays, UV light and certain other forms of radiant energy or by the impact of alpha and beta particles, protons or deuterons, etc. on atoms and molecules.

Kerosene: A petroleum distillate that boils at a temperature between 300 degrees and 550 degrees Fahrenheit. Kerosene is used in space heaters, cook stoves, and water heaters, and is suitable for use as an illuminant when burned in wick lamps.

Life Cycle Assessment: Analysis of the impacts (e.g. energy, environmental or economic impacts) a system over its complete lifetime from creation to destruction, sometimes including the lifetimes of key constituents and components.

Light Oil: Lighter fuel oils distilled off during the refining process. Virtually all petroleum used in internal combustion and gas turbine engines is light oil.

Liquefaction (coal, hydrogen): The conversion of coal to liquid hydrocarbons by reacting coal slurry with hydrogen in the presence of a catalyst (in a turbulent flow, packed bed reactor).

Liquefied Natural Gas (LNG): Natural gas (primarily methane) which has been liquefied by reducing its temperature to minus 260 degrees Fahrenheit at atmospheric pressure.

Load: The amount of energy (e.g. electric) needed to meet a requirement for an energy service by energy-consuming equipment at any specific point in a system.

Load Management: Use of power management techniques such as off-peak generation capacity to better match power supply with load demand so that generating resources are used to maximum efficiency.

Manufactured Gas: A synthetic gas obtained by processes such as destructive distillation of coal, thermal decomposition of oil or the reaction of steam passing through a bed of heated coal or coke. Examples are coal gases, coke oven gases, producer gas, blast furnace gas, blue (water) gas, carbureted water gas.

Market Conditioning: Actions taken by governments or firms or both that aim to improve the prospects for successful commercialization of a product or technology in a particular location. Market conditioning may involve policy actions such as government subsidies to industry, information dissemination and education, and export promotion/import restriction.

Membrane: A thin film or structure that selectively retards mixing or permits separation of one or more fluids.

Methane Hydrate: A colorless, odorless, gaseous hydrocarbon that is inflammable and is formed naturally or artificially. It can be used as a fuel or raw material for producing energy or as a feedstock for the production of other chemicals.

Methane: A hydrocarbon compounds that is the major component of natural gas; the most common gas formed in coalmines.

Methanol: A colorless, odorless, poisonous volatile inflammable liquid obtained by the destructive distillation of wood and used in organic synthesis, as a fuel and in the manufacture of formaldehyde, smokeless powders, paints, etc.

Methyl Tertiary Butyl Ether (MTBE): A color- less, flammable, liquid oxygenated hydrocarbon ((CH₃)₃COCH₃) that contains 18.15 percent oxygen and has a boiling point of 55.2 degrees Celsius. It is a fuel oxygenates produced by reacting methanol with isobutylene.

Motor Gasoline: A complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives, blended to form a fuel suitable for use in spark-ignition engines.

Multi-Phase Fluid Transport: Movement of fluid mixtures having multiple phases (solid, liquid and gases).

Nano- and Micro-Domains: Dealing with materials at very small scales of size; nano— ... and micro--...

Naphtha: A generic term applied to a petroleum fraction with an approximate boiling range between 122 and 400 degrees Fahrenheit.

Natural Gas: A naturally occurring mixture of hydrocarbon and non-hydrocarbon gases found in porous geological formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.

Nonutility Power Producer (NPP): A corporation, person, agency, authority, or other legal entity or instrumentality that owns electric generating capacity and is not an electric utility. NPPs include qualifying cogenerators, qualifying small power producers, and other non-utility generators such as independent power producers.

Nuclear Reactor: An apparatus in which the nuclear fission chain can be initiated, maintained, and controlled so that energy is released at a specific rate. The reactor apparatus includes fissionable material (fuel) such as uranium or plutonium; fertile material; moderating material (unless it is a fast reactor); a heavy-walled pressure vessel; shielding to protect personnel; provision for heat removal; and control elements and instrumentation. Designs of nuclear reactors currently in use or under development include:

Boiling-Water Reactor (BWR): A light-water reactor in which water, used as both coolant and moderator, is allowed to boil in the core. The resulting steam can be used directly to drive a turbine.

Breeder Reactor: A reactor that both produces and consumes fissionable fuel, especially one that creates more fuel than it consumes. The new fissionable material is created by a process known as breeding, in which neutrons from fission are captured in fertile materials.

Fast Breeder Reactor (FBR): A reactor in which the fission chain reaction is sustained primarily by fast neutrons rather than by thermal or intermediate neutrons. Fast reactors require little or no use of a moderator to slow down the neutrons from the speeds at which they are ejected from fissioning nuclei. This type of reactor produces more fissile material than it consumes.

Gas-Cooled Fast Breeder Reactor (GCFBR): A fast breeder reactor that is cooled by a gas (usually helium) under pressure.

Light-Water Reactor (LWR): A nuclear reactor that uses water as the primary coolant and moderator, with slightly enriched uranium as fuel. There are two types of commercial light-water reactors--the boiling-water reactor (BWR) and the pressurized-water reactor (PWR).

Liquid Metal Fast Breeder Reactor (LMFBR): A nuclear breeder reactor, cooled by molten sodium, in which fission is caused by fast neutrons

Pressurized-Water Reactor (PWR): A nuclear reactor in which heat is transferred from the core to a heat exchanger via water kept under high pressure, so that high temperatures can be maintained in the primary system without boiling the water. Steam is generated in a secondary circuit.

Ocean Thermal Energy System: A heat engine run by using the temperature difference (thermal gradient) between warm ocean surface water and the deeper cold layers of the ocean.

Ohm: The unit of measurement of electrical resistance. The resistance of a circuit in which a potential difference of 1 volt produces a current of 1 ampere.

OPEC: The acronym for the Organization of Petroleum Exporting Countries, oil-producing and exporting countries that have organized for the purpose of negotiating with oil companies on matters of oil production, prices, and

future concession rights. Current members are Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Oxidation: The chemical process in which the union of a substance with oxygen takes place.

Ozone: Three-atom oxygen compound (O₃) found in two layers of the Earth's atmosphere. One layer of beneficial ozone occurs at 7 to 18 miles above the surface and shields the Earth from ultraviolet light. Several holes in this protective layer have been documented by scientists. Ozone also concentrates at the surface as a result of reactions between byproducts of fossil fuel combustion and sunlight, having harmful health effects.

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

Particulates: Visible air pollutants consisting of particles appearing in smoke or mist emitted by the combustion of fossil fuels, primarily in the transportation, industrial, or electric utility sectors, or consisting of naturally occurring substances such as airborne dust particles.

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

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

Petroleum (Crude Oil): A naturally occurring, oily, flammable liquid composed principally of hydrocarbons. Crude oil is occasionally found in springs or pools but usually is drilled from wells beneath the earth's surface. Petroleum products are obtained from the processing of crude oil, natural gas and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphtha's, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products.

Photoconversion: The conversion of a substance from one form to another using the energy supplied by light.

Photovoltaic Cell: An electronic device consisting of layers of semiconductor materials that is capable of converting incident light directly into electricity (direct current).

Plutonium (Pu): A heavy, fissionable, radioactive, metallic element (atomic number 94). Plutonium occurs in nature in trace amounts. It can also be produced as a byproduct of the fission reaction in a uranium-fueled nuclear reactor and can be recovered for future use.

Pollution: Any substances in water, soil, or air that degrade the natural quality of the environment, offend the senses of sight, taste, hearing, or smell, and/or cause a health hazard. The usefulness of a natural resource is usually impaired by the presence of pollutants and contaminants.

Power: The rate at which energy is transferred. Electrical energy is usually measured in watts. Also used for a measurement of capacity.

Pressurized Fluidized Bed Combustion: Burning of coal in a reactor comprised of a bed through which gas is fed to keep the fuel in a turbulent state which improves combustion, heat transfer and recovery of waste products.

Prime Mover: The engine, turbine, water wheel, or similar machine that drives an electric generator; or, for reporting purposes, a device that converts energy to electricity directly (e.g., photovoltaic solar and fuel cell(s)).

Propane: A normally gaseous paraffinic compound (C₃H₈).

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

Pyrolysis: The thermal decomposition of a suitable solid material (e.g. hydrocarbon or biomass) at high temperature in the absence of oxygen.

Radionuclides: Radioactive material capable of giving off radiant energy in the form of particles or rays as alpha, beta and gamma rays by the disintegration of atomic nuclei.

Recovery Technologies: Technologies that are used in the removal of oil and gas from underground deposits. Recovery technologies are classified as primary (e.g.) secondary (e.g.) or tertiary (e.g.).

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and alcohol.

Reformer: A system that performs gasification via a low-temp steam reforming chemical reaction. The reforming reaction is conducted between liquid hydrocarbons and steam over a catalyst bed to form methane, hydrogen and carbon oxides.

Reformulated Gasoline (RFG): Gasoline whose composition has been changed (from that of gasoline's sold in 1990) to (1) include oxygenates, (2) reduce the content of olefins, aromatics, and volatile components, and (3) reduce the content of heavy hydrocarbons.

Refuse-Derived Fuel (RDF): Fuel processed from municipal solid waste that can be in shredded, fluff, or densified pellet forms.

Regulation: The governmental function of controlling or directing economic entities through the process of rulemaking and adjudication.

Renewable Energy Source: Replenishable flow resources such as wind, water, and biomass, that can be used as a fuel stock.

Research (Cross-Cutting): research and development (R&D) which involves more than one technical discipline or program area in order to be fully successful; also multi- or inter-disciplinary R&D.

Research and Development: The process of investigation and testing to increase technical know-how or basic understanding of a topic or area of study. Stages of the research and development process include:

Basic research: Scientific efforts that seek to gain more comprehensive knowledge or understanding of the subject under study, without specific applications or commercial objectives in mind.

Applied research: Inquiry aimed at gaining the knowledge or understanding to meet a specific, recognized need of a practical nature, especially needs to achieve specific commercial objectives with respect to products, processes, or services.

Development: The systematic use of the knowledge or understanding gained from research to create or improve useful materials, devices, systems, or methods through building and operating prototypes or test models.

Research and Development (R&D) Intensity: An economic measure of research and development (R&D) activity in a country usually defined as the ratio annual R&D expenditures/GDP.

Research and Development Portfolio: The collective body of science and technology programs, facilities, and expertise located and directed within a given jurisdiction and directed at a distinct set of organizational and policy objectives.

Research Infrastructure: The facilities, equipment and other supporting resources used in the conduct of research and development.

Residential Sector: Private single and multi-family household establishments which consume energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking and clothes drying.

Scrubber: An emission control device that adds alkaline reagents to react with and neutralize acid gases.

Sensors and Controls: The use of automated measurement (sensor) and actuator (control) devices in a coordinated system to improve the operation of equipment or processes through better equipment settings.

Separation Process: The dissociation of selected constituents from a mixture via physical, chemical or other means.

Smog: Air pollution associated with the presence of photochemical oxidants such as oxides of nitrogen in the lower atmosphere released by the combustion of fossil fuels.

Solar Cell: Refers to a solar photovoltaic cell for converting sunlight directly into electricity.

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

Solar Thermal Collector: A device designed to receive solar radiation and convert it into thermal energy. The collector typically consists of a metal frame, metal absorption panels with integral liquid or airflow channels and glazing and insulation on the sides and back. The heat collected by the solar thermal collector may be used immediately or stored for later use.

Solar Thermal Process (active): An energy conversion process, which converts solar energy to useful thermal or heat energy.

Solvent: A substance that dissolves, or makes a solution of, another substance

Steam-Electric Plant (Conventional): A plant in which the prime mover is a steam turbine. The steam used to drive the turbine is produced in a boiler where fossil fuels are burned.

Storage of Energy: The retention of energy available at one point in time in a form that permits the energy to be made available in a useful form at a later point in time. There are five basic methods of energy storage: electrochemical (e.g. batteries), thermal (e.g. diurnal or seasonal thermal systems), mechanical (e.g. pumped storage, flywheels and compressed air systems), magnetic (e.g. superconducting magnetic energy storage, SMES) and chemical (e.g. hydrogen storage and reversible chemical reactions).

Stranded Costs: Investments and prudently incurred expenses of electric utilities under regulated monopoly market conditions that become economically unviable as a result of utility deregulation. Provisions for the recovery of stranded costs is a major political issue in the process of electric utility restructuring in many countries including the U.S.

Sulfur: One of the elements present in varying quantities in coal, which contributes to environmental degradation through acid precipitation when coal is burned.

Supercapacitor: A very high capacity energy storage system consisting of two parallel conductive plates separated by a dielectric material. The electric energy is stored as an electrostatic field between the plates by the electric charges accumulated on the plates.

Superconductors: A small number of metals that lose nearly all their electrical resistance in certain temperature ranges with the result that very high currents can be transmitted with very low losses. Use of these materials for electric power generation (superconducting turbine generators), storage (superconducting magnetic energy storage system, SMES) and transmission (superconducting transmission cables) promises important technical and cost advantages.

Synthetic Natural Gas, Syngas (SNG): A manufactured gas product resulting from the conversion or reforming of petroleum hydrocarbons or from coal gasification. It is chemically similar to natural gas and may be substituted for or interchanged with pipeline quality natural gas.

Therm: One hundred thousand British thermal units.

Transformer: An electrical device for changing the voltage of alternating current.

Transmission: The movement or transfer of electric energy at high voltage over an interconnected group of lines and associated equipment between points of supply and points at which it is either transformed for distribution and delivery to consumers or delivered to other electric systems. Transmission is considered to end when the energy is transformed to low voltage for distribution to the consumer.

Tritium Fuel: A radioactive isotope of hydrogen that does not occur in nature. It is an intermediate reactant of early stage fusion reactions that becomes a fuel for later reaction stages.

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

Uranium (U): A heavy, naturally radioactive, metallic element of atomic number 92. Its two principally occurring isotopes are uranium-235 and uranium-238. Uranium-235 is indispensable to the nuclear industry because it is the only isotope existing in nature to any appreciable extent that is fissionable by thermal neutrons. Uranium-238 is also important, because it absorbs neutrons to produce a radioactive isotope that subsequently decays to plutonium-239, an isotope that also is fissionable by thermal neutrons.

Waste Heat: Heat energy produced in an energy conversion or transfer process that is lost during conversion or transfer and is not available for useful purposes.

Watt (Electric): The electrical unit of power. The rate of energy transfer equivalent to 1 ampere of electric current flowing under a pressure of 1 volt at unity power factor.

Watt (Thermal): A unit of power in the metric system, expressed in terms of energy per second, equal to the work done at a rate of 1 joule per second.

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

Wave Energy: Energy that is available due to the motion of ocean waves.

Wellhead: The point at which the crude oil and/or natural gas exits the ground.

Wheeling: The use of the transmission facilities of one system to transmit power and energy by agreement of, and for, another system with a corresponding wheeling charge, e.g., the transmission of electricity for compensation over a system that is received from one system and delivered to another system).

Window Coatings: Thin layers of transparent materials deposited on the surface of windows to improve their ability to limit heat transfer while permitting light to pass through.