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ABSTRACT

This glossary of over 100 energy-related terms is intended to accompany the National Science Teachers Association's (NSTA) Fact Sheet on alternative energy technologies. Brief definitions of common concepts, principles, and expressions related to energy education are provided. (Author/CP)

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FACTSHEET

National Science Teachers Association

1977

18. ALTERNATIVE ENERGY SOURCES
A Glossary of Terms

John M Fowler and King C. Kryger

This glossary of terms is intended to accompany NSTA's Fact Sheets on alternate energy technologies. Although it should prove useful, independent of the Fact Sheets, it was not designed to provide a comprehensive listing of energy terms. Energy topics not covered in the Fact Sheets may be missing while specific technical terms that are defined within the text of individual Fact Sheets are not always included.

anthracite - "hard coal," low in volatile matter, high in carbon content, with a heat value of 6.40 million Calories/ton.

barrel (bbl) - A liquid measure of oil, usually crude oil, equal to 42 gallons or about 306 pounds.

base load - The minimum load of a utility (electric or gas) over a given period of time.

bioconversion - A general term describing the conversion of one form of energy into another by plants or microorganisms. It usually refers to the conversion of solar energy by photosynthesis.

biomass - Plant materials in any form from algae to wood.

bituminous coal - Soft coal; coal that is high in carbonaceous and volatile matter. It is "younger" and of lower heat value than anthracite or "hard coal." Heat value, 5.92 million Calories/ton.

black lung - A respiratory ailment, similar to emphysema, which is caused by inhalation of coal dust. Identified as a contributing cause in the deaths of many underground coal miners.

bottoming cycle - A means of using the low-temperature heat energy exhausted from a heat engine, a steam turbine, for instance, to increase the overall efficiency. It usually employs a low-boiling point liquid as working fluid.

breeder reactor - A nuclear reactor so designed that it produces more fuel than it uses. Uranium 238 ($_{92}U^{238}$) or thorium 232 ($_{90}Th^{238}$) can be converted to the fissile fuel, plutonium 239 ($_{94}Pu^{239}$) or uranium 233 ($_{92}U^{233}$), by the neutrons produced within the breeder reactor core.

British Thermal Unit (BTU) - An engineering unit of heat energy, the quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit, about one-quarter of a Calorie.

Calorie - A metric unit of heat energy, the amount of heat that will raise the temperature of one kilogram of water 1° Celsius. It is approximately equal to 4 BTUs. (In scientific terminology it is equivalent to the kilocalorie; 1,000 small calories.)

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capacity factor - A measure of the ratio of the electrical energy actually produced at a generating plant to the maximum design capacity of the plant.

capital intensive - Requiring heavy capital investment. The energy industry, for example, is said to be capital intensive rather than labor intensive because it employs relatively more dollars than people.

carbon dioxide (CO_2) - A compound of carbon and oxygen formed whenever carbon is completely burned (oxidized).

carbon monoxide (CO) - A compound of carbon and oxygen produced by the incomplete combustion of carbon. It is emitted by automobiles and is, as far as total weight is concerned, the major air pollutant.

carcinogen - A substance or agent producing or inciting cancerous growth.

catalyst - A substance which changes the speed of a chemical reaction without itself being changed.

catalytic converter - A device added to the exhaust system of an automobile that converts the air pollutants carbon monoxide (CO) and hydrocarbons (HC) to carbon dioxide (CO_2) and water. A similar conversion also removes nitrogen oxides (NO_x).

Celsius - The metric temperature scale in which the temperature of melting ice is set at 0°, the temperature of boiling water at 100°. One degree Celsius is 9/5 of a degree Fahrenheit. The Celsius scale is also known as the Centigrade scale.

Centigrade - See Celsius.

chain reaction - A reaction that stimulates its own repetition. In a fission chain reaction a fissionable nucleus absorbs a neutron and splits in two, releasing additional neutrons. These in turn can be absorbed by other fissionable nuclei, releasing still more neutrons and maintaining the reaction.

char - A porous, solid, nearly pure carbon residue resulting from the incomplete combustion of organic material. If produced from coal, it is called coke; if produced from wood or bone, it is called charcoal.

chemical energy - A form of energy stored in the structure of atoms and molecules, and which can be released by a chemical reaction.

coal gasification - The conversion of coal to a gas suitable for use as a fuel.

coal liquefaction - The conversion of coal into liquid hydrocarbons and related compounds, usually by the addition of hydrogen.

coal tar - A gummy, black substance produced as a by-product when coal is distilled.

coke - Degassed coal (see char).

conduction - (of heat) The transmission of energy directly from molecule to molecule.

confinement time - (in fusion) The time during which the reacting materials (deuterium and tritium, for instance) are physically confined at proper density to react.

convection - (of heat) The transfer of energy by moving masses of matter, such as the circulation of a liquid or gas.

cooling towers - Devices for the cooling of water used in power plants. There are two types: wet towers, in which the warm water is allowed to run over a lattice at the base of a tower and is cooled by evaporation; and dry towers, in which the water runs through a system of cooling fans and is not in contact with the air.

critical mass - The smallest mass of fissionable material that will support a self-sustaining chain reaction under stated conditions.

crude oil - A mixture of hydrocarbons in liquid form found in natural underground petroleum reservoirs. It has a heat content of 1.46 million Calories/barrel and is the raw materials from which most refined petroleum products are made.

declining block rate - A method of charging for electricity wherein a certain number of kilowatt hours (the first block) is sold at a relatively high rate and succeeding blocks are sold at lower and lower rates. Thus the charge for energy decreases as the amount consumed increases. (See "inverted block rate.")

deuterium - A non-radioactive isotope of hydrogen whose nucleus contains one neutron and one proton and is therefore about twice as heavy as the nucleus of normal hydrogen, which consists of a single proton. Deuterium is often referred to as "heavy hydrogen"; it occurs in nature as 1 atom to 6500 atoms of normal hydrogen.

efficiency - The efficiency of an energy conversion is the ratio of the useful work or energy output to the total work or energy input. (This is sometimes called "First Law Efficiency.")

electrolysis - The decomposition of a substance by means of an electric current as in the production of hydrogen and oxygen from water.

electron - An elementary particle with a negative charge that orbits the nucleus of an atom. Its mass at rest is approximately 9×10^{-31} kg, and it composes only a tiny fraction of the mass of an atom. Chemical reactions consist of the transfer and rearrangement of electrons between atoms.

electrostatic precipitator - A device that removes the bulk of particulate matter from the exhaust of power plants. Particles are attracted to electrically charged plates and the accumulation can then be washed away.

energy - A quantity having the dimensions of a force times a distance. It is conserved in all interactions within a closed system. It exists in many forms and can be converted from one form to another. Common units are Calories, joules, BTUs, and kilowatt-hours.

energy intensiveness (EI) - A measure of energy utilization per unit of output. For passenger transport, for example, it is a measure of Calories used per passenger mile.

enrichment - A process whereby the percentage of a given isotope present in a material is artifically increased, so that it is higher than the percentage of that isotope naturally found in the material. Enriched uranium contains more of the fissionable isotope uranium 235 than the naturally occurring percentage (0.7%).

exothermic reaction - A reaction which releases more energy than is required to start it. The combustion reaction (burning) is an example as are fission and fusion reactions.

external combustion engines - An engine in which the fuel is burned outside the cylinders.

Fahrenheit - A temperature scale in which the temperature of melting ice is set at 32° and the temperature of boiling water at 212°. One Fahrenheit degree is equal to five-ninths of a Celsius degree.

fertile nucleus (or "fertile materials") - A material, not itself fissionable by thermal neutrons, which can be converted into a fissile material by irradiation in a reactor. There are two basic fertile materials, uranium 238 and thorium 232. When these fertile materials capture neutrons, they are converted into fissile plutonium 239 and uranium 233 respectively.

First Law of Thermodynamics - Also called the Law of Conservation of Energy. It states: Energy can neither be created nor destroyed.

fission - The splitting of heavy nuclei into two parts (which are lighter nuclei), with the release of large amounts of energy and one or more neutrons.

fluidized bed - A furnace design in which the fuel is buoyed up by air and some other gas. It offers advantages in the removal of sulfur during combustion.

fossil fuels - Fuels such as coal, crude oil, or natural gas, formed from the fossil remains of organic materials.

fuel cell - A device for combining fuel and oxygen in an electrochemical reaction to generate electricity. Chemical energy is converted directly into electrical energy without combustion.

fuel reprocessing - A recycling operation. Fissionable uranium and plutonium are recovered from uranium fuel rods which have undergone intense neutron bombardment in a nuclear reactor and fission products are removed.

fusion - The formation of a heavier nucleus by combining two lighter ones. In the reaction under study, as a source of energy hydrogen (or helium 3) nuclei combine to form helium 4 with a subsequent release of energy.

gasoline - A petroleum product consisting primarily of light hydrocarbons. Some natural gasoline is present in crude oil but most gasoline is formed by "cracking" and refining crude oil. It has a heat value of 1.32 million Calories/barrel.

generating capacity - The capacity of a power plant to generate electricity. Usually measured in megawatts (Mw).

geopressured reservoir - Geothermal reservoir consisting of porous sands containing water or brine at high temperature or pressure.

geothermal energy - The heat energy in the Earth's crust whose source is the Earth's molten interior. When this energy occurs as steam, it can be used directly in steam turbines.

greenhouse effect - The warming effect of carbon dioxide, CO_2, and water vapor in the atmosphere. These molecules are transparent to incoming sunlight but absorb and reradiate the infrared (heat) radiation from the Earth.

half life - The time in which half the atoms of a particular radioactive substance disintegrate to another nuclear form. Measured half-lives vary from millionths of a second to billions of

years.

heat - A form of kinetic energy that flows from one body to another because of a temperature difference between them. The effects of heat result from the motion of molecules. Heat is usually measured in Calories or British Thermal Units (BTUs).

heat engine - Any device that converts thermal heat energy into mechanical energy.

heat pump - A device that transfers heat from a cooler region to a warmer one (or vice versa) by the expenditure of mechanical or electric energy. Heat pumps work on the same general principle as refrigerators and air conditioners.

heat value - The energy released by burning a given amount of the substance; also energy equivalent.

Helium 3 ($_2He^3$) - A rare, non-radioactive isotope of helium.

Helium 4 ($_2He^4$) - The common isotope of helium.

horsepower - Originally, the power output of a typical working horse. Equal to 3/4 of one kilowatt or 0.18 Calories per second.

hot rock reservoir - A potential source of geothermal power. The "hot rock" system requires drilling deep enough to reach heated rock then fracturing it to create a reservoir into which water can be pumped.

hydrocarbons - Molecules composed of carbon and hydrogen atoms in various proportions. They are usually derived from living materials.

hydroelectric plant - An electric power plant in which the energy of falling water is converted into electrical energy by a turbine generator.

hydrogenation - The addition of hydrogen to an organic molecule to increase the ratio of hydrogen to carbon, for instance in the production of oil from coal or from organic waste.

hydrothermal reservoir - One of the forms of geothermal reservoir systems. Consists of naturally circulating hot water or steam ("wet steam") or those which contain mostly vapor ("dry steam"). The latter type of hydrothermal reservoir is the most desirable type with present technology.

inertial confinement - One of two major techniques used in nuclear fusion experimentation. (See "Magnetic Confinement"). A frozen pellet of deuterium and tritium is bombarded from all sides by an energy source - a laser beam of charged particles. The resulting implosion of the pellet results in high temperature and density which allows ignition of the fusion reaction and the pellet explodes.

internal combustion engine - An engine in which power is generated within one or more cylinders by the burning of a mixture of air and fuel, and converted into mechanical work by means of a piston. The automobile engine is a common example.

in situ - In the natural or original position or location. In situ conversion of oil shale, for instance, is an experimental technique in which a region of shale is drilled, fractured, and set on fire. The volatile gases burn off, the oil vaporizes, then condenses and collects at the bottom of the region, from which it can be recovered by a well. There also has been some experimentation with in situ conversion of coal.

inverted block rate - A method of selling electricity wherein a first "block" of kilowatt hours is offered at low cost and prices increase with increased consumption.

ionization - Removal of some or all electrons from an atom or molecule, leaving the atom or molecule with a positive charge, or the addition of one or more electrons, resulting in a negative charge.

ions - Atoms or molecules with electric charges caused by the addition or removal of electrons.

isotope - Any of two or more species of atoms having the same number of protons in the nucleus, of the same atomic number, but with differing numbers of neutrons. All isotopes of an element have identical chemical properties, but the different nuclear masses produce different physical properties. Since nuclear stability is governed by nuclear mass, one or more isotopes of the same element may be unstable (radioactive). In the usual notation, isotopes of the same element are identified by the total of neutrons and protons in the nucleus, and the atomic number for example, uranium 235 ($_{92}U^{235}$) and uranium 238 ($_{92}U^{238}$).

joule - A metric unit of work or energy; the energy produced by a force of one newton operating through a distance of one meter. One BTU = 1055 joules, and one Calorie = 4.185 joules.

kerosene - A petroleum distillate with a heat value of 1.43 million Calories/barrel presently used in gas turbines and jet engines.

kilocalorie - See Calorie.

kilowatt (kw) - A unit of power, usually used for electric power, equal to 1,000 watts, or to energy consumption at a rate of 1,000 joules per second.

kilowatt-hour (kw-hr) - A unit of work or energy. Equivalent to the expenditure of one kilowatt in one hour, about 853 Calories.

kinetic energy - The energy of motion. The ability of an object to do work because of its motion.

land subsidence - The sinking of a land surface as the result of the withdrawal of underground material. It results from underground mining and is a hazard of the development of geothermal fields.

laser - A device for producing an intense beam of coherent, sharply focused, light. The name is an acronym for Light Amplication by Stimulated Emission of Radiation.

Law of Conservation of Energy - See First Law of Thermodynamics.

Lawson Criterion - A rough measure of success in fusion. For a self-sustaining fusion reaction to take place, the product of the confinement time (in seconds), and the particle density (in particles per cm^3) must be about 10^{14}.

life cycle costs - The total cost of an item including initial purchase price as well as cost of operation, maintenance, etc. over the life of the item.

lithium - The lightest metal; a silver-white alkali metal. Lithium 6 is of interest as a source of tritium for the generation of energy from a controlled fusion reaction. Molten lithium will also be the heat exchanger.

liquified natural gas (LNG) - Natural gas that has been cooled to approximately -160°C, a temperature at which it is liquid. Since liquefaction greatly reduces the volume of the gas, the costs of storage and shipment are reduced.

load factors - The percentage of capacity actually utilized. For example, the average number of passengers for a certain size car divided by the passenger capacity of that size car.

magnetic confinement - A confinement technique used in nuclear fusion in which electrons are stripped from the reacting nuclei (deuterium and tritium, for example) forming a "plasma" which can be controlled by a magnetic field. There are several different types of magnetic confinement systems under development. (See "Tokamak," "magnetic mirror," and "magnetic pinch device.")

magnetic mirror - (See above) Consists of linear tubes in which the magnetic field confining a "plasma" is shaped so as to turn particles around at each end, as a mirror does a light beam. The most successful of these devices is the 2X-IIB at the Lawrence Livermore Laboratory of the University of California.

magnetic pinch device - (See above) - An interior space is filled with plasma which is then "pinched," or compressed by a magnetic field. This is accomplished by increasing the strength of the field and forcing the plasma toward the center of a tube. The Scyllac at Los Alamos is the major pinch device.

magnetic storage - a futuristic concept in which energy can be stored in a magnetic field around a superconducting material.

magnetohydrodynamic (MHD) generator - An expansion in which electricity is generated from the combustion of fuels without going through an intermediary steam turbine. Hot, partially ionized gases move through a magnetic field, and are separated by charge, generating a current that is then collected by electrodes lining the expansion chambers.

mechanical energy - One form of energy. It is observable as the motion of an object.

megawatt (mw) - A unit of power. A megawatt equals 1,000 kilowatts, or 1 million watts.

Methane Gas (CH_4) - A light hydrocarbon; an inflammable natural gas with a heat value of 257 Calories/cubic feet. Forms explosive mixtures with air. It is the major part of marsh gas and natural gas but can be manufactured from crude petroleum or other organic materials. (See coal gasification.)

Mev. - One million (or 10^6) electron volts - a unit of energy. It is equivalent to 1.6×10^{-13} joules.

MHD generator - See magnetohydrodynamic generator.

mill - A tenth of a cent. The cost of electricity is often given in mills per kilowatt hour.

moderator - A material used in a nuclear reactor to slow the speed of neutrons and thus control the rate of fission. Common moderators are graphite, water, deuterium, and beryllium.

molecule - Atoms combined to form the smallest natural unit of a substance. For example, the

water molecule is composed of two atoms of hydrogen and one atom of oxygen.

neutron - An elementary particle which is present in all atomic nuclei except for the most common isotope of hydrogen. Its mass is approximately that of a proton, but it has no electric charge. Neutrons are released in fission and fusion reactions.

Nitrous Oxides (NOx) - Compounds formed whenever combustion occurs in air (in the presence of nitrogen). An air pollutant and component of "Photochemical smog."

nuclear converter reactor - A reactor in which the major process is the conversion of fissionable fuel into energy as distinguished from a "breeder reactor" which produces more fuel than it uses. A converter reactor also "converts" some fertile material into fissionable fuel but produces less fissionable fuel than it consumes.

nuclear energy - The energy released during reactions of atomic nuclei.

nuclear reactor - A device in which a fission chain reaction can be initiated, maintained, and controlled.

nucleus - The extremely dense, positively charged core of an atom. It contains almost the entire mass of an atom, but fills only a tiny fraction of the atomic volume.

ocean thermal energy conversion (OTEC) - A process of generating electrical energy by harnessing the temperature differences between surface waters and ocean depths.

"off-peak" power - Power generated during a period of low demand.

oil shale - A sedimentary rock containing a solid organic material called kerogen. When oil shale is heated at high temperatures, the oil is driven out and can be recovered.

OPEC - The Organization of Petroleum Exporting Countries. An organization of countries in the Middle East, North Africa, and South America which aims at developing common oil-marketing policies.

particulates - The small soot and ash particles produced by combustion.

peak demand period - That time of day when the demand for electricity from a powerplant is at its greatest.

peak load - The maximum amount of power delivered during a stated period of time.

peak load pricing - Charging more for the delivery of power during the daily period in which demand is the greatest. (See "peak demand period.")

petroleum - (or oil) an oily, flammable liquid that may vary from almost colorless to black and occurs in many places in the upper strata of the Earth. It is a complex mixture of hydrocarbons and is the raw material for many products.

photon - A quantum (the smallest unit) of electromagnetic radiation. It has no rest mass or electric charge, but behaves like both a particle and a wave in its interactions with other particles.

photosynthesis - The process by which green plants convert radiant energy (sunlight) into chemical potential energy.

Photovoltaic process - The process by which radiant energy is converted directly into electrical energy. Solar radiation striking certain materials is absorbed, causing separation of electrons from atoms. The migration of these electrons in one direction and of the positively charged electron vacancies ("holes") in the other can produce a small potential difference (or voltage), typically about 0.5 volts.

plasma - An electrically neutral, gaseous mixture of positive and negative ions. Sometimes called the "fourth state of matter," since it behaves differently from solids, liquids and gases. High temperature plasmas are used in controlled fusion experiments.

Plutonium (Pu) - A heavy, radioactive, man-made, metallic element with atomic number 94. Its most important isotope is fissionable plutonium 239 ($_{94}Pu^{239}$), produced by neutron irradiation of uranium 238. It is used for reactor fuel and in weapons.

potential energy - "Stored" energy. Energy in any form not associated with motion; such as that stored in chemical or nuclear bonds, or energy associated with the relative position of one body to another.

power - The rate at which work is done or energy expended. It is measured in units of energy per unit of time such as Calories per second, and in units such as watts and horsepower.

power gas - A mixture of carbon monoxide and hydrogen which has a low heat value (25-75 Calories/cubic feet) and is of most use as power plant fuel.

primary energy - Energy in its naturally-occurring form - coal, oil, uranium, etc. - before conversion to end-use forms.

proton - An elementary particle present in all atomic nuclei. It has a positive electric

charge. Its mass is approximately 1,840 times that of an electron. The nucleus of a hydrogen atom.

PSI - Abbreviation for "pounds per square inch." A measure of pressure.

pumped storage - An energy storage system in which reversible pump turbines are used to pump water uphill into a storage reservoir. The water can then be used to turn the turbines when it runs downhill.

Pyrolysis - Heating in the absence of oxygen. Also called "destructive distillation"; pyrolysis of coal produces three fuels: high BTU or pipeline gas, a synthetic crude oil (syncrude), and char, a carbon residue. Also used in the conversion of organic wastes to fuel.

radioactive decay - The spontaneous transformation of an atomic nucleus during which it changes from one nuclear species to another with the emission of particles and energy. Also called "radioactive disintegration."

reactor years - One year's operation of a nuclear reactor.

recoverable resource - That portion of a resource expected to be recovered by present-day techniques and under present economic conditions. Includes geologically expected but unconfirmed resources as well as identified reserves.

regenerative braking - Braking in which the energy is recovered either mechanically in a flywheel, for instance, or electrically. This energy can then be used in subsequent acceleration.

reserve - That portion of a resource that has been actually discovered but not yet exploited which is presently technically and economically extractable.

secondary recovery - Recovery techniques used after some of the oil and gas has been removed and the natural pressure within the reservoir has decreased.

Second Law of Thermodynamics - One of the two "limit laws" which govern the conversion of energy. Referred to sometimes as the "heat tax," it can be stated in several equivalent forms, all of which describe the inevitable passage of some energy from a useful to a less useful form in any cyclic energy conversion.

Second Law Efficiency - The ratio of the minimum amount of work or energy necessary to accomplish a task to the actual amount used.

solar cell - A device which converts radiant energy directly into electrical energy by the photovoltaic process. Each cell produces about 0.5 volts and about 0.6 watts of power.

solar energy - The electromagnetic radiation emitted by the sun. The Earth receives about 4,200 trillion kilowatt-hours per day.

solvent refined coal (SRC) - A tar-like fuel produced from coal when it is crushed and mixed with a hydrocarbon solvent at high temperature and pressure. It is higher in energy value and contains less sulfur or ash than coal.

Stirling engine - An external combustion engine in which air (or hydrogen in the newer versions) is alternately heated and cooled to drive the piston up and down. It is claimed to be non-polluting and more efficient than the internal combustion engine.

stratified charge engine - An engine in which the amount of charge, fuel plus air, is adjusted to engine conditions, directed to the area where it will burn best and fired at just the precise instant.

Strontium 90 ($_{38}Sr^{90}$) - A hazardous isotope produced in the process of nuclear fission. Strontium 90 has a "half-life" of 28 years. Thus it takes 28 years to reduce this material to half its original amount, 56 years to one quarter, 84 years to one eighth, and so on. Strontium 90 typifies problems of radioactive waste storage which are faced in producing power by means of nuclear fission.

sulfur smog (classical smog) - This smog is composed of smoke particles, sulfur oxides (SOx), and high humidity (fog). The sulfur oxide (SO_3) reacts with water to form sulfuric acid (H_2SO_4) droplets, the major cause of damage.

superconductor - A material which at very low temperatures, near absolute zero, has no electrical resistance and thus can carry large electrical currents without resistance losses.

synthetic natural gas (SNG) - A gaseous fuel manufactured from coal. It contains almost pure methane, CH_4, and can be produced by a number of coal gasification schemes. The basic chemical reactions are $C + H_2O + \text{heat} \longrightarrow CO + H_2$; $3CH_2 + CO \longrightarrow CH_4 + H_2O$.

tar sand - A sandy geologic deposit in which low grade, heavy oil is found. The oil binds the sand together.

tertiary recovery techniques - Use of heat and other methods to augment oil recovery (presumably occurring after secondary recovery).

thermal storage - A system which utilizes ceramic brick or other materials to store heat

energy.

thermodynamics - The science and study of the relationship between heat and other forms of energy.

thermostat - A temperature-sensitive device which turns heating and cooling equipment on and off at set temperatures.

Thorium (Th) - A naturally radioactive element with atomic number 90, and as found in nature, an atomic weight of approximately 232. The fertile thorium 232 ($_{90}Th^{232}$) isotope can be transmuted to fissionable uranium 233 ($_{92}U^{233}$) by neutron irradiation.

Tokamak - (toroidal magnetic chamber) The Russian adaptation of the toroidal or "doughnut" geometry. The plasma is confined in the central region of an evacuated doughnut-shaped vessel by a magnetic field provided by current-carrying windings around the outside. A separate set of windings produce a heating current in the plasma. American examples are the PLT (Princeton Large Torus) and the ORMAC (Oak Ridge Tokamak).

topping cycle - A means to use high-temperature heat energy that cannot be used in a conventional steam turbine. A gas turbine, for instance, might operate as a topping cycle on furnace gases of 2000°F and its exhaust could then heat steam for a turbine operating at 1000°F.

total energy system - A packaged energy system of high efficiency, utilizing gas fired turbines or engines which produce electrical energy and utilize exhaust heat in applications such as heating and cooling.

Tritium - A radioactive isotope of hydrogen with a half life of 12.5 years. The nucleus contains one proton and two neutrons. It may be used as a fuel in the early fusion reactors.

Uranium - A heavy, naturally occurring, radioactive nucleus of atomic number 92. Its most common isotope is 238U ($_{92}U^{238}$), but 235U ($_{92}U^{235}$, 0.7% of natural ore) is used as a fission fuel. $_{92}U^{233}$ which can be made from 232Th ($_{90}Th^{232}$) is also fissionable.

uranium tails - Depleted uranium derived as a by-product of uranium enrichment. Depleted uranium has a smaller percentage of $_{92}U^{235}$ than the 0.7% found in natural uranium.

watt (w) - A metric unit of power usually used in electric measurements which gives the rate at which work is done or energy expended. One watt equals one joule of work per second.

work - Energy that is transferred from one body to another in such a way that a difference in temperature is not directly involved. The product of an external force times the distance an object moves in the direction of the force.

working fluid - The material, usually a gas or a liquid, whose absorption of heat and subsequent expansion drives a heat engine. Steam is the "working fluid" of a steam engine.

yellowcake - The material which results from the first processing (milling) of uranium ore. It is sometimes called "artificial carnotite" and is about 53% uranium, a mixture of UO_2 and UO_3.

Factsheet Titles

1. Fuels from Plants (Bioconversion)
2. Fuels from Wastes (Bioconversion)
3. Wind Power
4. Electricity from the Sun I (Solar Photovoltaic Energy)
5. Electricity from the Sun II (Solar Thermal Energy Conversion)
6. Solar Sea Power (Ocean Thermal Energy Conversion)
7. Solar Heating and Cooling
8. Geothermal Energy
9. Energy Conservation Homes and Buildings
10. Energy Conservation. Industry
11. Energy Conservation: Transportation
12. Conventional Reactors
13. Breeder Reactors
14. Nuclear Fusion
15. New Fuels from Coal
16. Energy Storage Technology
17. Alternative Energy Sources: Environmental Impacts
18. Alternative Energy Sources A Glossary of Terms
19. Alternative Energy Sources. A Bibliography

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