A Nuclear Reactor

The term Nuclear Reactor means an interaction between two or more Nuclei, Nuclear Particles, or Radiation, possibly causing transformation of the nuclear type; includes, for example, fission, capture, and elastic container. Reactor means the core and its immediate container. Nuclear Reactors are used to produce electricity. The numbers of Nuclear Reactor plants have grown sufficiently. Electricity is being generated in a number of ways; it can be generated by using Thermal Power. It can be employed by using two basic systems a Steam Supply System and an Electricity Generating System these two systems are related to each other. The Steam Supply System produces steam from boiling water by the burning of coals and the Electricity Generating System produces electricity by steam turning turbines. The Nuclear power plants of this century depend on a particular type of Nuclear Reaction, Fission (The splitting of a heavy nucleus like the uranium atom to form two lighter "fission!
Fragments" as well as less massive particles as the Neutrons). In the Nuclear Reactors this splitting is induced by the interaction of a neutron with a fissionable nucleus. Under suitable conditions, a "chain" reaction of fission in which events may be sustained. The energy released from the fission reactions provide heat, part of which is ultimately converted into electricity. In the present day Nuclear power plants, this heat is removed from the nuclear fuel by water that is pumped past rods containing fuel. The basic feature of the nuclear reactor is the release of a large amount of energy from each fission event that occurs in the nuclear reactors core. On the average, a fission event releases about 200 million electron volts of energy. a typical chemical reaction, on the other hand releases about one electron volt. The difference, roughly a factor of 100 million electron volts. The complete fission of one pound of uranium would release roughly the same amount of energy as!
the combination of 6000 barrels of oil or 1000 tons of high quality oil. The reactor cooling fluid serves a dual purpose. Its most urgent function is to remove from the core the heat that results when the energy released from the Nuclear reactions is transformed by the collisions into the random nuclear motion. An associated function is to transfer this heat into an outside core, typically for the production of electricity. The designer provides for a nuclear core in a container through which a cooling fluid is pumped. This fluid may be used directly to drive a turbine generator. Alternately, it may be used to heat a secondary fluid, which drives the turbine. In most all the commercial systems that fluid is vaporized water.
Fission is the term used to describe the splitting of a heavy nucleus into two or more smaller nuclei. Slow moving neutrons are more easily captured by the nucleus. A moderator is a medium, which causes neutrons to travel more slowly. Graphite, heavy water, and beryllium are all excellent moderators, capable of slowing neutrons without absorbing them. The neutrons liberated by fission travel very quickly unless moderated. A very large amount of energy is released when an atom undergoes fission. In a typical fission reaction, the energy released is distributed as follows: 170 MeV (megavolt) of kinetic energy of fission fragments, 5 MeV of kinetic energy of neutrons, 15 MeV of energy beta particles and gamma rays, and 10 MeV as energy of antineutrinos.
An example of a typical fission is: Mass is not conserved in a nuclear reaction. The products formed during nuclear fission have a slightly lower mass, due to the nuclear mass defect. This nuclear mass defect can be used to determine the nuclear binding energy, which held the heavier nucleus together and was released when fission occurred. The energy released by fission can be calculated by finding the difference between the mass of the parent atom and neutron, and the masses of the daughter atoms and emitted neutrons, and converting this mass "loss" into energy using. Neutrons released when an atom undergoes fission are capable of causing other nuclei to undergo fission, if the neutrons are slowed down by a moderator. A sustained fission reaction caused in this way is called a chain reaction. Natural uranium ore contains about 0.7% uranium-235. To increase the likelihood of sustaining a chain reaction for uranium, the fissionable isotope of uranium must be increased in it!
S relative proportion through enrichment. An Isotope is one of two or more atoms of an element that differ in the number of neutrons found in the nucleus. A nuclear reactor produces a sustained chain reaction at a controlled rate. The heat energy produced by the reaction is used to drive turbines, generating electricity. Control rods, made of materials such as cadmium, which absorb neutrons, are used to control the rate of a chain reaction in a nuclear reactor. A critical mass of fissionable material is the minimum mass that will produce a nuclear explosion. To produce a sustainable nuclear chain reaction requires more material than the critical mass.
Most Reactors today use uranium; bundled in the form of uranium oxide fuel pellets, to produce electricity the refined uranium oxide fuel pellets are stacked into cylindrical rods. The rods are arranged into a fuel bundle, which is then ready to be placed in special pressure tubes inside the reactor. The reactor vessel is called the calandria. Nuclear reactors cannot explode like a nuclear bomb. Even under a worst-case scenario, with a core meltdown, a critical mass of fuel would not be present and the fuel would burn into the ground. (This, of course, would lead to very serious consequences, including possible loss of life and environmental damage.) Refuelling can be done by removing fuel bundles from the pressure tubes and replacing them with new bundles. Heavy water is used as the moderator in a reactor. Heavy water contains deuterium, an isotope of hydrogen having one neutron in the nucleus. Heavy water also transfers heat from the fuel into a heat exchanger, which heats!
Ordinary water to produce steam. The steam produced is used to turn turbines, which are connected to electric generators. Condensers change the steam back into water so it can be cycled back to the steam

generator. If excess heat builds up in the calandria, the heavy water can be drained out. This causes the chain reaction to stop, because the moderator is no longer present. Supporters of the use of nuclear energy feel that it is a safe and effective way to produce energy. With the demand for energy Increasing, and the problems associated with burning fossil fuels, such as acid precipitation and the greenhouse effect, they regard the use of nuclear energy as being necessary.

Nuclear energy avoids some of the problems of generating hydroelectric power. Flooding land to build dams creates environmental and social problems. The use of nuclear energy may avoid the need for long transmission lines. Nuclear plants can be built in relatively close proximity to where the power is needed. Nuclear energy produces very small amounts of waste by volume. The radioactive materials can be concentrated for storage and monitoring in one place. Poisonous metals (such as arsenic, lead, and mercury), toxic gases, carbon dioxide, and fly ash are not released into the atmosphere. Critics of the use of nuclear energy cite various problems with its use. The opposition to the use of nuclear energy has grown so strong in recent years that some reactors have been shut down. Other reactors scheduled for development have been delayed or were never completed because of the social and political pressure exerted by the antinuclear lobby. The debate continues. The Chernobyl n!

Nuclear accident lead to a justifiable scepticism about any claims of the safety of nuclear reactors, particularly if those claims come from spokespersons of the industry, who often cite the strict controls and regulations faced by the industry. Used nuclear fuel is both hot and radioactive. It is stored under water in large cooling pools for up to two years after use, until it cools. Some of the used fuel will still remain radioactive for up to several thousand years. This concerns many people. The storage of used fuel is a contentious issue for those concerned about the protection of the environment. No ideal solution has yet been developed to dispose the waste. Current proposals for waste management merely offer temporary storage solutions until better methods become available. Storage of waste in underground salt mines offers one possible solution. Arguments for or against the use of nuclear energy should be based on reason—not emotion. One needs to remain open-minded, list!

Ending carefully to the arguments presented by those who hold a different position. If one examines the uses of energy since before the Industrial Revolution, it becomes apparent that the major source used has changed throughout time, based on economics, the development of new technologies, and a variety of other factors. Some of these same factors are at work today, determining which sources of energy will be most advantageous to use in the future. A concern for the protection of the environment needs to play a prominent role whenever decisions, which might have an adverse affect on the environment, are being considered. Alternative solutions to problems need to be examined with regard to their environmental impact. One very important strategy is to promote conservation. Instead of demanding more and more energy, at the expense of the environment and our resources, individuals, institutions, and government all have to search for ways to conserve energy. If everyone strives to use energy wisely existing resources will last longer. Less damage to the environment will occur.