

Nuclear Power Plant

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Principles of nuclear energy

There are two processes in the production of nuclear energy: fission and fusion. In fission, the nuclei of uranium or plutonium atoms split with the release of energy. In fusion, energy is released when small nuclei combine or fuse. The fission process is used in all present nuclear power plants, because fusion cannot be controlled.

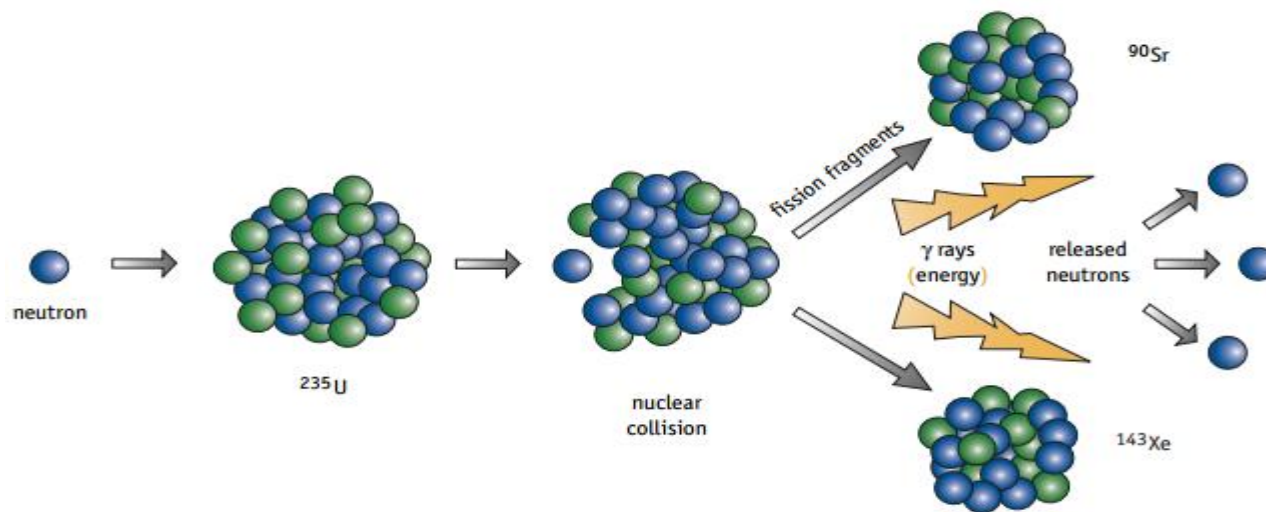


Fig: Fission Process

Nuclear power plant

The main components of nuclear power plant are:

1. Nuclear Reactor
2. Heat Exchanger(steam generator)
3. Steam turbine
4. Condenser
5. Electric Generator

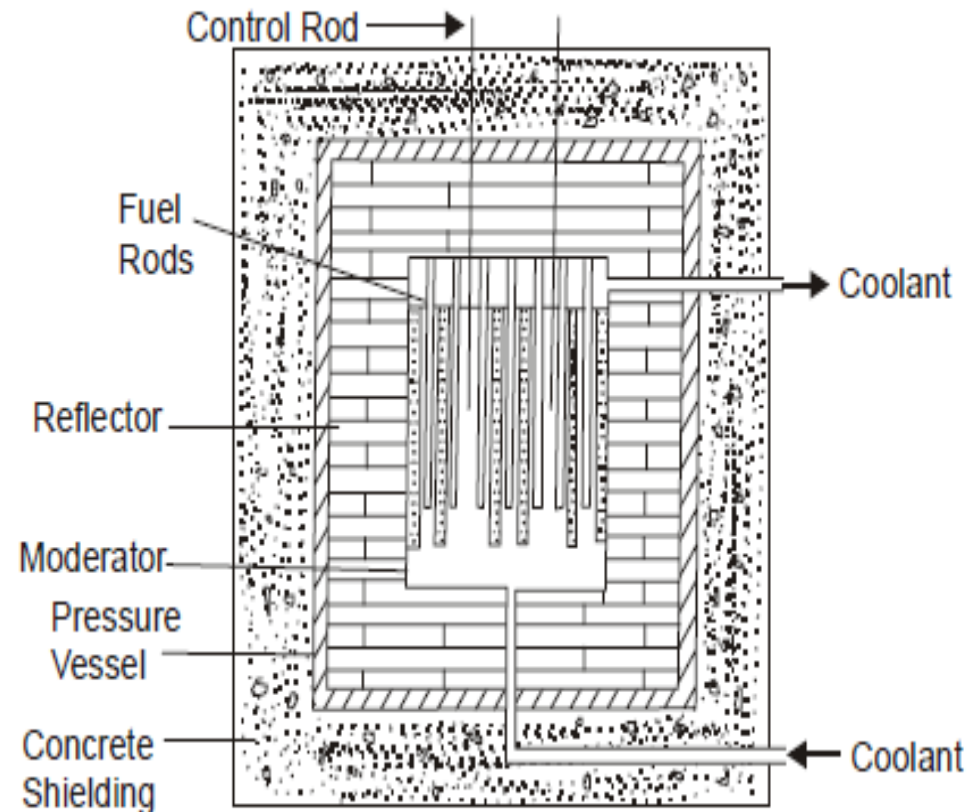
The basic mechanism is fission of nuclear fuel to produce thermal energy. This thermal energy is removed from heat source (reactor core) by contracting the fuel with coolant which can be used directly as the working fluid on the power conversion cycle or indirectly to heat another fluid as the working fluid. The working fluid drive a turbo-generator set to produce electrical power.

Basic components of nuclear reactors

Nuclear Reactor: A nuclear reactor is an apparatus in which nuclear fission is produced in the form of controlled self-sustaining chain reaction. It produces many useful products like heat, neutron, and radioisotopes.

Components are:

- Reactor core
- Reflector
- Control mechanism
- Moderator
- Coolant
- Measuring Instruments
- Shielding



Types of Nuclear Reactors

- Pressurized water Reactor (PWR)
- Boiling Water Reactor
- CANDU (Canadian-Deuterium-Uranium) Reactor
- Liquid Metal Cooled Reactor
- Gas-cooled Reactor
- Breeder Reactor

Nuclear waste disposal

- Radioactive Pollution
- Waste from Reactor
- Thermal Pollution

Method of disposal of radioactive waste materials are:

- Storage Tank
- Dilution
- Sea Disposal
- Absorption by soil

Site selection of nuclear power plants

The various factors to be considered while selecting the site for nuclear plant are as follows :

- **Availability of water:** At the power plant site an ample quantity of water should be available for condenser cooling and made up water required for steam generation. Therefore the site should be nearer to a river, reservoir or sea.
- **Distance from load centre:** The plant should be located near the load centre. This will minimise the power losses in transmission lines.
- **Distance from populated area:** The power plant should be located far away from populated area to avoid the radioactive hazard.
- **Accessibility to site:** The power plant should have rail and road transportation facilities.
- **Waste disposal:** The wastes of a nuclear power plant are radioactive and there should be sufficient space near the plant site for the disposal of wastes.