

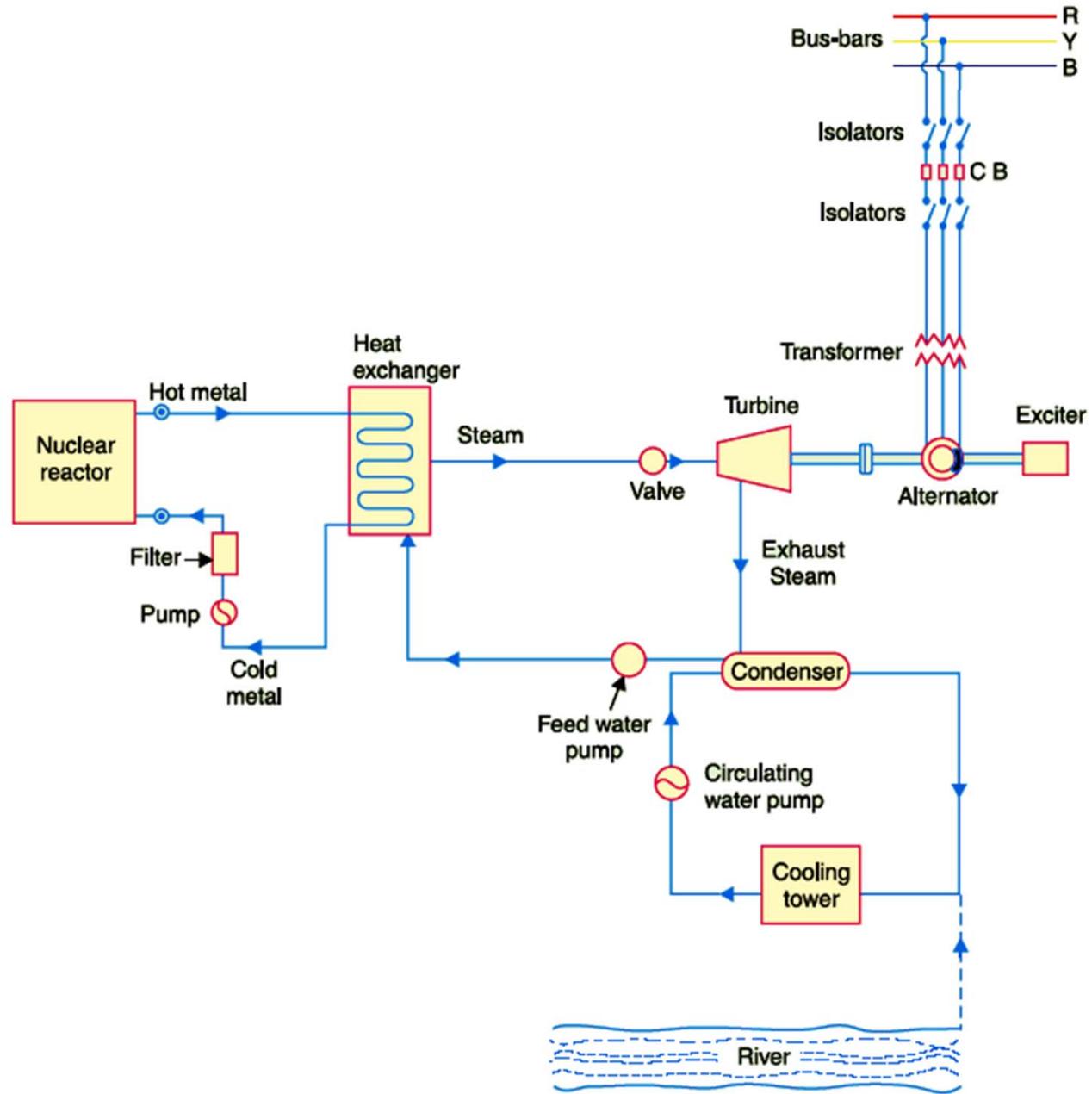
Nuclear Power Station



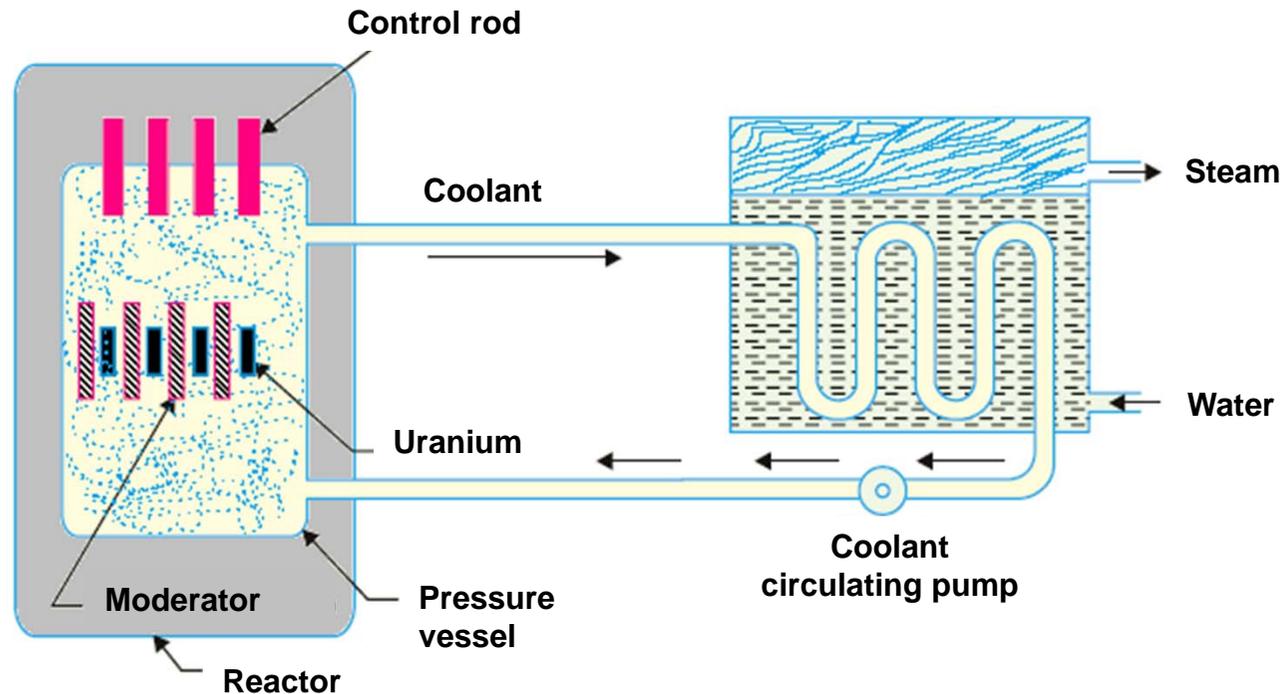
In nuclear power station, Uranium (U_{235}) is subjected to nuclear fission in *nuclear reactors* (breaking nuclei of heavy atoms into two parts with release of huge amount of energy) . Consequently, released heat energy raises steam's temperature and pressure.

The most important feature of a nuclear power station is that huge amount of electrical energy can be produced from a relatively small amount of nuclear fuel as compared to other conventional types of power stations. (complete fission of 1 kg of Uranium (U_{235}) is equivalent to burning of 4,500 tons of high grade coal).

Although the recovery of principal nuclear fuels is difficult and expensive, the total energy content of the estimated world reserves of these fuels are considerably higher than those of conventional fuels.



Schematic arrangement of Nuclear power station



- A *nuclear reactor* is a cylindrical stout pressure vessel that houses fuel rods of Uranium, moderator and control rods.
- Fuel rods constitute the fission material and release huge amount of energy when bombarded with neutrons.
- The moderator consists of graphite rods which enclose the fuel rods slowing down the neutrons before bombarding the fuel rods.
- Cadmium control rods are inserted into the reactor; being a strong neutron absorber, it regulates the supply of neutrons for fission. Lowering or raising of control rods is accomplished automatically according to load requirement.
- Heat produced in reactor is removed by the coolant, that carries heat to the *heat exchanger*.

Advantages

- (i) A nuclear plant requires less space compared to other types of same capacity.
- (ii) Very economical for producing bulk electric power (low running charges as a small amount of fuel is used).
- (iii) Can be located near load centers as it does not require large quantities of water
- (iv) There are large deposits of nuclear fuels all over the world. Therefore, such plants can ensure continued supply of electrical energy for thousands of years.

Disadvantages

- (i) The fuel used is expensive and difficult to recover.
- (ii) The capital cost is **very high** as compared to other types of plants.
- (iii) The erection and commissioning requires **greater technical know-how**.
- (iv) Fission by-products are radioactive and may cause a dangerous amount of radioactive pollution.
- (v) Maintenance charges are high due to lack of standardization. Moreover, high salaries of specially trained personnel handling the plant further raise the cost.
- (vi) Nuclear power plants are not well suited for varying loads as the reactor does not respond to the load fluctuations efficiently.
- (vii) The disposal of radioactive by-products is a big problem.