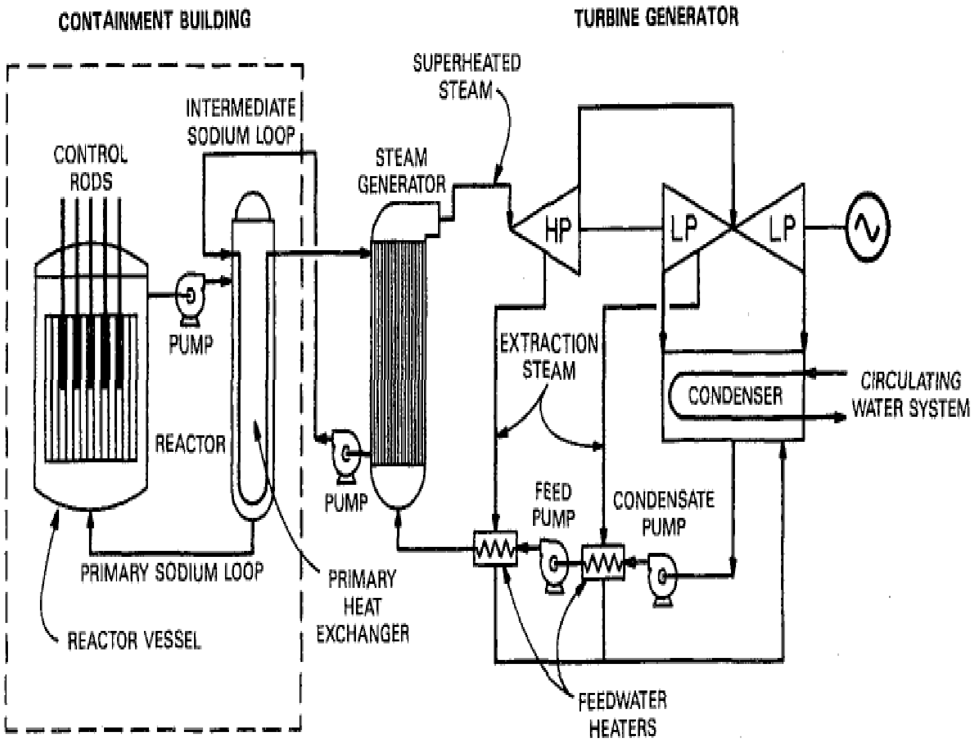
FAST BREEDER REACTOR



The breeder reactor has the capability of producing more fuel than it consumes through the breeding of uranium. The reactor core is surrounded by fertile material $^{238}_{92}U$, which Captures the neutrons not used for fashioning, and through a series of nuclear decays produces $^{239}_{94}P$, a fissile fuel.

Breeder reactors operate in the fast neutron energy range to take advantage of the higher number of neutrons produced take advantage of the higher number of neutrons produced per fission in uranium and plutonium fuel which result from the absorption of the high-energy neutrons.

Breeder reactors can produce additional plutonium fuel to support several light water reactors, and thus have the potential to increase nuclear fuel reserves.

Figure shows a simplified schematic of a breeder reactor. Liquid sodium is used as the coolant to remove the reactor fission energy and transfer the energy to steam generators. Sodium is used because of its good heat transfer properties, low neutron moderating characteristics, and low operating pressures. Since liquid sodium becomes radioactive in passing through the reactor, a primary heat exchanger (sodium to sodium) is used to prevent leakage of radioactive sodium into the steam cycle.

An additional advantage of the primary heat exchanger is to prevent water getting into the nuclear core. The breeder core consists of a number of fuel assemblies of stainless steel fuel rods that are packed with pellets of ^{238}U dioxide and ^{239}Pu dioxide material.

The intermediate coolant passes to a steam generator (sodium to water exchanger) that produces superheated steam at 1,535 psig (10.6MPag), 906˚F (486˚C). Superheated steam expands through the high and low pressure section of the turbine generator, is condensed, and then returned to the sodium/water steam generator. The steam cycle is similar to a conventional steam cycle utilizing a 3,600 rpm non reheat turbine generator.