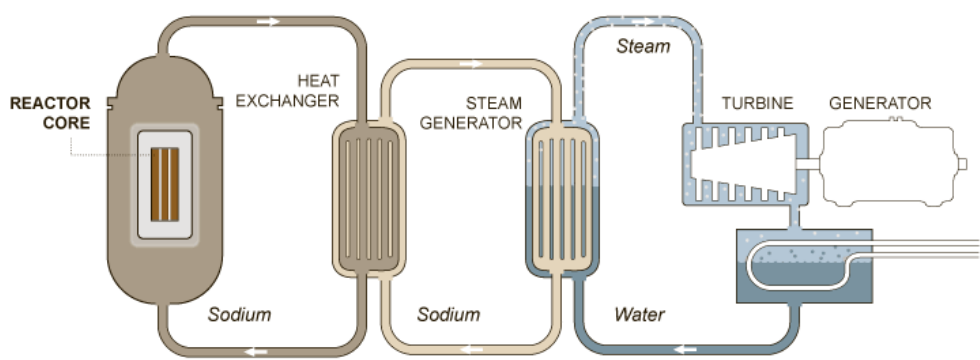


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How a Breeder Reactor Works

A fast-breeder nuclear reactor produces more fuel than it consumes, while generating energy. Conventional reactors use uranium as fuel and produce some plutonium. Breeders produce much more plutonium, which can be separated and reused as fuel.

1 The core of a breeder reactor contains fissile uranium and plutonium, atoms that split easily and release energy as heat and radiation. Neutrons released during this reaction are absorbed by a "blanket" of fertile uranium surrounding the core. Fertile uranium, harder to split than fissile uranium, turns into plutonium when it absorbs neutrons.



Unlike conventional reactors that use water to transfer heat, a breeder uses liquid sodium. The sodium does not slow the neutrons like water, and high-energy neutrons are more readily absorbed by the fertile uranium to create plutonium.

2 The sodium surrounding the core flows through a heat exchanger, a cluster of thin-walled metal tubes, and transfers its energy to a separate stream of sodium.

3 The heat then passes through a steam generator. If there is a leak and the sodium comes into contact with water or air, the sodium burns. A 1995 fire caused by a sodium leak shut down the Monju breeder reactor for 14 years.

4 The steam drives a turbine, generating electricity.

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Sources: International Panel on Fissile Materials; Idaho National Laboratory

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