



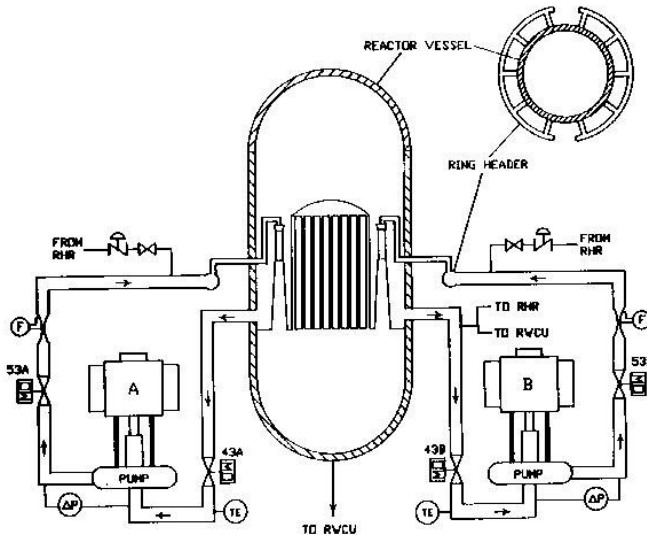
Vermont Yankee is equipped with two emergency diesel generators that supply power to vital plant equipment when power from the electrical grid is unavailable. The two diesel generators are shown in the lower right of the diagram as the circles around the sideways “Y’s.” The emergency diesel generators can supply electricity to internal Buses 3 and 4. These buses are normally fed from Buses 1 and 2. Note that the emergency diesel generators do not provide power to the recirculation pumps that are powered from Buses 1 and 2. The recirculation pumps do not have backup power supply; they are not needed for safety.

The recirculation pumps take water from the reactor vessel and return it to the reactor vessel. As shown in the figure, the recirculation pumps recycle water through the reactor vessel. The purpose of the recirculation pumps is to enhance control of the power output of the reactor. In boiling water reactors (BWRs) like Vermont Yankee, the splitting of uranium and plutonium atoms releases energy and neutrons. The energy boils water to produce the steam that spins the turbine/generator to make electricity. The neutrons can interact with other uranium and plutonium atoms to cause more splitting.

Neutrons travel farther in air and steam vapor than they do in water. Thus, when steam bubbles form in the reactor, neutrons travel farther and some travel past the uranium and plutonium atoms.

Increasing the recirculation pump flow pushes more water through the reactor core and “sweeps” the steam bubbles away faster. This slows down the neutrons allowing more to split atoms and increase

the reactor’s output. Conversely, reducing the recirculation pump flow results in a reduction in the reactor’s output. Of course, this recirculation pump power control function only works when the reactor is operating. After the reactor scrams, the recirculation pump flow rate cannot affect power output.



RECIRCULATION SYSTEM

At right is a figure illustrating the major components of a boiling water reactor like Vermont Yankee. When the event began, the feedwater system was supplying water to the reactor vessel at a rate matching the amount of water leaving the reactor vessel as vapor through the steam piping. The two recirculation pumps recycled the water inside the reactor vessel.

The event caused the generator, the turbine, and the reactor to trip (shut down). The recirculation pumps tripping had no effect on the power level or on the water level inside the reactor vessel. The pumps should not have tripped, but there was no safety consequence because they did.

