can cause the fission of still other uranium-235 nuclei. This chain reaction continues until all of the uranium-235 atoms have split or until the neutrons fail to strike uranium-235 nuclei. If the mass of the uranium-235 sample is below a certain minimum, too many neutrons will escape without striking other nuclei, and the chain reaction will stop. *The minimum amount of nuclide that provides the number of neutrons needed to sustain a chain reaction is called the* **critical mass.** Uncontrolled chain reactions provide the explosive energy of atomic bombs. **Nuclear reactors** *use controlled-fission chain reactions to produce energy and radioactive nuclides.*

Nuclear Power Plants

Nuclear power plants *use energy as heat from nuclear reactors to produce electrical energy*. They have five main components: shielding, fuel, control rods, moderator, and coolant. The components, shown in **Figure 15,** are surrounded by shielding. **Shielding** *is radiation-absorbing material that is used to decrease exposure to radiation, especially gamma rays, from nuclear reactors*. Uranium-235 is typically used as the fissile fuel to produce energy as heat, which is absorbed by the coolant. **Control rods** *are neutron-absorbing rods that help control the reaction by limiting the number of free neutrons.* Because fission of uranium-235 is more efficiently induced by slow neutrons, a **moderator** *is used to slow down the fast neutrons produced by fission*. Nuclear power plants can provide competitively priced electricity without emitting greenhouse gases or particulates. Concerns about nuclear power include storage and disposal of spent radioactive fuel, as well as public perception.

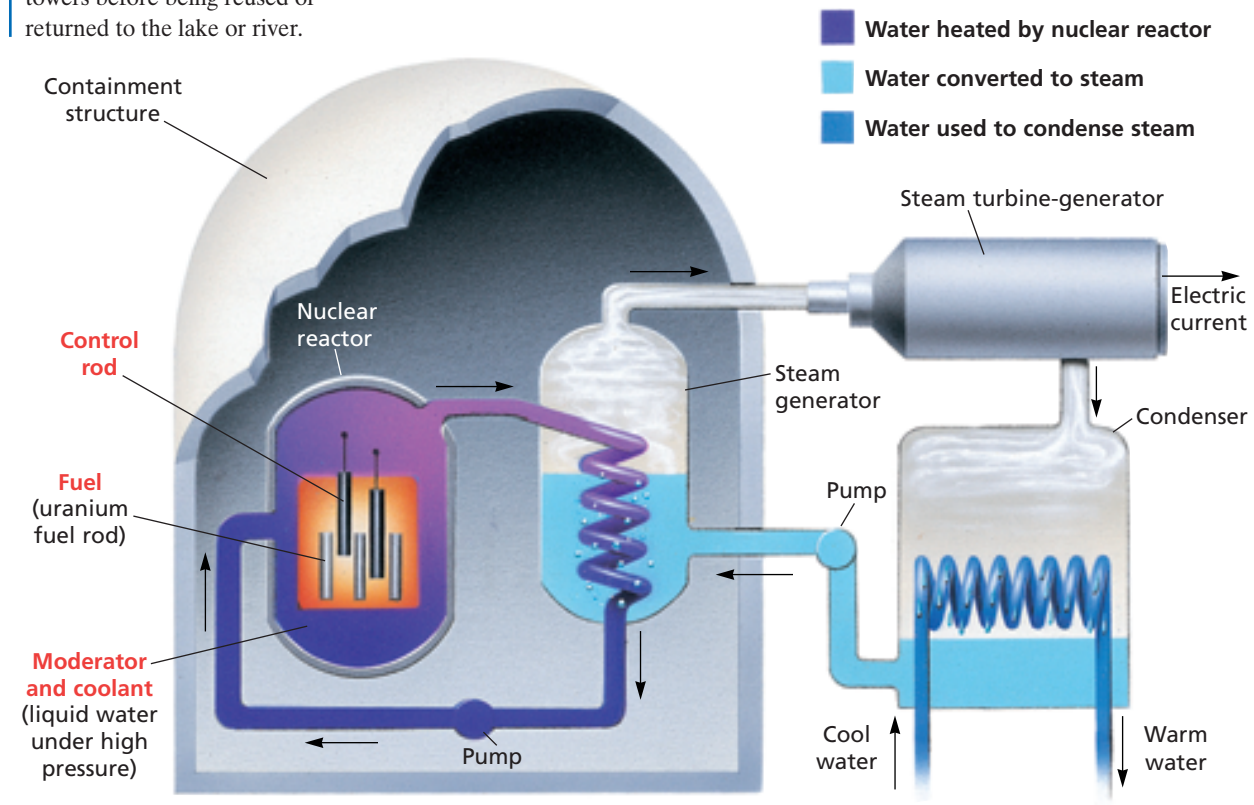

FIGURE 15 In this model of a nuclear power plant, pressurized water is heated by fission of uranium-235. This water is circulated to a steam generator. The steam drives a turbine to produce electricity. Cool water from a lake or river is then used to condense the steam into water. The warm water from the condenser may be cooled in cooling towers before being reused or returned to the lake or river.