



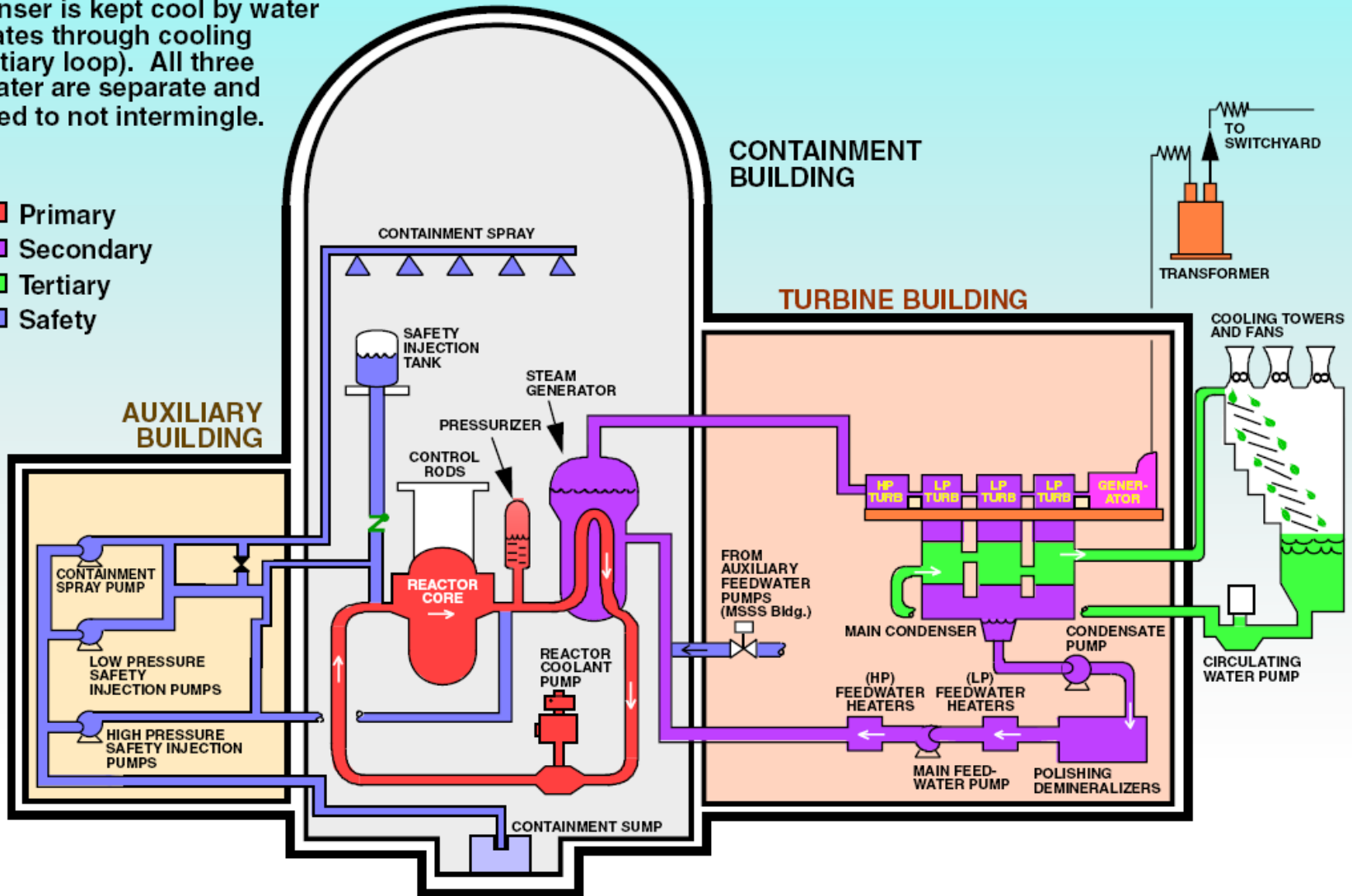
Nuclear Generating Station

How It Works

1 A Plant Overview

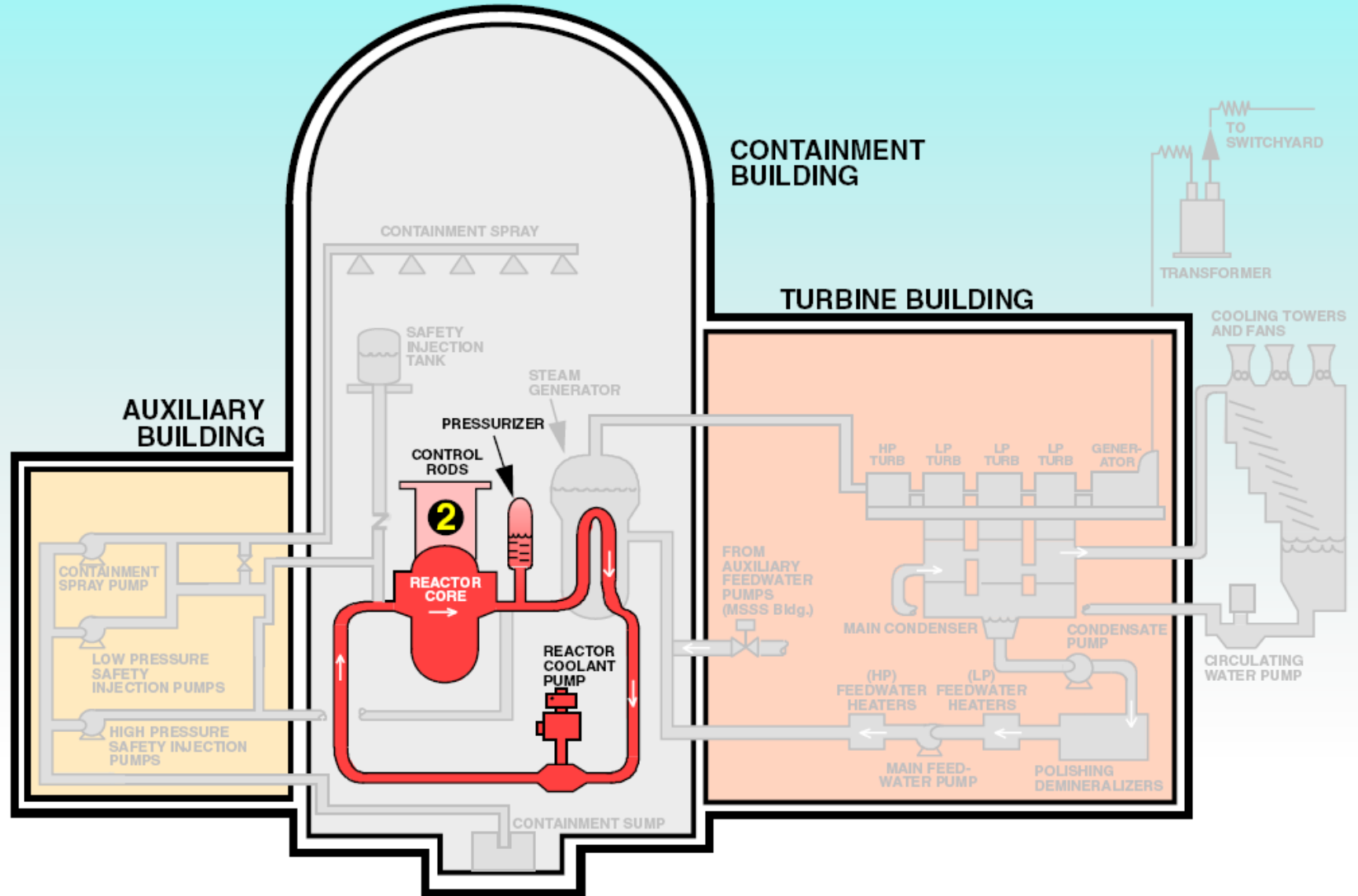
To produce electricity, Palo Verde needs heat, steam and an electrical generator. Heat comes from the reactor, where nuclear fission heats water to 610 degrees under great pressure so it doesn't boil. That superhot water (primary loop) circulates through the steam generator, where it boils water to produce steam. The steam (secondary loop) passes through turbines connected to electrical generators, which spin and produce electricity. The used steam then passes through a condenser where it is cooled into water and sent back to the steam generator to make yet more steam. The condenser is kept cool by water that circulates through cooling towers (tertiary loop). All three loops of water are separate and are designed to not intermingle.

- Primary
- Secondary
- Tertiary
- Safety



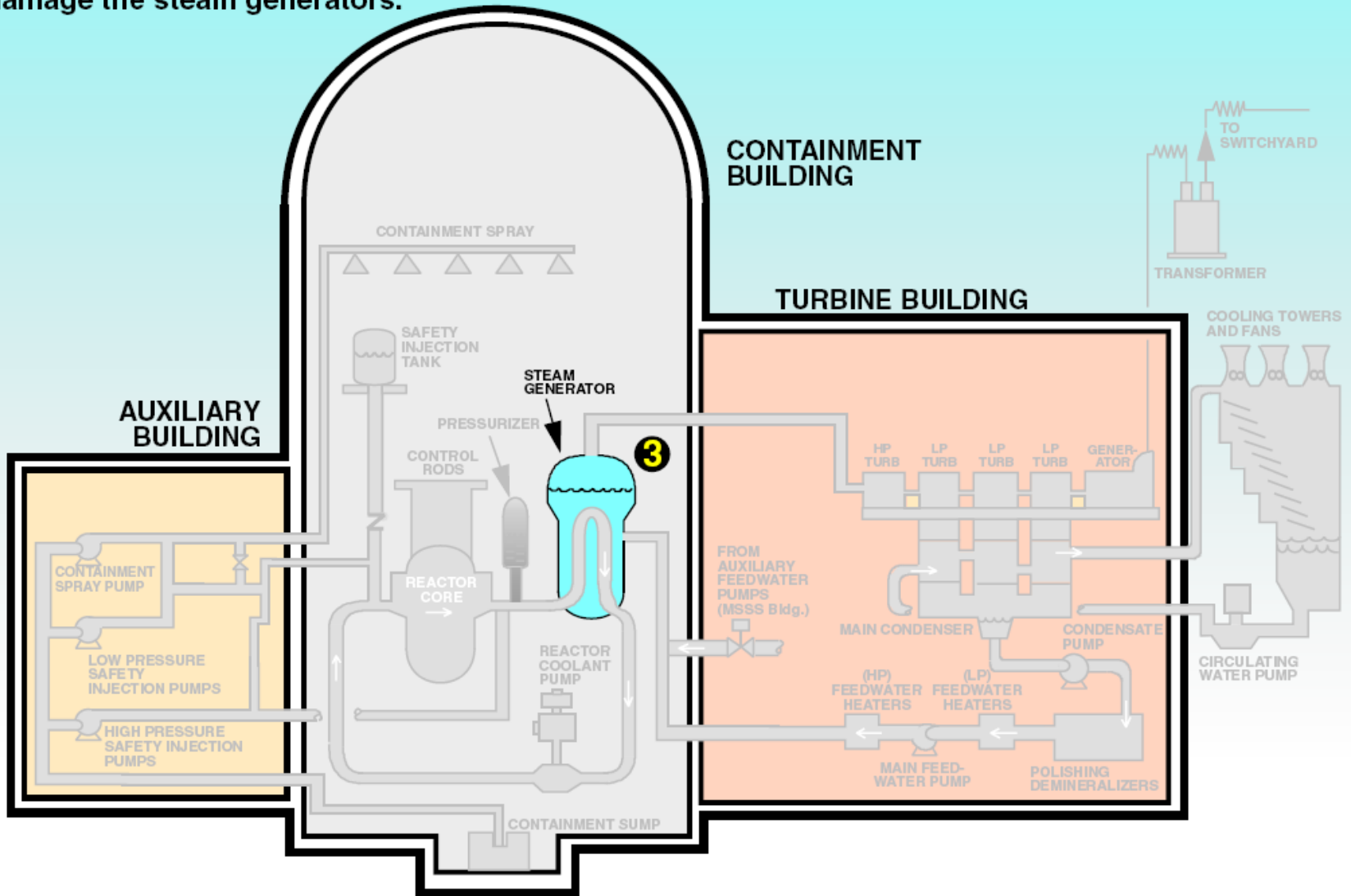
2 The Reactor

The fuel used at Palo Verde is made from uranium and sits inside the reactor. Through a controlled chain reaction called nuclear fission, uranium atoms split and give off heat inside the reactor. That heat eventually is used to boil water in the steam generators. The reactor can be shut down immediately using Control Element Assemblies. The control assemblies are made of boron, which blocks the chain reaction.



3 Steam Generators

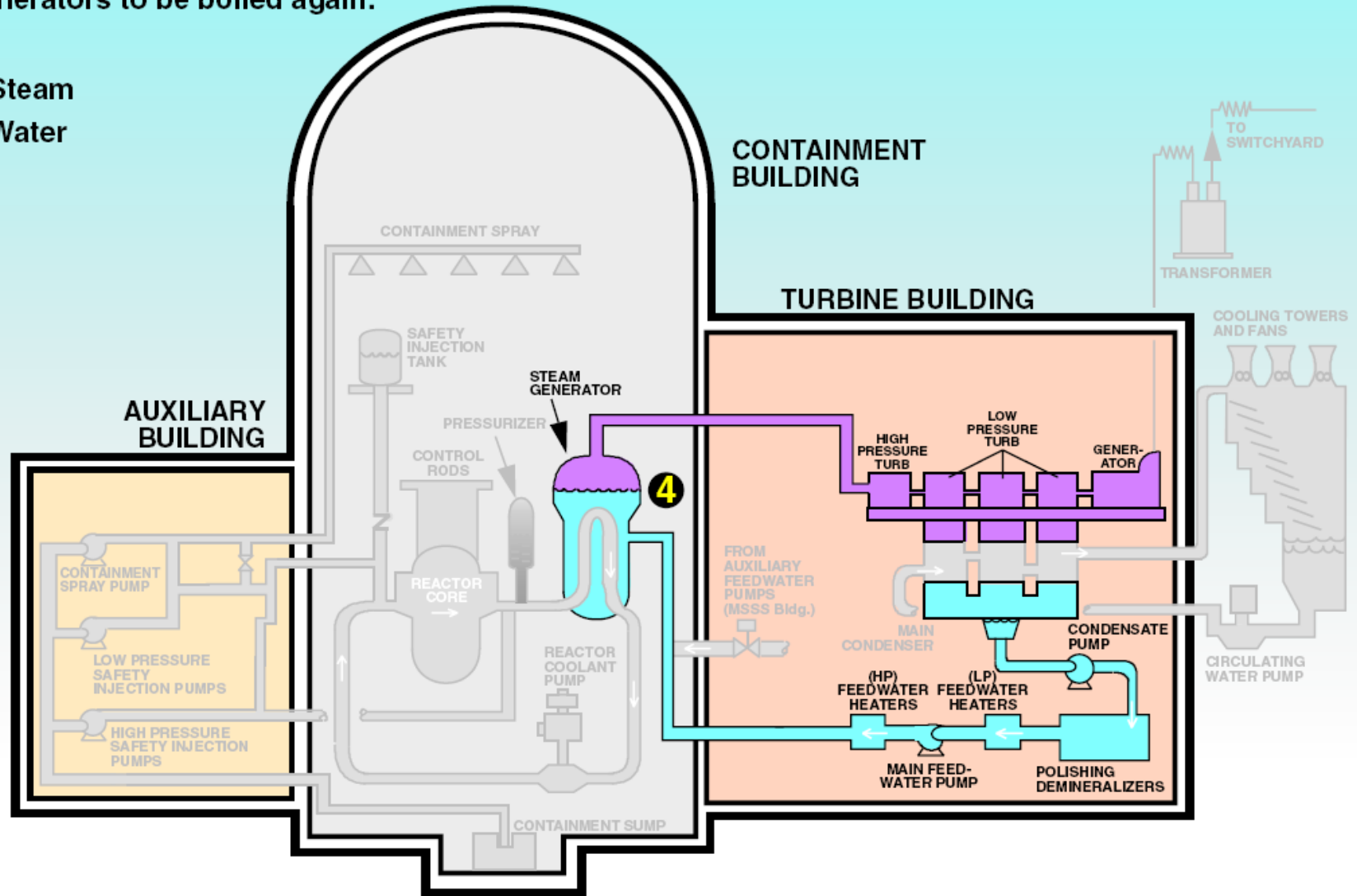
Steam generators are large heat exchangers. Superheated water from the reactor, under pressure to prevent boiling, passes through thousands of tubes in the steam generators. Water on the outside of these tubes boils and produces steam, which blows through large turbines that spin to produce electricity. Maintaining a proper chemical balance in the boiling water is essential to prevent corrosion and deposits that can damage the steam generators.



4 Secondary Loop

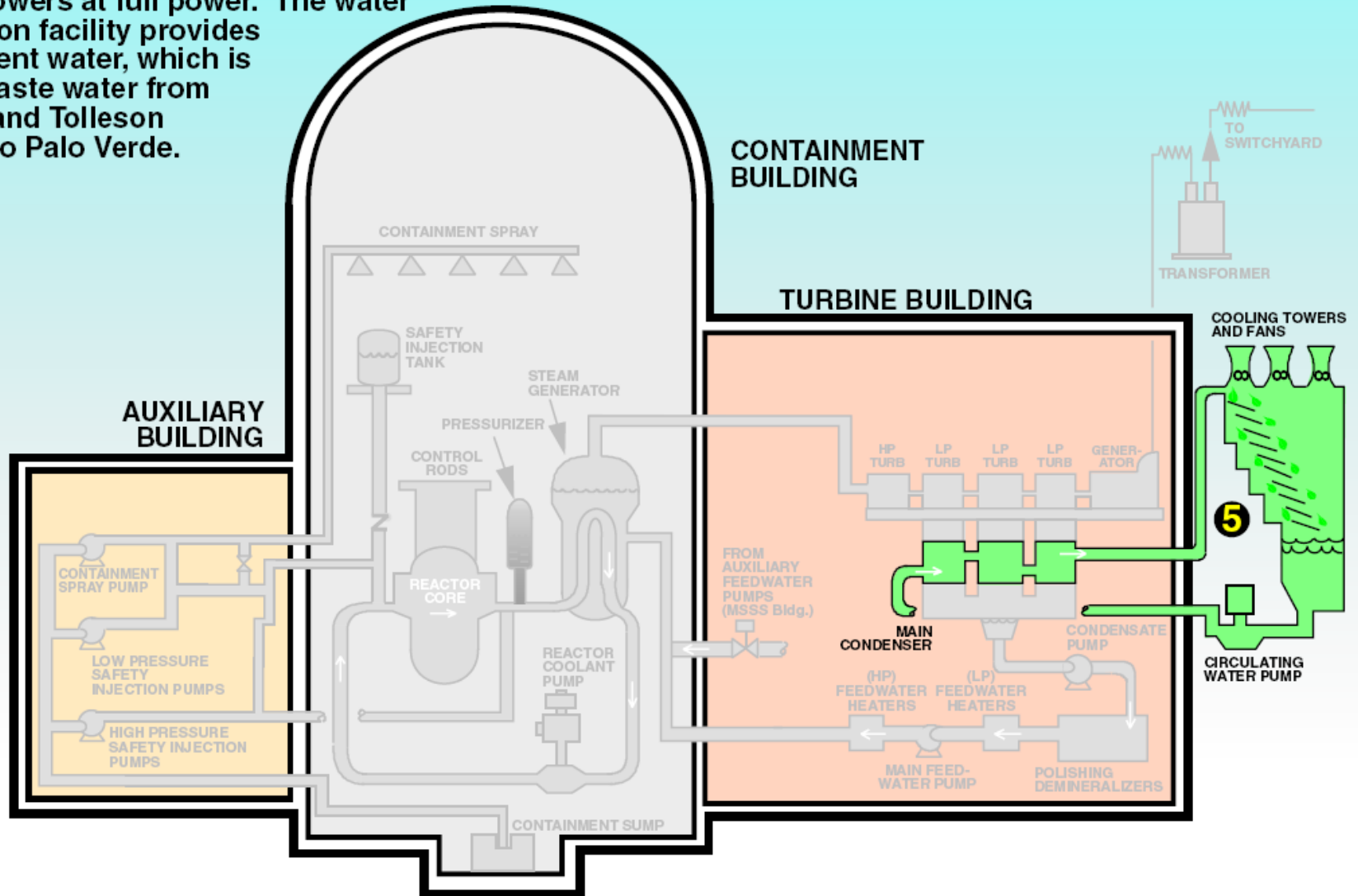
Steam produced in the steam generators actually turns four turbines that spin at 1,800 revolutions per minute. A shaft from the turbines is connected to the main generator, which can produce about 1.3 billion watts at full power. The used steam is then condensed back into water. The condensate system then pumps the water through filters and heaters to the feedwater system, which returns the water to the steam generators to be boiled again.

Steam
Water



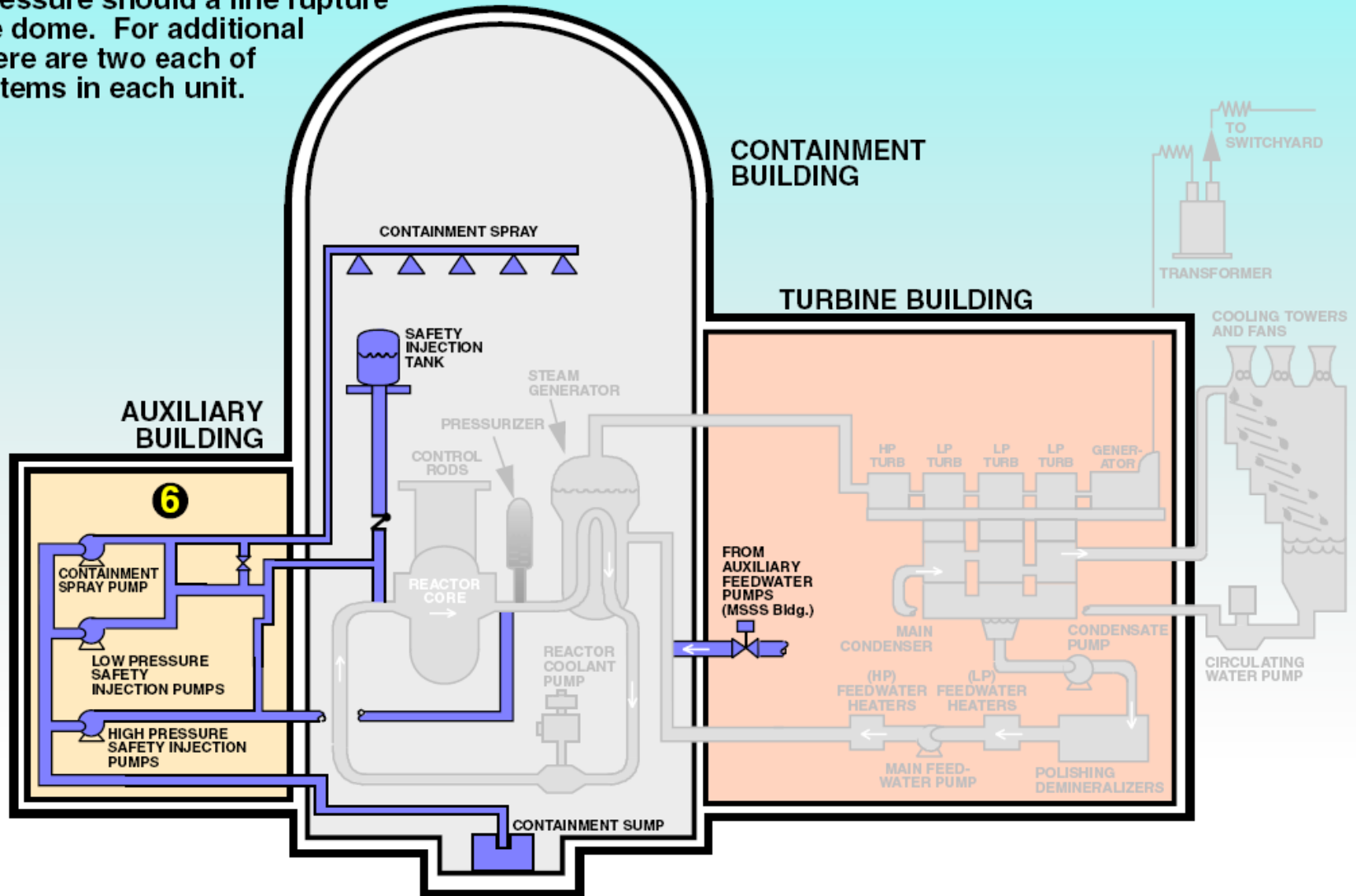
5 The Heat Sink

The circulating water system, the third loop in the plant cycle, removes heat from the steam after it passes through the turbines. As steam passes on the outside of thousands of tubes in the top of the condenser, water inside the tubes picks up the heat and passes it to the atmosphere. This is the water vapor seen rising from the cooling towers. About 14,000 gallons of water a minute evaporate from each unit's cooling towers at full power. The water reclamation facility provides replacement water, which is treated waste water from Phoenix and Tolleson pumped to Palo Verde.



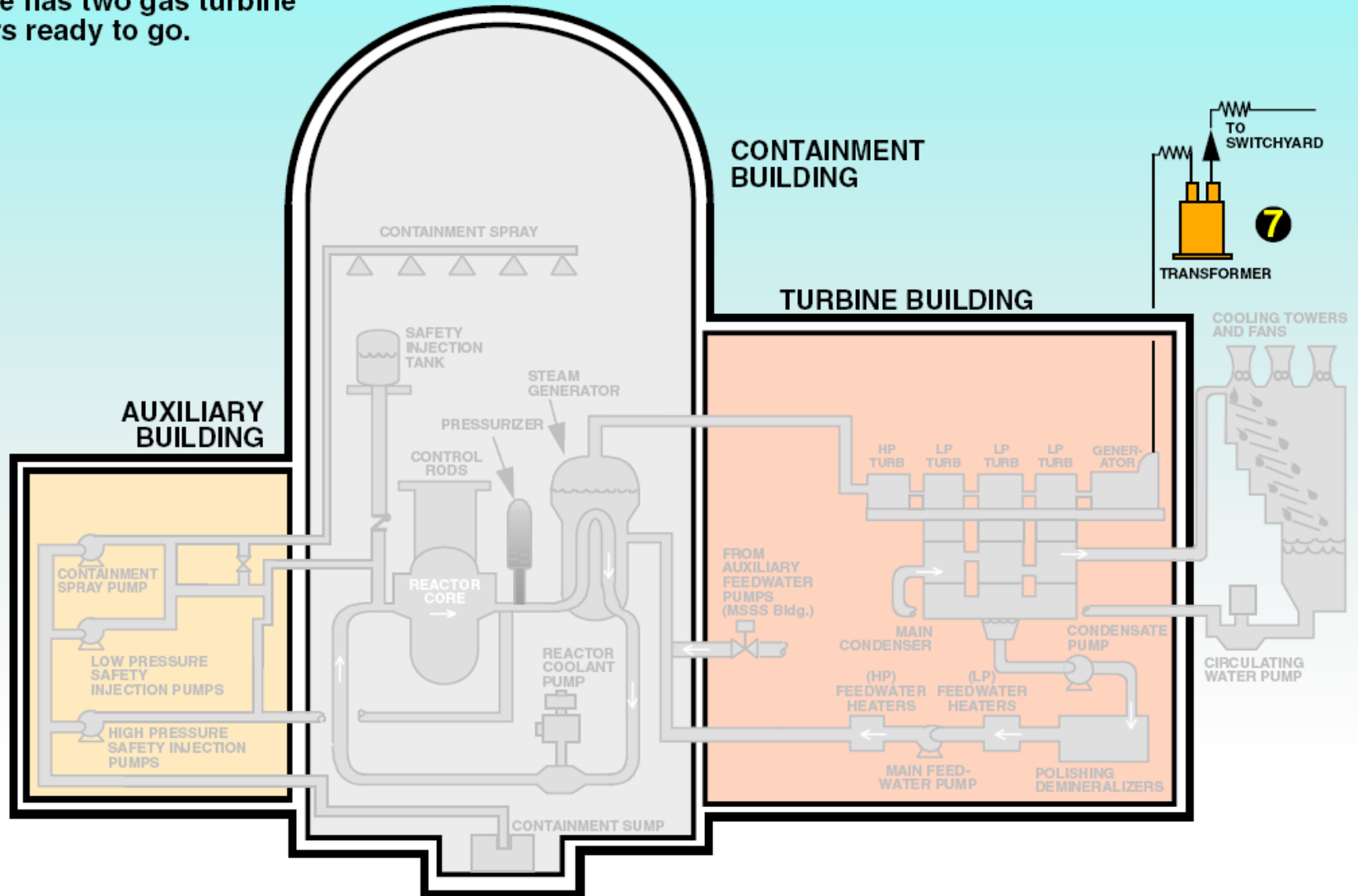
6 Safety Systems

The Safety Injection System includes safety injection, shutdown cooling and containment spray systems. Safety Injection can inject large quantities of water into the reactor for cooling in the event of a loss of reactor coolant. Shutdown cooling removes the residual heat and heat produced after the reactor is shut down. The containment spray system introduces a cool spray of water inside the containment dome to reduce pressure should a line rupture within the dome. For additional safety, there are two each of these systems in each unit.



7 Electrical Generation

Power generated by Palo Verde's three units is sent to the switchyard, which distributes the electricity among the plant's seven owners. Under normal conditions, some of that power is returned to the plant for use in running the site. In the event of a loss of off-site power, two diesel generators will start and supply power to the various safety systems. If for some reason the diesel generators are not available, Palo Verde has two gas turbine generators ready to go.



8 Spent Fuel Pool

Palo Verde's used uranium fuel is stored in three spent fuel pools, one in the fuel building of each unit. The spent fuel pool can hold up to 1,329 spent fuel assemblies. It also is possible to store spent fuel in large, dry concrete and steel drums. Some low-level radioactive waste, usually in the form of slightly radioactive trash, is shipped off-site for disposal. Most, however, is stored in a storage facility north of Unit 1 that is capable of storing waste for five years.

