Cable Lore

ANACONDA

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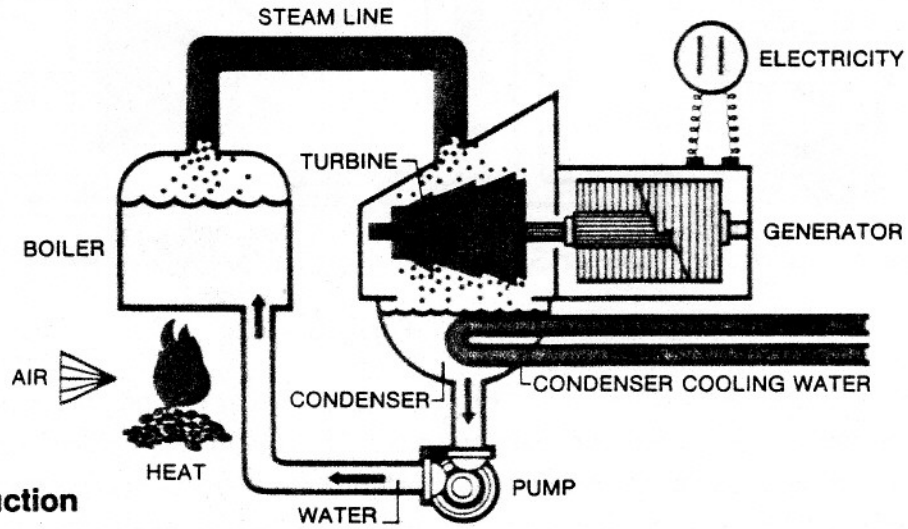
POWER AND CONTROL CABLES FOR NUCLEAR GENERATING STATIONS – A PRIMER

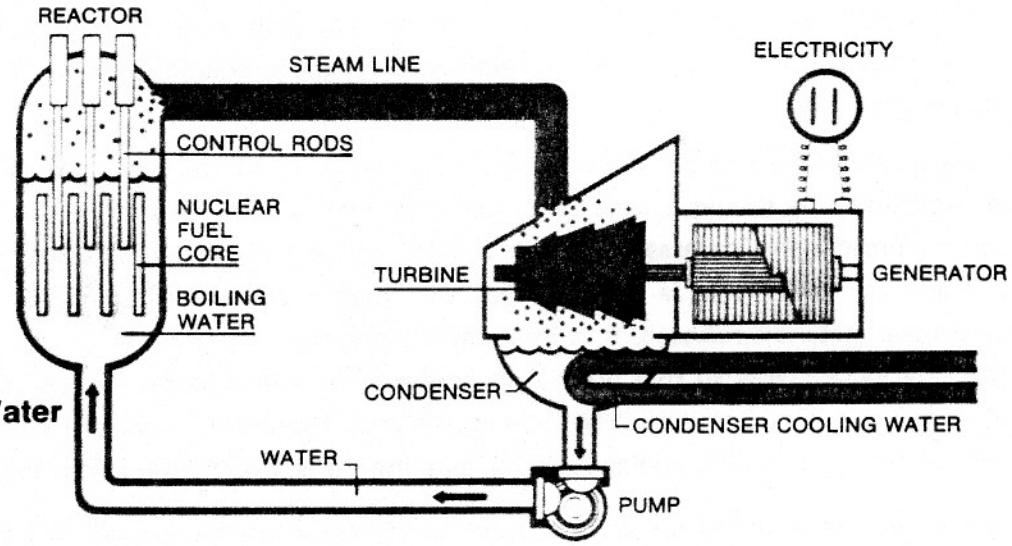
Nuclear generating stations differ from fossil fuel generating stations primarily in the system used to produce the steam to drive the turbines turning the generators. Fossil fuel stations burn coal, gas, or oil to produce steam from water.



Fossil Fuel Power Production

Figure 1

Nuclear stations use the kinetic energy of neutrons emitted by radioactive uranium to heat water. In a boiling water reactor the steam produced drives the generator turbine directly.



Boiling Water Reactor System

Figure 2

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In a pressurized water reactor the water heated by the uranium is kept in an isolated system and heat is transferred to a secondary water-steam system (See Figure 3). Other systems are possible, but not shown, e.g. for example, liquid sodium may be used in place of water as the primary heating fluid.

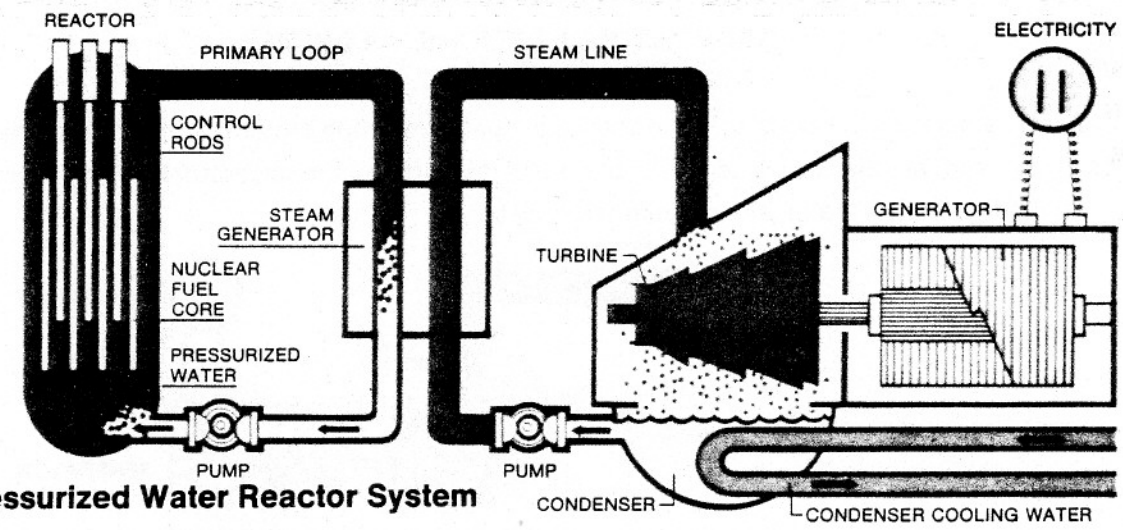

Figure 3

There are many safeguards built into nuclear generating stations to insure their continuous normal operation. The nuclear fuel cores are heat, radiation, and pressure resistant tubes filled with Uranium Dioxide. By precisely controlling conditions, a nuclear fission reaction can be maintained that gives off enormous, but controlled quantities of heat. This reaction may be controlled by positioning the control rods within the fuel core. These rods are filled with neutron absorbers that will stop the reaction when all are fully inserted, or slow it down when partially inserted. When the nuclear reactor is functioning normally, the fuel cores are surrounded with water (or other coolant) and the heat from the fission reaction continuously converts the water into steam. Under these conditions the radiation level in the containment is relatively low.

However, should the supply of water, which cools the reactor during its conversion into steam, be interrupted – should a Loss of Coolant Accident (LOCA) occur – the fission reaction would immediately increase in speed. If left unchecked, intense heat and radiation would develop very rapidly. It is possible that the interior of the reactor would be fused, and radioactive materials released. It is imperative therefore, that power and control cables remain intact during a LOCA so that prompt shutdown (scram) procedures may be initiated to stop a runaway condition. Some of these procedures are (1) insertion of control rods (2) flooding of the reactor with auxiliary coolant and (3) spraying the area with Boric Acid solutions.

How cables are qualified for such an important function will be covered in Cable Lore No. 51. A glossary of definitions is given in Cable Lore No. 50.

R. M. Wade