Big Rock Point Nuclear Plant

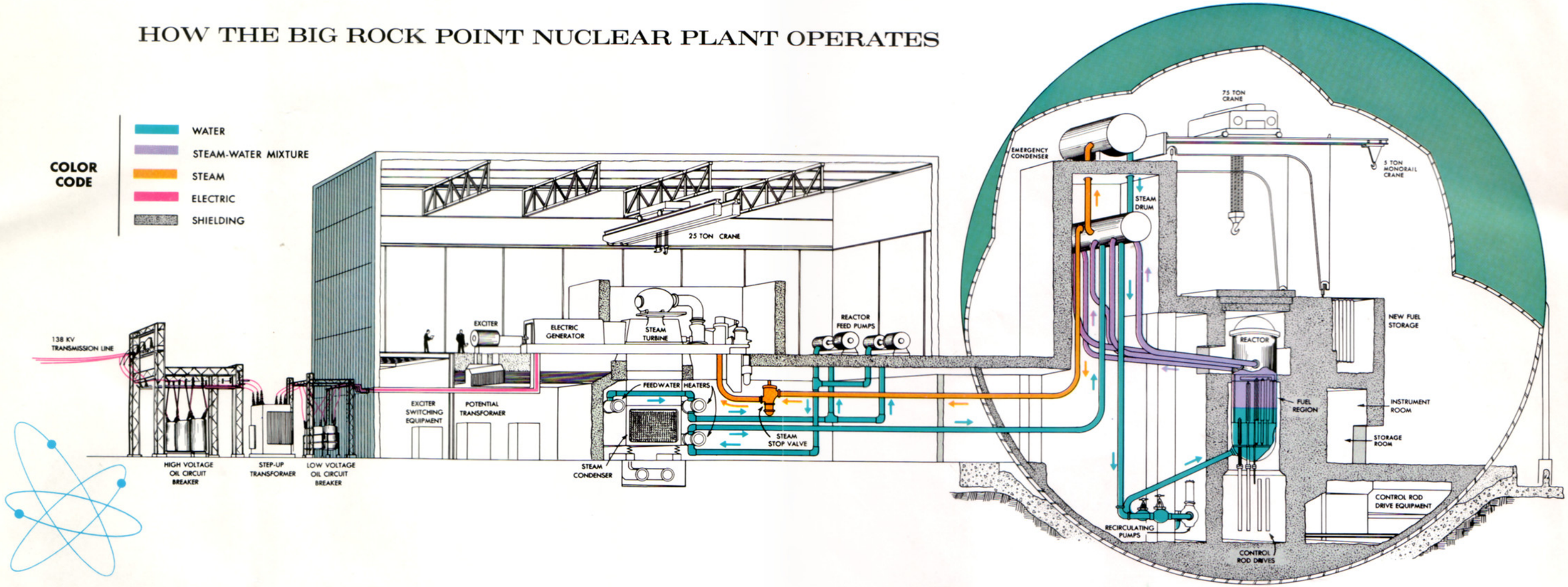
ON LAKE MICHIGAN NEAR CHARLEVOIX, MICHIGAN

Owned and operated by

Consumers Power

An investor-owned electric and natural gas utility serving 4.2 million Michigan people

HOW THE BIG ROCK POINT NUCLEAR PLANT OPERATES



Uranium is the heat source for producing steam to generate electricity

Electricity is generated in Big Rock Point Nuclear Plant in much the same manner as in a coal-burning or oil-burning electric station. The difference is that uranium, rather than coal or oil or gas, is the source of heat for the production of steam to turn the turbine-generator.

The plant includes a single-cycle forced circulation boiling water reactor instead of a conventional boiler.

The heart of the plant is the core of the reactor, indicated in the diagram by the words "fuel region." It is here that nuclear fission occurs. The core consists of 84 fuel bundles containing approximately 12 tons of slightly enriched uranium (about 3.2% U-235) in the form of uranium oxide (UO_2) pellets. A six-foot stack of pellets in a stainless steel tube sealed at each end by welded end-plugs makes up a fuel rod. There are 144 fuel rods per fuel bundle, or 12,096 fuel rods. The power available from a single load of fuel is roughly equal to that which could be generated by burning 580,000 tons of coal.

When the uranium within the core is fissioned it releases heat, causing the surrounding water to boil and form steam.

Fission is achieved and regulated by the movement of control rods out of or into the core, producing an increase or a decrease in power production.

A steam-water mixture leaves the reactor through piping and goes to the steam drum, where water is separated from the steam.

From the drum the steam goes to the turbine which drives the generator. The generator produces electricity at 13,800 volts. This voltage is increased to 138,000 volts in the outdoor substation before the electricity enters the Consumers transmission system.

The steam is condensed back to water by causing it to pass over condenser tubes through which cold water from Lake Michigan is flowing. The lake water goes back unchanged to the lake. It never comes in contact with the water in the steam system.

The water that has been condensed from the steam is pumped through intermediate heaters back to the steam drum and mixed with the water which was separated from the steam.

The water is taken from the drum and pumped into the bottom of the reactor vessel, closing the cycle.

The reactor system can produce nearly a million pounds of saturated steam per hour at a pressure of 1450 pounds per square inch.

The turbine is a General Electric 3600 rpm tandem-compound double-flow condensing unit.

Engineer-constructor of the Big Rock Point Nuclear Plant was the Bechtel Corporation.

Research and Development Progress

In 1964 the United States Atomic Energy Commission issued a full-term license for the plant, first operation at maximum capacity (75,000 kilowatts) was achieved, and a number of performance tests were successfully completed.

Following the tests, the plant entered the last leg of a 4½-year research and development program preceding full-time commercial operation. Consumers Power Company, the United States Atomic Energy Commission and General Electric Company are cooperating in the research and development program.

The program already has achieved its basic purpose of demonstrating that required amounts of heat for electric power generation can be obtained with less nuclear fuel. Further progress in this direction is expected.

The program also seeks to determine the best over-all operating conditions for the plant. Information is being obtained that will aid in the further development of boiling water reactors and in the general advancement of nuclear power generation as a competitive reality.

Big Rock Point Highlights

Big Rock Point Nuclear Plant was built by Consumers Power Company on its own initiative and entirely at its own expense. Total cost, including conventional turbine-generator and related facilities, was approximately $27,000,000.

Construction was begun in the spring of 1960 and completed ahead of schedule 29 months later. A controlled chain reaction was achieved September 27, 1962, first production of electricity occurred December 8, 1962, and full initial production was attained March 21, 1963.

Big Rock Point was Michigan's first nuclear electric plant to go into operation. It was preceded by only four other large-scale nuclear electric plants in the United States.

Construction of Big Rock Point and other pioneering nuclear electric plants by investor-owned electric companies has been a factor in bringing nuclear energy to its present state of competitiveness with coal as a heat source for the generation of electric power.

Big Rock Point is the largest electric generating station in Michigan north of the Bay City and Muskegon areas. At maximum expected gross capacity it will be capable of supplying enough electricity to meet all the needs — residential, commercial and industrial — of an average city of 100,000 persons.