



Big Rock Point Nuclear Plant

ON LAKE MICHIGAN NEAR CHARLEVOIX, MICHIGAN

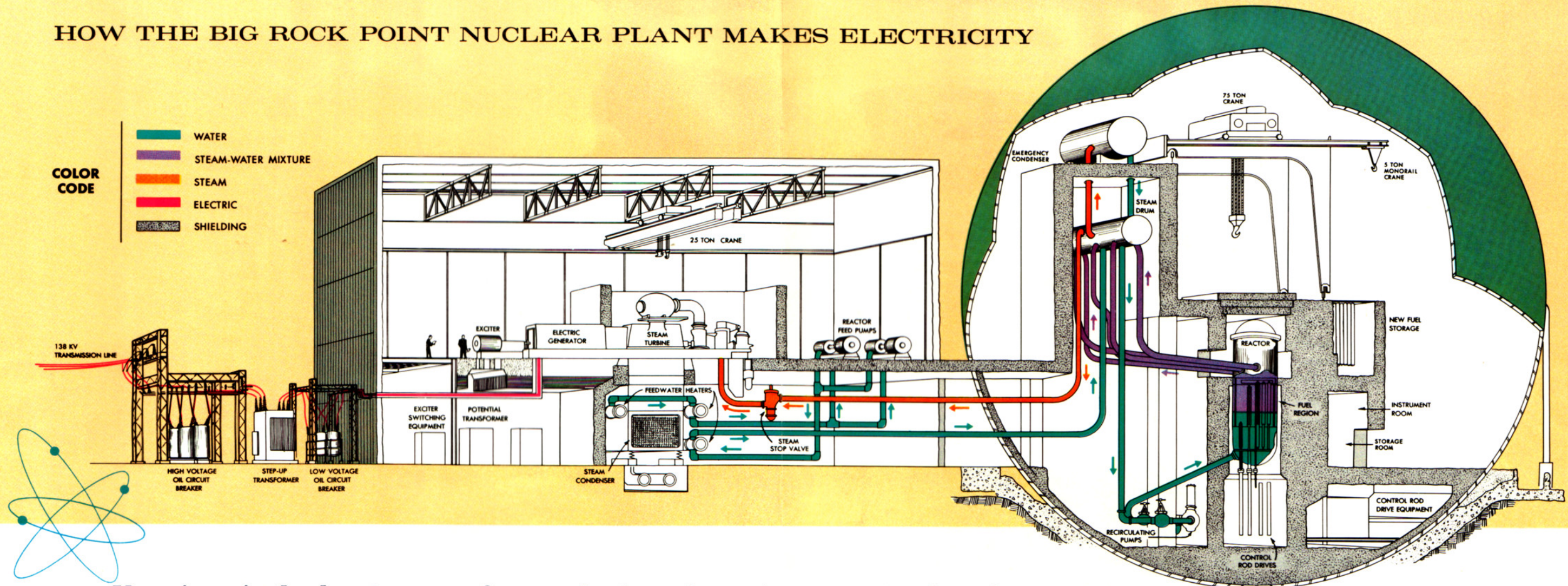


Owned and Operated by

**Consumers
Power
Company**

An investor-owned
electric and natural gas
utility serving 4.5
million Michigan people

HOW THE BIG ROCK POINT NUCLEAR PLANT MAKES ELECTRICITY



Uranium is the heat source for producing steam to generate electric power.

The cut-away diagram is intended to show, in simplified form, how a nuclear power plant makes electricity.

A nuclear plant is very similar to any other steam-powered generating plant. Each must use fuel to make steam. A majority of these plants use coal, oil, or gas (often referred to as "fossil fuels") as a source of heat. The heat brings water to a boil, and the boiling water turns into steam. The steam, in turn, drives a turbine generator, making electricity.

Thus, the only substantial difference between a nuclear plant and any other steam-powered generator is the *source of heat*. This nuclear plant and others that are commercially attractive in competition with steam plants fired with coal, oil, or gas, uses slightly

enriched uranium oxide as fuel. This fissionable rather than combustible heat source is particularly unique as it is the cleanest and most concentrated fuel used today by man.

In the diagram, the reactor (which might be called a boiler) can be seen in the center of the containment sphere, at the right of the illustration. It is shaped like an oversize, wide-mouthed jar, or bottle, and is made of steel. Inside the reactor (where water changes to steam-water mixture in the diagram) is the "fuel region" or core. The Big Rock Point core includes 84 bundles of nuclear fuel, each containing 144 stainless steel tubes filled with pellets of uranium oxide (UO_2). These tubes, slightly larger than a man's finger in diameter and six feet long, after loaded with pellets are sealed at each end with welded plugs,

so the nuclear fuel is tightly contained.

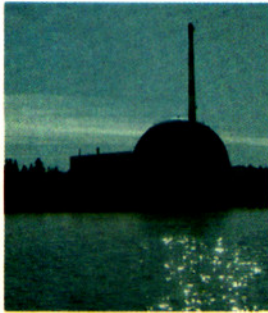
These individual fuel bundles, by themselves, produce no heat at all. However, if the bundles are placed in the reactor in a geometric pattern, at exactly the right distance from each other, atomic particles of uranium from one bundle fly out and strike uranium atoms in nearby bundles. The atoms which are struck by these uranium particles are caused to split, or "fission." The fissioned particles, in turn, fly off and strike other nearby atoms, creating what is known as a "controlled chain reaction."

This atom-splitting, or fissioning, is what causes the water in the reactor to become hot. Water, circulating in the reactor, is turned to steam, and the steam is then conveyed via a steam drum, which removes

moisture, to the turbine and thence to the generator, where electricity is made. After turning the generator, the steam is condensed back into water by passing it over condenser tubes through which cold water from Lake Michigan is flowing. The water that has been condensed from the steam is pumped back through the steam drum and eventually goes back into the bottom of the reactor. The lake water meanwhile is returned, unchanged, to Lake Michigan. It never comes in contact with the water in the steam system.

The turbine generator produces electricity at 13,800 volts. This is stepped up ten-fold to 138,000 volts in the outdoor substation before being fed into the Consumers Power 138 kv transmission system.

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 first achieved September 27, 1962. First production of electricity occurred December 8, 1962, and full initial production of electricity was attained March 21, 1963.

In 1964 the United States Atomic Energy Commission issued a full-term operating license for the plant. First operation at maximum capacity (75,000 kilowatts) was achieved in June. Following successful completion of a series of performance tests, the final phase of the initial research and development program at the plant was begun.

In late 1965, the Big Rock Point Nuclear Plant was placed in regular operation as part of Consumers Power Company's electric system.

An extensive research and development program has been carried out at Big Rock, and some projects still continue. In this R&D effort, Consumers Power Company, the United States Atomic Energy Commission and General Electric Company cooperated.

One of the major objectives of the research and development program was to test various types of nuclear fuel and determine how a given quantity of fuel could be made to yield the greatest possible amount of heat. The application of these demonstrations to the design of other plants has helped to improve the performance of other nuclear power plants, and helped to prove the economic feasibility of large nuclear generating stations.

Largely as a result of our experience with Big Rock Point, and the advent of economic nuclear power, Consumers Power Company decided in 1966 to proceed with construction of a major nuclear power plant on the shore of Lake Michigan, about 35 miles west of Kalamazoo. This generating station, to be known as the Palisades Plant, will have ten times the electric output of Big Rock Point. Its initial generating capacity will be 710,000 kilowatts. When it goes into commercial operation in 1970, it will increase the total capacity of Consumers Power Company's electric system by 20 percent.

Big Rock Point, now regarded as a relatively small nuclear plant, nevertheless is the largest electric generating station north of the Bay City and Muskegon areas. At maximum capacity, it is capable of supplying enough electricity to meet the non-industrial needs of an average city of 100,000 persons.

At the time it began operation in 1963, it was the first nuclear plant to produce electricity in Michigan. It was preceded by only four other nuclear electric plants in the entire United States.

On March 30, 1967, a significant milestone was passed when Big Rock Point generated its 1-billionth kilowatt hour of electricity.



Where "CP" stands for Continuing Progress In Nuclear Energy

GENERAL OFFICES: JACKSON, MICHIGAN