

**CONSUMERS POWER COMPANY'S**

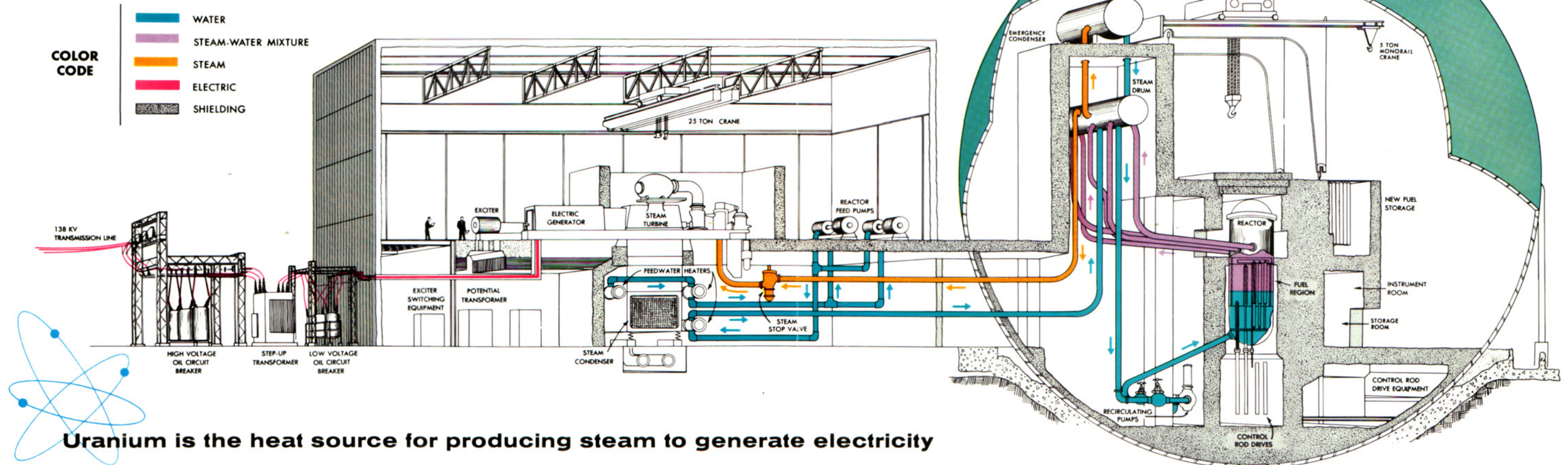
# *Big Rock Point Nuclear Plant*

**Five Miles North of Charlevoix, Michigan on U.S. 31**



# This 'X-Ray View'

## SHOWS HOW THE BIG ROCK POINT NUCLEAR PLANT OPERATES



Uranium is the heat source for producing steam to generate electricity

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

This is one of the projects through which the electric industry is learning how to use the energy of the atom most effectively in electric power production. The Big Rock Point Plant utilizes a boiling water, direct cycle, forced circulation, high power density nuclear reactor.

Consumers Power Company, sole owner, has made the plant available for a research and development program to be conducted for the United States Atomic Energy Commission by the General Electric Company with Consumers cooperating. This program will continue until early 1966.

Researchers are trying to extend the life of nuclear fuel. They are seeking to cut the cost of fuel fabrication. They are endeavoring to step up the initial generating capacity of the plant 50 per cent, thus improving the ratio between generating capacity and dollars invested.

These are essential objectives in the effort to make nuclear energy fully practicable as a heat source for the generating of electric power.

Construction at Big Rock Point began in the spring of 1960. A controlled chain reaction was achieved September 27, 1962, and first production of electricity occurred a few weeks later.

Electricity is generated 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.

While initial capacity was 50,000 electrical kilowatts, the plant is designed for a maximum expected gross capacity of 75,000 kilowatts. Big Rock Point is the largest electric generating station in Michigan north of the Bay City and Muskegon areas.

At the end of the initial research and development period the plant will be available for full-time service as a commercial generating unit, adding important strength to the power supply in the northern part of the Consumers Power Company service area.

Total cost, including conventional turbine-generator and related facilities, was approximately \$27,000,000.

Engineer-Constructor was the Bechtel Corporation.

### IT IS A SAFE PLANT

Boiling water reactors are inherently safe because they tend to shut themselves down if trouble develops. Safety systems of several types, operating independently of each other, also assure fullest protection to plant personnel, visitors and neighboring residents. These systems were developed and proved through

construction and operation of boiling water reactors elsewhere in the United States and in Europe.

An additional safety feature is the steel containment sphere enclosing the nuclear reactor. The sphere is 130 feet in diameter, about the height of an 11-story building.

### URANIUM OXIDE IN CORE

The power-producing unit is the core. The first core, consisting of 56 fuel bundles, contains approximately 9.5 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 8,064 fuel rods. The power from a single load of fuel will be roughly equal to that which could be generated by burning 260,000 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 Michigan 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 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 has an initial rating of 607,000 pounds of saturated steam per hour at a pressure of 1050 pounds per square inch. It is capable of supplying 964,000 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 directly connected with a hydrogen-cooled generator.

At initial capacity, the Big Rock Point Nuclear Plant is capable of supplying enough electricity to meet all the needs—residential, commercial and industrial—of an average city of 65,000 persons.





### **The Information Center at Big Rock Point**

The Information Center at Big Rock Point attracts as many as 10,000 visitors a week during the tourist season.

It includes a small auditorium for explanatory talks and motion pictures.

Closed circuit television enables visitors to observe activity within the plant as it occurs.

While looking at a cutaway scale model, visitors listen by "telephone" to a brief recorded explanation of how the plant operates.

Automatic exhibits, at the press of a button,

illustrate the fissioning of the atom, the action of control rods, the generating of electricity.

There is a small gallery of construction pictures.

An observation lobby provides a close-up view of the plant itself, and there is also an outdoor viewing platform with a telescope for looking out over Lake Michigan.

The Information Center is open to the public seven days a week in spring, summer and autumn.