district heating

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First Privately-Owned Dual-Purpose Nuclear Plant

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FIRST PRIVATELY-OWNED, DUAL-PURPOSE NUCLEAR PLANT TO BE BUILT NEAR MIDLAND, MICHIGAN BY CONSUMERS POWER COMPANY

On December 14, 1967 Consumers Power Company announced plans for the construction of the world's first privately-owned, dual-purpose nuclear plant which will not only produce electricity but will also provide steam for chemical processing. The facility, to cost $267 million, will be built south of Midland on a 650-acre site, and will be totally owned and operated by Consumers Power.

The twin-reactor plant will be Consumer's third nuclear plant in Michigan, will add 1.3 million kilowatts to the Company's electric system, and will be one of the largest nuclear plants yet built. Total energy capacity is equivalent to about 1.5 million kilowatts-electric. Additionally, it will deliver four million pounds of steam per hour for industrial use by The Dow Chemical Company in Midland.

The installation will use two water-cooled nuclear reactors as its source of heat for generation of steam and power. Plans call for the first reactor to become operational in 1974, and the second unit in 1975.

Slightly enriched uranium dioxide will fuel each of the giant reactors. A 90-ton core of fuel bundles in each reactor will produce heat energy equivalent to 4.5 million tons of coal.

The plant will operate for a full year between refuelings, at which time one-third of the nuclear fuel will be replaced.

A containment building will house the nuclear reactors and primary system components.

The steam produced within the reactor core will circulate in a closed system. The steam in the reactor core system will not leave the nuclear plant, and will not be the industrial steam sent to Dow.

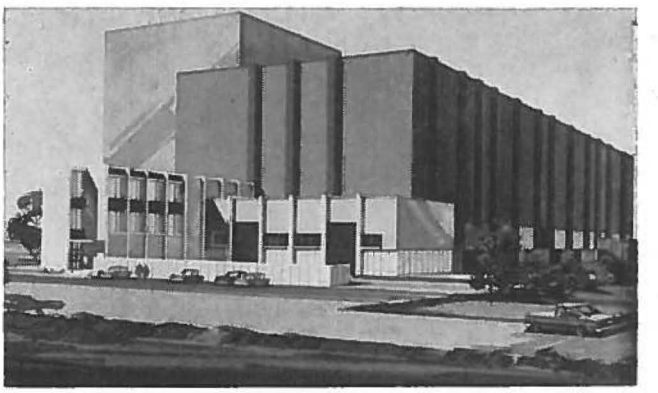
Auxiliary buildings will house the turbine-generators, pumps, and auxiliary systems.

Basically, all steam generating plants make electricity the same way. Water is heated until it turns into steam. Pressure in the steam lines is applied to thousands of turbine blades, imparting a spinning motion to the generator which produces electricity.

Many existing power plants burn some form of fossil fuel—coal, oil, or natural gas—to make steam. In a nuclear power plant, the heat of fission is used to produce steam.

Bundles of uranium fuel are arranged in geometric relationship to one another. When neutron absorbing control rods are withdrawn, the neutrons bombard uranium atoms, causing them to split or "fission." Heat results from the fissioning within the reactor, and produces steam in the lines.

When both units of the Midland nuclear plant are operating at maximum capacity, uranium atoms will be splitting at the rate of 144 quintillion fissions per second. Expressed differently, this figure is 144 million trillion or 144 multiplied by 10 to the 18th power.



Offices are in foreground, turbine-generator room next and, just visible at rear is a building for housing a reactor.

At least two other dual-purpose nuclear plants are known to be under active consideration.

In 1966 plans were announced for a dual-purpose electrical generation and water desalination plant to be built on an island off the coast of California near Los Angeles. Although 1973 has been set as the year for the plant to start operations, construction of the island has not yet begun.

In Germany the BASF (Badische) Chemical Company announced last June that it is "examining the possibility of using nuclear energy in a power station at Ludwigshafen which would supply not only electricity but steam as well." BASF said the project "would not be realized before the mid-seventies."

The conversion to nuclear-generated steam and electricity will be another in a significant series of steps taken by The Dow Chemical Company over the past 20 years in the peaceful use of nuclear energy.

Effective with the completion of the Midland plant of Consumers Power, Dow intends to phase out its own production of electricity and industrial steam used to produce more than 400 chemical and plastic products in one of the industry's largest complexes.

While construction of the Midland facility will represent significant progress in the utilization of nuclear energy, the concept is not new. What has been needed was a sufficiently large scale of operations, in an area of relatively high costs for other fuels, to make such a project economically attractive.

Midland meets the criteria on both scores. Dow is a large user of both steam and electricity in its Midland plant; Consumers Power is a major producer of electricity; and the cost of coal is high in Michigan.

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In addition, Dow sought a solution to the problem of air pollution that results from burning 1.3 million tons of coal a year. Nuclear energy will eliminate this problem.

No government money is involved in the project. It is not an experiment or developmental project, but rather it is a merger of proved nuclear and chemical production engineering and economics.

Primarily, the steam provides an economical means of transferring heat energy from a central generating station, and it is used by Dow for many purposes. While the heating of buildings is the most common-place application, it is the processing of chemicals that accounts for the greatest usage.

Caustic soda and Dowflake calcium chloride are examples of products that require large amounts of steam for their manufacture. The steam used to produce calcium chloride alone exceeds the amount needed for space heating in the Dow complex of some 800 buildings.

In the production of caustic soda, the raw material brine comes from wells about 4,000 feet deep, where salt has been dissolved by the injection of water. Before the brine goes to electrolytic cells that produce chlorine it is heated with steam, and the effluent from the chlorine cells flows to evaporators where, by using steam and closely controlling the amount of heat, caustic soda is produced in various strengths.

For the different manufacturing operations, the steam is supplied at pressures ranging from 15 to 400 psi. Since steam cannot be moved many miles, this is one reason most large chemical processing complexes must be located near economical sources of water and heat energy.

For Dow, the water vaporized into steam comes from Lake Huron. But unlike the city water it does not go through the municipal treatment plant, and about 13 million gallons a day are pumped directly from the Midland-Saginaw waterline.

Looking back into history, it might be said that steam lies at the foundation of The Dow Chemical Company. Joseph Dow, father of the company's founder, Dr. Herbert H. Dow, has been described as the first American pioneer in the field of steam turbines, and he invented a turbine used for some time by the United States Navy to power its torpedoes.

One of the earliest recorded events in the life of Dr. Dow is that at the age of ten he used money he had saved to finance a trip from his home in Connecticut to see the Corliss steam engine, then considered extraordinary because of its size and power, on exhibition at the Philadelphia Centennial of 1876.

And it was the availability of inexpensive steam, produced from lumber mills' waste wood, that attracted Dr. Dow to Midland as much as the underground salt and brines. It was in 1890, seven years before The Dow Chemical Company was founded, that Dr. Dow bought permission to run a rope from a lumber mill's steam engine so that he could generate electricity for the first factory production of bromine by electrolysis.

Dr. Dow entered the bromine business to take advantage of the cheap fuel in terms of inexpensive electric current. Subsequently, as he further exploited the energy in fuel, Dr. Dow put to work the exhaust steam from electric generators to heat vacuum evaporators. By evaporating brine with steam heat after it had been stripped of its bromine, he forced the brine to give up sodium chloride, magnesium chloride and calcium chloride — all products that the company today continues to manufacture with the use of steam.

Consumers Power Company's Midland nuclear plant is to be the third in a line that started in 1962 with operation of the Company's Big Rock Point nuclear plant, near Charlevoix, Michigan. The Company's second nuclear plant is now under construction at Palisades Park on Lake Michigan, about five miles south of South Haven.

The Palisades plant is expected to generate 710,000 kilowatts of electricity, nearly 10 times the capacity of the Big Rock Point plant. The two units of the Midland facility, at 1.3 million kilowatts, will have 17.3 times the generating capacity of the Big Rock Point plant.

All three nuclear plants are designed to use reactors cooled with ordinary, purified drinking water. This type of water-cooled reactor has proven successful, and has helped make nuclear fuel economically competitive with fossil fuels throughout much of the electric industry.

Consumers Power Company serves slightly more than one million electric customers in 61 of the 68 counties in Michigan's Lower Peninsula. The Company's present generating capacity is 3.5 million kilowatts. Operation of the Palisades plant will raise the kilowatt capacity to 4.2 million in 1970.

A pumped storage hydroelectric plant, to be built on Lake Michigan about four miles south of Ludington, Michigan, and the Midland plant will increase the Company's generating capacity still further to more than 7.3 million kilowatts.

As with all Consumers Power electric generating facilities, power from the Midland and Ludington plants will be fed into the Michigan power pool to help meet electricity demands forecast for the mid-1970's. Consumers Power Company and The Detroit Edison Company are the principal members of the pool.

At present, the Michigan power pool is interconnected with the hydroelectric power system of Ontario, Canada. In 1970, the Michigan power pool will be interconnected with Ohio, Indiana, and Illinois electric systems.

When the Midland plant is fully operational, 36 per cent of Consumers Power Company's base load capacity will be generated by nuclear energy.

The use of electricity is growing faster than the United States' population, which almost doubles every 40 years. The amount of electricity used in this country nearly doubles every ten years.

The construction and operation of the Midland nuclear plant is subject to approval of the relevant state and federal regulatory authorities. The project is another indication of how Consumers Power Company is preparing today to meet tomorrow's energy needs.+

A recent survey by the Department of Health, Education and Welfare of the motorcycle market has revealed that in 1960 there were about 562,000 motorcycles on the road. By the end of 1967 there were 2,250,000. An increase of 400%.

Every litter bit does hurt, for each piece of debris along our nation's highways costs taxpayers an average of 32¢. Just three pickups a year along a one mile stretch of highway cost $2,500.