OF CURRENT INTEREST

New G-E Dual-Cycle Boiling Reactor Will Power Largest All-Nuclear Station

DESIGN of a new atomic power reactor, described as a "major advance toward the economic generation of electricity from atomic energy," was announced recently by Francis K. McCune, General Electric Company vice-president and general manager of the company's Atomic Products Division.

Mr. McCune said that one of these new dual-cycle boiling reactors will power the proposed full-scale nuclear electric generating station that the company will construct, subject to Atomic Energy Commission approval of the project, for the Commonwealth Edison Company near Chicago, Ill.

Plans for the plant set the generating capacity at 180,000 kw, the largest all-nuclear station yet scheduled. The plant will be located on a 750-acre site near the confluence of the Kankakee and Des Plaines rivers in Grundy County, Ill., and will be owned and operated by the Commonwealth Edison Company.

The new power reactor design will be able to produce several times as much power in a given size as its predecessor, the direct boiling reactor. The General Electric dual-cycle boiling reactor is a type expected to achieve competitive generating costs with ordinary steam power plants in succeeding models.

The reactor was described as capable of being used without heat exchangers by generating steam directly inside the reactor core, thus eliminating the need for high operating pressures and temperatures used in liquid-water-cooled power reactors.

The proposed Illinois station will be sponsored by the Nuclear Power Group, Inc., and will be financed completely with private funds. Sponsoring companies are: American Gas and Electric Service Corporation, Bechtel Corporation, Commonwealth Edison Company, Pacific Gas and Electric Company, Union Electric Company of Missouri, Central Illinois Light Company, Illinois Power Company.

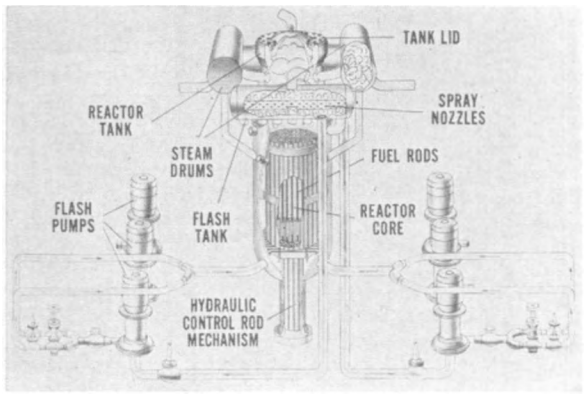
The original concept of the direct-boiling reactor, pioneered at the Atomic Energy Commission's Argonne National Laboratory by Dr. W. H. Zinn and associates, was adapted by General Electric for use in a large power station. In doing so, ways have been found to multiply the output of such reactors, permitting their application to large power plants on a commercial scale.

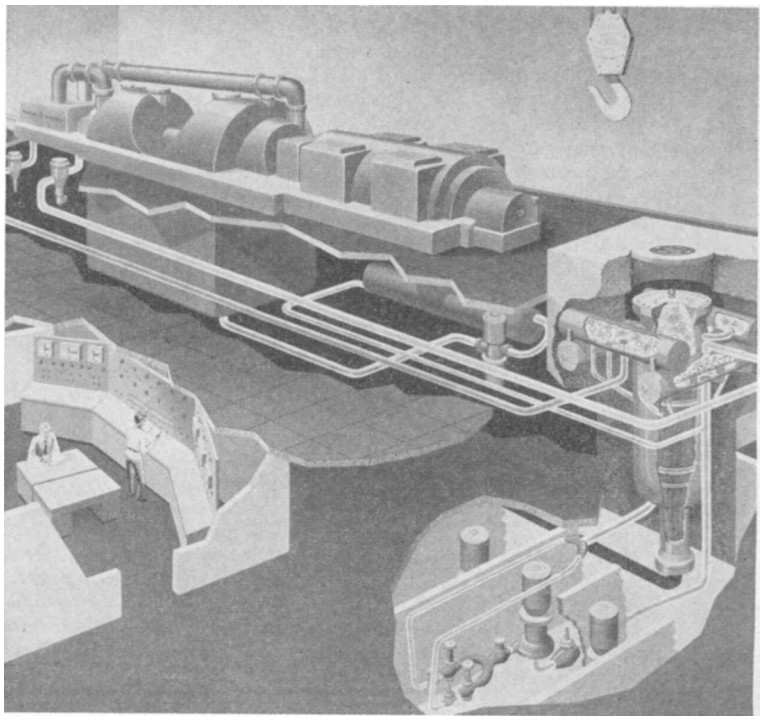
The inherent safety of the direct boiling reactor has been retained in the dual-cycle design, and at the same time stability with relation to load has been vastly improved. When increased load demands are made on the direct-boiling reactor, output tends to be reduced just at that point when power is needed most.

General Electric engineers introduced a "flash tank" system into the new reactor which controls steam formation by feeding cooler water into the entrance of the reactor as load demands increase. This maintains the delicate balance of the chain reaction in such a way that the reactor automatically delivers more power to supply the load increase. The dual-cycle reactor in effect, accommodates itself to the demands of the power system without requiring changes in reactor controls. Steam is provided to the turbine at two pressures; for example, 600 pounds per square inch from the reactor vessel for the first turbine stages, and 350 pounds from the "flash tanks" for immediate stages.

In contrast, nonboiling reactors cooled by high-temperature high-pressure water would have to operate under a pressure of approximately 2,000 pounds in order to generate steam at 500 pounds for use in the turbine.

The dual-cycle reactor also has the following advantages: (1) primary loop pressure essentially the same as turbine pressure; (2) good thermal efficiency for a given reactor temperature; (3) exceptionally high degree of inherent safety due to boiling in the reactor; (4) flexibility of operation to meet power demand changes without delay; (5) self-stabilizing power level to match load variations.





DUAL-CYCLE BOILING REACTOR details are shown in the drawing above. Water circulates up from bottom of main pressure vessel through reactor core and is converted into steam. Flash tank furnishes additional steam to turbine-generator and water at temperatures well below boiling to reactor. At right is an artist's conception of how the 180,000-kw dual-cycle reactor might look when coupled to a turbine-generator for production of power for home and industries. Water is boiled directly inside atomic reactor, right of picture, to produce steam that drives turbine-generator at upper left. Control panel for dual-cycle reactor is at lower left of the illustration. The new reactor will be used to power a proposed nuclear electric generating station.