New Nuclear Designs Ready To Power Economic Reconstruction

In America, Russia, and South Africa, companies have designed new nuclear reactors—small, inherently safe high-temperature modules, ideal for industrializing underdeveloped regions. Marjorie Mazel Hecht reports.

The fourth-generation high-temperature gas-cooled nuclear reactors are supersafe (actually meltdown-proof), modular, efficient, and cost-effective—and they can be on line within this decade. Their fuel is in the form of tiny particles encased in ceramic spheres, which serve as "containment buildings" for the fission products. The overall design of these reactors prevents them from ever getting hot enough to split open the ceramic spheres that contain the fuel. These reactors also have inherent and passive safety features, which shut the reactor down safely, without any human intervention, if there is a problem.

The new form of fuel containment—tiny ceramic spheres—also precludes the kind of terror scenarios projected in the case of an airplane attack on a nuclear plant.

The modular designs make these new reactors ideal for use in a developing country, where one module can be constructed at a site where others will be added, later, as the country's power grid expands. Their higher output temperatures also make them efficient to combine with industrial centers that can make use of their process heat. Modular high-temperature gas-cooled reactors are also most suitable for powering the proposed industrial corridors of the Eurasian Land-Bridge.

Enormous Potential Worldwide

Sixty years after the beginning of the fission age, the enormous potential of nuclear technology is still waiting to be explored and developed. Worldwide, instead of building 2,000 nuclear plants by the year 2,000, as envisioned by the optimism of the Atoms for Peace program in the late 1950s and early 1960s, the world has only 420 operating nuclear plants. The United States, which has 103 reactors, supplying about 20 percent of the nation's electricity, is in the midst of an energy crisis.

Although the rest of the world has continued to go nuclear, if at a very slow pace, no new nuclear reactor has been ordered in the United States since the 1970s. This was the result of a massive public relations campaign, scaring the public away from nuclear power, funded by the oligarchs who ran the ecology movement, including Prince Philip, Prince Bernhard of the Netherlands, and the huge U.S. foundations. At the same time, the Carter Administration, run by Zbigniew Brzezinski's Trilateral Commission and its plan for a post-industrial economy in the United States, paralyzed long-term investment with interest rates of 20% or more, and time-consuming regulations that dragged out nuclear constuction, vastly increasing the cost of nuclear plants. The last U.S. nuclear plants built took 20 years to come on line. In contrast, French nuclear plants of similar size were put on line in five years.

The fourth-generation modular nuclear plants can begin to fulfill the intentions of Atoms for Peace in this decade. South Africa intends to develop a capability for mass producing as many as 30 Pebble Bed Modular Reactors per year for export! General Atomics, in the United States, is also interested in mass production for the GT-MHR. Other advanced reactor designs are available—from conventional light water reactors to breeder reactors—and, in fact, such reactors are under construction now in India, China, and Japan, with many other nations, from Vietnam to Mongolia, discussing going nuclear.

Described here are two fourth-generation reactors, the Gas Turbine-Modular Helium Reactor (GT-MHR), under de-

velopment by the San Diego-based General Atomics company, and the Pebble Bed Modular Reactor (PBMR), which is being developed by the South African government. The reactors are similar in concept, but have different fuel configurations.

Walter Simon, a senior vice president at General Atomics who has worked with high-temperature gas-cooled reactors for 40 years, discusses why GA's reactor is being built in Russia, and will use weapons-grade plutonium as its fuel source.

South Africa's PBMR Is Moving Ahead

The Pebble Bed Modular Reactor (PBMR) now under development by South Africa's electricity company, Eskom, is a 110 megawatt-electric (MW-e) design. This type of reactor was developed in Germany, but Eskom has added new technologies, such as the direct-cycle helium turbine, to make the reactor more efficient.

Eskom's partners in the PBMR project include South Africa's Industrial Development Corp., British Nuclear Fuels Ltd., and the U.S. company, Exelon.

The initial feasibility report for the PBMR in South Africa has been completed, and the detailed feasibility report has been reviewed by the investor groups, and is now before a 14-member panel of international experts appointed by the South African government.

According to PBMR spokesman Tom Ferreira, "The feasibility study has confirmed that there are no unresolvable issues. The investors have indicated that they remain positive about the PBMR's potential and toward the end of the year will make decisions about the way forward for the project."

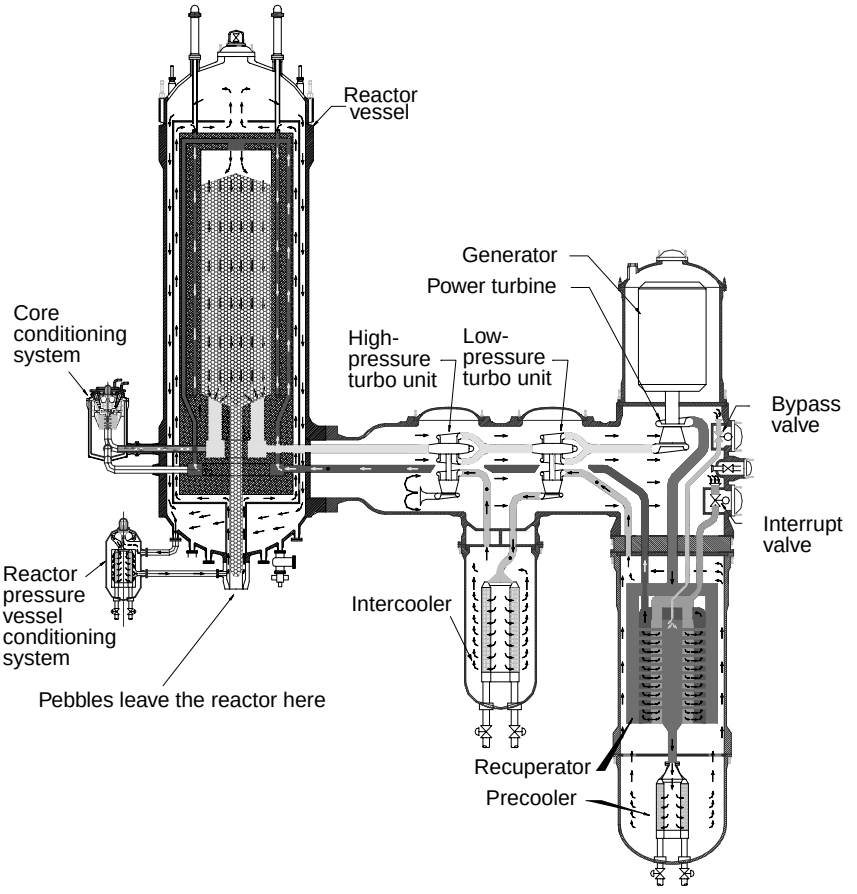
Ferreira said that "the investors are taking a cautious and prudent approach to satisfy themselves that all the remaining technical and organizational uncertainties surrounding the project are resolved to the appropriate degree, before committing funds to the construction of the first reactor."

The next phase of the project is more detailed engineering and planning work. In addition, there will be a round of public meetings on the environmental impact assessment early this year. "It is hoped that the South African government and the shareholders will give the green light for the building of a construction module before the end of 2002," Ferreira said.

Because of its small size and low cost, the PBMR is an ideal design for developing nations, which have electricity grids that may be too small, initially, to handle a larger plant. These countries or regions can add PBMR modules as needed. To reach higher powers, Eskom envisions siting as many as ten PBMR units at one location, with a common control room.

Eskom anticipates exporting up to 30 PBMR modules a year once the program for mass production is under way. Because of the economies of mass production of standardized modules, Eskom has estimated a total cost of PBMR-generated electricity at less than 1.6¢ per kilowatt hour. (Now, most U.S. consumers are paying 8¢, or more.)

FIGURE 1
Cutaway View of the PBMR



Source: Courtesy of Eskom.