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Science & Technology

Carter policy challenged on breeder reactor

by Vin Berg

On the tenth of November, a special task force operating in secret under the Carter White House and the National Security Council will report to the President on how he can kill the fast breeder reactor, despite the overwhelming clamor for its development. Idaho Senator-elect Symms is credited with disclosing the existence of a secret NSC memo to that effect, and the formation of the task force to carry out the project-termination order immediately after the general presidential election.

Carter had hoped that the International Nuclear Fuel Cycle Evaluation (INFCE) study issued at the end of February in Vienna, Austria, would advise against breeder reactor development in the name of "nuclear nonproliferation." Instead, the 66 nations and five international organizations that participated in that 2½-year study—at Jimmy Carter's request—repudiated his policy by proclaiming the breeder essential to the future of nuclear power.

In response, Carter and National Security Adviser Zbigniew Brzezinski have moved stealthily against the breeder program in the United States anyway.Whether Carter's electoral loss, or "transition" activity by the incoming Reagan administration, will now deter the "lame ducky" forces in the White House remains to be seen.

The breeder's potential

The United States will not have adequate energy supplies in the near future, and cannot experience the economic benefits of growing nuclear exports, unless the nuclear fuel cycle is closed through two actions required of the President and the Congress.

- Construction of facilities for reprocessing of spent nuclear fuel, now 75 percent complete in Barnwell, South Carolina, must be completed now, while planning, siting, and construction of additional facilities are gotten under way.
- The development of a commercial plutonium fast breeder reactor at Clinch River facilities in Tennessee, delayed in the same April 1977 presidential order that halted Barnwell construction, must proceed on the basis of an upgraded timetable and quality of design.

Without the combined application of reprocessing technology and breeder reactors, the world's nuclear industry in little more than a decade will grind to a halt as it intersects the resource limitations inherent in existing nuclear technology. At present, the light water reactors in use in the United States depend on that small amount of naturally occurring uranium-235 that makes up the nuclear fuel component in world uranium ore reserves; it will be gone shortly after 1990, even if there is no significant increase in nuclear power use.

This does not mean, however, that nuclear energy is doomed to an early demise. At one time, there were other naturally occurring fissionable isotopes that could have been used as a fuel, for example, U-233 and plutonium-239 (Pu-239). Their half-lives, however, were shorter than that of U-235, and they decayed away long before mankind appeared to make use of them. But they can be *recreated* today using the neutrons generated by fission reactions.

One method for obtaining these isotopes involves reprocessing of spent fuel. In a light water reactor, fission reactions in U-235 fuel gradually produce Pu-239, so that when the spent fuel is removed from the reactor, it contains some leftover U-235, the more common U-238, and the newly produced Pu-239 which can be extracted and refabricated into new fuel.

In short, what is commonly thought of as "nuclear waste" is not waste at all. As much as 96 percent of spent fuel can be reprocessed and recycled back into reactors as new fuel. Put differently, when President Carter ordered a halt to the Barnwell, South Carolina reprocessing facility, he reduced the fuel resources available to the nuclear industry by 25 times, increased the sheer volume of what is designated "nuclear waste" by 25 times and ironically, later refused to make a decision about where this "waste" was to be buried.Over the 40-year lifetime of a single 1,000 megawatts-electric nuclear power plant, this comes to the equivalent of more than 130 million barrels of oil or 37 million tons of coal.

There is a second method of obtaining new fuel: fast breeder reactors. This new technology, now being aggressively developed in other nations, three of which, Great Britain, France and the Soviet Union, are ahead of the U.S., is even more efficient than reprocessing methods applied to light water reactor spent fuel.

The fast breeder reactor is a more advanced or "next generation" nuclear fission power reactor which operates in similar ways to current light water reactors. But the breeder has two important advantages.

First the fast breeder reactor has a much higher

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power density. Its use of higher-energy neutrons, called "fast" neutrons, permits a much more efficient fission process for electricity generation. Second, the breeder reactor is able to actually create or "breed" new fissionable fuel. What distinguishes the breeder from other reactors that also convert fission products back into fissionable fuel is that the breeder reactor actually "breeds" more fissionable fuel than it burns up in the course of its operations.

In the Clinch River design, the breeder's fast neutrons provide a large, high-energy neutron flux that escapes the core region and is captured in an adjacent "breeding blanket" composed of uranium-238, which makes up 99 percent of uranium ore reserves. The interaction of fast neutrons with U-238 produces Pu-239, the excellent fissionable fuel that no longer occurs naturally.

Thus, one breeder reactor, producing more fuel than it consumes, can not only keep itself going but provide enough fuel for another breeder or light water reactor. In some second or third generation designs, one breeder will produce enough fuel to fire three or even four additional reactors. On the basis of existing reserves of naturally occurring U-235, the breeder reactor will increase available nuclear fuel supplies by 70 times!

The importance of breeder technology to a world confronting limited uranium supplies could not be more obvious.

Weapons proliferation

The nonproliferation argument has been used by the National Security Council to prevent export of even light water reactors to Third World nations. Four percent of their spent fuel is Pu-239, the material used today in nuclear bombs.

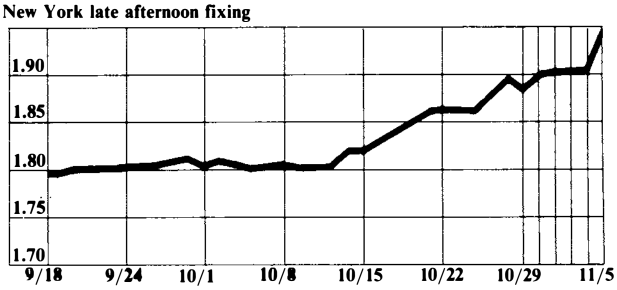
The possibility of plutonium diversion to weapons applications is very small, because such diversion is extremely uneconomical in light water or breeder reactors *that have not been designed to produce bomb material.*

An enormous outlay of funds, skilled manpower, and special equipment is required. The radioactive plutonium-bearing fuel can only be handled by remote operations in sealed and shielded cells and containers. The chemical processing operation to extract Pu-239 would require skill in the remote-operation chemical processing technique that produces a plutonium oxide or nitrate compound.

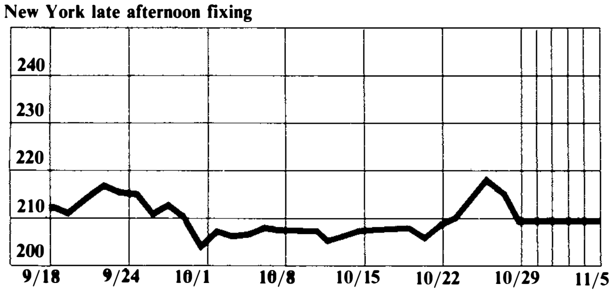
Since this is well known among specialists, the "nuclear proliferation" argument against nuclear exports and breeder development is raised principally by those who either seek to prevent underdeveloped nations from obtaining nuclear technology for peaceful economic development, or to undermine the export basis of advanced nations' nuclear industries.

Currency Rates

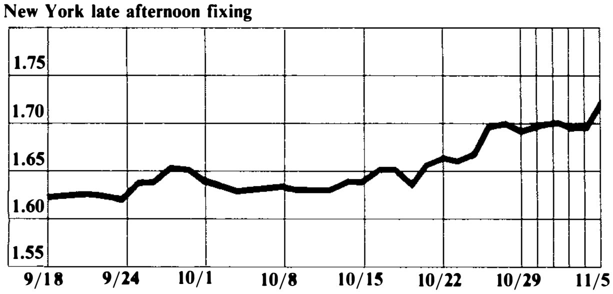
The dollar in deutschemarks
New York late afternoon fixing



The dollar in yen
New York late afternoon fixing



The dollar in Swiss francs
New York late afternoon fixing



The British pound in dollars
New York late afternoon fixing