

# Civex Technology Clears Way For Breeder

The unveiling a few weeks ago of a "proliferation-proof" nuclear fuel reprocessing cycle for the fast breeder reactors has undermined the primary rationale which the Carter Administration has used to support its opposition to this advanced energy production technology.

The new process, called Civex, makes it virtually impossible for plutonium, the chief ingredient of fast breeder fuel, to be diverted into nuclear weapons production. The process defeats the shaky supposition that breeder plutonium could be diverted to "bomb-quality" material, an already ridiculous argument which has been used to stop nuclear development.

The reprocessing cycle was unveiled at a press conference on the first day of the Energy Technology Conference in Washington, D.C. on Feb. 27. The announcement was made jointly by Dr. Walter Marshall, deputy chairman of the United Kingdom's Atomic Energy Authority,

and Dr. Chauncy Starr of the U.S., president of the Electric Power Research Institute (EPRI).

Here is a report on the Civex process, its technology, its potential, and its critics, by nuclear engineer Jon Gilbertson of the Fusion Energy Foundation.

## How the Civex Process Works

The Civex process underscores that the solution to all technical problems of nuclear energy development lies in advanced technologies. Not only does Civex eliminate the so-called proliferation issue, but it takes the world further in the direction of more efficient, highly automated, closed-cycle industrial systems — exactly the way industrial development must progress if it is to meet

Figure 1

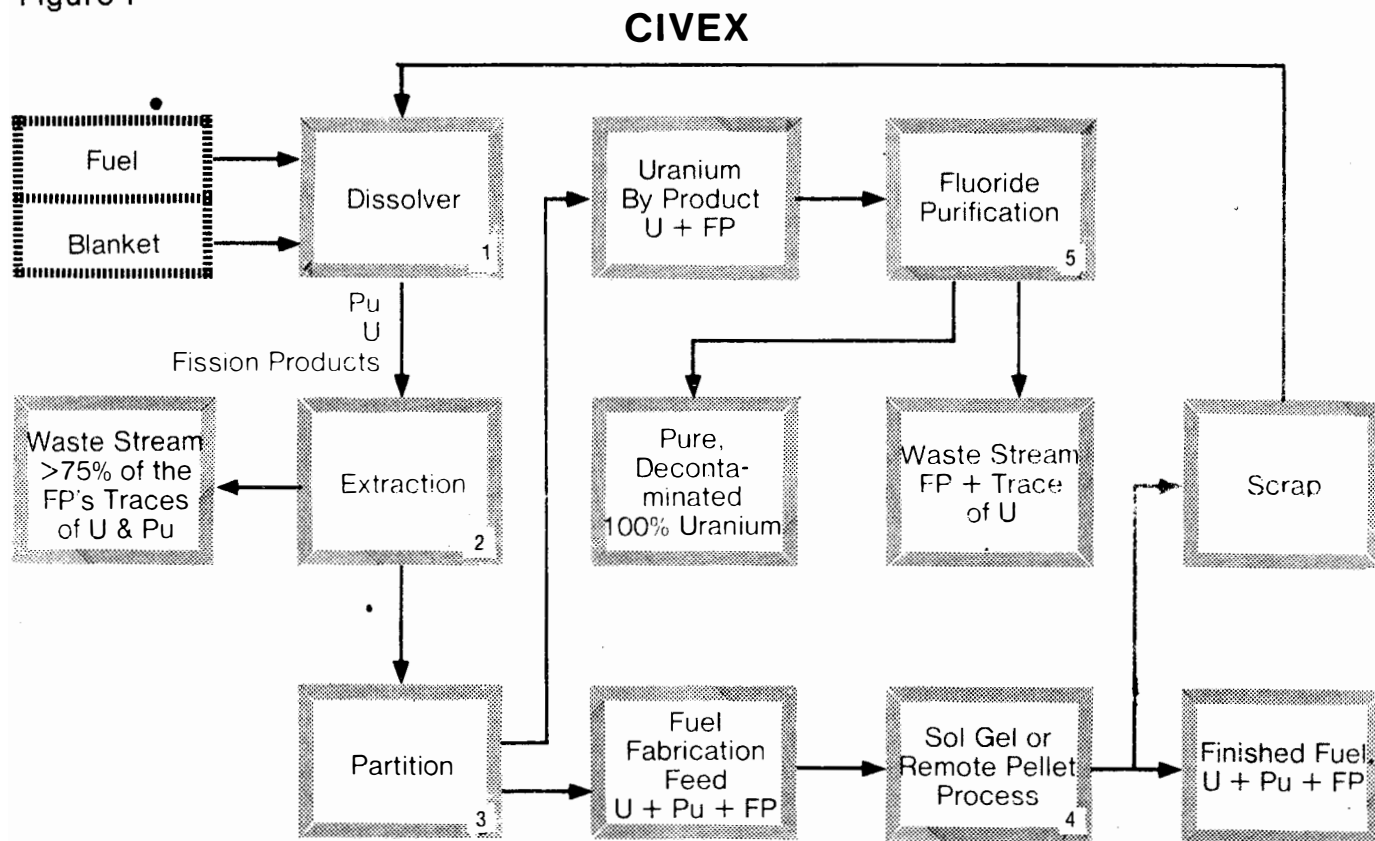
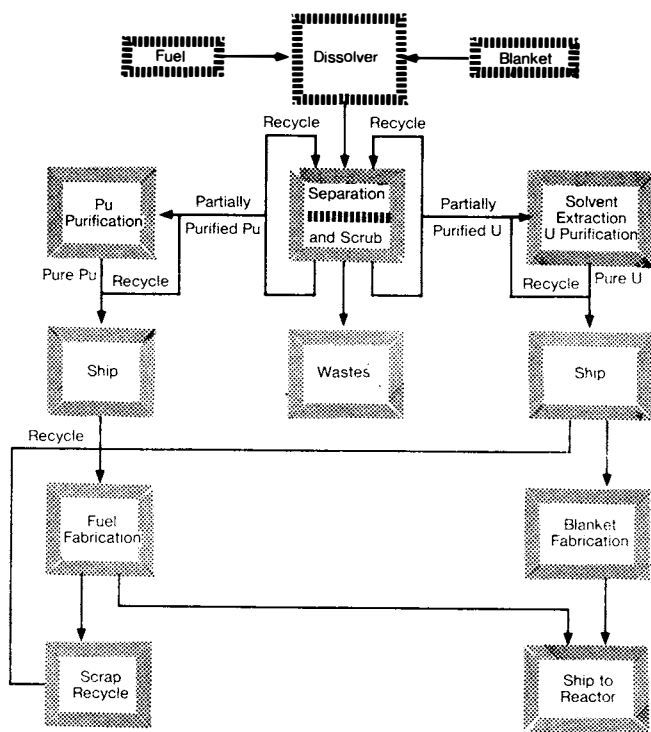


Figure 2

## PUREX



the future world demands for energy, capital goods, and agricultural products.

This and similar processes brings us another major step into the transition towards a fusion-based economy in terms of providing the new technologies, the higher skilled manpower, and the engineering capabilities that will be needed for the most advanced and efficient form of breeders — i.e., the fusion-fission hybrid reactor, and eventually full fusion reactors themselves.

Civex (Figure 1) is different than the Purex process (Figure 2) now being used, in that plutonium is never concentrated in the plutonium-uranium fuel mixture beyond 15 to 25 percent, i.e., that mixture required for new fast breeder fuel. It takes over a 60 percent concentration to make nuclear weapons. Furthermore, some of the most radioactive fission products (ruthenium, zirconium, and niobium) are left within the fuel mixture when it is refabricated into new fuel, thereby making it impossible for anyone to get anywhere near it without a several foot thickness of concrete. The Purex process completely separates *all* fission products from the new fuel mixture.

This high radioactivity combined with the design of the Civex process, which is a completely remote operation, fully self-contained, fully automated closed cycle, makes it "terrorist-proof" as well.

Under Civex most of the fission products are separated from the fuel mix (as in the Purex process), stored in a concentrated liquid form in tanks for five years, and then stored in a more concentrated solid form for several hundred years, underground. This is the most efficient and economic way to handle the storage of nuclear wastes. The fuel mixture (plus selected fission products)

is refabricated into new fuel elements within the Civex plant and recycled back into the fast breeder reactors.

The major advantage of the fast breeder reactor compared to the current Light Water Reactors (LWRs) is that the breeder can expand the supply of reactor fuel by over 70 times by "breeding" plutonium out of the abundant but now useless uranium-238 isotope. LWRs are now fueled by uranium-235, the only naturally occurring fission fuel, which makes up less than one percent of mined uranium and is expected to be in very short supply by the end of this century.

The Purex process is now only a fuel reprocessing plant, while the Civex process will, as a minimum, combine the fuel reprocessing and fuel fabrication operations. That is, highly radioactive burned-up fuel will enter one end of the plant while highly radioactive new fuel will leave the other end, with no personal access to it in between. Furthermore, the cycle can be completely closed if the "reactor park" concept is used. Here, several fast breeders and a Civex plant will occupy the same site and will be completely interconnected from the time the fuel is removed from the reactor core until it returns.

The issue is therefore not whether such a system is technically feasible, but whether an economically desirable commercial large-scale Civex system can be developed. Preliminary estimates of the costs of Civex versus those of the standard Purex process have indicated roughly comparable total costs. The normal process operating costs for Civex will be much less than for the Purex process because the plant is about half the size. That is, the number of separation-process streams are reduced by about half, since plutonium, uranium, and some fission products are now coprocessed rather than removed separately. On the other hand, the remote fabrication techniques required in Civex will make capital costs considerably higher than for Purex. On balance, therefore, the total costs appear to be about equal, within a range of 20 percent. However, as the automated Civex processes gain commercial operational experience and as mass production is introduced, its costs can be expected to decrease.

## Zero Growther Attacks Civex

It was inevitable that the hardbitten advocates of energy no-growth would react to the announcement of the Civex breakthrough with outrage — and, of course, with a fresh batch of untruths about the insurmountable "proliferation" and environmental dangers of this and every other form of nuclear power.

Setting the tone (see box) was New Directions, which the day of the press conference announcing Civex rushed out a statement attacking the proposal. New Directions is the "lace-curtain" end of the most sinister and most significant current in the environmentalist movement, the faction most firmly devoted to negative growth, in energy, in Third World development, in the U.S. economy, in global living standards. As its leaders it brings members of the terrorist command center, the Institute for Policy Studies, and social-control ideologue Margaret Mead together with men like cold warrior Paul