

# NRC Shuts Down Submarine Fuel Plant

*New discrepancy in uranium inventory points up the problem of nonproliferation safeguards*

The Nuclear Regulatory Commission (NRC) has ordered a temporary shut-down of a nuclear fuel fabrication plant in Erwin, Tennessee, on learning that the latest inventory indicated that the plant had at least 20 pounds less high-enriched uranium than it was supposed to have. This is potentially enough to make an atom bomb.

The storage adds to accumulated inventory losses at Erwin of 246 pounds over the past decade. Although theft is not suspected, the episode highlights the difficulties of inventorying and thus safeguarding sensitive nuclear materials. It has implications for the sharing of nuclear technology, for if an advanced nation like the United States can't keep track of its weapons-grade nuclear materials, can any better be expected of a developing nation?

The Erwin plant, operated by Nuclear Fuel Services Corp. and known as NFS-Erwin, is one of a dozen private facilities licensed by the NRC to handle weapons-grade nuclear materials. An old plant, constructed in 1956 to fabricate submarine fuel when Admiral Rickover's nuclear submarine program was launched, NFS-Erwin is notorious for having problems with its material accounting and control procedures, which the NRC considers essential components of efforts to ensure the security of weapons-grade material. The Natural Resources Defense Council (NRDC) has been pestering the NRC to upgrade security for this group of plants, and has specifically—most recently in a 29 August letter to NRC commissioners—demanded that NFS-Erwin's license be revoked. Erwin was shut down before, in 1975, when the inventory revealed a surplus of uranium (according to one source, NFS-Erwin has closed down informally a number of times because of "ID's," or inventory differences). According to Thomas B. Cochran of the NRDC, Erwin has a history of "fairly wild oscillations" in its inventories, ranging up to an MUF (material unaccounted for) in 1968 of 74 kilograms. After the NRC took over from the Atomic Energy Commission in 1975, it estab-

lished 9 kilograms (19.8 pounds) as the MUF threshold, over which the plant would be required to be shut down for reinventory. "What's significant this time," says Cochran, "is this plant is probably not going to reopen." An NRC source was also quoted in one news account as saying, "Given the long history of inventory discrepancies at the NFS facility, there really is a question whether the plant will operate again."

The Erwin closing once again points up the difficulty, and perhaps impossibility, of making accurate inventories of uranium in such complex processes. The Erwin facility handles uranium in solid, liquid, and gaseous form; it also recycles much of its material, which makes material accounting exceedingly elusive. Doing inventory has been described by an NRC public relations man as something like "balancing your bank account"; however, according to William J. Dircks of NRC's Office of Nuclear Material Safety and Safeguards, it is a little more complicated. "We're not counting discreet items," he says, "we're really estimating the amount of uranium atoms that may be within the system at any one time. It's more like putting a net in a tank where you think you have a certain number of fish, and taking a statistical sample to see if you have the number of fish per meter that you think you should have. If the fish are all at the bottom feeding, or stuck somewhere," then you have a problem. So Erwin is flushing through all its miles of piping "to see where the fish are hiding."

One never knows how much apparently missing uranium may be caught in the pipes or tanks, lost in scrap, floating around in the air, or a figment of prior miscalculation. There is also the possibility of random measurement errors and bias in measurement instruments or—the possibility that all these measures are designed to detect—of diversion or theft. A small inventory difference may be just as significant (or insignificant) as a large one, says Cochran: "If there are small inventory differences there is no theoretical way of knowing if it's the sum of a positive diversion and a negative random

variable." So, he says, "because random errors and biases are so potentially large, they totally mask any diversion that might be taking place."

For these reasons, according to Cochran and other critics, the elaborate measures taken by NRC to investigate the matter are little more than a charade. "Shutting down is just a temporary measure until they explain it away." In a sarcasm-tinged letter to NRC commissioner Victor Gilinsky in 1978, Cochran wrote, "under present NRC practices, the MUF game is played as follows: When the MUF exceeds [the alarm threshold] the facility is shut down. A big review is launched. Several possible loss mechanisms are 'discovered' or 'postulated,' and then, casting all logic aside in one mystical leap, the NRC staff concludes the MUF is due to one or more of these loss mechanisms and there is 'no evidence of diversion.' Through this mechanism the MUF is 'explained,' i.e. reduced to less than [the alarm threshold] and the facility is allowed to reopen."

A former NRC safeguards official characterizes the procedure as follows: "The NRC shows the flag and sends a task force to investigate, they have one or two reinventories, they find or lose 3 or 4 kilograms and arrive at a final figure. They then look at the whole operation and say the material unaccounted for could have disappeared into the river or hung up in the pipes or whatever, but say they find no direct evidence of theft or diversion. It's just a ritual with a lot of thrashing around, with letters from congressional oversight committees demanding to know what's going on. Then they go back to making fuel for the Admiral until the next episode two or three inventories later. It's a ho-hum thing for everybody in the system. The fact of the matter is they are playing a game and nobody really believes in the accounting system."

Cochran and the former official, in short, have two complaints about the inventory system. One is that the uncertainties are large and probably irreducible, so it cannot accurately reveal

*(Continued on page 32)*

(Continued from page 30)

whether material has been diverted. The other is that no one pays sufficient attention to the matter of physical security. Says the ex-official, "NRC and DOE have wasted millions of dollars a year trying their damndest to improve material control and accounting—money that would be far better spent in adding more sophisticated physical security measures." He says the NRC "mind-set" is comparable to their attitude about reactor safety before the Three Mile Island episode. Any discrepancies are regarded as "just another glitch in the system" because diversion could not happen. Cochran, for his part, quotes an NRC memorandum about Erwin to the effect that officials "have not yet identified the causes of the large ID fluctuations . . . [or] identified any fact that leads us to believe that strategic special nuclear material has been stolen or diverted. It, therefore, is the NRC staff judgment that the safeguards system in place at NFS has been effective in preventing the theft or diversion of a significant quantity of strategic special nuclear material." Cochran sums up this statement as meaning: "we don't know the reason for the ID so we assume there has been no diversion."

The NRDC and some people within the federal government believe that one way to improve the situation is to transfer the four NRC-licensed facilities that are involved in fuel cycle operations for the nuclear submarine program to the Department of Energy, which oversees most facilities involved in nuclear work for the military. The former safety official contends that "they are a continual embarrassment to the NRC," which is basically in the business of regulating civilian nuclear power facilities. Even if accounting procedures are sloppy, "the NRC can't shut these plants down permanently. In the minds of the American people the operation of these plants is an accepted imperative. If shutting them down means putting a crimp on the Admiral's fuel-making capacity you can be sure it won't happen." In his opinion, "Erwin doesn't belong under NRC jurisdiction any more than Rocky Flats does." Cochran concurs, saying, "the present system is making liars out of honest men—the NRC feels obligated to keep the plants operating for national security reasons even if it means they have to fudge on safeguardability." He adds that if a plant such as the Erwin one were removed to a military reservation,

physical security could be enhanced.

According to a government expert on arms control, the problem at Erwin has "important implications for proliferation policy. There has been a lot of talk recently about multinational plants to make plutonium processing facilities [in nonnuclear weapons states] safer. Here we have an example of a plant in a very sophisticated country having inventory problems. It reemphasizes the problem of whether anyone can make facilities with weapons-grade nuclear materials safe." So, he says, it bolsters the case for avoiding commitments to reprocessing facilities and breeder reactors, both of which produce weapons-grade fuel. "If we introduce weapons-usable materials into civilian nuclear power there will be orders of magnitude more material than goes through the Tennessee plant. . . ." So, "maybe we should limit ourselves to low-enriched uranium for civilian nuclear power."

As for NFS-Erwin, Dircks of NRC sounded stern about its future. "We have been very critical of their operations and have told them they are living on a short tenure till they have convinced us that they can control that plant."—CONSTANCE HOLDEN

## Relaxation Seen in Nonproliferation Policy

*Rowen and Wohlstetter criticize shift from "policy of denial," but Ford study calls for a "less heavy handed approach"*

During the first 2 years of the Carter Administration, the U.S. position on the link between nuclear power and nuclear weapons proliferation became what some have called a "policy of denial." That is to say, the government, in the Nuclear Nonproliferation Act of 1978, adopted policies that would, as a general rule, seek to deny to nonnuclear weapons countries access to nuclear fuels and equipment that could be readily used to make nuclear weapons. But, accordingly to some nongovernment critics, the State Department officials charged with implementing the policy are now trying to make it more flexible and permissive.

Opinion is divided both inside and outside the government as to the wisdom of the perceived change, and the stage may be set for a review of the policy. Two recent reports reinforce the opposing sides in this emerging debate. One is a con-

tract study by two prominent academic specialists on nonproliferation issues, Henry Rowen of Stanford University and Albert Wohlstetter of the University of Chicago; they argue strongly against the apparent relaxation of the U.S. position. The other is a Ford Foundation-sponsored report on energy policy (see box); it maintains that a policy of denial is mistaken and counterproductive.

The Rowen-Wohlstetter study was commissioned by the Department of Energy (DOE), the National Security Council (NSC), and the Council on Environmental Quality (CEQ). It came about as the result of conversations more than a year ago between Jessica Mathews, then of the NSC staff (and now an editorial writer at the *Washington Post*), and Gus Speth, a member of CEQ who had long been concerned about the hazards of a "plutonium economy." A trenchantly

worded document, the study warns, in effect, that America's nonproliferation policy is being compromised:

The U.S. position . . . has been undergoing a significant shift in recent months. The direction of this change is on the whole backwards; like the pre-1976-77 position, it would permit ready access to nuclear explosive materials to nonweapon states. Faced with opposition, U.S. spokesmen on these matters have been shifting from a position of opposition to fuel cycles that increase access to readily fissionable materials to trying to win international acceptance of the position that this access is appropriate for industrialized countries but not for developing ones. Moreover, they are increasingly asserting that these materials will be safe enough if "controlled" by international organizations. This exercise in line drawing seems virtually certain to fail.

(Gerald Oplinger, an NSC staffer, told *Science* that "it's probably a bum rap" to suggest that there has been a deliberate attempt to change the policy on non-