



WARHEAD PLUTONIUM DISPOSITION AND COMMONWEALTH EDISON

I. Introduction to Warhead Plutonium Disposition Issues

A. Background and Recent Congressional Action

With the end of the Cold War, the United States and Russia confront the question of how best to dispose of surplus military plutonium. Spherical "pits" of plutonium metal---a highly toxic element produced in nuclear reactors---form the explosive core of most nuclear weapons in the U.S. and Russian arsenals. A mere 15 pounds of plutonium, an amount the size of an orange, is enough to produce a bomb capable of destroying an entire city.

To date, President Clinton has declared 45 metric tons of plutonium surplus to defense needs, out of a total U.S. stockpile of about 100 tons. The U.S. Department of Energy anticipates that eventually a total of 50 tons of plutonium will be declared surplus and require disposal. Though the Soviet Union produced considerably more military plutonium than the United States, Russia is also expected to plan disposal of at least 50 metric tons.

No treaty has been concluded between the United States and Russia to govern the disposal of surplus weapons materials, although bilateral technical discussions continue. Neither START I nor START II addresses the issue of warhead material disposition, although START III would require the actual destruction of warheads under the terms of the treaty and prohibit the re-use of their fissile materials in new weapons, according to recent summit agreements between Presidents Clinton and Yeltsin.

Unlike highly enriched uranium, the other nuclear-weapon-usable fissile material, warhead plutonium cannot be blended down into a form unsuitable for conversion into weapons. Virtually any isotopic mix of plutonium can be used to make a bomb. It is necessary, therefore, to put plutonium into a form that makes its recovery for re-use in weapons difficult. The U.S. National Academy of Sciences (NAS) has recommended a "spent fuel standard": warhead plutonium should be put in a form that makes recovery and re-use in weapons as difficult as the recovery of plutonium from the highly radioactive spent fuel of nuclear reactors.

Two sets of technologies have been identified as the most feasible for the plutonium disposal mission. The first is immobilization---combining the plutonium with highly radioactive waste for disposal in a geological repository. This approach involves mixing plutonium with, or encasing it in, glass or ceramic logs containing highly radioactive fission products that would provide a radiation barrier against theft or recovery of the plutonium. The other is combining with uranium into mixed-oxide (MOX) fuel, which would be irradiated in existing nuclear power reactors. Either waste form (immobilized glass logs or spent MOX fuel) would be highly radioactive and require disposal in a nuclear waste repository.

B. Congressional Action

Congressional action to date on plutonium disposition has been limited to funding DOE's Office of Fissile Materials Disposition, and mandating that DOE conduct studies of all disposition options, including General Atomic's gas-cooled reactor, and a "triple-play reactor" option that would use

warhead plutonium MOX fuel in commercial nuclear power reactors to also produce tritium, a radioactive gas used in nuclear weapons.

C. The Clinton Administration's Approach

In December 1996, the Department of Energy (DOE) issued its final programmatic environmental impact statement (PEIS), the product of a three-year assessment of plutonium disposition alternatives. In January 1997, outgoing Energy Secretary Hazel O'Leary issued a record of decision (ROD) favoring a "dual track approach." Some 17 tons of plutonium would be immobilized, while the majority of the surplus plutonium (some 33 tons) would be fabricated into MOX fuel for use in U.S. (and possibly Canadian) commercial nuclear power reactors.

Despite a pledge by Secretary O'Leary in December 1996 that DOE would study both options for another two years, leading to a final Presidential decision in 1998, DOE officials have since stated that there will be no further study. Instead, implementation of both options will begin immediately, with DOE possibly even concluding contracts during FY98 with nuclear electric utilities and with contractors for construction of a MOX fuel fabrication plant.

II. Why Immobilization is a Better Approach than MOX

A. It's Faster

DOE's own studies show that the immobilization approach could get started six years earlier, and be finished 13 years sooner, than the MOX approach. The sooner plutonium can be disposed of, the sooner we can make the arms control and disarmament gains of recent years permanent.

B. It's Cheaper

Assuming utilities insist on fees to irradiate MOX fuel, and insist on receiving that fuel at a substantial discount over the price they would have paid for uranium fuel, DOE's own studies suggest that the MOX approach could cost as much as \$2.6 billion---two and a half times more than the immobilization approach. Subsidies to keep uneconomic reactors operating could increase this cost by billions of dollars over the next 20 years.

C. It's Safer

Neither the United States nor Russia have had significant experience with MOX fuel in light-water reactors, the type of reactor used in commercial nuclear-power plants, and there is no experience anywhere with use of weapons-grade plutonium in MOX fuel.

Use of MOX fuel:

- Reduces the stability of reactor cores, so that operators have less time to respond and maintain safety in the case of rapid changes in the state of the reactor;
- Increases the severity of certain accidents, such as those that cause a sudden cooling of the core;
- Increases the amount of certain extremely toxic radionuclides in the reactor core by a factor of five. In a catastrophic loss-of-containment accident, these additional radionuclides could increase the consequences by anywhere from 10 to 50 percent, and result in additional thousands of latent cancers.

D. It's Best for National Security, Non-Proliferation, and Arms Control

Most serious, the "dual-track" approach does not account for the MOX option's severe proliferation risks. The MOX option would clearly encourage the civil use of plutonium, as Arms Control and Disarmament Agency Director John Holum warned in a memorandum to Energy Secretary O'Leary last November:

I recommend strongly that you reject the hybrid option and select immobilization. . . .
U.S. decisions on plutonium disposition are inextricably linked with U.S. efforts to

reduce stockpiles as well as limit the use of plutonium worldwide. The multi-decade institutionalization of plutonium use in U.S. commercial reactors would set a very damaging precedent for U.S. nonproliferation policy. *In contrast, an immobilization-only alternative would have no proliferation downside for either the U.S. or for influencing Russia, and potentially could have important benefits in supporting our continuing efforts with Russia to secure its stockpiles of weapon-usable material.* [emphasis in original]

Although Holum was forced to back down under severe pressure from the White House and other agencies, it is clear that such a sea change in U.S. policy would confuse and complicate U.S. nonproliferation diplomacy. It would send the wrong signal to Western Europe, Japan, and other non-nuclear-weapon states. The MOX option also presents a greater risk of diversion primarily because of the fuel-fabrication stage, a process that is difficult to safeguard effectively. Such uncertain verification could severely limit the trust nations place in an international nuclear arms reductions and nonproliferation regime.

II. Specific Concerns About Commonwealth Edison's Participation in a MOX Disposition Program

ComEd is heading up "Project PEACE," a consortium that also includes Duke Power, British Nuclear Fuels Ltd. (BNFL), and COGEMA. The latter two corporations are the world's largest commercial reprocessors of spent fuel to separate plutonium. Mike Wallace, a senior vice president at ComEd, is the chair of the Nuclear Energy Institute's Plutonium Working Group, a nuclear industry group working to pave the way for use of MOX fuel in the United States.

We contend that ComEd is a wholly inappropriate candidate for MOX use for the following reasons:

A. ComEd's safety performance is "dismal" and not improving

- Since March 1996, the NRC has fined ComEd more than a million dollars.
- Six of its 12 reactors are currently on NRC's "watch list," including two LaSalle plants that ComEd proposes for MOX.
- Numerous safety incidents have occurred at each of its 12 reactors over the last several years.

B. ComEd's MOX mission could divert ComEd and NRC resources from improving safety performance

- In a 1992 paper on ComEd's safety problems, NRC staff noted that "[t]he corporate organization seems to overemphasize the development of new programs rather than focusing on good implementation of existing programs. When resources are needed to implement new programs, this stresses [ComEd]'s ability to complete existing programs."
- NRC staff also stated that "[e]xtensive participation in various industry groups and initiatives has further strained management resources." We are concerned that ComEd's MOX consortium, as well as NEI's Plutonium Working Group (chaired by Mike Wallace of ComEd), represent additional strains.
- Joseph Callan, NRC's executive director of operations, stated in April that ComEd's failure to improve performance is straining NRC's limited enforcement resources, with the Zion, Dresden and LaSalle stations each receiving almost 10,000 hours of direct inspection time, "roughly twice the inspection effort that average two-unit facilities would be receiving."

C. ComEd's MOX mission also raises important security concerns

- According to a 1994 General Electric study, ComEd's "position is that the MOX fuel bundles should be treated as normal reactor fuel once inside the facility protected area, and that existing plant security plans and handling processes are sufficient for protection of the fuel. This condition

can be accommodated by modifying the existing DOE regulations to exempt the MOX fuel for this program from the current safeguards requirements."

- Such a position is in conflict with the National Academy of Sciences' 1995 plutonium disposition study, which found an increased potential for diversion and theft of plutonium:

The biggest risks of these kinds involve the steps before the WPu [weapons plutonium] has been either irradiated in a reactor or mixed with radioactive wastes. *In order to ensure that the overall process reduces net security risks, an agreed and stringent standard of security and accounting must be maintained throughout the disposition process, approximating as closely as practicable the security and accounting applied to intact nuclear weapons.* [emphasis added]

- Given that weapons plutonium could be separated from fresh MOX fuel by straightforward chemical means, and that less than 12 pounds of plutonium is enough for a bomb that could destroy a city the size of Chicago, ComEd's cavalier attitude toward security arrangements for MOX fuel is unacceptable.
- There is also disturbing evidence that security problems fall on deaf ears at ComEd. The NRC found that ComEd's security firm illegally fired two supervisors in 1994 after they expressed security concerns about the Braidwood station (one of the sites ComEd has proposed for MOX fuel).

D. A ComEd MOX Program Could Require Hundreds of Millions in Federal Subsidies

- According to recent independent estimates, ComEd is burdened by more "stranded costs" (investment costs the utility may not be able to recover from ratepayers in a deregulated market) than any other electric utility in the country (over \$9.87 billion).
- A recent study projected that half of ComEd's nuclear units are economically vulnerable to premature shutdown.
- We are concerned that ComEd's financial weaknesses will ultimately be a drain on the financial resources of a plutonium disposition program. In fact, according to a 1994 plutonium disposition study conducted by General Electric, ComEd would require "financial incentives...sufficient to offset the business risks of committing to the [MOX] program." Ultimately, hundreds of millions of dollars in federal subsidies could be required to keep ComEd's nuclear power plants afloat for the duration of their plutonium disposition mission.

III. Recommendations

- Congress should prohibit DOE from concluding contracts in FY98 for construction of a MOX fuel fabrication plant or irradiation of MOX fuel in reactors. Such expensive and irreversible commitments are premature, and any contract decisions must await resolution of numerous problems with the MOX approach. O'Leary's original commitment for a two-year comparative study of the MOX and immobilization options should be reinstated.
- Congress should require DOE to place top program and budget priority on proving the immobilization option, with particular emphasis on the "can-in-a-canister" approach that is presently most promising, but exploring other immobilization options, including ceramic, as well.
- Congress should require DOE to make clear that when direct immobilization is validated, it will be used to its full potential with the goal of disposing of all excess military plutonium, including pits.
- Congress and DOE should make clear that the United States regards plutonium as a dangerous liability, not as a valuable energy resource. Congress and DOE should also make clear that the United States is strongly opposed to the commercial use of plutonium, and thereby deny European, Japanese and Russian plutonium interests any opportunity to exploit the dual-track approach to their advantage.

- Congress should work with the Administration to develop an attractive offer to Russia to participate in a joint, parallel plutonium immobilization program. Argonne National Laboratory has considerable technical expertise to contribute to such an effort.
- Because of its dismal safety and performance record, and its inability to improve this record despite repeated warnings from the NRC, ComEd should be disqualified by DOE and NRC as a candidate for MOX fuel use, if ComEd refuses to withdraw itself from consideration.

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