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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004  
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May 5, 1995

The Honorable Hazel R. O'Leary  
Secretary of Energy  
Washington, D.C. 20585

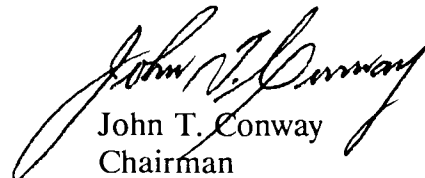
Dear Secretary O'Leary:

On May 3, 1995, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(5), unanimously approved Recommendation 95-1 which is enclosed for your consideration. Recommendation 95-1 deals with Improved Safety of Cylinders Containing Depleted Uranium.

42 U.S.C. § 2286d(a) requires the Board, after receipt by you, to promptly make this recommendation available to the public in the Department of Energy's regional public reading rooms. The Board believes the recommendation contains no information which is classified or otherwise restricted. To the extent this recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161-68, as amended, please arrange to have this recommendation promptly placed on file in your regional public reading rooms.

The Board will publish this recommendation in the Federal Register.

Sincerely,

  
John T. Conway  
Chairman

Enclosure

c: Mark B. Whitaker, EH-9

RECOMMENDATION 95-1 TO THE SECRETARY OF ENERGY  
pursuant to 42 U.S.C. § 2286a(5)  
Atomic Energy Act of 1954, as amended.

Dated: May 5, 1995

The three large gaseous diffusion plants that were operated by the Department of Energy (DOE) and its predecessors produced enriched uranium, some for defense use and some for incorporation into nuclear fuel for civilian reactors in the United States and other countries. In the course of isotope separation, most of the uranium ended up as the part depleted in U-235, designated as "tails" or "tailings". Enriched uranium at all desired assays was simultaneously extracted from the plants, for all purposes, and so no amount of tails can be identified as related to enrichment solely for either defense or civilian purposes. Most of all uranium ever mined in the United States or imported into the United States remains in tails at the gaseous diffusion plants. These tails are stored on-site at the three plants in large steel containers, normally termed "cylinders", as the chemical compound UF<sub>6</sub>.

Members of the staff of the Defense Nuclear Facilities Safety Board recently had an opportunity to visit the gaseous diffusion plants, to follow up on information that had been obtained on safety of storage of the tails. A short report documenting the results of their review is attached. It was found that DOE has approximately 50,000 cylinders in outdoor storage at the three diffusion plants, containing more than 500,000 metric tons of UF<sub>6</sub>. Poor maintenance and storage conditions, combined with mechanical damage suffered during handling, have led to corrosion and subsequent breaching of several of these carbon steel cylinders.

Cylinders have surface coatings (paint) of varying quality and integrity, which in a large number of cases is severely degraded. Cylinders are kept outdoors, some stacked on pads and some directly on the ground. Some older cylinders have been in storage in excess of forty years. Although general external corrosion seems to increase with time, handling damage and localized corrosion attributable to electrolytic attack appear to be more important factors in deterioration.

The corrosion-resistant coatings have not been maintained, leaving the vast majority of cylinders vulnerable to localized corrosion. Visual inspections have shown abundant pitting and crevice corrosion of the cylinders, as well as galvanic attack near bronze valves and plugs. Since neither localized corrosion rates nor the extent of existing defects in the cylinders are well known or well understood, it is uncertain how many cylinders may be expected to fail in the near future. DOE and MMES (Martin-Marietta Energy Systems) are attempting to evaluate the extent of the corrosion rates and their consequences; results are very preliminary, but they indicate that more than 1,000 cylinders have a potential to breach before the year 2020 if no remedial actions are taken, with the result that their contents of more than 10,000 tons of uranium could become accessible to release to the environment.

In Section 1016 of Public Law 102-486 (October 24, 1992), Congress directed the Department of Energy to provide within one year a uranium inventory study that would include among other matters recommendations for the future use and disposition of inventories of all Government-owned uranium or uranium equivalents, including depleted tailings. The Department has not yet complied with this requirement, presumably at least in part because the matters addressed by the Congressional action are very comprehensive and require extensive decisions on future courses of action.

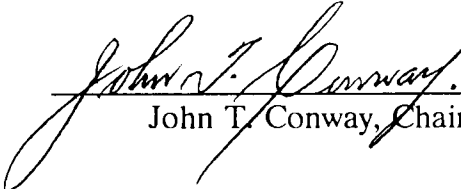
It is clear to the Board that directions developed in response to Section 1016 of Public Law 102-486 will affect the long-term future of the vast inventory of depleted uranium tails. However, the very size of that inventory means that no matter what actions may be taken, they will require a long time to consummate, with deterioration of the cylinders continuing all the while.

To protect against the dispersal of large amounts of uranium to soil and ground water in years to come, an early start to remedial action should be planned and then instituted. The alternative could be a massive problem with extraordinary financial costs.

Therefore, the Board recommends that:

1. An early program be started to renew the protective coating of cylinders containing the tails from the historic production of enriched uranium.
2. The possibility of additional measures be explored, to protect these cylinders from the damaging effects of exposure to the elements, as well as any additional handling that may be called for.
3. A study be instituted to determine whether a more suitable chemical form should be selected for long-term storage of the depleted uranium.

The Board has designated Mr. Steven Krahn as its principal staff member for discussions with those in DOE whom you may designate to act on this recommendation and matters that may arise concerning it.

  
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John T. Conway, Chairman