DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004
(202) 208-6400

March 3, 1997

The Honorable Charles B. Curtis
Acting Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Mr. Curtis:

On March 3, 1997, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(a)(5), unanimously approved Recommendation 97-1 which is enclosed for your consideration. Recommendation 97-1 deals with the Safe Storage of Uranium-233.

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 the Department of Energy under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161-68, as amended, please arrange to have this recommendation promptly 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: Mr. Mark B. Whitaker, Jr.

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

RECOMMENDATION 97-1 TO THE SECRETARY OF ENERGY

pursuant to 42 U.S.C. § 2286a(a)(5)
Atomic Energy Act of 1954, as amended.

Dated: March 3, 1997

Approximately one ton of Uranium-233 (^{233}U), a man-made isotope of uranium, was produced by the Department of Energy (DOE) and its predecessor agencies. This material has been studied extensively, and uses were found for it in DOE's defense-related applications and in nuclear reactor programs supported both by DOE and commercial companies. The ^{233}U in this country is now all in the possession of DOE. It is presently stored at several DOE sites, predominantly within defense nuclear facilities under the purview of the Defense Nuclear Facilities Safety Board (Board). Almost all of the ^{233}U has been determined by DOE to be excess to its needs, and with minor exceptions it is regarded as legacy material. As will be apparent from the following, however, any future processing or disposal of the ^{233}U will be accompanied by deep problems which will cause handling of the relatively small inventory of this material to be exceptionally difficult.

Most of this material in DOE storage has a specific alpha-activity which approaches that of weapons grade plutonium. Furthermore, all ^{233}U contains an amount of ^{232}U which varies from one lot to another. One of the daughter products in the radioactive decay chain of the ^{232}U is Thallium-208 (^{208}Th). That isotope of Thallium emits a high-energy (2.6 Mev) gamma ray when it decays. Depending on the amount of ^{232}U present in the ^{233}U, the surrounding radiation field can vary from somewhat less than one Rem/hr to several tens of Rem/hr. This radiation field causes handling and processing of any single item to be highly hazardous and very difficult to perform. Even visual inspection of a container housing ^{233}U will usually be difficult.

DOE has recently completed a review of issues associated with highly-enriched uranium. The results of that review have been made available to the Board in a report entitled the *Highly Enriched Uranium Environmental, Safety and Health Vulnerability Assessment Report*. This report stated that ^{233}U in storage exists in various forms throughout the complex, including metal, compounds, and scrap material. In addition, it noted that there was uncertainty as to the identity of some of the items and the material condition of many of the storage containers. Members of the Board's staff have also recently reviewed the storage of ^{233}U. The results of that review have been issued by the Board as the report "Uranium-233 Storage Safety at Department of Energy Facilities" (DNFSB/TECH-13). The assessments in that report have led the Board to identify several areas of concern.

Responsibility for the ^{233}U inventory remaining within the DOE complex is diffuse. Several secretarial officers and office heads are responsible for aspects of defense nuclear facilities that store significant quantities of ^{233}U. For example, Defense Programs is responsible for Building 3019 at the Oak Ridge National Laboratory, where more than 400 kg of ^{233}U resides. Environmental Management now has responsibility for the Chemical Processing Plant and the

Radioactive Waste Management Complex at the Idaho National Engineering Laboratory, where there are about 350 kg of unirradiated ^{233}U in various chemical and physical forms and a large number of irradiated nuclear fuel elements. An additional complication results from the role of DOE's Office of Material Disposition in developing strategies for final disposal of excess special nuclear material. By way of contrast to this state of dispersed responsibility, the Board notes the better practice of placing stabilization of plutonium residues under a single project manager, in response to the Board's Recommendation 94-1.

Uncertainty as to the condition of many items of stored ^{233}U generates additional concerns. Review of the original storage and packaging of the items of ^{233}U reveals wide variations in practices. Questions exist in some cases as to the original state and composition of stored items. Furthermore, many of the containers in which U-233 is stored have not been inspected for decades, and in some cases have not even been accessed over this interval. The inactivity leads to additional doubts as to the condition of the stored material, and degrades even further the information base which should be improved before it becomes necessary to process the contents of the containers for ultimate disposal. It also raises questions as to how the storage facilities themselves can be deactivated, cleaned up, and decommissioned, since some will be contaminated with this highly radioactive material.

It cannot be ruled out that problems exceeding those which motivated the Board in issuance of its Recommendation 94-1 may be found where ^{233}U is stored under conditions such that physical deterioration can occur. For this reason it would appear prudent to assess the adequacy of packaging of the items of ^{233}U as they are presently stored, as well as the state of the storage facilities, and to correct any problems that are found. The assessment would profit from the example of DOE's implementation of the Board's Recommendation 94-1, in developing a standard for the interim packaging and storage of plutonium. A similar standard would probably be appropriate for ^{233}U, but some differences may be called for.

The Board understands that work is presently on-going within DOE to address some of the above concerns. However, actions to deal with DOE's remaining inventory of U-233 would be greatly enhanced by a more systematic and focused approach. Therefore, the Board recommends that DOE:

1. Establish a single line project to deal with issues attached to safe storage of ^{233}U.

2. Develop standards to be used for packaging, transportation, and interim and long-term storage of ^{233}U.

3. Characterize the items of ^{233}U presently in storage in DOE's defense nuclear facilities, as to material, quantity, and type and condition of storage container.

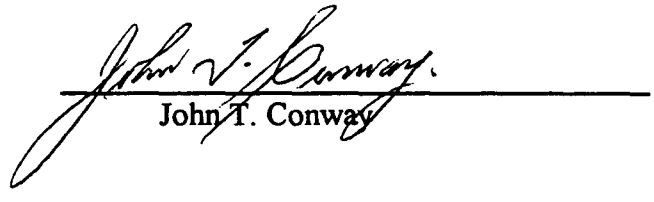
4. Evaluate the conditions and appropriateness of the vaults and other storage systems used for the ^{233}U at DOE's defense nuclear facilities.

5. Assess the state of storage of the items of ^{233}U in light of the standards mentioned in recommendation 2 above.

6. Initiate a program to remedy any observed shortfalls in ability to maintain the items of ^{233}U in acceptable interim storage.

7. Establish a plan for the measures that can eventually be used to place the ^{233}U in safe, permanent storage.

8. Until these ultimate measures are taken, ensure that the DOE complex retains the residue of technical knowledge and competence needed to carry through all of the measures needed to ensure safe storage of the ^{233}U in the short and the long term.



John T. Conway