DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
(202) 208-6400

May 1, 1998

The Honorable Elizabeth A. Moler
Deputy Secretary of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-1000

Dear Ms. Moler:

The staff of the Defense Nuclear Facilities Safety Board (Board) has been following the Department of Energy's (DOE) effort to develop a new standard for packaging and storage of plutonium-bearing materials. The Board understands that the effort to develop this standard is in progress. The enclosed issue report notes several concerns with the draft standard and the existing long-term storage standard, DOE-STD-3013. The use of this standard is a commitment made by DOE in the Implementation Plan for Recommendation 94-1. The report is forwarded to you because of the need to ensure that any revisions to this standard meet the objective of the Implementation Plan.

The enclosed issue report is forwarded for your information and use. The Board requests that DOE consider the noted concerns with the draft standard during its ongoing development efforts. DOE should also address the concern with DOE-STD-3013.

If you have comments or questions, please feel free to call me.

Sincerely,

John T. Conway
Chairman

c: The Honorable Victor H. Reis
Mr. James M. Owendoff
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

DNFSB Staff Issue Report

April 1, 1998

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: R. E. Kasdorf

SUBJECT: New Plutonium-Bearing Material Stabilization, Packaging, and Storage Standard

This report documents concerns related to the Department of Energy's (DOE) effort to develop a new standard for stabilization, packaging, and storage of plutonium-bearing material. Defense Nuclear Facilities Safety Board (Board) staff member R. E. Kasdorf and outside expert J. Leary attended a workshop held to further the development of the subject standard. This standard is being developed at the request of DOE-Environmental Management, which wants to broaden the coverage of the existing long-term storage standard, DOE-STD-3013 (i.e., to include material with plutonium concentrations of less than 50 percent) and to change some of the requirements in that standard. Defense Programs is responsible for STD-3013 and has indicated it has no desire to change the standard at this time. A draft strawman standard was presented and discussed during the meeting. It should be emphasized that this was a strawman standard, and there was no agreement among the working group regarding some of the proposed changes.

New Plutonium Standard. The draft standard is essentially a revision of STD-3013, incorporating the following changes:

- The scope includes all plutonium-bearing materials with plutonium concentrations above the Safeguard Termination Limits.
- Several testing techniques for determination of moisture content in the material after stabilization are allowed.
- The minimum 2-hour stabilization hold time is deleted.
- A small amount of organic material is allowed in the inner convenience can.
- The outer can is to be designed to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code.
- The allowed wattage for stored plutonium metal is lowered.
- The 100°C temperature limit for storage of alpha plutonium is deleted.

- A new maximum temperature of 400°C for stored plutonium metal is added.

Concerns with the New Plutonium Standard. The Board's staff has the following concerns with the draft standard:

- There is no technical basis for long-term storage of plutonium-bearing material stabilized simply by heating. The staff does not believe that heating for an unspecified time is necessarily adequate for all the materials that could be stored according to this standard. While the draft standard still requires a 950°C stabilization temperature, there is an ongoing effort to reduce the temperature.

- The proposed testing techniques for determining moisture are not reliable at this time and in some cases not in practice. The techniques may also be calibrated to determine moisture content and may not identify other volatile constituents that could contribute to pressure in the can.

- The technical basis for deleting the temperature limit for alpha plutonium is based on only one set of tests performed by Los Alamos National Laboratory. No theoretical justification was presented. Additionally, the proposed new temperature limit of 400°C (based on not exceeding the plutonium iron eutectic temperature of 428°C) does not provide an adequate margin for the limiting temperature. This high temperature ought not to be necessary for storage in practice.

- Storage of the myriad of materials allowed by the draft standard would most likely be safer in filtered, vented containers than in the sealed cans. The pressures generated by these materials when in a sealed can will continue to be problematic and difficult to predict.

- The scope of the draft standard overlaps with the existing STD-3013, resulting in two standards with different requirements covering the same material.

Several other, lesser concerns were also noted and will be provided to the standard development team.

Concerns with DOE-STD-3013. During the workshop, a technical concern with STD-3013 was highlighted. The calculation for maximum theoretical pressure that can be developed in the storage can assumes that the material has an ideal density for plutonium oxide. Many materials that can be stored according to the standard have a density less than that of ideal plutonium oxide, which would lead to a higher maximum theoretical pressure. The outer storage can, developed by British Nuclear Fuels Limited, was proof tested at a pressure of about 750 psig and bursts at over 4000 psig. The inner storage can must show pressure at less than 100 psig according to the standard. While the staff believes the outer storage can is very robust and would be adequate assuming an appropriate surveillance program, several variables could be adjusted to compensate for the density difference. DOE needs to address this concern with the existing standard.