

John T. Conway, Chairman  
A.J. Eggenberger, Vice Chairman  
Joseph J. DiNumno  
Herbert John Cecil Kouts  
John E. Mansfield

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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



April 29, 1999

The Honorable Ernest J. Moniz  
Under Secretary of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-1000

Dear Dr. Moniz:

The staff of the Defense Nuclear Facilities Safety Board (Board) has been following technical issues associated with the detection, control, bioassay, and internal dosimetry of metal tritides. The need to address these issues has been recognized by the Department of Energy (DOE) and the contractor at the Miamisburg Environmental Management Project (MEMP). Currently, radiation protection program measures are being developed in support of upcoming work at MEMP in areas suspected of having metal tritide contamination, but more work remains to be done.

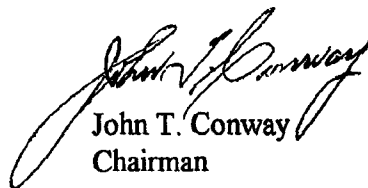
Radiation protection program measures for metal tritides are evolving at MEMP, but may be applicable to other DOE defense nuclear facilities as well. Some metal tritides and organically bound tritium may behave differently from elemental tritium or tritium oxide, and new radiation protection approaches appear to be needed. The Board believes that it is appropriate for DOE Headquarters to articulate a technical position on this matter to ensure that appropriate radiation protection measures regarding metal tritides and organically bound tritium are implemented across the DOE defense nuclear complex. Therefore, pursuant to 42 U.S.C. § 2286b(d), the Board requests that DOE provide by June 1, 1999, information regarding DOE's technical position on the approach that should be used for radiation protection programs for work involving tritium compounds such as metal tritides and organically bound tritium. This technical position should address characterization, monitoring, control in the workplace, release of contaminated materials, bioassay, and internal dosimetry, and compare the recommended approach with that planned at MEMP and other DOE defense nuclear facilities. DOE is also requested to describe any new requirements, guidance, and compensatory measures that may be necessary.

The Honorable Ernest J. Moniz

Page 2

Comments resulting from the review conducted at MEMP by the Board's staff are provided for your information in the enclosed report. If you have comments or questions on this matter, please do not hesitate to contact me.

Sincerely,



John T. Conway  
Chairman

c: Mr. Mark B. Whitaker, Jr.  
Mr. James M. Owendoff  
Mr. Richard Kiy

Enclosure

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

### Staff Issue Report

March 26, 1999

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director  
J. K. Fortenberry, Deputy Technical Director

**COPIES:** Board Members

**FROM:** J. W. Troan

**SUBJECT:** Deactivation and Decommissioning of Tritium Facilities at  
Miamisburg Environmental Management Project

This report documents a review of deactivation and decommissioning activities involving tritium and its compounds, with a focus on metal tritides, at the Miamisburg Environmental Management Project (MEMP). This review was conducted by J. W. Troan and L. M. Zull of the staff of the Defense Nuclear Facilities Safety Board (Board) during March 8–11, 1999.

**Background.** Deactivation and decommissioning activities at MEMP are expected to involve work in areas suspected of being contaminated with stable metal tritides (SMTs). SMTs are chemical compounds that contain tritium. SMT contamination consists of particles of material whose particular properties are dependent on their physical and chemical form. The dose resulting from a given intake of a particular type of SMT may be many times greater than that for tritium oxide (HTO). Therefore, a radiation protection approach somewhat different from that traditionally used for elemental tritium (HT) and HTO is needed for work with SMTs. For work that involves potential exposure to metal tritides, procedures for characterization, monitoring, radiological controls, release of material, bioassay, and internal dosimetry are required to ensure adequate worker protection. In some cases, these needs have only recently been recognized, and some requisite radiation protection program elements are still under development.

**Discussion.** Techniques and procedures for detecting and assessing dose from exposure to SMTs are needed to support critical-path work at MEMP starting in May 1999. The contractor, Babcock and Wilcox of Ohio, has developed a procedure for controlling work in areas suspected to contain SMT contamination, and has been working on methods for detecting SMTs for characterization and workplace monitoring, as well as procedures for bioassay and internal dosimetry. The Board's staff found that preparations for work involving SMTs are still under development or do not comprehensively address the issue.

Shortfalls were noted in the following areas:

- Past characterization efforts to identify and locate SMT contamination were limited. As of the time of the staff's review, a rigorous characterization program had not yet

---

been fully developed; however, it was indicated to the staff that efforts are being made to improve the program.

- The Basis for Interim Operations (BIO) does not address deactivation and decommissioning activities in a detailed manner. The BIO also does not adequately address SMTs.
- The technical bases for radiation protection program measures associated with SMTs were under development or incomplete. In some cases, the technical bases communicated during the review were excessively qualitative.
- Development of an integrated radiation protection program addressing SMTs had not been completed.

The detailed observations and comments that support the above conclusions have been reviewed with cognizant Department of Energy (DOE) and contractor personnel. The staff anticipates that further discussion and information will be needed to better understand the radiation protection program for SMTs. It is encouraging to note that an action plan for SMT issues was prepared following the staff's review. Furthermore, the staff was informed that DOE-MEMP intends to send the contractor a letter formally requesting a corrective action plan.

Since SMTs may be present at other sites where tritium is handled, the techniques, procedures, and lessons learned at MEMP regarding SMTs are expected to have application at other DOE defense nuclear facilities. Additional work to assess the prevalence and health and safety consequence of SMTs at other DOE defense nuclear facilities is required. Furthermore, there may be a need for improved detection methods and the development of air monitoring equipment.

During technical exchanges at MEMP in support of the decision on how to approach dose assessment for exposure to SMTs, it was noted that International Commission on Radiological Protection (ICRP)-71, *Age-Dependent Dose to Members of the Public from Intake of Radionuclides: Part 4, Inhalation Dose Coefficients*, provides dose conversion factors for tritium particulate aerosols (e.g., metal tritides). This information may be useful in updating DOE directives since DOE's limits and control levels for tritium and its compounds are based only on HT and HTO. This latter approach was taken for 10 CFR 835, *Occupational Radiation Protection Rule*, because DOE had found that in the case of metal tritides, no dose assessment methodology existed, and that for low-molecular-weight organic compounds, there was no generally accepted dosimetry model. ICRP-71 shows that the dose consequence for a given intake of a particular type of metal tritide and organically bound tritium (OBT) is greater than that for HTO. Furthermore, DOE directives do not provide control levels for tritium particulate and OBT aerosols. Consequently, the Board's staff believes there is a need for the DOE Office of Environment, Safety, and Health (DOE-EH) to revisit and update applicable requirements and guidance for tritium compounds.

Given the need to develop radiation protection program elements for working in areas at MEMP suspected of having SMTs, the staff believes it is appropriate for DOE-EH to provide a technical position on the radiation protection approach for SMTs and OBTs, and its applicability for other DOE defense nuclear facilities. That position should be compared with the approaches of MEMP and other DOE nuclear facilities. New requirements, guidance, and compensatory measures may be necessary.