

Bruce Hamilton, Chairman
Jessie H. Roberson
Joyce L. Connery

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



June 25, 2020

The Honorable Dan Brouillette
Secretary of Energy
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Brouillette:

We reviewed the hazard categorization for the Low-Activity Waste Facility located at the Hanford Site, Washington. We determined that the hazard categorization does not account for all radiological material that might be processed or present in the facility.

This condition is contrary to requirements contained in Department of Energy Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. We understand that the Office of River Protection and its contractor, Bechtel National, Incorporated, will be revising the hazard categorization. The enclosed report is provided for your information and use.

Yours truly,

A handwritten signature in black ink that reads "Bruce Hamilton".

Bruce Hamilton
Chairman

Enclosure

c: Mr. William I. White
Mr. Brian Vance
Mr. Joe Olencz

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

May 4, 2020

Hazard Categorization of the Low-Activity Waste Facility

Summary. Members of the Defense Nuclear Facilities Safety Board's (Board) staff reviewed the hazard categorization for the Low-Activity Waste (LAW) Facility [1]. The objective of this review was to determine whether the facility's hazard categorization met the requirements of Department of Energy (DOE) Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* [2].

Contrary to requirements contained in this standard, the Board's staff confirmed with the Office of River Protection (ORP) and its contractor, Bechtel National, Incorporated (BNI), that some undefined quantities of radiological material, expected to be located within the facility, are not accounted for in the facility hazard categorization.

The Board's staff conducted two teleconference reviews with ORP and BNI on September 9, 2019, and February 20, 2020. The Board's staff also received written responses to lines of inquiry from BNI on January 6, 2020. During the most recent teleconference, BNI stated that it would revise the hazard categorization to address the excluded radiological materials identified by the Board's staff.

Background. The Waste Treatment and Immobilization Plant at the Hanford Site, Washington, includes the LAW Facility, which is designed to vitrify radioactive liquid waste using a pair of joule-heated ceramic melters. The LAW Facility will receive waste from the Hanford tank farms in a process known as "direct feed low-activity waste" (DFLAW). The final product from the LAW Facility will be glass product containers filled with the vitrified radioactive waste, which results from processing the DFLAW. DOE plans to begin radiological waste processing operations at the LAW Facility in calendar year 2022. DOE will dispose of filled glass product containers at the Hanford Site.

Title 10, Code of Federal Regulations, Part 830, *Nuclear Safety Management*, requires DOE contractors to categorize their facilities "consistent with" DOE Standard 1027-92 [3]. The hazard categorization defines the facility's hazard potential, determines which safety-related standards and requirements are applicable to a facility, and helps to define the graded approach for complying with those standards and requirements.

BNI's hazard categorization concluded that the maximum radiological inventory to be processed or present in the facility is approximately 75 percent of that needed for hazard category 2 classification. Therefore, BNI classified the facility as hazard category 3 with an approximate 25 percentage-point margin. The standard defines hazard category 3 facilities as having operational hazards with "significant localized consequences" but not the "significant on-

site [broader than localized] consequences” associated with hazard category 2 facilities. Based on this categorization, BNI developed the facility’s safety basis using the approach defined in DOE Standard 1228-2019, *Preparation of Documented Safety Analysis for Hazard Category 3 DOE Nuclear Facilities* [4].

Hazard Categorization Deficiencies. Sections 3.1.2 and 4.1.1.a of DOE Standard 1027-92 require that hazard categorization be based on the “maximum inventory permitted to be processed or present in specific locations in the facility.” The Board’s staff identified two examples of radiological material excluded from the hazard categorization without a documented technical basis. These are described below.

Excluded Radionuclides—The hazard categorization does not consider 18 radionuclides that the tank farms operating contractor, Washington River Protection Solutions (WRPS), expects to be in the facility feed. The official database for radiological inventory at the Hanford tank farms is known as the “Best-Basis Inventory (BBI).” BBI includes estimates of the radiological inventories in each of the tank farms’ 177 tanks, based on sampling data and calculations. WRPS used BBI to generate DFLAW feed vectors for the LAW Facility that list quantities for 46 radionuclides for different batches of feed. BNI used WRPS’ feed vectors to categorize the facility, but only considered 28 of the potential 46 radionuclides contained in the data.

BNI stated that the radionuclides excluded from the hazard categorization will only be present in low quantities in the material being fed to the LAW Facility and will therefore only have a minor impact on the hazard categorization. However, BNI was not able to explain the (1) basis for that assumption, or (2) details regarding sampling processes that it would use to protect that assumption. As a result, the Board’s staff concludes the impact on the hazard categorization and other safety basis assumptions from these excluded radionuclides is unclear. The impact could be significant if the proposed sampling strategy and waste acceptance criteria are not sufficient to ensure compliant feed is delivered to the facility.

Other Excluded Radiological Materials—The hazard categorization does not consider radioactive solid waste and spent contaminated materials that could potentially be located in the facility’s truck load area for disposal. Revision 3 of the facility’s documented safety analysis, section 2.9.1.6, states that these items can include up to 1,000 drums from the radioactive solid waste handling system, melter consumables (e.g., bubblers, level detectors, thermocouples), and spent agitator drives, pumps, and high efficiency particulate air filters [5]. The Board’s staff expects that incorporating these items will have a minor impact on the hazard categorization, but believes that they should be included to be consistent with DOE Standard 1027-92 requirements.

Conclusions. The Board’s staff reviewed the hazard categorization for the LAW Facility against requirements in DOE Standard 1027-92. Contrary to this standard, the staff team identified radiological material that was not considered in the hazard categorization. The Board’s staff concludes the following:

- ORP and BNI should quantify the excluded radiological materials and include them in the hazard categorization to be compliant with DOE Standard 1027-92. During the February 20,

2020, teleconference with the Board's staff, BNI stated that it would revise the hazard categorization to incorporate the excluded radiological inventory.

- Additional integration between WRPS and BNI in maturing the details of feed delivery, sampling analyses, and waste acceptance criteria may be warranted to ensure compliant feed is delivered to the facility. ORP stated that it will require further integration in these areas.

References

- [1] Bechtel National, Inc., *Final Hazard Categorization for LAW*, 24590-LAW-Z0C-U10T-00001, Revision 2, Richland, WA, February 2018.
- [2] Department of Energy, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, DOE Standard 1027-92, Change Notice 1, Washington, DC, September 1997.
- [3] Title 10 Code of Federal Regulations, Part 830, *Nuclear Safety Management*.
- [4] Department of Energy, *Preparation of Documented Safety Analysis for Hazard Category 3 DOE Nuclear Facilities*, DOE Standard 1228-2019, Washington, DC, May 2019.
- [5] Bechtel National, Inc., *Documented Safety Analysis for the Low Activity Waste Facility*, 24590-LAW-DSA-NS-18-0001, Revision 3, Richland, WA, January 2020.