

Department of Energy
Office of Nuclear and Facility Safety Policy
Nuclear Safety Technical Position
NSTP 2002-2

Methodology for Final Hazard Categorization for Nuclear Facilities from Category 3 to Radiological

Issue:

DOE-STD-1027-92 defines a lower threshold criterion for preliminary hazard categorization as a nuclear Hazard Category 3 (HC-3) facility or activity. But it does not provide a method other than inventory reduction or segmentation on how an HC-3 facility or activity can be demonstrated to be below HC-3 (i.e., radiological) in final hazard categorization.

Background:

10 CFR 830 Subpart B requires that all DOE nuclear facilities categorized as HC-3 or above have a DOE approved safety basis compliant with the requirements of Subpart B. The rule requires the use of DOE-STD-1027-92 (STD-1027) as the methodology for categorizing DOE nuclear facilities. STD-1027 requires a preliminary categorization be established on the basis of the inventory of radionuclides in a facility or involved in an activity. It also permits a safety analyses (see STD-1027 section 3.1.2) to establish a final hazard categorization that may be different from the preliminary. STD-1027 defines a method for establishing how to go from a preliminary categorization of HC-2 to a final categorization of HC-3. But it does not define a method for establishing how to go from a preliminary categorization of HC-3 to a final categorization of radiological (below HC-3). Previously, several Interpretation memos for DOE Order 5480.23 (now canceled) addressed this issue. However, these Interpretation memos have no standing under 10 CFR 830 Subpart B.

In accordance with STD-1027 section 3.1.2, hazard categorization is finalized after a hazard analysis has been performed as discussed in section 4 of the Standard, and is based on the facility and activities described in the Documented Safety Analysis (DSA). If the facility mission, processes, or life cycle stage of the facility changes, then the DSA must be revised to reflect the current facility status and activities. This analysis may result in a different final hazard categorization.

The qualitative definition of a HC-3 facility is that the hazard analysis shows the potential for only significant localized consequences. This is intended to exclude those facilities that could have a significant radiological impact outside the facility (which would be HC-1 or HC-2). STD-1027 provides a table of radionuclides, and a method of combining them that permits a comparison of facility inventory of radionuclides to the table threshold values as a standard way of establishing hazard categorization. The table values for HC-3 are intended to represent levels of material that, if released, would produce less than 10 rem doses at 30 meters. The values are based on a modification of EPA definitions of Releasable Quantities (RQs) for radionuclides in 40 CFR 302.4, Appendix B. The values in the table are the most limiting of four dose pathways of food intake, direct radiation exposure, ingestion of radionuclides in groundwater, and inhalation of radionuclides.

Two methods of reducing a facility or activity hazard category to radiological are explicitly described in STD-1027. One is by reducing inventory of radionuclides to below the thresholds for HC-3 in Table A. 1. Another is by segmentation of a facility or activities, in accordance with the criteria of STD-1027, so that the inventory of any one segment is below the threshold for HC-3.

A third method for final categorization is generally discussed in the Standard, based on an unmitigated release of available hazardous materials. For the purposes of hazard categorization, "unmitigated" is meant to consider material quantity, form, location, dispersibility, and interaction with available energy sources, but not to consider safety features that could prevent or mitigate a release. This method is the subject of this technical position.

Technical Position:

HC-3 thresholds are based on the most limiting dose pathway that would result in a 10 rem dose at 30 meters from an unmitigated release of the total inventory of radionuclides. These thresholds are derived from the Annual Limits of Intake (ALIs) published for 757 radionuclides in ICRP Publication 30. LA-12981-MS, "Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides," referenced in a footnote to Table A. 1 of STD-1027, shows the limiting pathway for each radionuclide. With the exception of two radionuclides (Ta- 179, Ir- 189), these pathways are inhalation, direct radiation, and food ingestion. Both inhalation and food ingestion pathways depend on an airborne release fraction. With the exception of noble gases, the direct radiation pathway is exposure to a point source. The report "Technical Background Document to Support Final Rulemaking Pursuant to Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act: Radionuclides: A Report to the Emergency Response Division, Office of Emergency and Remedial Response, U. S. Environmental Protection Agency," February 1989 describes the parameters and models used for analysis of the three dose pathways considered.

The HC-3 threshold values for radionuclides for which the food pathway or the inhalation pathway are limiting may be revised if, based on the physical and chemical form and available dispersive energy sources for the facility and its hazardous materials, the credible release fractions (airborne release fractions) can be shown to be significantly different than the values used in the EPA Technical Background Document. All potential accident scenarios must be considered under unmitigated conditions. All the pathways must be considered and the most limiting pathway must be used. All data and assumptions used to modify the STD-1027 Table A. 1 HC-3 values must be supported in the hazard analysis.

Approved: Beverly A. Cole Disapproved: _____ Date: 11/13/02