

IMPLEMENTING 10 CFR PART 830 SUBPART B AT WIPP

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ABSTRACT

Implementation of Title 10 Code of Federal Regulations Part 830, Subpart B Nuclear Safety Management (1) was accomplished at the Waste Isolation Pilot Plant (WIPP) in a timely and efficient manner. The primary reason the transition went smoothly was that the existing safety analysis was relatively new, initially developed in 1995, and written in accordance with the safe harbor document DOE-STD-3009 (2). The WIPP Safety Analysis Report (SAR) (3) is kept up-to-date with the unreviewed safety question (USQ) process and thorough oversight and input provided by DOE-Carlsbad Field Office (CBFO) documented in the annual safety evaluation report (SER) process.

INTRODUCTION

Title 10 CFR Part 830, Subpart B Safety Basis Requirements became effective January 10, 2001. The newly promulgated rule contained specific requirements for the following facility authorization basis documents: the unreviewed safety question process, documented safety analysis (DSA), technical safety requirements (TSRs) and preliminary documented safety analysis (PDSA). It also provided an implementation schedule for compliance. Westinghouse TRU Solutions (WTS) revised, submitted and received DOE-CBFO approval for each of these WIPP documents in a timely manner consistent with the rule requirements. The review process also identified unnecessary (orphan) requirements which were removed from the documents.

Unreviewed Safety Question Process

WTS was required to submit the USQ process to DOE-CBFO for approval by April 10, 2001. The WTS procedure was submitted to DOE on April 4, 2001. DOE-CBFO comments were resolved June 1, 2001 and WTS issued the updated procedure June 5, 2001. The most significant change made to the procedure resulted from the designation of the waste hoist brake system as "safety significant." This is the first safety-significant system at the WIPP; therefore, the procedure was updated to improve the safety evaluation process.

Preliminary Documented Safety Analyses

PDSAs were required for major modifications that began after December 11, 2000 and were not to be completed on or before April 9, 2001. The rule required DOE approval of these analyses prior to procurement of material or beginning of construction for the modifications. WIPP had two major modifications in progress at that time: Remote Handled (RH) Transuranic (TRU) Waste Handling and Contact Handled (CH) TRU Waste Centralized Confirmation Facility. The existing hazards and accident analyses were submitted for approval as the PDSAs for the projects on January 30, 2001. The PDSAs were approved by DOE-CBFO on February 9, 2001.

Documented Safety Analysis including Technical Safety Requirements

The rule required facilities not in compliance with the rule to submit for DOE approval a DSA that is in compliance with the rule by April 10, 2003. Facilities that met the requirements were required to submit a DSA for DOE approval by April 9, 2001. WTS submitted the WIPP CH SAR annual update and associated TSR changes to DOE-CBFO on March 12, 2001. The SAR was approved by DOE-CBFO as being compliant with the rule on May 31, 2001.

Substantial changes were made to the documents in order to comply with the new rule. DOE-STD-3009 Change 1 is identified in 10 CFR Part 830 as a safe harbor document. The standard recommends a deterministic approach rather than probabilistic approach in the analysis of postulated accidents for selection of safety structures, systems or components (SSCs). Section A.2, Paragraph 4, states:

There is no predetermined frequency cutoff value, such as 1E-6 per year, for excluding low frequency operational accidents (i.e., internally initiated). In fact, for operational accidents there is no explicit need for a frequency component to the unmitigated release calculations, since the determination of need is solely driven by the bounding consequence potential.

Prior to 10 CFR Part 830, the WIPP CH SAR used a probabilistic approach to derive the frequency of the bounding source term. For analyzed accident scenarios which involved multiple waste containers, it was conservatively assumed that the reasonable maximum material at risk (MAR) was such that (1) one waste container contained the maximum allowable radionuclide inventory of 80 PE-Ci,* and (2) the remaining waste contained an average radionuclide inventory of 8 PE-Ci per container. A binomial sampling analysis of the waste drum population demonstrated that the probability that mixtures of drums exceeding the MAR being involved in accidents was very low. Therefore, it was conservatively concluded that the accident assumptions produced a reasonable maximum MAR.

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Following the issuance of 10 CFR Part 830 WIPP implemented the deterministic approach. In doing so two options were considered to reduce the maximum MAR. The first option was to reduce the drum inventory limit. However, WIPP wanted to minimize the impact to generator sites and accommodate future drum loading needs. Therefore the second option was adopted which was to establish inventory limits for onsite waste handling to lower the maximum MAR available for each accident scenario.

A waste handling TSR administrative control now limits container inventory for normal operations to 128 PE-Ci for each seven-pack drum configuration. The drums are received and handled in seven-pack drum configurations. By limiting the container inventories, the maximum MAR for accident scenarios is assumed to be 80 PE-Ci for single drum releases. Multiple drum releases can be up to 128 PE-Ci with one at 80 PE-Ci and the others contain the remaining 48 PE-Ci.

By using the deterministic approach, the maximum MAR for the WIPP waste hoist accident increased. This resulted in an unacceptable unmitigated consequence to the facility worker. Therefore, the waste hoist brake system was designated as safety significant. As a result, the WIPP Technical Safety Requirements (TSR) were updated to not only establish a loading limit of 128 PE-Ci per seven-pack drum configuration but also add TSR administrative controls for pre-operational checks of the safety-significant (waste hoist brake system) system.

Orphan Requirements

During the DOE-CBFO review of the WIPP SAR and TSR documents unnecessary (orphan) requirements, which are not supported by regulatory requirements, were identified and subsequently removed from the WIPP safety basis documentation. The elimination of five orphan requirements increases effectiveness of WIPP processes, minimizes cost and removes regulatory redundancy. The DOE's basis for approval of the WIPP SAR and TSR includes an examination of the rationale and efficacy of removal of the subject orphan requirements. The additional changes included:

- Restricted access to the exhaust air from the waste panel is now procedurally controlled. The requirement was changed to allow workers to access the disposal area exhaust drift without disrupting waste disposal. This is only for specific situations such as maintaining the continuous air monitoring.
- Emergency response personnel staffing requirements were removed from the TSR. Emergency response personnel now are administratively on duty 24 hours per day, but do not have to be physically on site. Previously, if emergency personnel left the WIPP site, e.g., to respond to an emergency, waste handling operations had to be suspended until they returned.

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- Mode Compliance Procedure WP 04-AD3001 required immediate stoppage of waste handling for off normal events. This was changed to agreed with the TSR and allow for an orderly transition to the Waste Storage/Disposal Mode
- Waste Handling Engineer staffing requirements were changed to require only one Waste Handling Engineer onsite during waste handling operations.
- The USQ procedure previously required USQ screening for all procedural changes. The USQ procedure was revised to allow categorical exclusion of maintenance documents and procedures not explicitly or implicitly described in the SAR.

In summary, the implementation of 10 CFR Part 830 at WIPP propagated valuable revisions to the SAR and TSR documents and increased awareness for timely analysis prior to facility modifications.

FOOTNOTES

Appendix B of the WIPP CH SAR explains the concept of Plutonium-239 Equivalent Activity (PE-Ci) is intended to eliminate the dependency of radiological analyses on specific knowledge of the radionuclide composition of a transuranic waste stream. A unique radionuclide composition and/or distribution is associated with virtually every transuranic waste generator and storage site. By normalizing all radionuclides to a common radiotoxic hazard index, radiological analyses can be conducted for the WIPP facility, which are essentially independent of these variations. Plutonium-239, as a common component of virtually all defense transuranic wastes, was selected as the radionuclide to which the radiotoxic hazard of other transuranic radionuclides could be indexed.

Operational releases from the WIPP facility, including both routine and accident related, are airborne. There are no significant liquid release pathways during the operational phase of the facility. This, and the fact that transuranic radionuclides primarily represent inhalation hazards, allows a valid relationship to be established, which normalizes the inhalation hazard of a transuranic radionuclide to that of Pu-239 for the purpose of the WIPP radiological analyses. In effect, the radiological dose consequences of an airborne release of a quantity of transuranic radioactivity with a known radionuclide distribution will be essentially identical to that of a release of that material expressed in terms of a quantity of Pu-239.

REFERENCES

1. Title 10 Code of Federal Regulations Part 830, Subpart B, Safety Basis Requirements, 2001.
2. Preparation Guide for U. S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports, DOE-STD-3009-94, Change Notice 1, January 2000.
3. Waste Isolation Pilot Plant Contact Handled Safety Analysis Report, DOE/WIPP-95-2065, Revision 5, 2000.