DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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July 30, 2009

The Honorable Steven Chu
Secretary of Energy
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Chu:

On July 29, 2009, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(a) (5), unanimously approved Recommendation 2009-1, *Risk Assessment Methodologies at Defense Nuclear Facilities,* which is enclosed for your consideration. This Recommendation identifies the need for adequate policies and associated standards and guidance on the use of quantitative risk assessment methodologies at the Department of Energy's (DOE) defense nuclear facilities.

After you have received this Recommendation and as required by 42 U.S.C. § 2286d (a), the Board will promptly make it available to the public. The Board believes that this Recommendation contains no information that is classified or otherwise restricted. To the extent that this Recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161-2168, as amended, please arrange to have it placed promptly on file in your regional public reading rooms. The Board will also publish this Recommendation in the *Federal Register*. The Board will evaluate DOE's response to this Recommendation in accordance with the Board's Policy Statement 1, *Criteria for Judging the Adequacy of DOE Responses and Implementation Plans for DNFSB Recommendations*. Further delay in the implementation of this Recommendation may be avoided through exercise of your authority under the Atomic Energy Act to implement any portion of this Recommendation prior to finalization of the implementation plan.

Sincerely,

A. J. Eggenberger
Chairman

Enclosure

c: Mr. Mark B. Whitaker, Jr.

RECOMMENDATION 2009-1 TO THE SECRETARY OF ENERGY
Risk Assessment Methodologies at Defense Nuclear Facilities
Pursuant to 42 U.S.C. § 2286(a)(5)
Atomic Energy Act of 1954, As Amended

Dated: July 30, 2009

Overview

Quantitative risk assessment techniques are widely used to improve the safety of complex engineering systems. Such techniques have been relied upon in the nuclear industry for decades. One of the seminal documents, known as WASH-1400, used an event-tree, fault-tree methodology to assess the risk of accidents at nuclear power reactors operating in the United States.[1] Today, the U.S. Nuclear Regulatory Commission (NRC) employs a more sophisticated set of risk assessment tools and methodologies.[2] Likewise, the National Aeronautics and Space Administration (NASA) has developed and implemented a detailed policy on the use of quantitative risk assessment for its missions.[3]

The Department of Energy (DOE) has historically endorsed a "bounding" or deterministic approach to hazard and accident analysis, which continues to have important applications at defense nuclear facilities. Beginning in the early 1990s, the Defense Nuclear Facilities Safety Board (Board) observed increasing use of quantitative risk assessment techniques by DOE. This increased use was not viewed by the Board as objectionable in itself; the Board's concern was that DOE was using quantitative risk assessment methods without having in place a clear policy and set of procedures to govern the application of these methods at facilities that perform work ranging from assembly and disassembly of nuclear weapons to nuclear waste processing and storage operations. For this reason, the Board wrote to the Secretary of Energy on April 5, 2004, and made the following observation:

> [T]he Board has reviewed the DOE's use of risk management tools at defense nuclear facilities. This review revealed that DOE and its contractors have employed risk assessment in a variety of activities, including the development of documented safety analyses and facility-level decision making. The level of formality of these assessments varies over a wide range. The Board's review also revealed that DOE does not have mechanisms (such as standards or guides) to control the use of risk management tools nor does it have an internal organization assigned to maintain cognizance and ensure the adequacy and consistency of risk assessments. Finally, the Board's review showed that other federal agencies involved in similar high-risk activities (e.g., National Aeronautics and Space Administration, U.S. Nuclear

[1] The Reactor Safety Study, October 1975 (sometimes known as the "Rasmussen Report").
[2] The NRC approach is summarized at http://www.nrc.gov/about-nrc/regulatory/risk-informed.html.
[3] NASA's policies and methods can be found at http://www.hq.nasa.gov/office/codeq/risk/index.htm.

> Regulatory Commission) have, to varying degrees, formalized the use of quantitative risk assessment in their operations and decision-making activities. These agencies have relevant standards and defined organizational elements, procedures, and processes for the development and use of risk management tools.

On this basis, the Board requested that the Secretary "brief the Board within 60 days of receipt of this letter as to DOE's ongoing and planned programs and policies for assessing, prioritizing, and managing risk."

The Board's initial concerns on this issue have been reiterated in letters dated November 23, 2005, and May 16, 2007. In the Board's 2006 Annual Report to Congress, the section on Risk Assessment Methodologies noted "the slow pace of its development," and the 2008 report noted that "all progress [has come] to a halt." The Board's most recent annual report stated that at "a time when governments, financial institutions and industries worldwide are expediting the implementation of enterprise-wide risk governance programs, DOE's slow pace for developing a policy is of serious concern."

DOE's most recent correspondence on this issue, dated January 9, 2007, outlined plans and progress toward developing a policy and accompanying guidance document on the use of risk assessment at defense nuclear facilities. This DOE letter indicated that the draft policy and guidance document would be ready for submittal to the DOE directives system in March 2007. Despite periodic meetings with the Board's staff and briefings to the Board, as of July 2009, the draft policy and guidance document has not been entered into the DOE Directives system, and near-term resolution of the issue is not evident. Without such a policy, DOE has little basis to accept the validity of existing risk management tools that use quantitative risk assessment. This is particularly important since the managers of DOE's field elements are allowed to accept the safety risks that high-hazard operations pose toward workers and the public based on widely varying levels of assessments.

Though Title 10, Part 830 of the Code of Federal Regulations (10 CFR 830, *Nuclear Safety Management*) and its associated quality assurance considerations govern nuclear safety evaluations at a fundamental level, these existing requirements are not of sufficient specificity to guide the use of complex quantitative risk assessments. The continued pursuit of ad hoc applications of risk assessment in the absence of adequate DOE policy and guidance is contrary to the standards-based approach to nuclear safety espoused by DOE and endorsed by the Board[4].

[4] The Board's Recommendation 2008-1 is similarly directed at DOE's use of a safety methodology (in this case, classifying fire protection systems as safety-class or safety-significant) in advance of developing criteria and guidance.

Recommendation

Therefore, the Board recommends that DOE:

1. Establish a policy on the use of quantitative risk assessment for nuclear safety applications.

2. Consistent with this policy, establish requirements and guidance in a DOE directive or directives that prescribe controls over the quality, use, implementation, and applicability of quantitative risk assessment in the design and operation of defense nuclear facilities.

3. Evaluate current ongoing uses of quantitative risk assessment methodologies at defense nuclear facilities to determine if interim guidance or special oversight is warranted pending the development of formal policy and guidance.

4. Establish a requirement to identify deficiencies and gaps in ongoing applications of quantitative risk assessment along with the additional research necessary to fill those gaps in support of the development and implementation of the final policy and guidance.

A. J. Eggenberger, Chairman