

Joyce L. Connery, Chair  
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**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



June 15, 2021

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

Dear Secretary Granholm:

The weapon response development process is integral to the safety of nuclear explosives operations at defense nuclear facilities. In 2019 and 2020, the Board evaluated the weapon response technical basis at Sandia National Laboratories (SNL) in New Mexico. The Board assessed SNL's development of weapon response against DOE-NA-STD-3016-2018, *Hazard Analysis Reports for Nuclear Explosive Operations*, for the W88, B61, and W80 weapon systems.

The Board determined that SNL's weapon response and the underlying technical basis documents for these systems were thorough, technically defensible, and sufficient to support control selection at the Pantex Plant for the responses for which SNL was responsible. The Board did identify opportunities for improvement—provided in the enclosure—that NNSA may consider to bolster the rigor of the weapon response development process at SNL.

More broadly, NNSA should consider how best to improve federal oversight of this process to address the weaknesses also discussed in the enclosure. As identified in its June 23, 2020, letter regarding W88 weapon response development at Los Alamos National Laboratory, the Board encourages NNSA to consider establishing requirements for federal oversight of the weapon response process.

Sincerely,

Joyce L. Connery  
Chair

Enclosure

c: Dr. Charles P. Verdon  
Mr. Joe Olencz

## **Enclosure**

### **Review of Sandia National Laboratories' Weapon Response Technical Basis**

The Defense Nuclear Facilities Safety Board's (Board) staff conducted a review of Sandia National Laboratories' (Sandia) weapon response development process, as well as the technical bases supporting the current weapon response summary documents (WRSD) for three weapon programs (i.e., W88 Alt 370, B61-12, and W80 Alt 369). The Board's staff evaluated the impact of recent weapon response consequence definition changes in DOE-NA-STD-3016-2018, *Hazard Analysis Reports for Nuclear Explosive Operations*.

During its review, the Board's staff did not identify any significant impacts from the weapon response consequence definition changes in DOE-NA-STD-3016. However, consistent with the results of its review of weapon response development at Los Alamos National Laboratory, the staff team noted a lack of detailed federal oversight of Sandia's weapon response development process. Furthermore, the staff team identified several observations and opportunities to improve the robustness and traceability of Sandia's weapon response technical bases.

#### **Sandia's Weapon Response Process and WRSD Technical Basis.**

1. Generally, Sandia's technical basis documents support the rules provided in the WRSD for the W88, B61, and W80 programs. The staff identified one instance where Sandia misapplied an assumption that the safety theme was intact in an inappropriate W88 configuration; however, the weapon response rule was not impacted.
2. The Board's staff found that Sandia commonly did not provide details on the source for reference values used in weapon response calculations (e.g., material ignition temperatures). Elaborating on the source for such values would improve their defensibility.
3. The Board's staff identified opportunities to improve the formality in documentation of the technical bases including:
  - Eliminating instances where a section of the technical basis referenced as providing the justification for assumptions or analysis methodologies used elsewhere in the technical basis does not in fact contain the required information (W88);
  - Avoiding nested references in the documentation (W80);
  - Avoiding references that do not completely justify the technical conclusions (W80, W88, B61); and
  - Improving the discussion regarding weapon response code artifacts (W80).

4. The Board's staff identified several opportunities to improve the training provided to weapon response analysts to address weaknesses in weapon response documentation. Specifically, Sandia should consider training its weapon response analysts to:
  - Provide a more complete explanation of the basis for determinations that are based on engineering judgment (e.g., improving the documented basis when engineering judgment is used to determine that certain severe impact conditions are not deemed credible) (W80, W88, B61);
  - Perform conservatively realistic analysis in the absence of data, including
    - 1) appropriately selecting a margin of safety to use in the analysis,
    - 2) considering potential component interaction, and
    - 3) making appropriate assumptions for falling technician analysis; and
  - Better explain assumptions used in the analysis (e.g., one assumption indicated that fragment insults would not occur for a given configuration; however, Sandia stated that this assumption was meant to indicate that the analyst expected Pantex to prevent the insult).
5. The Board's staff found that the National Nuclear Security Administration (NNSA) did not perform detailed oversight of weapon response development at Sandia. The Board's staff noted the following:
  - The Sandia Field Office (SFO) performs oversight of the contractor's quality assurance program. This gives the Department of Energy (DOE) some confidence that the contractor has adequate quality assurance processes (e.g., design control, non-conformance, and issues management processes) to perform weapon response analyses. However, the staff did not find any instances of SFO directly evaluating a sample of weapon response analyses to ensure that these processes demonstrated the appropriate rigor to meet either programmatic requirements or the requirements in DOE-NA-STD-3016.
  - The NNSA Office of Defense Programs (NA-10) performs federal project oversight of the contractor, focusing on meeting project and mission goals. While some of this project oversight aligns with safety requirements, this oversight does not engage with the details of the weapon response analysis process.
  - Challenges to addressing these weaknesses in federal oversight include clearly defining roles and responsibilities for various DOE offices to ensure there are no gaps in oversight, ensuring adequate federal training and qualifications for oversight of this technical process, and establishing a set of criteria and review approach documents to ensure all safety requirements are periodically evaluated.