DEFENSE NUCLEAR FACILITIES SAFETY BOARD
Washington, DC 20004-2901

January 30, 2025

The Honorable Ingrid Kolb
Acting Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Ms. Kolb:

In its January 16, 2024, letter, the National Nuclear Security Administration (NNSA) stated that it had completed all deliverables associated with the revised implementation plan for Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*. One of the last deliverables from the implementation plan was a revision of the *B61 Hazard Analysis Report* (HAR).

The B61 HAR is the first safety basis document that incorporates safety improvements resulting from Recommendation 2019-1, as well as from other Pantex safety basis enhancement efforts (e.g., the *Pantex Safety Basis Vision* initiative). NNSA and its new management and operating contractor, PanTeXas Deterrence, LLC, continue to apply similar improvements to the remaining Pantex safety basis documents, with a planned completion of December 2025.

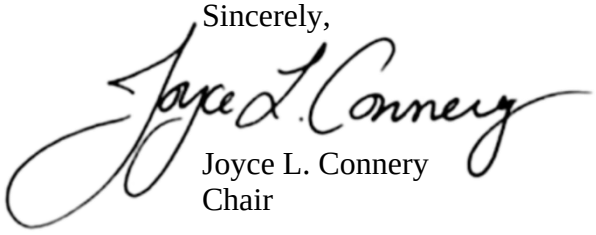
The Defense Nuclear Facilities Safety Board (Board) recently completed its review of the revised B61 HAR. The Board found that NNSA has mostly corrected the safety basis issues outlined in Recommendation 2019-1 on this weapon program. However, as documented in the enclosed report, a few open safety issues will require your commitment to further action and consideration as the remaining safety basis documents are developed and revised.

Pursuant to 42 United States Code (U.S.C.) § 2286b(d), the Board requests that within 120 days of receipt of this letter NNSA provide the Board with a written report on (a) any actions taken or planned for these remaining open safety issues and observations and (b) implementation of these actions across the other appropriate weapon programs.

Based on the work done to date, as well as the commitment of NNSA to continue to revise the safety basis documents as outlined in its implementation plan and with consideration of the related safety issues outlined in this review, the Board considers Recommendation 2019-1

closed. The Board's staff will continue to monitor and evaluate progress of the site's safety basis revisions and enhancement efforts and will communicate any safety issues identified.

Sincerely,



Joyce L. Connery
Chair

Enclosure

c: Ms. Teresa Robbins, Acting Administrator, National Nuclear Security Administration
Mr. Jason Armstrong, Manager, NNSA Pantex Field Office
Mr. Joe Olencz, Director, Office of the Departmental Representative to the Board

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

October 31, 2024

B61 Hazard Analysis Report Review at the Pantex Plant

Summary. During 2023 and 2024, the Defense Nuclear Facilities Safety Board's (Board) staff team conducted a review of the revised *B61 Hazard Analysis Report* (HAR) for assembly and disassembly operations at the Pantex Plant [1] [2] [3]. The staff team reviewed the safety basis for the weapon program and associated supporting documentation. Additionally, the staff team assessed extent of condition evaluations and control applications resulting from Board Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant* [4]. The staff team found that the National Nuclear Security Administration (NNSA) field office, the Pantex Field Office (PFO)[1], and its contractor, Consolidated Nuclear Security, LLC (CNS)[2], mostly addressed the safety basis issues outlined in Recommendation 2019-1. However, the staff team identified safety issues warranting additional action.

Background. Board Recommendation 2019-1 identified various safety concerns with the Pantex safety basis, including the following:

1. Certain hazard scenarios with high-order consequences[3] were not adequately controlled; may have had controls but lacked documentation linking the controls to the hazards; or had controls that were not sufficiently robust or that lacked sufficient pedigree to reliably prevent the event.

2. Key elements of safety management programs were inappropriately credited as the controls relied upon for preventing high-order consequence hazard scenarios.

3. Special tooling performance criteria were absent from the safety basis.

As discussed in its January 16, 2024, letter [5], NNSA has completed all deliverables within the revised Recommendation 2019-1 Implementation Plan [6] [7]. Per the modified implementation plan, PFO approval of the revised B61 HAR [8] was one of the final remaining actions to be completed. The B61 HAR was the first safety basis document that incorporated safety improvements resulting from Recommendation 2019-1, as well as from other Pantex safety basis enhancements, such as the *Pantex Safety Basis Vision* [9]. This latter initiative aimed to modernize the safety basis documentation, including (1) streamlining the documents to

[1] On April 2, 2024, NNSA established PFO to oversee operations at the Pantex Plant. Previously, the NNSA Production Office had oversight responsibilities at both Pantex and the Y-12 National Security Complex.
[2] On June 13, 2024, NNSA announced that the Pantex management and operating contract would transition from CNS to PanTeXas Deterrence, LLC, in early fiscal year 2025.
[3] These consequences include *high explosive violent reaction*—now categorized as *aerosolized dispersal*—and *inadvertent nuclear detonation*, which significantly exceed the DOE Evaluation Guideline dose consequence of 25 rem total effective dose to the maximally exposed offsite individual.

ensure only the necessary content remained for federal review and (2) revising specific administrative controls (SAC) and design features to be consistent with DOE Standard 3009-2014 [10] and DOE Standard 1186-2016 [11] expectations and requirements.

Consequently, the B61 HAR revision offered the staff team the opportunity to gauge the effectiveness of the suite of NNSA actions in response to the recommendation and other safety basis improvements. PFO and the site contractor continue to apply similar changes across the remaining safety basis documents, which are anticipated to be completed by December 2025.

The conclusions of the review of the B61 HAR are detailed in the remainder of this report. Of note, the safety issues with design feature implementation and special tooling performance criteria are directly related to deliverables from the Recommendation 2019-1 Implementation Plan.

Positive Developments. During the review of the revised B61 HAR and discussions with PFO and CNS, the staff team identified the following safety improvements:

- In the revised B61 HAR, CNS removed terminology related to the "use of initiating event frequencies" from the safety basis aligning with DOE Standard 3016 [12] expectations. As noted in DOE Standard 3016, "[w]ith the exception of [natural phenomena hazard] and man-made external events, initiating event probability information must not be used to dismiss the need to apply controls for plausible accident scenarios resulting in [high-order consequences]."

- As a result of the staff team's questions, CNS said it planned to modify the disposition statement for one hazard scenario to be consistent with other similar scenarios (i.e., the event will not be considered credible).

- As a result of staff team questions and PFO feedback on the Proximity Restriction SAC, CNS added additional conservatism into the control by modifying the required standoff distance between freestanding equipment and nuclear explosive configurations. Furthermore, CNS modified this limiting conditions for operation format SAC to require immediate removal of any freestanding equipment in violation of this requirement when identified. These changes increase the safety margin between the potential topple hazard and nuclear explosive, as well as ensure immediate rectification when equipment does not meet the required standoff.

- The previous and revised B61 HARs specified an incorrect amount of material contained within certain special nuclear material components. As a result of staff team questions, CNS stated it planned to incorporate accurate values into the safety basis document. Furthermore, as CNS obtained the incorrect values from certain design agency documentation, it formally relayed this discrepancy to the appropriate design agencies.

Safety Issues. The staff team identified the following safety issues that warrant further action from NNSA.

Design Feature Implementation—As part of the safety basis modernization effort related to the *Pantex Safety Basis Vision*, CNS reconfigured various SACs into safety class and safety significant design features. For example, if a SAC previously required installation of equipment (e.g., special tooling), CNS deleted the SAC and specifically credited the physical equipment to perform the necessary safety function. The staff team agrees with this approach as it follows the hierarchy of controls provided in DOE Standard 3009-2014. However, since the design feature requires operator action to provide its safety function, there is a potential gap regarding consistent and reliable application of the control.

At the current time, CNS documents when the design feature needs to be applied (e.g., for certain nuclear explosive configurations) within the control description and then applies a *critical step* within the nuclear explosive operating procedures to ensure consistent and reliable implementation of the administrative actions. While this approach is reasonable, safety basis documentation and requirements should be revised to formalize this practice (e.g., within local site procedures), ensuring appropriate flowdown of safety basis requirements into nuclear explosive operating procedures and continued protection of design feature application in the future. Alternatively, NNSA could formalize such practices within the Alternate Methodology Proposal [13]—a new safe harbor methodology currently under review by NNSA for development of safety basis documents for nuclear explosive operations.

Special Tooling Performance Criteria—As part of the Recommendation 2019-1 Implementation Plan, PFO and CNS defined performance criteria for safety class and safety significant special tooling. Reasonably conservative factors of safety within the special tooling performance criteria ensure existing and newly designed tooling can perform their credited safety functions during both normal operations and accident scenarios. However, the staff team found that the new performance criteria related to normal and rare event loading were non-conservatively established. CNS adopted lower factors of safety in the B61 HAR—compared to previous safety margin design requirements, which were denoted as functional requirements within the safety basis—to allow use of a limited set of commercial components employed in special tooling (e.g., casters). A comparison between the previous special tooling functional requirements and new performance criteria is presented below in Table 1.

As noted by CNS during the review, the Special Tooling Safety Management Program [14] and Special Tooling Design Manual [15] still require design of special tooling—outside of these procured commercial components—at the higher factors of safety (e.g., 3:1 at yield for static loading and 1.25:1 at yield for rare event loading). Given that only very limited quantities of commercial components are used in special tooling that cannot meet these higher factors of safety, it would be prudent for Pantex to define tooling performance criteria consistent with the safety management program and tooling design manual. At a minimum, Pantex should maintain the required higher factors of safety identified within Chapter 18 of the Sitewide Safety Analysis Report [14] to provide confidence in future safety margins when developing new special tooling.

Additionally, for a certain vacuum fixture (i.e., Aft HE Vac Plate II), the design feature control description specifies a certain level of vacuum for the special tooling to maintain positive control of the supported configuration. As the vacuum fixture requires this level of vacuum to

perform its safety function and Pantex designs the special tooling based on this value, this requirement should be flowed into the performance criteria. Though not explicitly evaluated during this review, this same safety concern could apply to vacuum fixtures used across the other weapon programs.

Table 1. *Special Tooling Safety Basis Changes.*

Loading Condition	Previous Functional Requirements	New Performance Criteria
Anticipated (normal)	Tooling shall be designed to carry anticipated loads with a minimum safety factor of 3:1 at yield or 5:1 at ultimate/breaking strength.	Tooling shall maintain positive control and structural integrity for the maximum anticipated normal loads with a minimum margin of 25 percent.
Rare event – seismic	Tooling shall be designed to carry anticipated loads under a Performance Category-3 seismic event with a minimum factor of safety of 1.25:1 at yield or 1.5:1 at ultimate/breaking strength and remain stable and not topple or collapse during the event.	Tooling shall maintain positive control and structural integrity for Performance Category-3 seismic rare event loads without toppling.
Rare event – tripping technician	Tooling shall be designed to carry anticipated loads under a 95th percentile technician-tripping event with a minimum factor of safety of 1.25:1 at yield or 1.5:1 at ultimate/breaking strength and remain stable and not topple or collapse during the event.	Tooling shall maintain positive control and structural integrity for 95th percentile tripping technician rare event loads.

Procedural Compliance Assumptions within the Safety Analysis—The safety basis has limited protection for situations in which the technician could bring the wrong piece of equipment up to the unit. While the safety basis should not evaluate gross deviations from the procedure, the current safety analysis assumes 100-percent operator compliance with the procedure. This assumption of operator perfection is unrealistic and inconsistent with the current environment at Pantex in which conduct of operations events are occurring [16] [17], including instances in which workers brought incorrect special tooling up to the unit. Reasonable operational deviations should be reflected in the safety basis to preclude configurations with unanalyzed, uncontrolled hazards. Without such a bounding hazard analysis, plausible operational deviations could result in configurations outside the established safety envelope.

To account for the current Pantex operating environment with a less experienced workforce, safety basis changes may be warranted to prevent reliance on perfect compliance from the technicians (e.g., use of more conservative weights for impact hazards for instances in which incorrect special tooling could be plausibly used). One example discussed during the review included using the worst-case vacuum fixture weight for impact hazards for weapon configurations across an operating procedure.

Opportunities to introduce this content into the safety basis could occur during life extension programs for the various weapon programs, where significant operational changes may require extensive safety basis modifications and the use of Hazard Analysis Task Teams to assess the plausibility and severity of various hazard scenarios. Additionally, Pantex could demonstrate greater confidence in procedural compliance through other human factor improvement efforts (e.g., initiatives for bolstering Disciplined Operations Specialist efforts or

establishing reader-worker-checker program enhancements to formalize technician repeat backs and verify comprehension prior to executing procedure steps).

Soft Mitigative Surfaces—The safety basis credits the Credited 35-Account Materials design feature to provide protection during various impact hazard scenarios. As discussed in the control description, the 35-account material provides a soft mitigative surface to preclude significant impacts resulting from potential drops of various nuclear explosive configurations. During the review, CNS stated that, when the control was applied to unscreened hazard scenarios, the mitigative surface precludes the impact and no additional controls were necessary. However, the design agency provided a mitigated weapon response that demonstrates the design feature mitigates the likelihood of an adverse response but does not preclude it. As a result, some small risk to the facility worker remains and potentially requires the consideration of additional controls. While this is a fairly unique situation, in which the design agency contended that the Pantex-owned control does not adequately preclude the hazard, this discrepancy should be addressed and additional controls considered to protect the worker.

Electrostatic Dissipative (ESD) Footwear—The Electrostatic Discharge Requirements SAC states that "[o]nly personnel wearing ESD footwear and tested for continuity shall be within 6 ft of any B61 [electrostatic discharge]-sensitive configuration." To protect the assumption that only ESD footwear *passing* the continuity test will be used when entering a B61 nuclear explosive facility, the SAC should be rewritten as follows: "Only personnel wearing ESD footwear that has passed a continuity test immediately prior to facility entry shall be within 6 ft of any B61 electrostatic discharge-sensitive configuration."

Additionally, to comply with the Electrostatic Discharge Requirements SAC, personnel entering these nuclear explosive facilities must use the ESD footwear checker to ensure that they do not introduce any unanalyzed electrical hazards and meet ESD requirements (i.e., their footwear satisfies a certain electrical resistance threshold). However, CNS did not formally credit the ESD footwear checker in the B61 HAR as a safety class control, noting the equipment is only a tool and does not prevent and/or mitigate the hazard scenarios.

The staff team identified concerns with this approach and the rationale provided in RP CNS-F-0076-000 01, *Differentiating between Items and Structures, Systems, and Components (SSCs) and Elevation of SSCs Relied upon for Performance of Specific Administrative Controls* [18], for identifying *items* versus *SSCs* and designating safety-credited SSCs, which CNS used to support the lack of safety classification for the ESD footwear checker. Based on discussions between PFO, CNS, and the staff team, Pantex intends to revise this safety classification guidance document. As noted in DOE Standard 3009-2014:

> *For existing facilities, support SSCs shall be designated at the same classification (SC or SS) as the safety controls they support, or else compensatory measures shall be established to assure that the supported safety-SSC can perform it safety function when called upon. SSCs whose failure would result in losing the ability to complete an action required by a SAC shall be identified. These shall be designated as [safety class] or [safety significant] based on the SAC safety function, or justification provided if not so designated.* [10]

Therefore, given that an SSC, i.e., the ESD footwear checker, is required for the Electrostatic Discharge Requirements SAC to perform its intended safety function, the footwear checker should be designated at the same safety classification level. Furthermore, Pantex should perform commercial grade dedication to include failure modes and effects analysis, demonstrating ESD footwear checker reliability and assessing the potential for inappropriate acceptance of footwear.

Additional Observations. The staff team also noted five observations that may warrant further consideration by NNSA.

Government Furnished Equipment—For SACs related to implementation of government furnished equipment (e.g., installation of electrical protective covers provided by the design agencies to ensure selected weapon response rules remain applicable), CNS stated that the site is typically provided limited performance characteristics for this equipment. As a result, CNS retained these SACs and did not transition to new design features. This approach is reasonable, but the staff team found that this process limits Pantex's control with this provided safety equipment and could introduce gaps related to quality assurance and acceptance of the items prior to use.

Safety Basis Streamlining—As part of the *Pantex Safety Basis Vision* initiative, CNS streamlined the Pantex safety basis documentation, removing content deemed superfluous and not necessary for federal review and approval. As a result of these modifications, the staff team found an inconsistent description of operational tasks within Chapter 2 of the B61 HAR that is reviewed by the field office. These operational descriptions are meant to offer an overview of the nuclear explosive activities and provide context for hazard identification, analysis, and control selection. However, some of these task descriptions in the B61 HAR did not provide sufficient information on the described operation.

CNS acknowledged the inconsistent description of some of the operational tasks but noted that the removed content remained within a *hidden text* version of the document. Of note, the *hidden text* version is managed by the site contractor under configuration control but is not reviewed and approved by the field office.

PFO personnel stated that they use the *hidden text* version during their review of safety basis revisions. This approach is necessary as some of the *hidden text* content is critical to gauge the adequacy of the safety basis. In particular, Appendix A of the safety analysis is maintained only in the *hidden text* version but provides necessary information on how certain hazard scenarios are dispositioned (e.g., screened from further consideration through weapon response). This content should not just exist within the *hidden text* version but also be visible in the documented safety analysis formally reviewed and approved by PFO.

Weapon Response Rule Application—For one hazard scenario, CNS may have inappropriately applied a mitigated weapon response rule to assert a component insult was precluded. While the application of the weapon response rule may be incorrect, through analysis

of the hazard scenario, other relevant weapon response rules, and applied controls, the staff team determined that the scenario was adequately controlled.

Control Failure Probabilities—Based on discussions during the review, the control failure probabilities provided in Table 3.3-2 of the B61 HAR do not have a sufficient technical basis and provide a false sense of control reliability. Given that Pantex does not use these values anymore within the safety basis to assess control effectiveness, it would be prudent to remove these values from the B61 HAR and other safety basis documents.

Proximity Restriction SAC—This administrative control prevents freestanding equipment from impacting nuclear explosive configurations during potential hazard scenarios. Per the SAC, CNS said it would execute a surveillance requirement at the start of each shift, verifying that freestanding equipment maintains an appropriate standoff distance from the configurations. This selected surveillance frequency represents a missed an opportunity to identify such issues following worker reentry into the facility at other times (e.g., following a break). However, freestanding equipment not complying with this requirement should be readily apparent to workers during performance of their routine duties.

Conclusion. The review of the revised B61 HAR and supporting documentation provided the staff team an opportunity to evaluate how Pantex addressed safety issues outlined in Recommendation 2019-1, as well as other improvements resulting from the *Pantex Safety Basis Vision*. While PFO and CNS addressed most of the safety issues in Recommendation 2019-1 in this HAR, the staff team identified several open safety issues warranting commitment to further action and additional observations for consideration by NNSA, including safety issues related to the efficacy of Recommendation 2019-1 that may not have been realized without the benefit of this review.

References

[1] Consolidated Nuclear Security, LLC, *AB-21-81, AB-HAR-940572, (U) B61 SS-21 Disassembly and Assembly Hazard Analysis Report*, July 11, 2022.

[2] Consolidated Nuclear Security, LLC, *Letter from David N. Kupferer to W. T. Mallison, Contract DE-NA0001942, AB-21-81, Modernizing Safety Controls in the B61 Hazard Analysis Report*, July 11, 2022.

[3] Consolidated Nuclear Security, LLC, *Letter from David N. Kupferer to W. T. Mallison, Contract DE-NA0001942, AB-21-81-R1, Modernizing Safety Controls in the B61 Hazard Analysis Report*, May 9, 2023.

[4] Defense Nuclear Facilities Safety Board, *Recommendation 2019-1, Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, February 20, 2019.

[5] National Nuclear Security Administration Production Office, *Letter from Teresa M. Robbins to Joyce L. Connery*, January 16, 2024.

[6] National Nuclear Security Administration, *Implementation Plan for the Defense Nuclear Facilities Safety Board Recommendation 2019-1, Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant, Revision 1*, June 5, 2020.

[7] National Nuclear Security Administration, *Letter from Jill Hruby to Joyce L. Connery*, June 15, 2023.

[8] National Nuclear Security Administration Production Office, *Letter from Teresa M. Robbins and W. T. Mallison to to David N. Kupferer, Modernizing Safety Controls in the B61 Hazard Analysis Report*, August 26, 2023.

[9] Consolidated Nuclear Security, LLC, *PLN-0111, Pantex Safety Basis Vision Execution Strategy, Revision 1*, July 2021.

[10] Department of Energy Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, November 2014.

[11] Department of Energy Standard 1186-2016, *Specific Administrative Controls*, December 2016.

[12] Department of Energy Limited Standard 3016-2023, *Hazard Analysis Reports for Nuclear Explosive Operations*, April 2023.

[13] Consolidated Nuclear Security, LLC, *Alternate Methodology Proposal, Preparation of Documented Safety Analyses for Nuclear Explosive Operations at the Pantex Plant*, April 2024.

[14] Consolidated Nuclear Security, LLC, *AB-SAR-314353, (U) Sitewide Safety Analysis Report, Revision 385*, October 18, 2023.

[15] Consolidated Nuclear Security, LLC, *MNL-293130, Special Tooling Design Manual, Issue 15*, September 2022.

[16] Defense Nuclear Facilities Safety Board, *Letter from Joyce L. Connery to J. Granholm, Observations from Review of Training and Qualification Program and Conduct of Operations Implementation at the Pantex Plant*, June 9, 2021.

[17] Defense Nuclear Facilities Safety Board, *Letter from Joyce L. Connery to J. Hruby, Pantex Safety Posture*, July 20, 2022.

[18] Consolidated Nuclear Security, LLC, RP CNS-F-0076-000 01, *Differentiating between Items and Structures, Systems, and Components (SSC) and Elevation of SSCs Relied upon for Performance of Specific Administrative Controls*, May 2022.

AFFIRMATION OF BOARD VOTING RECORD

SUBJECT: B61 Hazard Analysis Report Review at the Pantex Plant

Doc Control#: 2025-100-0011

The Board acted on the above document on 01/30/2025. The document was Approved.

The votes were recorded as:

	APRVD	DISAPRVD	ABSTAIN	NOT PARTICIPATING	COMMENT	DATE
Joyce L. Connery	☑					01/29/2025
Thomas Summers	☑					01/30/2025
Patricia Lee	☑					01/29/2025

This Record contains a summary of voting on this matter together with the individual vote sheets, views and comments of the Board Members.

Shelby Qualls
Executive Secretary to the Board

Attachments:

1. Voting Summary
2. Board Member Vote Sheets

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

NOTATIONAL VOTE RESPONSE SHEET

FROM: Joyce L. Connery

SUBJECT: B61 Hazard Analysis Report Review at the Pantex Plant

Doc Control#: 2025-100-0011

DATE: 01/29/2025

VOTE: Approved

COMMENTS:

None

Joyce L. Connery

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

NOTATIONAL VOTE RESPONSE SHEET

FROM: Thomas Summers

SUBJECT: B61 Hazard Analysis Report Review at the Pantex Plant

Doc Control#: 2025-100-0011

DATE: 01/30/2025

VOTE: Approved

COMMENTS:

None

Thomas Summers

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

NOTATIONAL VOTE RESPONSE SHEET

FROM: Patricia Lee

SUBJECT: B61 Hazard Analysis Report Review at the Pantex Plant

Doc Control#: 2025-100-0011

DATE: 01/29/2025

VOTE: Approved

COMMENTS:

None

Patricia Lee