DEFENSE NUCLEAR FACILITIES SAFETY BOARD
Washington, DC 20004-2901

December 6, 2024

The Honorable Jennifer M. Granholm
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Granholm:

Following Defense Nuclear Facilities Safety Board (Board) Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*, the Department of Energy (DOE) issued DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, which presents significantly clearer safety requirements than its predecessor document as the safe harbor methodology for preparing nonreactor nuclear facility documented safety analyses (DSA). As the Board noted in its April 1, 2015, letter, to tangibly strengthen safety, DOE must implement these improved requirements across its defense nuclear complex.

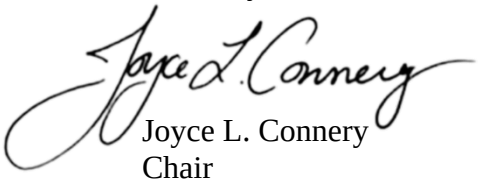
The enclosed staff report finds that in the decade since its issuance, DOE Standard 3009-2014 has not seen widespread application, and evidence suggests that this trend will continue. The Board identified multiple examples where applying the clear requirements found in DOE Standard 3009-2014 at DOE defense nuclear facilities could result in important safety improvements, such as the need to implement additional safety controls.

Based on these findings, DOE should strengthen its efforts to implement DOE Standard 3009-2014 and potential successor documents, placing priority on higher hazard nonreactor facilities with enduring missions. Therefore, pursuant to 42 United States Code § 2286b(d), the Board requests a briefing and a report within 120 days of receipt of this letter that contains:

- For defense nuclear facilities with DSAs written to DOE Standard 3009-94:
    - DOE's plans to transition facility DSAs to DOE Standard 3009-2014, binned by timeframe (e.g., within one year, within three years, within five years).
    - DOE's rationale for facilities that will not transition to DOE Standard 3009-2014 within 5 years.

- DOE's plans to ensure wide and timely implementation of new safe harbors that strengthen safety requirements.

Sincerely,



Joyce L. Connery
Chair

Enclosure

c: The Honorable Jill Hruby, Administrator, National Nuclear Security Administration
Ms. Candice Robertson, Senior Advisor, Office of Environmental Management
Mr. Todd Lapointe, Director, Office of Environment, Health, Safety and Security
Mr. John Dupuy, Director, Office of Enterprise Assessments
Mr. Joe Olencz, Director, Office of the Departmental Representative to the Board

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

September 30, 2024

Implementation of Department of Energy Standard 3009-2014

Summary. Department of Energy (DOE) Standard 3009 provides the primary methodology for preparing documented safety analyses (DSA) for DOE nonreactor nuclear facilities. Following Defense Nuclear Facilities Safety Board (Board) Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers* [1], DOE issued DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis* [2]. This major revision of the standard presents significantly clearer nuclear safety requirements and guidance for important DSA preparation topics.

Since its issuance in November 2014, DOE Standard 3009-2014 has not been widely implemented, and based on a Board's staff's survey of DOE sites, it will continue to be under-used. Over the past decade, the Board has identified examples where implementing DOE Standard 3009-2014 requirements or guidance could result in important safety improvements and potential changes to facility safety control strategies. Accordingly, DOE should strengthen its efforts to implement DOE Standard 3009-2014 and potential successor documents, placing priority on higher hazard facilities.

Background. Title 10 Code of Federal Regulations Part 830, *Nuclear Safety Management* (10 CFR 830) [3], identifies DOE Standard 3009 as an acceptable methodology (i.e., a safe harbor) for preparing a DOE nonreactor nuclear facility DSA to meet the requirements set out in the regulation. A DSA that has been reviewed and approved by DOE documents the activities that are authorized to be performed, the potential hazards of those activities, and the controls that are needed to ensure adequate protection of the public and workers from those operations. 10 CFR 830 also includes other safe harbors for specific types of nuclear facilities, including: DOE Standard 3011 [4] for a DOE nuclear facility with a limited operational life and DOE Standard 1120 [5] for the decommissioning of a DOE nuclear facility.

Regarding DOE Standard 3009, 10 CFR 830 specifically cites DOE-STD-3009, Change Notice (CN) 1, January 2000, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* [6], or its successor document. DOE issued two additional change notices [7, 8] to DOE Standard 3009-94. Based on a Board's staff's survey, most DOE nonreactor nuclear facility safety bases are written to DOE Standard 3009-94, CN3.

Recommendation 2010-1 laid out the challenges with implementing DOE Standard 3009-94 CN3 as a safe harbor. The recommendation noted that DOE Standard 3009-94 "was intended to provide guidance on meeting the requirements imposed by DOE Order 5480.23, *Nuclear Safety Analysis Reports*, a set of nuclear safety requirements that preceded and were supplanted by 10 CFR Part 830.…As such, it did not contain any nuclear safety requirements." Prior to

Recommendation 2010-1, the Board asked DOE [9] to clarify what parts of DOE Standard 3009-94 CN3 were mandatory and what parts were optional. In its June 10, 2010, letter [10], DOE recognized that DOE Standard 3009-94 "was not written as a prescriptive item-by-item requirements document." In Recommendation 2010-1, the Board noted the "difficulties inherent in applying a guidance document as a safe harbor" were illustrated by the National Nuclear Security Administration's approval of a DSA for the Los Alamos National Laboratory (LANL) Plutonium Facility that did not apply adequate controls to mitigate offsite dose consequences to below the evaluation guideline—a key concept suggested by DOE Standard 3009-94 CN3.

Accordingly, the Board recommended that DOE, "Revise DOE Standard 3009-94 to identify clearly and unambiguously the requirements that must be met to demonstrate that an adequate level of protection for the public and workers is provided through a DSA." In its implementation plan for the recommendation, DOE committed to revising DOE Standard 3009, DOE Standard 1120, and DOE Standard 3011. DOE issued the revision to DOE Standard 3009 in 2014 and revisions for DOE Standard 1120 [11] and DOE Standard 3011 [12] in 2016. Separate from the implementation plan, DOE also developed DOE Standard 1228 [13], which contains a methodology for preparing DSAs for hazard category 3 nuclear facilities.[1]

As the standard notes, DOE Standard 3009-2014 "is a significant revision of and successor document to DOE-STD-3009-94…and is intended to clearly identify those portions of the Standard that are required to meet 10 C.F.R. Part 830 requirements if this methodology is used for DSA preparation." As such, it clearly delineates which parts of the standard are requirements (i.e., denoted by "shall" statements) and which parts are recommended practices (denoted by "should" statements). In its April 1, 2015, letter [15], the Board was "encouraged by the significantly improved safety requirements contained in" the standard, but stated that to "tangibly strengthen safety, DOE must apply these improved requirements to defense nuclear facilities."

DOE Standard 3009-2014 also contains additional safety improvements and clarifies several topics from DOE Standard 3009-94 CN3. For example, the revised standard:

- Includes dose consequence evaluation of a co-located worker receptor to determine the need for safety significant controls.

- Establishes clear requirements for parameters used in atmospheric dispersion models.

- Requires engineering evaluations to ensure that safety controls in existing facilities can meet or exceed their performance criteria.

It also provides greater clarity on important safety analysis topics such as:

- The appropriateness of unmitigated analysis assumptions and initial conditions.

[1] In its February 8, 2021, letter [14], the Board concluded that DOE Standard 1228-2019 is inconsistent with 10 CFR 830 and advised DOE to revise the standard.

- DOE's preferred hierarchy of controls.

- The defense-in-depth philosophy and elevating controls to safety significant as important contributors to defense-in-depth.

- When particular standard industrial hazards may need to be considered in a DSA.

In response to Recommendation 2010-1, DOE issued a document titled *Regulatory Analysis of Potential Changes to Requirements Documents to Invoke Documented Safety Analysis Development and Review Criteria* [16]. In the regulatory analysis, DOE concluded that DOE Standard 3009-2014 should be applied to existing facilities with mitigated dose estimates that exceed the evaluation guideline of 25 rem total effective dose, and to major modifications to existing facilities. DOE also concluded that "Decisions on whether or not to apply the new Standard for [other] existing facilities will be made by the responsible PSOs [Program Secretarial Officers]."

Subsequently, the Deputy Secretary of Energy issued an Operating Experience (OE)-1 document [17]. The OE-1 document required field offices to evaluate a subset of facilities against a limited set of criteria that were derived from DOE Standard 3009-2014. These criteria were focused on impacts to the offsite public and did not include factors related to co-located or facility workers. The OE-1 document also required DOE safety basis approval authorities (SBAA) to use the results to determine "whether any potential safety or documentation improvements or other actions are warranted." The OE-1 document did not explicitly require SBAAs to use this evaluation to decide whether to implement DOE Standard 3009-2014, in either the near-term or the long-term.

In the OE-1 document, the Deputy Secretary of Energy "encouraged" facilities to upgrade their DSAs to the methodology of DOE Standard 3009-2014 "over time (i.e., 5-10 years)." The OE-1 document stated that sites can evaluate the adoption of DOE Standard 3009-2014 "through the normal processes of evaluating new standards to determine applicability and benefit." However, the OE-1 document did not require that evaluation.

Discussion. To better understand the current and future implementation of DOE Standard 3009-2014 across the complex and the safety impacts of not implementing the standard, the Board's staff team surveyed DOE sites and reviewed past Board correspondences.

Current and Future Implementation of DOE Standard 3009-2014—The staff team surveyed DOE sites[2] to better understand:

[2] The Hanford Site (Hanford), Idaho National Laboratory (INL), LANL, Lawrence Livermore National Laboratory (LLNL), the Nevada National Security Site (NNSS), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), the Pantex Plant (Pantex), Sandia National Laboratories (SNL), the Savannah River Site (SRS), the Waste Isolation Pilot Plant (WIPP), the Y-12 National Security Complex (Y-12). INL, LLNL, and Pantex have no near-term plans to revise safety bases to be DOE Standard 3009-2014 compliant and are not included in Table 1.

1. Which existing hazard category 2 defense nuclear facilities currently use DOE Standard 3009-2014 as their DSA preparation methodology.

2. DOE's and its contractors' plans to revise existing hazard category 2 defense nuclear facility safety bases to be DOE Standard 3009-2014 compliant.

3. Which hazard category 2 projects and major modifications are currently using DOE Standard 3009-2014 to develop their safety design basis documents.

Table 1 shows the current and projected near term implementation of DOE Standard 3009-2014 across the complex. Of the approximately 60 existing hazard category 2 DOE defense nuclear facilities with enduring missions surveyed by the staff, 4 have approved DOE Standard 3009-2014 compliant DSAs (highlighted in green)[3]. Additionally, some sites have developed plans to revise existing facility DSAs to be compliant with DOE Standard 3009-2014, but the planned approval dates for those DSAs have passed (labeled as "date passed" in Table 1).

DOE Order 420.1C, *Facility Safety* [18], requires new DOE nonreactor nuclear facilities and major modifications to existing DOE nonreactor nuclear facilities to use DOE Standard 3009-2014 if selecting the DOE safe harbor method to satisfy 10 CFR 830 requirements. DOE currently has five hazard category 2 projects or major modifications that are using DOE Standard 3009-2014 to develop their safety design basis documents (highlighted in blue).

Table 1. *Current and projected near term implementation of DOE Standard 3009-2014*

Site	Facility	Type	Approval Date
Hanford	Canister Storage Building	Existing Facility	Jun 2019
Hanford	Capsule Storage Area	Project	FY2025
Hanford	Tank Farms	Existing Facility	FY2028
Hanford	WTP/High Level Waste Facility	Project	FY2030+
LANL	Area G	Existing Facility	FY2025
LANL	Plutonium Facility	Existing Facility	FY2025
LANL	RANT Shipping Facility	Existing Facility	Date passed
LANL	Transuranic Waste Facility	Existing Facility	Date passed
LANL	Weapons Engineering Tritium Facility	Existing Facility	Date passed
NNSS	Device Assembly Facility	Existing Facility	FY2025+
NNSS	PULSE (formerly U1a Complex)	Existing Facility with Two Major Modifications	FY2028+
NNSS	Radioactive Waste Management Complex	Existing Facility	FY2025
ORNL	Building 2026	Project	Oct 2023
PNNL	Building 325	Existing Facility	FY2025
SNL	Sandia Pulsed Reactor/Critical Experiment Facility	Existing Facility	May 2021

[3] Some hazard category 2 DOE defense nuclear facilities are in the process of being decommissioned or have a limited lifetime. DOE has revised several of these facilities' DSAs to meet DOE Standard 1120-2016 and DOE Standard 3011-2016, respectively. These facilities are outside the scope of this staff report.

Site	Facility	Type	Approval Date
SRS	Savannah River Plutonium Processing Facility	Project	FY2030+
SRS	Surplus Plutonium Disposition Project	Major Modification	FY2029+
WIPP	Waste Isolation Pilot Plant	Existing Facility	Apr 2016

Examples Where Implementing DOE Standard 3009-2014 Could Result in Safety Improvements—Over the past decade, the Board has identified examples where implementing DOE Standard 3009-2014 requirements or guidance could result in safety improvements and potential changes to facility safety control strategies. The following are notable examples. Appendix A contains additional examples.

- February 24, 2023, *Flammable Gas Hazards in Idaho National Laboratory's Nuclear Waste Drums* [19]. In April 2018, four waste drums at INL's Radioactive Waste Management Complex (RWMC) over-pressurized due to methane generation. The over-pressurization caused the drum lids to eject, spreading radiological material within the facility. Fortunately, no workers were in the facility at the time of the event. During a follow-up effort, a staff team reviewed the DSA for the Advanced Mixed Waste Treatment Project (part of RWMC), which is written to DOE Standard 3009-94 CN3. The unmitigated analysis for drum deflagrations assumes the co-located worker evacuates within 15 minutes. DOE Standard 3009-94 CN3 does not include the co-located worker as a receptor. DOE Standard 3009-2014 requires consequence analysis of the co-located worker but does not support the assumption that the co-located worker evacuates. Appropriately implementing the unmitigated analysis requirements in DOE Standard 3009-2014 for the co-located worker would result in higher dose consequences and the potential need for additional controls.

- August 11, 2022, *Observations Related to the Inadvertent Tritium Release Event* [20]. Operators inadvertently released tritium gas through the stack of the H-Area New Manufacturing facility at SRS. Some of the tritium gas re-entered the facility through the ventilation system intake, potentially exposing facility personnel to tritium. At the time, Savannah River Nuclear Solutions, LLC, determined this event did not represent a potential inadequacy of the safety analysis because the meteorological conditions on the day the tritium was released exceeded those assumed in the DSA (i.e., 50^{th} percentile).

  DOE Standard 3009-94 CN3 states that "there is no predetermined frequency cutoff value…for excluding low frequency operational accidents (i.e., internally initiated)." DOE Standard 3009-2014 further clarifies cases where an operational event can be considered not plausible: "Necessarily, no such sequence of events may ever have actually happened in any nonreactor nuclear facility." Because the event did happen, DOE Standard 3009-2014 requires it to be analyzed in the DSA, which might result in the need to identify additional controls.

- August 11, 2022, *Receipt and Repackaging of Large Amounts of Heat Source Plutonium at the Los Alamos National Laboratory Plutonium Facility* [21]. While

reviewing the implemented DOE Standard 3009-94 CN3 compliant DSA for the LANL Plutonium Facility, the staff found three areas in which the safety analysis appears inconsistent with DOE Standard 3009-2014.

- In the unmitigated analysis, the DSA assumes that administrative controls limit combustibles such that fires do not spread beyond two glovebox lines or the laboratory room. The Plutonium Facility has the potential to accumulate combustibles that could lead to greater fire spread. DOE Standard 3009-2014 does not allow DSAs to apply the effects of administrative controls such as combustible controls in the unmitigated analysis. Under DOE Standard 3009-2014, the unmitigated analysis should consider fire spread in the absence of administrative controls or identify passive safety controls related to fire spreading that could survive the accident.

- The DSA analyzes multiple accident scenarios at individual locations but does not consider a single accident involving all these locations caused by a common initiator. The Plutonium Facility does not have safety controls that would prevent material-at-risk at all locations from being impacted by a seismic event.

- The unmitigated analysis for the seismic event assumes that heat source plutonium solutions spill and then are exposed to elevated temperatures during the post-seismic fire. This results in a smaller release than the operational fire event, which assumes the heat source plutonium solutions do not spill and are heated to boiling. DOE Standard 3009-2014 clarifies that unmitigated consequence calculations must be based on the selection of bounding accident scenarios. The seismic event should assume that the heat source plutonium solutions do not spill and are heated to boiling and derive additional controls as necessary.

Future Safe Harbor Revisions—As noted earlier, only a small fraction of hazard category 2 defense nuclear facilities with enduring missions currently implement DOE Standard 3009-2014. One method to improve implementation of revised safe harbors is to establish requirements and guidance in the DOE directives system. This approach could include the need to evaluate the impact of upgrading a DSA against established criteria and having the SBAA determine whether to pursue a safety basis revision. Another method is to require site contractors to implement the new safe harbor through contracting direction. DOE should consider these methods to improve implementation of DOE Standard 3009-2014 and future safe harbor revisions.

Future Revisions of DOE Standard 3009—DOE is in the early stages of considering revising DOE Standard 3009-2014. To better understand implementation challenges and potential needed changes to the standard, the DOE Office of Nuclear Safety is initiating a "listening tour" in Fall 2024. DOE staff will meet with current users of DOE Standard 3009 to seek feedback on challenges related to implementing DOE Standard 3009-2014 (e.g., unclear language, over-conservatisms). DOE will use this feedback as it considers potential revisions to the standard.

Conclusion. Since DOE issued it in November 2014, DOE Standard 3009-2014 has not been widely incorporated as the methodology for developing DSAs for DOE nonreactor nuclear facilities. Based on a survey of DOE sites, DOE Standard 3009-2014 will continue to be under-used. DOE Standard 3009-2014 contains significantly clearer safety requirements and guidance. Over the past decade, the Board has identified examples in which implementing DOE Standard 3009-2014 requirements or guidance could result in safety improvements and potential changes to facility safety control strategies. Accordingly, DOE should strengthen its efforts to implement DOE Standard 3009-2014 and potential successor over a defined time period placing priority on higher hazard facilities.

Appendix A. Examples where Implementing Department of Energy (DOE) Standard 3009-2014 Could Improve Safety

The following is a non-exhaustive list of examples from Defense Nuclear Facilities Safety Board (Board) correspondence where the Board found that safety could be improved by following the requirements in DOE Standard 3009-2014. Note, the third column contains direct quotes from the cited correspondence.

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
February 28, 2023, Board letter and staff report, *Direct-Feed Low Activity Waste Facility Integration of Safety Bases* [22].	Hanford	*Safety Classification for Waste Characterization*— The Board's staff identified the following as a best practice for protecting waste characterization assumptions: WRPS [Washington River Protection Solutions] personnel informed the Board's staff that they plan to convert the waste characteristics administrative control key element to a SAC [specific administrative control] and make associated changes to the respective DSAs [documented safety analysis] and TSRs [technical safety requirements] via a draft safety basis amendment in 2022. Currently, in the Tank Farms DSA, waste characteristics are controlled through an administrative control key element rather than a SAC. The DSA notes that "The safety function of the waste characteristic control is to protect assumptions on waste characteristics used to estimate accident consequences." The calculated unmitigated consequences from some of the tank farms accidents require safety significant controls (e.g., flammable gas accidents). DOE Standard 1186-2004 notes that "Programmatic ACs [administrative controls] should not be used to provide specific or mitigative functions for accident scenarios identified in DSAs where the safety function has importance similar to, or the same as, the safety function of safety class or safety significant SSCs [structures, systems, and	A staff team reviewed the integration of the safety basis documents that implement the Direct-Feed Low Activity Waste Mission at Hanford. The Hanford Tank Farms DSA, which is written to DOE Standard 3009-94 CN3, credited an administrative control key element (waste characteristic control), instead of a specific administrative control, to protect assumptions on waste characteristics used to estimate accident consequences. For some accident scenarios, the unmitigated consequences require safety significant controls. While DOE Standard 3009-94 notes that "programmatic administrative controls should not be used to provide preventive or mitigative functions for accident scenarios identified in the safety basis where the safety function has importance similar to, or the same as the safety function of safety-class or safety-significant SSCs," DOE Standard 3009-2014 clarifies: "The

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		components].” DOE Standard 3009-1994, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, (the version of DOE Standard 3009 invoked in the Tank Farms DSA) does not specifically describe the parameters for administrative control key elements. However, DOE Standard 3009-2014 states that “It is not appropriate for a key element to be identified in lieu of a SAC.” This is because when a control is elevated to the class of SAC, DOE and contractors should ensure the “effectiveness and dependability of these important administrative controls beyond that which might be experienced if the specific action AC were simply to be implemented under the auspices of a Safety Management Program” (from DOE Standard 1186-2004). This concern was included in DNFSB Technical Report 48, *Hanford Tank Farms Safety Basis Review*, issued on September 15, 2021. Technical Report 48 notes, “instead of using a SAC to prevent an inappropriate transfer, WRPS uses a TSR administrative control key element requiring that certain characteristics be evaluated prior to each waste transfer as part of a safety management program.” Further, “This ambiguity and level of control appear to be inconsistent with the intent of DOE requirements and guidance. It may be appropriate to designate these controls as SACs to clear up ambiguity as to the control strategy or implications stemming from potential violations.”	criteria for designating an AC as a SAC include two conditions that need to be met: (1) ACs are identified in the safety analysis as a control needed to prevent or mitigate an accident scenario and (2) ACs have a safety function that would be SS [safety significant] or SC [safety class] if the function were provided by an SSC. These criteria include two “may” considerations: (1) ACs may protect initial conditions and (2) ACs may provide the main mechanism for hazard control. For example, an AC may serve as the most important control or only control, and may be selected where existing engineered controls are not feasible to designate as SS SSCs. Therefore, when ACs are selected over engineering controls, and the AC meets the criteria for an SAC, the AC is designated as a SAC.” DOE committed to upgrading the control to a SAC, thus improving the safety posture of the tank farms.

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		After Technical Report 48 was issued, the DOE Office of Enterprise Assessments (DOE-EA) issued an assessment on the SACs at the Hanford Site Tank Farms on December 20, 2021. The DOE-EA assessment notes that the waste characterization administrative control key element is inappropriately categorized and implemented as an administrative control rather than SAC. DOE-Hanford distributed the DOE-EA report as an operational awareness report on January 3, 2022. After Technical Report 48 and the operational awareness report were issued, WRPS issued a condition report action that notes, "Corrective action will be launched indicating that directive action statements, and the requirements of [the Waste Characteristics Controls] that fulfill the stated safety function, will be converted into a new SAC." Further, WRPS plans to make associated changes to the respective DSAs and TSRs via a draft safety basis amendment by January 31, 2024.	
February 24, 2023, Board letter and staff report, *Flammable Gas Hazards in Idaho National Laboratory's Nuclear Waste Drums* [19].	INL	***Co-located worker analysis***: In the unmitigated analysis, the AMWTP [Advanced Mixed Waste Treatment Project] analysis assumes that the co-located worker evacuates, such that this receptor is not exposed to the plume after 15 minutes. The analysis states, "A collocated worker at 100 m (328 ft) is assumed to quickly become aware of the fire and take action. However, for this analysis, it is conservatively assumed that evacuation is delayed for 15 minutes."	In April 2018, four waste drums at Idaho National Laboratory's Radioactive Waste Management Complex (RWMC) over-pressurized due to methane generation. The over-pressurization caused the drum lids to eject, spreading radiological material within the facility. Fortunately, no workers were in the facility at the time of the event. During a follow-up effort, a staff team reviewed the DSA for the Advanced Mixed Waste

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		Regarding the unmitigated analysis, DOE Standard 3009-2014 does not support the assumption that a co-located worker would evacuate. The standard discusses how the unmitigated analysis could account for the facility worker (immediately in the vicinity of the hazard) recognizing the event and leaving, but not the co-located worker. Thus, the assumption in the AMWTP analysis is inconsistent with DOE Standard 3009-2014. While the AMWTP analysis is using an older version of the standard, that older version does not address the co-located worker. This situation illustrates the importance of applying the new standard, which is more comprehensive.	Treatment Project (part of RWMC), which is written to DOE Standard 3009-94 CN3. The unmitigated analysis for drum deflagrations assumes the co-located worker evacuates within 15 minutes. DOE Standard 3009-94 CN3 does not include the co-located worker as a receptor. DOE Standard 3009-2014 requires consequence analysis of the co-located worker but does not support the assumption that the co-located worker evacuates. Appropriately implementing the unmitigated analysis requirements in DOE Standard 3009-2014 for the co-located worker would result in higher dose consequences and the potential need for additional controls.
August 11, 2022, Board letter and staff report, *Observations Related to the Inadvertent Tritium Release Event* [20].	SRS	*Incomplete Hazards Analysis*—Many design basis accidents involve tritium releases that are much larger than what occurred on January 30, 2022. Thus, it is important to consider whether the behavior of the plume that day has any implications to the safety analysis for HANM [H-Area New Manufacturing], including the identified controls. SRNS's [Savannah River Nuclear Solutions, LLC] hazard analyses for the SRTE [Savannah River Tritium Enterprise] estimated the consequences of various events that involve the release of tritium. For many events, the hazard analyses assumed that facility workers would evacuate the immediate area around the initial point of release in order to reduce their	Operators inadvertently released tritium gas through the stack of the H-Area New Manufacturing facility at SRS. Some of the tritium gas re-entered the facility through the ventilation system intake, potentially exposing facility personnel to tritium. At the time, SRNS determined this event did not represent a potential inadequacy of the safety analysis (PISA) because the meteorological conditions on the day the tritium was released exceeded those assumed in the safety basis (i.e., 50th percentile).

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		exposure. The hazard analyses did not consider the possibility that tritium could be released from a facility and then re-enter a building through the ventilation system. Re-entry of tritium into buildings could expose facility workers to tritium in locations that the hazard analyses did not anticipate, and therefore it is unclear whether the assumptions of the hazard analyses remain valid for such an accident progression. For some cases, the hazard analyses identify TAMs [tritium air monitor] as a safety control to inform workers of airborne tritium. NNSA [National Nuclear Security Administration] should consider evaluating the location, configuration, and safety classification of TAMs in light of possible tritium re-entry, as discussed further in the next section. Following discussions with the Board's staff, SRFO [Savannah River Field Office] directed SRNS to enter the PISA process on February 17, 2022. SRNS concluded that a PISA did not exist on March 3, 2022. SRNS stated that the safety analysis assumes 50th percentile (i.e., median) meteorological conditions when evaluating consequences to workers. SRNS, with assistance from Savannah River National Laboratory (SRNL) meteorologists, determined that the conditions of January 30, 2022, were beyond the 50th percentile conditions (i.e., half the time, the release would have led to lower worker exposure; the other half, the same release amount would have led to higher worker exposure). Accordingly, SRNS concluded there is no safety issue with the safety basis because this meteorological condition did not need to be analyzed in the safety analysis.	DOE Standard 3009-94 CN3 states that "there is no predetermined frequency cutoff value…for excluding low frequency operational accidents (i.e., internally initiated)." DOE Standard 3009-2014 further clarifies cases where an operational event can be considered not plausible: "Necessarily, no such sequence of events may ever have actually happened in any nonreactor nuclear facility." Because the event did happen, DOE Standard 3009-2014 requires it to be analyzed in the safety basis, which might result in the need to identify additional controls.

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		The fact that tritium re-entry occurred shows that re-entry is a plausible accident progression at HANM, and Department of Energy (DOE) standards indicate that plausible (or credible) progressions should be analyzed. An event with tritium re-entry could be initiated in several different ways, including operational events as well as natural phenomena (e.g., earthquake). DOE Standard 3009-94 Change Notice 3, *Preparation Guide for U.S Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, states that "there is no predetermined frequency cutoff value…for excluding low frequency operational accidents (i.e., internally initiated)." DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, provided further clarification by indicating that operational accidents should be analyzed if they are plausible. Thus, operational events that could credibly result in tritium re-entry should be considered in the hazard analysis.	
August 11, 2022, Board letter and staff report, *Los Alamos National Laboratory Plutonium Facility Updated Leak Path Factor Analysis* [23].	LANL	The LPF [leak path factor] analysis relies heavily on how long the confinement doors are assumed to be open during an evacuation. Previously, in the MELCOR model, LANL [Los Alamos National Laboratory] assumed that the PF-4 confinement doors would only be open for five minutes. For the updated LPF analysis, Triad personnel plan to use the software package *PathFinder* to develop an evacuation model of PF-4. This model will estimate the time required for personnel to evacuate the facility such that the confinement doors can close. DOE Standard 3009-2014 requires that assumptions made when defining a	A staff team reviewed a draft of the LANL contractor's revised leak path factor methodology for the Plutonium Facility. The safety analysis credits the passive confinement structure to mitigate consequences through use of a leak path factor. DOE Standard 3009-94 CN3 does not discuss requirements for calculating a leak path factor for the mitigated analysis. DOE Standard 3009-2014

Correspondence Date and Subject	Related Site	Quotation from Board Correspondence Referencing DOE Standard 3009-2014	Summary/Analysis
		meaningful accident scenario be protected at a level commensurate with their importance. In this case, the staff finds that there are no viable controls to ensure the confinement doors will be closed shortly after the accident initiates or that the confinement doors will remain closed, given that emergency responders will need to enter the facility to engage in firefighting or rescue operations. … **Fire Modeling Assumptions and Combustible Controls.** The updated fire methodology uses the Consolidated Fire and Smoke Transport (CFAST) modeling software and inputs based on initial PF-4 room walkdowns to adjust heat release rates (HRR). These HRRs are key inputs for the LPF calculation. For each evaluated room, a Microsoft Excel® spreadsheet (i.e., "HRR [Heat Release Rate] calculator") documents the number and type of combustibles found during the walkdown and determines the location where contiguous combustibles result in the maximum HRR for the room. However, the combustible loading assumed in the LPF fire methodology is based on a snapshot in time and may not bound all conditions. Because the assumed combustible loading is not protected in the current combustible control program, operators may introduce combustibles that exceed the amounts assumed in the LPF analysis and invalidate the results. …	requires: "For mitigated analysis, analytical tools used in calculating the LPF shall be appropriate to the physical conditions being modeled, including the use of input parameters, such that the overall LPF would be conservative." A key input parameter to the leak path factor analysis is the assumption that the confinement doors will close shortly after the accident initiates. The staff team found that there were no viable controls to protect this input parameter. The leak path factor methodology also relies on combustible loading conditions in the facility based on a snapshot in time. The combustible loading assumed in the analysis was not protected by a safety control and thus, the combustible loading in the facility could exceed what was used as an input to the leak path factor methodology. To be compliant with DOE Standard 3009-2014, the leak path factor analysis should either assume bounding combustible loading conditions or protect this key input parameter.

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		Given the sensitivity of the LPF results to fire intensity, combustible loading inputs should be considered initial conditions in the documented safety analysis that may need to be protected by a specific administrative control consistent with the guidelines established in DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*.	
August 11, 2022, Board letter and staff report, *Receipt and Repackaging of Large Amounts of Heat Source Plutonium at the Los Alamos National Laboratory (LANL) Plutonium Facility* [21].	LANL	The Defense Nuclear Facilities Safety Board's (Board) staff found three areas in the Plutonium Facility (PF-4) documented safety analysis (DSA) that appear to be inconsistent with Department of Energy (DOE) Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, and should be considered in the new DSA development: • In the unmitigated analysis, the DSA assumes that fires do not propagate beyond two glovebox lines (operational fire) or the room (seismic fire). However, PF-4 has the potential for the accumulation of combustibles that could lead to fire propagation. The safety basis does not identify any fire barriers as safety design features to prevent the further spread of fire. Thus, the staff team finds that the unmitigated analysis should consider the further propagation of a fire. DOE Standard 3009-2014 does not allow DSAs to apply the effects of administrative controls such as combustible controls in the unmitigated	While reviewing the current DOE Standard 3009-94 CN3 compliant safety basis for the LANL Plutonium Facility, the staff found three areas where the safety analysis appears inconsistent with DOE Standard 3009-2014. In the unmitigated analysis, the DSA assumes that administrative controls limit combustibles such that fires do not spread beyond two glovebox lines or the laboratory room. The Plutonium Facility has the potential to accumulate combustibles that could lead to greater fire spread. DOE Standard 3009-2014 does not allow DSAs to apply the effects of administrative controls such as combustible controls in the unmitigated analysis. Under DOE Standard 3009-2014, the unmitigated analysis should consider fire spread in the absence of administrative controls or identify passive safety controls

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		analysis. • The DSA analyzes multiple accident scenarios at individual locations (e.g., the first floor, basement, outdoor waste pads) but does not consider a single accident involving all these locations caused by a common initiator (e.g., seismic event). • For operational fires, the DSA applies a combined airborne release faction and respirable fraction (ARF*RF) value of 2E-3 for HS-Pu [heat source plutonium] solutions. For the post-seismic fire, the DSA applies an ARF*RF value of 3E-5 for the same solutions. Per DOE Handbook 3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, the 2E-3 value corresponds to boiling of solutions, while the 3E-5 value corresponds to heating of solutions without boiling. The DSA (page 3-318) explains that for the seismic event, the solutions are assumed to spill first and then are exposed to elevated temperatures. The DSA should analyze the bounding accident progression, which in this case is to assume the solutions do not spill and are heated to boiling in the same way as the operational fire accident scenario.	related to fire spreading that could survive the accident. The DSA analyzes multiple accident scenarios at individual locations but does not consider a single accident involving all these locations caused by a common initiator. The Plutonium Facility does not have safety controls that would prevent material-at-risk at all locations from being impacted by a seismic event. The unmitigated analysis for the seismic event assumes that heat source plutonium solutions spill and then are exposed to elevated temperatures during the post-seismic fire. This results in a smaller release than the operational fire event, which assumes the heat source plutonium solutions do not spill and are heated to boiling. DOE Standard 3009-2014 clarifies that unmitigated consequence calculations must be based on the selection of bounding accident scenarios. The seismic event should assume that the heat source plutonium solutions do not spill and are heated to boiling and derive additional controls as necessary.
July 19, 2022, Board letter with enclosure, *Proposed Safety*	Hanford	**Lack of Technical Basis for Changes.** DOE and WRPS personnel have stated that it is not practical or economically feasible to accomplish the modifications	A staff team reviewed proposed changes to the safety strategy for the 242-A Evaporator Facility at the

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Approach for 242-A Evaporator Facility [24].		that DOE originally proposed to the Board for upgrade of control system components to ensure they fail safe in a fire (i.e., upgrading the physical protection for the solenoid valves to withstand design basis fire conditions). However, DOE and WRPS personnel have not clearly demonstrated why other potential engineered solutions are not technically feasible. Additionally, they state that installing an automatic seismic shutdown switch to dump the vessel is no longer warranted because, based on more recent seismic hazard analyses, the seismic hazard level has changed. They now posit that the evaporator control room will survive the reduced-hazard event, thus assuring operator ability to carry out their key element safety function of manually dumping the evaporator vessel. However, they have not shown why the use of an automatic seismic shutdown is not feasible. Further, they intend to use this approach without providing an adequate technical basis within their strategy for using a potentially less reliable key element control instead of an engineered control for a safety significant function that is still required for the seismic event. DOE Standard 3009-1994-CN3, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses* [DSA], states that "the established hierarchy of hazard controls requires that engineering controls with an emphasis on safety-related SSCs [systems, structures, and components] be preferable to ACs [administrative controls] or SACs due to the inherent uncertainty of human performance." The 2014 version of the standard (which clarified DOE's intent behind the	Hanford Site. DOE found that it was not practical or economically feasible to accomplish modifications it had originally proposed to the Board following a 2014 Board letter. Instead, the new safety strategy would rely on administrative controls. The staff team found that DOE did not clearly demonstrate why other potential engineered controls were not technically feasible. DOE Standard 3009-2014 requires the safety basis to "provide a technical basis that supports the controls selected" when the "hierarchy of controls is not used for situations requiring SC/SS controls (e.g., a SAC is selected over an available SSC)."

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		1994 version) further requires that "when the hierarchy of controls is not used for situations requiring SC/SS [safety class/safety significant] controls (e.g., a SAC is selected over an available SSC), the DSA shall provide a technical basis that supports the controls selected" and that "an AC may serve as the most important control or only control, and *may be selected where existing engineered controls are not feasible to designate as SS SSCs* [emphasis added]." Contrary to this approach, WRPS has not provided a defensible technical basis that justifies their use of administrative controls in lieu of the previously proposed or other engineered controls to preclude this event, including showing that engineered controls are not feasible.	
November 16, 2021, Board letter and staff report, *Review of the Central Waste Complex Safety Basis* [25].	Hanford	**Inappropriate Use of Screening Criteria:** The Hazardous Material Protection Program and Organization section of the MDSA [master documented safety analysis] states: *No single location inventory of hazardous waste chemicals within the SWOC [Solid Waste Operations Complex] exceeds the applicable threshold quantity* [TQ] *or threshold planning quantity screening criteria values of 29 CFR 1910.119, 'Process safety management of highly hazardous chemicals;' 40 CFR 355, 'Emergency Planning and Notification;' or 40 CFR 68, 'Chemical Accident Prevention Provisions.' Consequently, it is not necessary to perform a quantitative*	A staff team reviewed the safety basis for the Central Waste Complex at Hanford, which is written to DOE Standard 3009-94 CN3. The team found that the safety basis screened chemical hazards from consideration based on threshold quantities from outside the DOE directives system. DOE Standard 3009-94 CN3 requires a hazard analysis to include scenarios involving chemical releases but provides a vague, qualitative threshold for safety significant controls to address chemical/toxicological consequences.

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		assessment of the adequacy of existing controls or to provide credited controls for hazardous materials to reduce the risks from accidents. However, the use of threshold quantities as screening criteria to exclude chemical hazards from further analysis is inconsistent with DOE directives, guidance, and requirements. Chemicals with significantly smaller amounts than these threshold values may cause irreversible health hazards to workers. The guidance provided in DOE Standard 3009-94 does not contain any allowance for exclusion of chemical hazards from further analysis based on their TQ values. Such chemical hazards may only be excluded if they don't result in "significant chemical" consequences to workers. The revised version of DOE Standard 3009-2014 provides explicit criteria and a methodology for evaluation of the consequences of chemical and toxicological hazards that are based on a time-weighted average concentration and comparison with protective action criteria.	DOE Standard 3009-2014 provides explicit criteria and a methodology for evaluating chemical hazards. Following DOE Standard 3009-2014 would require an analysis and potentially additional safety controls.
November 2, 2021, Board letter and staff report, *Review of Savannah River Site's Building 235-F Safety Basis* [26].	SRS	*Board's Staff Team Analysis: Inappropriate Initial Conditions*—Both fire protection reports provide a realistic snapshot of the current fire risk at Building 235-F. However, these reports would more appropriately serve as inputs into the fire hazards analysis and should not be used alone to rule out hazard scenarios in the safety basis. DOE directives explicitly prohibit consideration of many of the assumptions relied upon for the reports' conclusions during development of the unmitigated analysis in the safety basis. Specifically, the reports implicitly rely	A staff team reviewed DOE's approach to addressing Recommendation 2012-1 and revisions to the Building 235-F safety basis. While Building 235-F is a nuclear facility undergoing decommissioning, its DSA is written to DOE Standard 3009-94, CN3. Similar to the December 2020 Board letter (see entry below beginning at the bottom of page A-15), the staff team

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		on combustible controls and the fire protection program as initial conditions and they assume non-credited controls will perform credited safety functions. In the unmitigated analysis, it is inappropriate to credit combustible controls or other key elements of the fire protection program, even if they are elevated to a specific administrative control (SAC). DOE Standard 3009-94, which is the version cited in the SRNS contract, states, "the concept of 'unmitigated release' was developed to conservatively estimate the consequence potential from the candidate DBAs [design basis accidents] that are selected from the hazard analysis **without taking credit for any safety features**" [emphasis added]. DOE Standard 3009-14, which clarifies the requirements of DOE Standard 3009-94, is even clearer on this topic, and states, "The following conditions shall not be assumed to be available for unmitigated analysis…ACs [administrative controls] or safety management programs in the unmitigated analysis. For example, **combustible controls may not be used as an initial condition** to show that a full facility fire is not plausible" [emphasis added]. "ACs, such as combustible controls, that are elevated to a SAC as an initial condition for the unmitigated analysis would circumvent the control selection process considering the hierarchy of preferences, and place greater reliance on ACs over available engineered controls."	found that the safety basis continues to credit combustible controls and the fire protection program as initial conditions to rule out fire hazard scenarios. DOE Standard 3009-2014 clearly requires an unmitigated analysis to assume administrative controls are not available, even if they are designated specific administrative controls. The team also found that the analysis assumes non-credited controls will perform a credited safety function. It assumes that compartmentation will reduce the potential for multi-compartment fire spread, however, the compartments are not designated as safety controls rated to survive the accident. DOE Standard 3009-94 notes that defining assumptions in an unmitigated calculation "may warrant some level of safety SSC designation to assure that the assumptions remain valid in the future" but DOE Standard 3009-2014 further clarifies that "assumptions shall be protected at a level commensurate with their importance. For example, if a passive barrier is assumed to survive a fire that would otherwise lead to a significant consequence, then the barrier's configuration would need to be protected as a TSR design feature."

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		In addition to the assumptions regarding initial conditions, the reports assume non-credited controls will perform a credited safety function. Specifically, SRNS-TR-00378 states that the overall risk of a fire propagating is low based on "a high degree of compartmentation that reduces the potential for multi-compartment fire spread." However, these compartments are not credited as safety-significant design features rated to survive the accident. This approach is inappropriate for safety bases and is inconsistent with DOE Standard 3009-14, which states, "An assumption that an SSC exists does not automatically require SC [safety class] or SS [safety significant] designation. However, assumptions shall be protected at a level commensurate with their importance. For example, **if a passive barrier is assumed to survive a fire that would otherwise lead to a significant consequence, then the barrier's configuration would need to be protected as a TSR [technical safety requirement] design feature**" [emphasis added]. The SRNS report also mentions low combustible loading, early warning smoke/heat detection, and emergency response, but these controls are not credited in the BIO to perform a safety function and should not be used as an initial condition.	Following DOE Standard 3009-2014 would require reanalysis of the accident scenarios and likely require additional safety controls.
August 26, 2021, Board letter and staff report, *Nevada National Security Site Radioactive Waste Facilities Safety Basis Review* [27].	NNSS	*Improper Implementation of the Protective Overburden SAC*—The protective overburden SAC requires a layer of soil (overburden) that covers the disposed low-level radioactive waste to be present at the RWMS in Area 3 during overflights. This SAC protects an initial condition in the hazard analysis that low-level radioactive waste present at Area 3 will not	A staff team performed a review of the safety basis for the Radioactive Waste Facilities at Nevada National Security Site (NNSS), which was written to DOE Standard 3009-94 CN3. The team found that the unmitigated analysis for aircraft crash events credits

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		be impacted by potential aircraft crashes from low altitude flights. Based on this initial condition, the safety basis assumes the unmitigated dose consequences of an aircraft crash are negligible. The control evaluation in the safety basis states that low altitude flights over Area 3 must be coordinated with the Operations Command Center. However, the staff team found that the implementing procedures for this SAC do not describe this coordination effort. DOE Standard 1186-2016, *Specific Administrative Controls*, recommends that the procedures for SACs include specifications for implementation. Without clear specifications on implementing the coordination effort, the staff team could not determine how this SAC will perform its credited safety function. In addition, based on DOE Standard 3009-2014, using a SAC as an initial condition in the hazard analysis may be inappropriate. Specifically, DOE Standard 3009-2014, which clarifies DOE Standard 3009-94, states, "The following conditions shall not be assumed to be available for unmitigated analysis of plausible accident scenarios…ACs [administrative controls] or safety management programs in the unmitigated analysis. Other ACs, such as combustible controls, that are elevated to a SAC as an initial condition for the unmitigated analysis would circumvent the control selection process considering the hierarchy of preferences, and place greater reliance on ACs over available engineered controls."	a specific administrative control to establish a protective overburden of soil that covers low-level radioactive waste during overflights. DOE Standard 3009-2014 clearly requires that administrative controls, including specific administrative controls, not be assumed in the unmitigated analysis. To be compliant with DOE Standard 3009-2014, the accident scenario would need to be revised and, following the hierarchy of controls, the safety basis might need to credit engineered controls or document why engineered controls are not available.
June 9, 2021, Board letter and staff report, *Adequacy of Safety Structures, Systems, and*	LANL	*System Boundary*—The EDS [electrical distribution system] boundary now includes all the automated switching equipment capable of transitioning credited	The staff team reviewed the reliability of several safety systems at LANL, including the EDS for the Plutonium

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Components Los Alamos National Laboratory [28].		loads between normal and backup power. This represents a significant improvement; however, the normal source of power (the grid) and the backup power source (the diesel generator) are not included within the system boundary. Following a seismic event, the EDS is expected to survive, but the grid and the backup diesel generator are not. The EDS-supported loads are designed to be able to perform their safety functions following a loss of power from the EDS. However, per Department of Energy (DOE) Standard 3009-2014, a control could be elevated to safety significant if it provides a "significant contribution to defense in depth." The review team concludes that including the new diesel generator within the EDS boundary warrants consideration, as it would offer a significant contribution to defense in depth, namely, continuing to provide power to the EDS-supported loads following an event which results in a loss of power from the grid.	Facility, which is a safety significant support SSC to several other safety SSCs. As part of upgrades to the electrical distribution system, LANL installed a new non-safety backup diesel generator. Citing DOE Standard 3009-2014, the team concluded that LANL should include the new backup diesel generator within the safety significant boundary as it would be a "significant contributor to defense in depth" by providing power to the EDS-supported loads following an event that results in a loss of power from the grid. DOE Standard 3009-94 CN3 discusses the philosophy of defense-in-depth in general, but does not provide specific criteria for elevating controls that contribute to defense-in-depth.
December 23, 2020, Board letter with Enclosure, *Additional Information Regarding Safety-Related Activities at Savannah River Site's (SRS) Building 235-F* [29].	SRS	The assumptions and analysis in the *Fire Scenarios For 235-F* report rule out any fire events that would impact MAR [material-at-risk] inside the process enclosures. The BIO (basis for interim operation) does not formally identify any fire protection controls as credited initial conditions. That being said, the BIO states that the "The Fire Protection Program reduces the frequency of fires by limiting ignition sources, the quantity of transient combustible material, and the quantity of flammable or combustible fluids and flammable gas that are allowed	A staff team reviewed the safety basis for Building 235-F at the Savannah River Site, which is a basis for interim operations written to DOE Standard 3009-94 CN3. The staff team found that the safety basis credits the Fire Protection Program to protect several assumptions in the hazard analysis related to combustible loading to preclude any fire events that would

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		to be in the vicinity of MAR, enclosure rooms or area that abuts enclosure rooms." The BIO credits the Fire Protection Program to protect several assumptions in the hazards analysis (e.g., limited amounts of flammable liquids and flammable gas cylinders). This approach is inconsistent with DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, which states that safety management programs are not to be assumed available for unmitigated analysis of plausible accident scenarios. The standard provides an example, stating that "combustible controls may not be used as an initial condition to show that a full facility fire is not plausible." The example is similar to the approach taken in the *Fire Scenarios For 235-F* report, which assumes a lack of combustibles as an initial condition.	impact material-at-risk inside process enclosures. In developing an unmitigated analysis, DOE Standard 3009-94 CN3 recognizes that "there may be assumptions that are necessary to make in order to define a meaningful scenario, but which also impact the magnitude of the resultant consequences" and allows the analysis to take credit for passive safety features that would survive the accident. It does not clearly establish what other assumptions are appropriate and whether administrative controls should be considered in the unmitigated analysis. DOE Standard 3009-2014 clearly states that administrative controls, including specific administrative controls (aside from MAR limits and waste acceptance criteria), are not allowed to be applied in the unmitigated analysis. Relevant to this letter, DOE Standard 3009-2014 provides an example: "Other ACs, such as combustible controls, that are elevated to a SAC as an initial condition for the unmitigated analysis would circumvent the control selection process considering the hierarchy of preferences, and place greater reliance

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			on ACs over available engineered controls." The unmitigated safety analysis should consider fires affecting MAR in process enclosures and derive appropriate safety controls.
January 7, 2016, Board letter and staff report, *Tritium Extraction Facility Safety Basis Review* [30].	SRS	*Asphyxiation Hazards Identified as Standard Industrial Hazards*—Due to the small free volume in many rooms within TEF [Tritium Extraction Facility], failure of the inert gas (i.e., nitrogen and argon) transfer piping can result in asphyxiation hazards for the facility worker. For example, failure of inert gas transfer piping in the HVAC [heating, ventilation, and air conditioning] Equipment Room (Room 122) within the Tritium Processing Building (TPB) would reduce the room oxygen concentration to levels that could potentially result in loss of consciousness, or even death, within minutes. Due to these concerns, SRNS personnel installed restrictive orifices to limit the gas flow within the transfer piping, such that failure of the piping would not result in an asphyxiation hazard (i.e., room oxygen concentrations below 19.5 percent). Within the *TEF Consolidated Hazard Analysis*, assumption 63 states, "According to M-CLC-H-02447, *TEF Asphyxiation Calculation* … when the recommended restrictive orifices are installed then the asphyxiation hazard no longer exists in TPB or RHB [Remote Handling Building]. These orifices were installed in accordance with [Commercial Light Water Reactor] pipe and instrument designs…therefore asphyxiation due to leaks of nitrogen or argon is not credible."	A staff team reviewed the safety basis for the Savannah River Site TEF which is written to DOE Standard 3009-94 CN3. Due to the small free volumes in many rooms within TEF, failure of the inert gas transfer piping can result in asphyxiation hazards for the facility worker. Due to these concerns, SRNS personnel installed restrictive orifices to limit the gas flow within the transfer piping. The staff team was concerned about SRNS treating this asphyxiation hazard as a standard industrial hazard and not considering the need for safety significant controls for facility worker protection. Classifying the restricting orifices as safety significant design features would require appropriate hazard screenings prior to modification or removal. DOE Standard 3009-94 CN3 states that "standard industrial hazards do not require DSA coverage" but does not provide clear guidance for when these types of hazards might need to be

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		Treating this asphyxiation hazard as a standard industrial hazard without considering the need for SS [safety significant] controls is inconsistent with both site procedures and current DOE Directives. Attachment 8.5, *Safety Item Selection Precedence*, within SRNS Manual E7, Procedure 2.25 – Revision 20, *Conduct of Engineering and Technical Support Procedure Manual: Functional Classifications*, states, "As described in DOE Standard 1189-2008, *Integration of Safety into the Design Process*, Appendix C…SSCs that are covered under [SMPs applied for facility worker risk reduction] do not require specific classification as SS, but may be covered as part of the SMP. However, some conditions warrant consideration of SS SSCs. These include … [l]eaks from process systems where asphyxiation of a Facility Worker normally present may result." Further, while not yet adopted by SRNS, DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, clarifies this scenario: "Examples of conditions that warrant consideration of SS designation include … [u]nique hazards that could result in asphyxiation or significant chemical/thermal burns."	considered within the DSA. DOE Standard 3009-2014 clarifies that unique hazards may need to be evaluated because hazardous material quantities may be larger than those encountered in general industry or are uniquely used in DOE operations. In this case, it clearly establishes that: "Significant quantities of cryogenic material or compressed gases/liquids may also warrant consideration because of asphyxiation hazards that might affect the ability of facility operators to safely manage the facility. Such unique hazards are not treated as standard industrial hazards and are evaluated in the DSA."

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