Thomas A. Summers, Acting Chair
Patricia L. Lee

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Washington, DC 20004-2901

October 10, 2025

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

Dear Secretary Wright:

The Defense Nuclear Facilities Safety Board (Board) has focused for decades on the nuclear safety posture of the Plutonium Facility at the Los Alamos National Laboratory (LANL). During this period, the Board has identified significant public health and safety issues with the facility, resulting in formal recommendations, correspondence, and public hearings. Most recently, the Board held a public hearing in November 2022 to discuss the Department of Energy's (DOE) revisions to the safety analysis, proposals for new safety controls, and upgrades to existing ones. This hearing occurred after Congress mandated an increase in the number of plutonium pits DOE must produce to support the nation's nuclear deterrent; much of this work is set to be performed at LANL's Plutonium Facility.

The safety posture of the Plutonium Facility relies on technical analysis and engineered safety controls. LANL management submitted a new draft safety analysis to DOE in April 2024. The Board reviewed this analysis and determined that it depends on assumptions that cannot be technically verified and are sometimes non-conservative. The heavy reliance on computer models, rather than the set of engineered controls typically used to protect the public at DOE facilities (such as safety-class active confinement ventilation), also adds more uncertainty to the analysis. Compliance with consensus nuclear safety requirements which protect assumptions is paramount to assuring the public that DOE's mission can be accomplished safely. Unverified assumptions and worker actions which have not been documented as required safety controls may not protect public safety.

While DOE has improved the quality of existing engineered safety controls, many safety infrastructure projects have been significantly delayed, including projects to address seismic vulnerabilities for fire suppression and glovebox systems. Maintaining momentum for these safety infrastructure projects is more important in light of the issues with the safety analysis. LANL tracks many of its project initiatives in a Project Execution Strategy for the area of the laboratory housing the Plutonium Facility, which is updated annually; however, this document is not formally approved by DOE.

Given the enduring and essential national security mission of LANL's Plutonium Facility, the Board requests, pursuant to 42 U.S.C. 2286b(d), that DOE provide a briefing within 12 months of the date of this letter on actions taken to improve nuclear safety at this facility including progress towards upgrading the engineered safety systems tracked as part of the Project Execution Strategy. The Board requests that such briefings continue annually, until all projects listed in the Appendix to the attached staff report are completed.

Sincerely,

Thomas A. Summers

Thomas A. Summers
Acting Chair

Enclosure

c: The Honorable Brandon Williams, Under Secretary for Nuclear Security, Administrator, National Nuclear Security Administration
Mr. Joe Olencz, Director, Office of the Departmental Representative to the Board

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

August 11, 2025

Review of the Los Alamos Plutonium Facility Documented Safety Analysis

Summary. In April 2024, the Los Alamos National Laboratory (LANL) management and operating contractor, Triad National Security, LLC (Triad), submitted a draft Documented Safety Analysis (DSA) for the Plutonium Facility to the National Nuclear Security Administration (NNSA) Los Alamos Field Office (NA-LA) for review [1]. When NA-LA approves this document, it will be the first version of the Plutonium Facility DSA written to comply with the requirements of Department of Energy (DOE) Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, instead of the 1994 version of the standard [2] [3]. This submittal also represents a significant shift in strategy from the current safety basis, since the fire suppression system will now be credited with new safety functions [4].

The Defense Nuclear Facilities Safety Board's (Board) staff has reviewed this DSA submittal and finds that, while the overall Plutonium Facility safety strategy includes an adequate set of controls, there are several areas where LANL's analysis is non-conservative or not fully justified. This report captures the staff's findings for information and use moving forward.

While reviewing the DSA, the Board's staff also discussed with LANL the status of initiatives to upgrade engineered controls in the Plutonium Facility. The Board's staff appreciates that Plutonium Facility personnel are pursuing physical improvements to safety systems, including formally credited safety systems as well as other engineered systems that perform important safety functions. However, the staff team notes that many of these projects have encountered delays for a variety of reasons, including inconsistent funding. This report also summarizes those conversations and highlights some key projects that DOE should prioritize.

Background on Los Alamos National Laboratory. LANL is a federally funded research and development laboratory that supports missions related to the nuclear deterrent and stockpile stewardship. It is one of two locations (the other being the Savannah River Site near Aiken, South Carolina) that DOE has designated for manufacturing plutonium pits. This work is currently done at the Plutonium Facility; the First Production Unit of the W87-1 pit was completed in October 2024. DOE is expanding the facility's capabilities to be able to make at least 30 weapons-usable pits per year. The Plutonium Facility also has many other missions, including the manufacture of heat source plutonium[1] power sources, as well as disposition of legacy plutonium-bearing materials.

Because of the amount of nuclear material and the type of work done in the Plutonium Facility, the Board has maintained an interest in the facility's safety posture for several decades.

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[1] Heat source plutonium largely contains the isotope plutonium-238, which is not suitable for use in pits, but produces significant heat energy due to its relatively short radioactive half-life. This material therefore has useful applications for both national security and space exploration.

As the only facility in the DOE complex that can process large quantities of plutonium in many forms, it represents a unique capability for the nation's nuclear deterrent.

Key Past Correspondence. The Board has long advocated for the use of safety-related active confinement systems in nuclear facilities for the purposes of confining radioactive materials. In Recommendation 2004-2, *Active Confinement Systems*, the Board stated the following:

> *There is a long-standing safety practice in the design, construction, and operation of nuclear facilities to build-in and maintain structures, systems, and components that contain or confine radioactive materials. The Department of Energy (DOE) establishes requirements to ensure such containment or confinement. In the hierarchy of safety controls, passive design features are preferred over active systems; however, controls must be capable of performing their intended function. Passive confinement systems are not necessarily capable of containing hazardous materials with confidence because they allow a quantity of unfiltered air contaminated with radioactive material to be released from an operating nuclear facility following certain accident scenarios. Safety related active confinement ventilation systems will continue to function during an accident, thereby ensuring that radioactive material is captured by filters before it can be released into the environment [5].*

DOE Order 420.1C, *Facility Safety*, codified this preference in Chapter I, Nuclear Safety Design Criteria:

> *Hazard category 1, 2, and 3 nuclear facilities…must have the means to confine the uncontained radioactive materials to minimize their potential release in facility effluents during normal operations and during and following accidents, up to and including design basis accidents (DBAs). Confinement design must include…(c) An active confinement ventilation system as the preferred design approach for nuclear facilities with potential for radiological release. Alternate confinement approaches may be acceptable if a technical evaluation demonstrates that the alternate confinement approach results in very high assurance of the confinement of radioactive materials [6].*

In Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, the Board noted that the Plutonium Facility safety basis described very large potential dose consequences to the public following seismic events, even after safety controls were formally credited with mitigating those consequences [7]. As part of DOE's implementation plan for addressing the recommendation, DOE committed to upgrade and seismically qualify the ventilation system, with a particular focus on a specific ventilation subsystem (called the Zone 2 Bleedoff System[2]) as potentially sufficient to function as the final engineered barrier to a radioactive release:

[2] This ventilation subsystem is the one responsible for filtering contaminated air inside the facility and ensuring that air exhausted to the environment is clean. Consequently, this subsystem is the one most important for protecting the public from potential accidents.

In 2006, [the LANL contractor] completed the PF-4 [Plutonium Facility] confinement ventilation system evaluation, a commitment under DNFSB Recommendation 04-2. Seismically upgrading the entire active confinement system would be prohibitively expensive and is also unnecessary. The evaluation concluded that one subsystem, the bleed-off system, should be sufficient to keep the building air pressure negative relative to the outside, thereby minimizing any release of radioactive material to the environment. Early implementation focuses seismic upgrades to those required to provide the appropriate safety function (i.e., keeping the building differential air pressure negative with respect to the outside). This set of ventilation controls is still being determined… However, the bleed-off sub-system alone with its power and controls may be sufficient to function as the final engineered barrier to a radioactive release for the post-seismic fire event.

Milestone 5.4.2: Conceptual design for seismically-qualified active confinement ventilation subsystem…Deliverable 5.4.2: Analysis of various options to achieve a seismically-qualified safety-class active confinement ventilation capability (i.e., Performance Category 3 qualified)…Due Date: March 2011 [8]

Though some of the project-related details changed, this remained the planned safety strategy for the Plutonium Facility for many years. The Board and DOE communicated on this topic several times, including a public hearing in 2017. However, in a March 2022 letter to the Board, the NNSA Administrator stated that the planned strategy would shift away from safety class active confinement:

The path forward…is the modification of individual components of the existing [Plutonium Facility] PF-4 ventilation systems to manage obsolescence and to improve the [ventilation system]. Individual components will be upgraded and installed as replacements are needed. While these incremental upgrades could support the [system] being credited as Safety Class…in the future, these upgrades alone will not achieve Safety Class Active Confinement Ventilation.

A safety class [active confinement ventilation system] would require substantial facility upgrades far in excess to those that are currently planned…[T]he confinement strategy, and therefore the credited safety function for the ventilation system will remain unchanged at the end of the proposed planned upgrades [i.e., the system will remain <u>not</u> safety class][9].

Since 2022, DOE has fully embraced a passive confinement strategy for the Plutonium Facility. DOE has taken credit for passive confinement for many years, including as the interim safety strategy while physical upgrades were pursued. However, this 2022 decision solidified passive confinement as the safety strategy for the foreseeable future. Shortly after this decision, the Board held another public hearing with DOE to discuss the new safety strategy. Figure 1 shows a timeline of key actions, correspondences, and public interactions on these topics.

2004

- Board issues Recommendation 2004-2 on active confinement ventilation in nuclear facilities.

2009-2010

- Board issues Recommendation 2009-2 on seismic safety at the Plutonium Facility.
- DOE issues Implementation Plan for Board Recommendation 2009-2. DOE commits to safety class, active confinement ventilation.

2009-2017

- DOE makes several upgrades to the facility per its Implementation Plan.

2017

- Board closes Recommendation 2009-2, but notes that work remains to ensure the Plutonium Facility is suitable for long-term operations.
- Board holds public hearing regarding the safety posture of the Plutonium Facility.

2020

- DOE affirms its commitment to an active confinement strategy for the Plutonium Facility in a briefing to the Board

2022

- DOE de-commits from a strategy of safety class, active confinement ventilation in a letter to the Board, and instead commits to passive confinement strategy.
- Board holds a public hearing regarding the safety posture of the Plutonium Facility

2024

- LANL submits draft safety basis for DOE review.

Figure 1: Timeline of key events related to safety at the Plutonium Facility

LANL's Proposed Safety Strategy. LANL's proposed passive confinement strategy involves quantifying the fraction of radioactive contaminants that would escape the facility following accident conditions. This numerical term, between 0 and 1, is called the leak path factor (LPF). Unmitigated accident analyses must assume that all contaminants escape (i.e., LPF = 1). Mitigated analyses, however, can credit safety design features or specific administrative controls with lowering consequences. For example, as a result of Board Recommendation 2009-2, DOE made numerous modifications to the facility structure for this purpose; this effort led to the external structure (though not necessarily all internal walls or other features) being able to withstand seismic events at the Performance Category 3 (PC-3) level,[3] an improvement over pre-2009 performance [10].

Figure 2 shows a simplified physical representation of how LPF is used in safety analyses. To calculate LPF, LANL analysts created a virtual model of the Plutonium Facility and its surroundings using computer codes including CFAST, MELCOR, Fluent, and MACCS-2.[4] Those models were run to encompass a variety of accident conditions, the most severe of which were typically fires. Variables included the specific fire location within the facility, amount and location of combustible material for fuel, length of time internal and external facility doors are assumed to be open, meteorological conditions, and other factors.

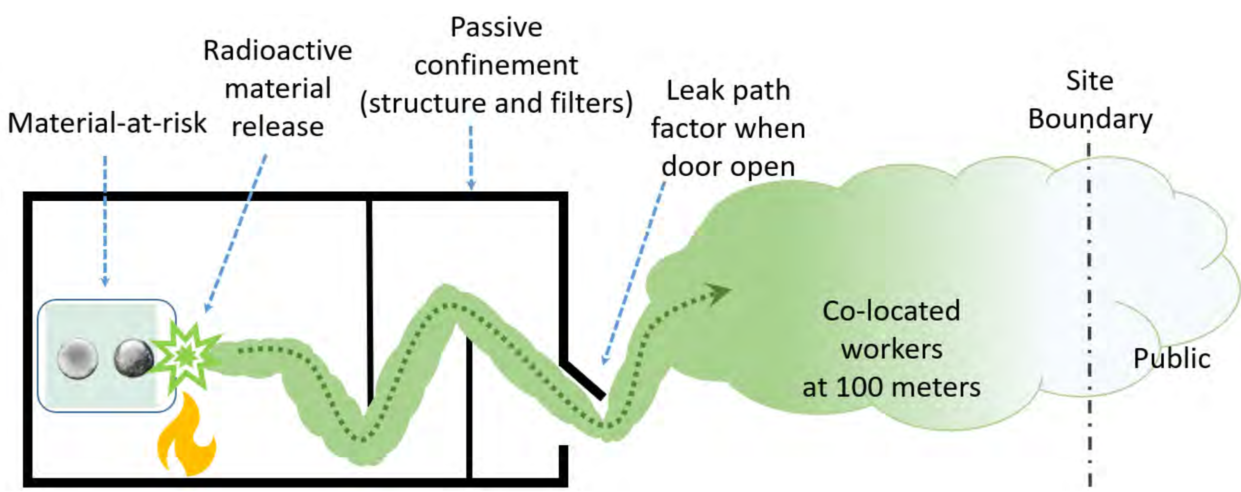

Figure 2: Simplified diagram showing concepts important to Leak Path Factor

This general approach to LPF was used in the prior versions of the DSA, as discussed in numerous correspondences between DOE and the Board, including a Board letter dated

[3] Performance Categories are assigned per DOE Standard 1021-1993, *Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components*, and determine the required performance of engineered controls in nuclear facilities. For example, controls designed to meet PC-3 must maintain functionality during and after the ground motion caused by the 2,500-year earthquake predicted for a given locale. Controls credited at the safety class level generally must be designed to PC-3.

[4] CFAST is an open source two-zone fire modeling code provided by the National Institute of Standards and Testing. Fluent is a fluid simulation software developed by Ansys, Inc. MELCOR and MACCS-2 are both nuclear accident codes developed by the Sandia National Laboratories.

August 11, 2022 (and going back as far as Recommendation 2004-2). However, LANL's latest DSA submittal is the first to credit the facility fire suppression system (FSS) as a safety class system. Previously, the FSS was not assumed to survive the bounding seismic event. To take this additional credit, DOE made physical upgrades to the system, completed physical testing of piping and other components, and performed additional modeling to determine the effects of the system on confining the released radioactive materials in an accident. The system's functional requirement is to actuate in response to fires that exceed a certain threshold and remain functional during and after design basis seismic events. Analysts use the models to determine when the FSS actuates and the effects it has on fire size (using CFAST), the transport of particulates both within and out of the facility (using MELCOR), and the effects of meteorology on the behavior of the contaminated air (using FLUENT and MACCS-2).

The effect of the FSS on LPF is described by the following paragraph from the DSA's system evaluation:

> *Conservative analyses of fire suppression sprinkler actuation times…show that the sprinklers in the PF-4 laboratories will actuate between ±1.5 and ±3 minutes of ignition of a fire and that the sprinkler water will be highly effective at controlling the fire and cooling the hot layer. This reduces the driving force for transport of radioactive aerosol from the fire room to the corridor. The first-floor sprinklers actuate at a nominal temperature of 165°F.*

By crediting the reduction in driving force available to move radioactive particles around and out of the building, DOE is crediting the FSS with lowering LPF. The LPFs credited for the first floor of the Plutonium Facility range from 0.0156-0.0674 for the 2,500-year earthquake, depending on the specific location. The subsequent effect on dose consequence is significant; the FSS and other controls in the suite are credited with lowering the offsite dose consequences of a seismic fire from 257 rem to approximately 7 rem.

Non-conservatisms in LANL's Analysis. On the subject of input parameters for dose consequence calculations, DOE Standard 3009-2014 states the following:

> *When an input parameter used is not a default or bounding value, an acceptable technical basis of the value describes why the value selected is appropriate for the physical situation being analyzed, and references relevant data, analysis, or technical standards. The completeness and level of detail in the technical basis should increase as the parameters depart from default or bounding values.*

For LPF specifically, the standard further states:

> *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.*

The proposed control strategy credits several safety class controls with mitigating the potential dose consequences of accidents to a value below the evaluation guideline of 25 rem, which aligns with requirements in DOE Standard 3009-2014. However, the calculations of these mitigated dose consequences use many assumptions and analytical models that are unprecedented for nuclear facility safety bases. While DOE has long credited passive confinement as part of the Plutonium Facility safety strategy, it is one of very few facilities where this is done. Further, crediting the FSS with "reducing driving force" and calculating a numerical contribution of that effect to the dose consequence has not been historically used in nuclear industry applications, and would be new for DOE nuclear safety analysis.

While this passive confinement approach is within the bounds of DOE safety standards, it creates opportunities for the overall dose consequence analysis to be non-conservative. It would be better to credit active confinement, which requires relatively few underlying assumptions, as opposed to relying on passive confinement, which requires many assumptions. However, given that DOE has adopted the passive confinement approach, the Board's staff team identified several areas where LANL's analysis is either non-conservative or not fully justified, which are documented in this report for consideration moving forward.

Complex Models and Facility Assumptions—Consequence calculations for potential accidents at DOE nuclear facilities depend on several factors, such as LPF. Most DOE nuclear facilities where LPF is quantitatively analyzed credit an active confinement system. Quantifying LPF at facilities with active confinement is relatively simple, since it relies primarily on the system's filtration characteristics, which are typically well understood and therefore technically sound. For example, the Savannah River Site's H-Canyon facility credits the sand filtration system to mitigate certain accidents:

> *The H-Canyon sand filter system is credited with removing 99.89% of the airborne radioactive material. This results in an LPF of 1.1E-03, or the amount of material released through the sand filter of 0.11%. [11]*

Similar language can be found in the DSA for the Plutonium Facility (B332) at Lawrence Livermore National Laboratory:

> *An LPF of 2.0 × 10–6 is used in the mitigated case if release occurs through the room ventilation or glovebox exhaust final HEPA filtration stages. Two stages of HEPA filters are provided in each final plenum. These HEPA filters remove material from the exhaust stream with an assumed filter efficiency of 99.9% for the first stage and 99.8% for the second (Elder-1996). The overall LPF is thus (1.0 – 0.999) × (1.0 – 0.998) = 2.0 ×10–6. When room ventilation exhaust fans are running normally, leakage from the building through other paths does not occur; the room ventilation system creates a pressure differential causing any airflow to be inward into the building. If room ventilation is assumed to be unavailable in a mitigated evaluation, the assigned LPF conservatively remains 1.0. [12]*

As alluded to in the B332 DSA, properly designed and functioning active confinement systems can draw sufficient air through them to minimize passive air leakage out of the building through other unfiltered flowpaths. The Board discussed this Technical Report 34, which was attached to Recommendation 2004-2:

> *A safety-related active confinement ventilation system that is identified in a facility's safety basis as mitigating the dose consequences of an event must be effective during certain normal and abnormal conditions and meet a number of functional requirements. These requirements include maintaining a certain negative pressure with respect to the outside atmosphere in a cascading manner to ensure that the flow of air would be directed from cleaner areas to more contaminated ones. Meeting this requirement necessitates limiting the size of facility leakage paths (e.g., cracks around doors and penetrations) to a very small value. Unfiltered leakage of air containing radioactive materials following an accident is not expected if the active confinement system is designed properly (i.e., considers potential leak paths), remains intact, and continues to operate [13].*

However, the Los Alamos Plutonium Facility's active confinement system is not credited to mitigate public dose consequences, so LPF calculations rely on the facility's passive confinement characteristics. Without an engineered system to actively move and filter contaminated air, these calculations are more complicated by nature. As discussed in Technical Report 34:

> *Predicting the amount of release under passive confinement conditions can be quite complex. Fire or explosions could add energy to the facility's atmosphere and introduce a motive force that could carry hazardous materials through an exhaust path. In addition, quantifying the leakage area that exists in a facility, which is analogous to the periodic containment leak rate tests required at commercial nuclear reactors, although possible, is not easily and accurately accomplished at nuclear processing facilities. Therefore, determination of the amount of radioactive material that could escape the facility becomes very complex and uncertain. The following list illustrates a number of complications that prevent safety analysts from estimating the consequences of potential events to workers or the public with any degree of accuracy:*
>
> - *Airborne contaminants would travel throughout the facility following the path of least resistance and under the event's dynamic forces, which generally cannot be analyzed realistically (e.g., smoke and hot gases, pressure waves, or external parameters such as wind).*
> - *Facility workers might use any number of emergency exits to evacuate the facility, thus allowing the radioactive material to be released in an undeterminable fashion.*
> - *The emergency crew and security personnel might access the facility from outside for an indefinite amount of time, allowing air containing the radioactive materials to leave the building unfiltered.*
> - *The uncontrolled spread of radioactive material in the facility could jeopardize the future use of the facility, interfering with its national security*

mission, as well as resulting in potential worker safety issues during facility recovery and/or decontamination activities.

Determining the quantitative efficacy of passive confinement using computer models requires many assumptions about the facility configuration as inputs to those models. For the Plutonium Facility, the calculated LPFs for post-seismic fire scenarios is the product of several steps:

1. Determine the combustible fuel loading and location in various rooms of the Plutonium Facility (based on facility engineer walkdowns).

2. Quantify the size of a fire that consumes the segregated combustible materials by calculating the heat release rate and resultant accumulation of heat energy in laboratory rooms (using CFAST).

3. Determine the amount of time between the fire starting and the actuation of the FSS, and the subsequent effects on heat energy released in the room (using CFAST).

4. Calculate the amount of radiological material driven out of the laboratory rooms and the facility due to fires and meteorological conditions (using MELCOR, Fluent).

5. Quantify the transport of radioactive materials from the vicinity of the Plutonium facility to the nearest public receptor (using MACCS-2).[5]

Each of these stages involves assumptions about the facility configuration that would not be required if the facility instead relied on properly designed and credited active confinement. While LANL safety basis analysts did perform scoping calculations to determine the relative importance of several assumptions—such as which laboratory doors are open and for how long—the LPFs credited in the DSA are based on one facility configuration each for design basis spills and fires. That is, LPFs are single numbers, each of which is the output of a calculation ultimately based on a single facility configuration (e.g., door X is open, wall Y is still standing, glovebox Z has failed). In a post-seismic environment where physical configurations are uncertain, it is difficult to definitively state that the configuration chosen is adequately conservative for use in safety analysis.

The Board's staff team reviewed documentation and considered whether the input assumptions were sufficiently conservative to meet the intent of DOE safety standards. The team initially found that the documentation did not include analysis of certain facility configurations which could significantly affect the LPF. For example, the analysis did not explicitly consider the effects of interior walls (which are not seismically qualified) falling and changing the size and movement of air volumes. Additionally, the analysis did not fully consider how laboratory door configurations (e.g., certain doors closed or open) would affect LPF

[5] While this step is not strictly part of the process for calculating LPF, Triad analysts pair LPF and transport calculations for parts of the safety analysis. Therefore, while it is not a primary subject of this paper, it is listed here for completeness.

calculations. The team communicated these and other concerns to LANL and DOE in its review agenda and in discussions held at the site.

LANL analysts subsequently prepared scoping analyses of several specific situations along the lines of the staff team's concerns. In general, the results of these calculations led the LANL analysts to conclude that the configuration already chosen for the safety basis was more conservative than those the staff team postulated, but the analysts also stated that they would consider revisions to the technical documents to incorporate this new scoping information. LANL analysts also stated that there are many other conservatisms already included in the passive confinement analysis which, in their engineering opinion, would counterbalance most non-conservatisms that could be postulated.[6]

The staff team acknowledges LANL's technical arguments about the specific cases discussed during this review; however, in general, the staff team concludes that it is challenging to ensure that an appropriately conservative configuration is used to calculate LPF from passive confinement, because numerous alternative post-seismic configurations with higher LPFs can be postulated. Since DOE Standard 3009-2014 requires that "[dose consequence] calculations shall be made based on technically-justified input parameters and underlying assumptions such that the overall consequence calculation is conservative," the technical details of those assumptions should be better documented before one conservatism is weighed against another.

Combustible Loading Assumptions—One key assumption in an early stage of the LPF calculation process is determining the amount and arrangement of combustible material in laboratory rooms. Facility engineers perform walkdowns to determine and record the amount and location of combustibles in the facility. Each laboratory room is treated individually, and materials are grouped into "clusters" of chairs, desks, and nearby objects; engineers calculate which of those clusters would result in the highest Heat Release Rate (HRR) were it to catch fire. This information serves as the input to CFAST, which models the room temperature during a fire starting with that specific cluster, as well as the amount of time before the FSS actuates. Figure 3 shows a typical cluster for one laboratory room.

[6] For example, analyses of fires in the Plutonium Facility generally assume that, at the time the fire starts, the radioactive source material is already aerosolized and distributed throughout the laboratory space. Additionally, the analysis conservatively assumes that material is present outside of the gloveboxes used to process material, when in reality those gloveboxes would provide some confinement and protection from fire.

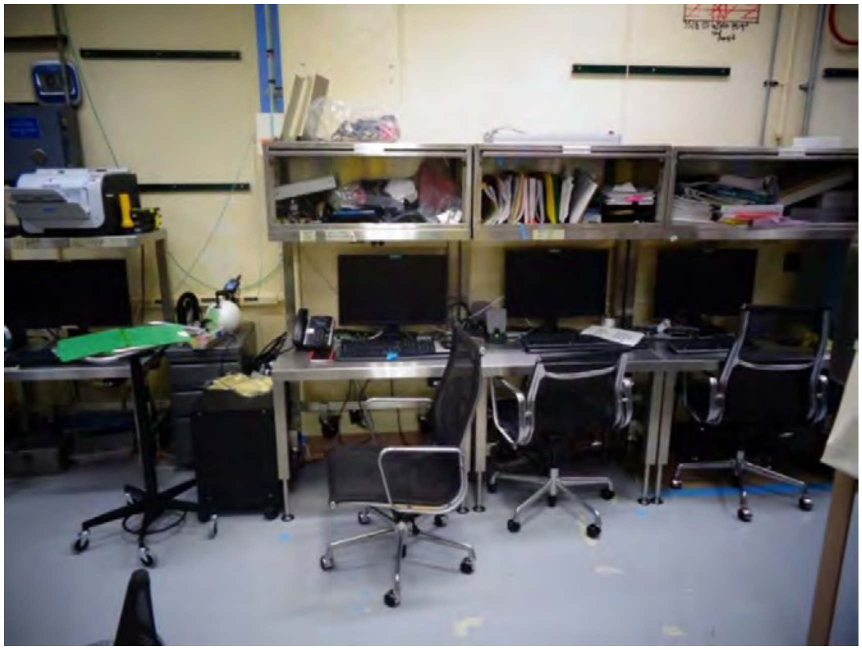

Figure 3: Typical cluster of combustible objects for one Plutonium Facility laboratory room

DOE Standard 3009-2014 states that "accident analysis relies upon well-founded assumptions that are protected at a level commensurate with their importance. TSRs [technical safety requirements] are used to protect the validity of significant assumptions." Because the combustible loading assumptions directly affect calculated LPF values, which are credited to lower the dose consequences to the public, those assumptions should be protected with TSR-level Specific Administrative Controls (SAC). However, the submitted DSA does not include any such controls related to the amount and location of combustibles. The staff team specifically noted the following issues with not having combustible controls at the TSR level:

- There is no configuration control for the size of the analyzed fuel clusters. For example, additional furniture, computer equipment, or paper products could be added to a fuel cluster, changing the fire growth rate characteristics.

- Housekeeping in the Plutonium Facility is variable and depends heavily on the designated staff lead for work being performed in a given room. The Board's staff has previously noted numerous instances of combustible trash or other items being left in disallowed locations for extended periods of time.

- Simultaneous ignition of multiple combustible clusters is not considered, even though that would be possible following a seismic event that disrupts electrical systems.

- Miscellaneous combustibles throughout laboratory rooms are not considered, even though they could shift during seismic events, serve as a "bridge" between clusters, or otherwise increase the combustible loading in a meaningful way.[7]

LANL staff stated that many of these characteristics are protected through implementing the facility's combustible materials safety management program (which encompasses a set of administrative controls that do not rise to the level of being specifically included in the DOE-approved DSA or TSRs). LANL analysts further detailed one scenario from a sensitivity study relating combustible clusters and heat release rate that determined the chosen safety strategy would hold even if the fuel loading was three times the expected level: that is, the FSS, as credited (discussed further below), would be capable of performing its safety function and protecting calculated LPF characteristics even if the bounding cluster tripled in size. LANL analysts stated that a tripling of the expected combustible load would be such a gross violation of typical facility posture that it would not, in their opinion, require protection with SACs. However, the review team noted that these controls are of lower pedigree than SACs, which means the strategy does not align with the expectations of DOE Standard 3009-2014 to protect assumptions "at a level commensurate with their importance."

Given operational and facility uncertainties (e.g., changing operational priorities, potential post-seismic equipment shifts) and the importance of combustible loading in calculations of public dose consequences, LANL and DOE should establish TSR-level controls on combustibles that would better protect key analytical assumptions.

FSS Efficacy—While onsite, the staff team discussed technical details related to the efficacy of the Plutonium Facility FSS with LANL analysts. Figure 4 below shows HRR vs. time for one laboratory room, both with and without actuation of the FSS, for analyzed fire conditions in one of the laboratory rooms. This curve was taken from LANL's combustible loading evaluation document that supports the DSA [14].

[7] In addition to these miscellaneous combustibles, the staff team also noted that large amounts of movable plastic shielding are present in certain rooms to lower the neutron dose to personnel working with radioactive materials. However, this plastic shielding is not analyzed in the combustible loading analysis and could shift during a seismic event, adding to combustible clusters. LANL analysts stated that the type of plastic used in this shielding is a poor combustible and therefore would not significantly contribute to fires in laboratory rooms. However, they acknowledged that this information was missing from the combustible loading analysis and agreed to better document the technical basis for this conclusion.

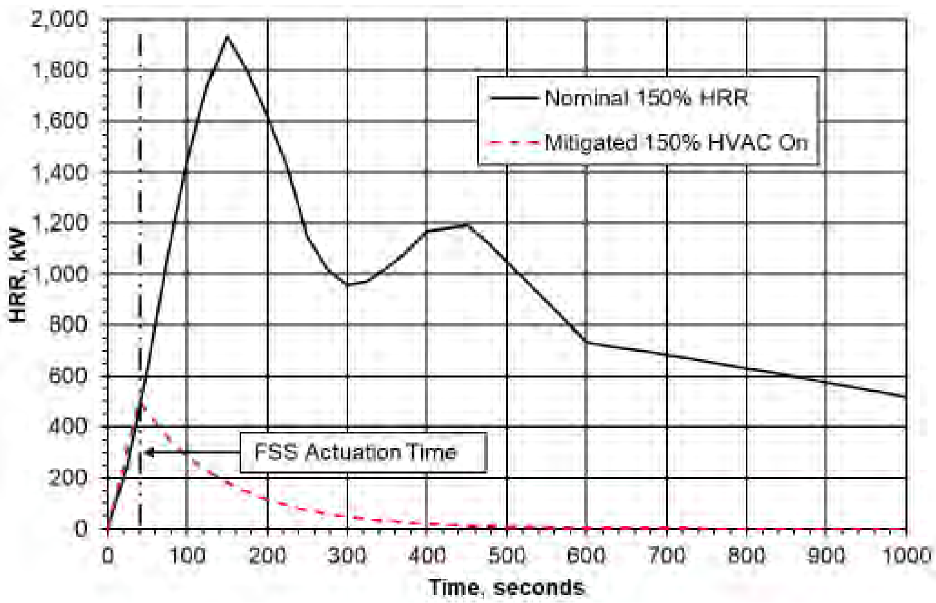

Figure 4: Representative HRR vs. time curve for one Plutonium Facility laboratory room.

The solid black line represents the HRR associated with an unmitigated fire involving one cluster of combustible materials; the increases and decreases represent the ignition, burning, and extinguishing of individual items (each with different combustible characteristics), which add together to make the total curve. The red dashed line represents the HRR that LANL analysts calculated (using CFAST) following FSS actuation, based on the FSS characteristics (e.g., actuation temperature, water flowrate) input into the code.

The staff team noted during discussions that the significant downward slope of the red dashed line is not typical in safety analysis. Typically, an FSS like the one installed in the Plutonium Facility is assumed to perform a "control" function, for which the red dashed line would instead extend horizontally from the actuation point, rather than a "suppress" function, which is represented by the curve currently on the graph. This difference is illustrated in Figure 5 below.

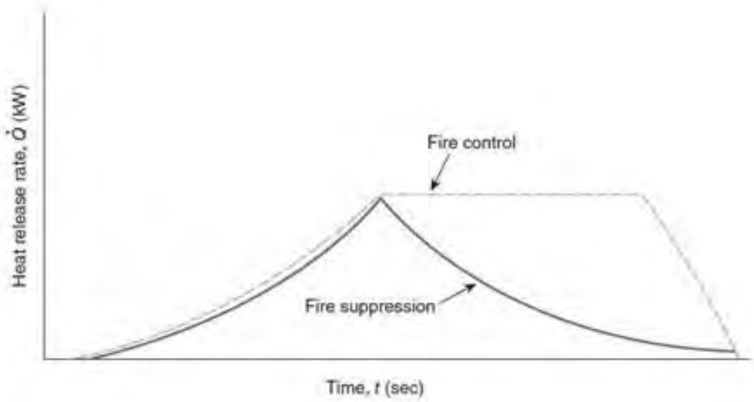

Figure 5: Generic representation of the difference between control and suppression of fires.

Without explicit design (such as deluge systems or inert gas systems), it may be inappropriate to assume the FSS behavior assumed in Figure 4, since it could overstate the efficacy of heat removal and therefore overstate the effects on calculated LPF and dose consequences.

LANL analysts stated that the Plutonium Facility FSS is designed in accordance with requirements in National Fire Protection Association (NFPA) 13, *Standard for the Installation of Sprinkler Systems*, for Ordinary Hazard Group 2 occupancies, consistent with "spaces with moderate to high quantity and combustibility of contents," and is therefore able to deliver a minimum of 0.2 gallons of water per minute per square foot (0.2 gpm/ft^2) [15]. Since the FSS is a credited safety class system, these design characteristics are protected in the TSRs. They further argued that the Plutonium Facility has a much lower level of combustible loading than typical Ordinary Hazard Group 2 occupancies (which could involve large amounts of wooden furniture, bookshelves, carpet, and other items that the Plutonium Facility does not generally contain). Since this FSS is designed to "control" a fire in a facility with significantly higher combustible loading, they stated that they were confident in the ability of the FSS to lower the HRR consistent with their analysis (i.e., the red dashed line in Figure 4).

However, the staff team noted that the trajectory of the HRR after FSS actuation—which follows from the 0.2 gpm/ft^2 flowrate assumption—relies on near-perfect energy transfer from fire to water, without any safety margin to account for unfavorable conditions or other inefficiencies. Water can pool or behave in other ways that do not directly contribute to removing energy from fires. Not accounting for these effects may result in an overstating of the true FSS efficacy. LANL did perform some scoping analysis of HRR as a function of lower FSS water delivery to reflect potential system degradation (e.g., only 50% of the water is delivered through sprinklers). LANL's analysis of a generic room fire, taken from the combustible loading calculation updated after the staff team's site visit, is shown in Figure 6 [16]. While this analysis was performed for a different purpose (and, as stated above, FSS characteristics are protected in the TSRs), carrying this analysis forward to determine LPF for those scenarios may be an appropriate method for adding appropriate safety margin.

Additionally, the staff team noted that LANL's combustible analysis does not adequately account for the possibility of fires occurring in locations where the FSS spray pattern may be impeded. This could also affect the assumed FSS actuation time and therefore also affect calculated dose consequences (e.g., fires could start underneath obstructions and burn for a time without heat flux directly being "seen" by sprinklers). During discussions, LANL analysts stated that, given the sprinkler coverage in the Plutonium Facility and expected spray patterns and angles, there would be few areas completely hidden from coverage. However, these conclusions are in part based on the facility configuration observed during walkdowns, rather than a generalized and conservative analysis of potential facility configurations. In a conservative safety analysis using a novel approach to crediting fire suppression, the staff team believes this possibility should be more comprehensively considered and accounted for.

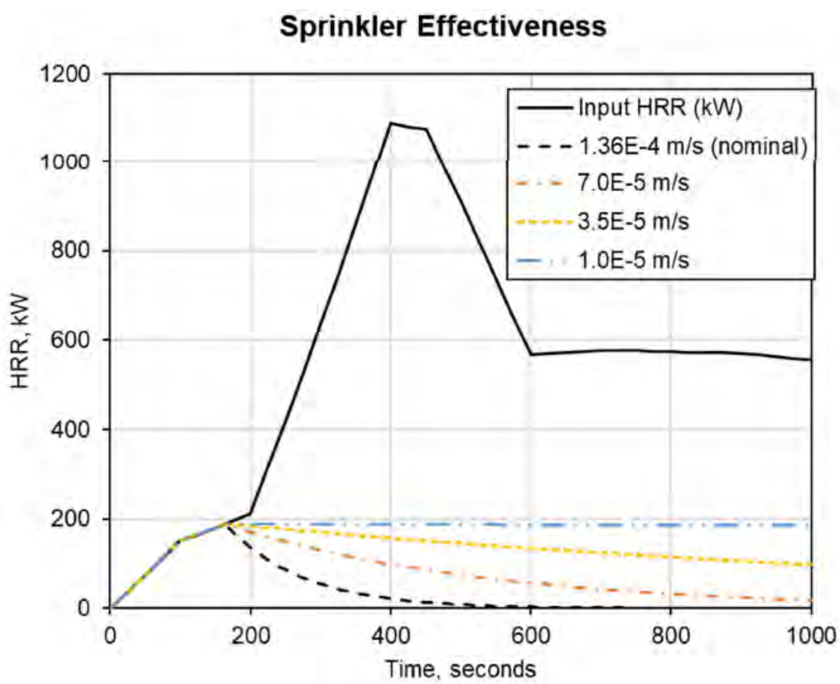

Figure 6: LANL's analysis of different throughputs of fire water—reflecting degraded FSS conditions—and the subsequent effects on HRR. This analysis could be extended as a method for adding safety margin to key LPF calculations.

Modeling Uncertainties—In a letter dated August 11, 2022, the Board communicated concerns related to existing and planned LPF analyses at the Plutonium Facility. Since the general methodology used for this submitted safety basis is similar to that used in the analyses reviewed at the time, many of the same concerns still apply. The Board's letter and attached report stated the following:

> *The staff identified concerns with the quality of the analyses in the working documents…[which] would challenge LANL's ability to appropriately follow DOE requirements and ensure the validity and protection of the results of the safety basis analysis if not addressed in the final calculation…*

[The staff] is concerned with some simplifications in the current working versions of the Computational Fluid Dynamics (CFD) and MELCOR models and the validation of the CFD model. While modeling simplifications are often appropriate, some might lead to non-conservative results.

- *The current working versions of the CFD and MELCOR models contain simplifications that may strongly influence the results. They should be evaluated for conservatism and model sensitivity (e.g., non-seismically qualified building collapse height and topography, number of room stratifications). [Triad] personnel noted that the model simplifications followed commonly used approaches in the field and were needed to reduce the computational demands of the model.*

- *The current working version of the CFD model validation approach seems to validate the software (i.e., Ansys Fluent), rather than the model of PF-4. Triad personnel noted that their validation approach was driven by a lack of available data needed for a direct comparison and that it was similar to the approach used for the original LPF analysis.*

- *For the MELCOR model, Triad personnel noted that additional time is needed to develop, evaluate, and document assumptions and limitations [17].*

Further, there are still documented issues with validation for references used in this submitted version of the safety basis. The CFD methodology document for the Plutonium Facility states the following:

A model validation was conducted based on a standardized case of flow passing perpendicular to a cube. Experimental pressure coefficient contours on cube surfaces provided by literature and American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) standards were compared to the modeling approach applied to the non-seismic and seismic analyses conducted. Unity was not achieved between the numerical predictions and experimental results; however, the model currently implemented was able to match the front face perfectly and match the expected behavior on both sides, the top, and the back with error less than approximately 10% for regions with large pressure gradients and where those gradients were expected on the cube surfaces geographically [18].

In other words, LANL created a simple geometric model to validate use of this CFD software, and that simple model did not fully align with experimental results as expected. Since good agreement could not be achieved with the simple cube model (pictured in Figure 7), the LPF values that are obtained using more complicated models also have questionable precision (an example of which is also pictured in Figure 7).

Additionally, the use of several interconnected models and computer codes to calculate LPF creates opportunities for compounding uncertainties. For example, the Fluent model of the

Plutonium Facility includes uncertainties in the grid size used (as shown in the grid refinement study) and in the modeling approach when compared against a standard cube model (as discussed above); feeding models with those uncertainties into further models in sequence creates the opportunity to compound existing errors, since mismatches between the boundary conditions of steady-state and transient models create additional opportunities for uncertainty propagation during handoff. An error propagation analysis—which is commonly done when several computer models are used in sequence—was not performed. LANL analysts agreed that there are opportunities for improvement in model handoffs.

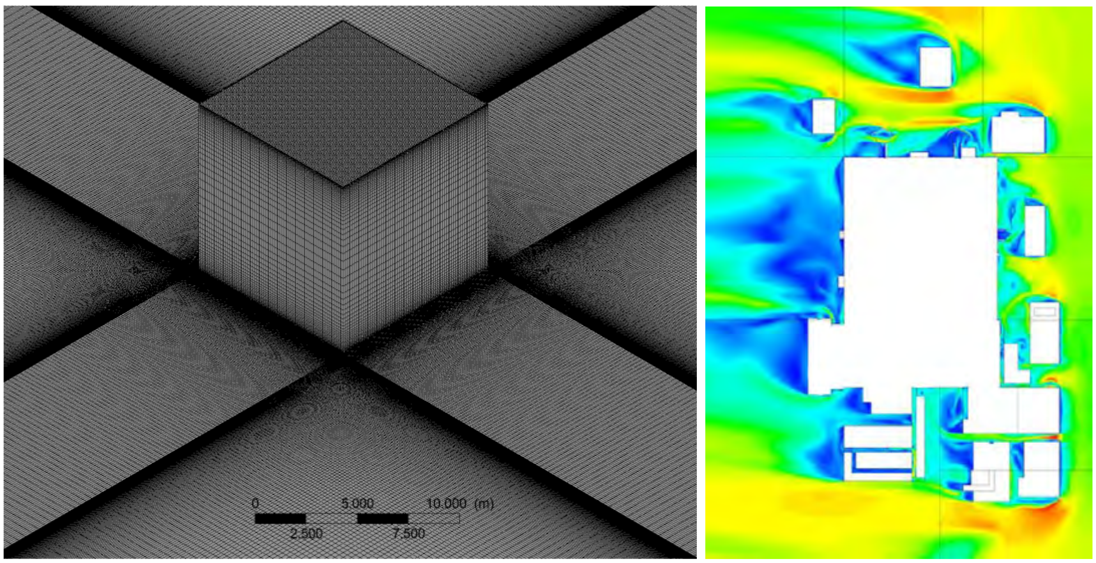

Figure 7: Left: surface mesh along a simple cube geometry used to validate computational fluid dynamics models. However, this model did not achieve unity with experimental results. Right: one of the outputs of LANL's computational models, a wind velocity contour map around the Plutonium Facility and surrounding buildings.

Airborne Release Fractions / Respirable Fractions (ARF×RF)—The staff team noted several instances of potentially non-conservative application of these coefficients, which are used to estimate the amount of radioactive particles of a certain size (10μm or less) released during accidents and available for transport to the public receptor.

In a 2022 review of the DSA implemented at the time, the staff team noted that an ARF×RF used for post-seismic fires involving plutonium solutions was potentially non-conservative. This was discussed in the Board's August 11, 2022, letter to the NNSA Administrator regarding heat source plutonium operations. A section of this letter, which referred to the DSA implemented at that time, is quoted here:

> *For operational fires, the DSA applies a combined [ARF×RF] value of 2E-3 for HS-Pu solutions. For the post-seismic fire, the DSA applies an [ARF×RF] value of 3E-5 for the same solutions. Per [DOE Handbook 3010-1994], the 2E-3 value corresponds to boiling of solutions, while the 3E-5 value corresponds to heating of solutions without boiling. The DSA…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 [19].

This non-conservative assumption is still present in the submitted DSA, which states "it is assumed that the solution would spill during a PC-3 event and thus be exposed to a fire within an enclosure" which means that a non-bounding ARF×RF is still used.

Further, the staff team noted during this review that there is further non-conservatism in the use of this ARF×RF value. Given the above language from the DSA, it follows logically that some materials would be subjected to stressors associated with both spills and fires, which would necessitate application of two separate ARF×RF values. However, the submitted DSA applies the ARF×RF value associated with either spill or fire—whichever is more conservative—but not both in sequence, that is, with some material released as a result of the spill and then get oxidized in the fire, and the remaining material airborne during the fire. This is meaningful, as the ARF×RF used for spills of salt solutions is 1.00E-4, and the ARF×RF used for fires involving salt solutions is 3.00E-5. Accounting for only one stressor, instead of both, would underpredict the source term for this material type.[8] During onsite discussions, LANL and NA-LA personnel stated that there would be no technical basis for combining stressors, since ARF×RF values are typically taken from DOE Handbook 3010-1994, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, which derived such values from data from experiments that did not specifically include both stressors [20]. However, the staff team asserts that combining multiple stressors is routinely done in DSAs throughout the complex and is explicitly discussed in other DOE standards, some of which reference the handbook as a technical basis. For example, Section 4.3.3 of DOE Standard 5506-2021, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*, includes a flow chart (Figure 4-2) that directs application of multiple ARF×RFs for events that follow a progression (e.g., a waste drum ejects some of its contents, resulting in two ARF×RFs for that material, one for ejection and impact, and the other for unconfined burning) [21]. Therefore, the application of only one ARF×RF on principle does not align with expectations in DOE standards.

Other issues related to ARF×RF were communicated to site personnel during the interaction. Given the potential for uncertainties with the analysis to aggregate to a meaningful level and affect calculated dose consequences, the selection of important parameters should be physically conservative and logically bounding.

Summary of Issues Identified—To summarize, the staff team identified several areas where LANL's analysis is either non-conservative or not fully justified:

- Dose consequence calculations rely on passive confinement and complex facility assumptions, rather than an engineered active confinement system and simple, conservative assumptions.

[8] Additionally, the staff team notes that the ARF×RF for fire (3.00E-5) is used for solutions of heat source plutonium, while the ARF×RF for spill (1.00E-4) is used for solutions of other isotopes of plutonium. There is no stated reasoning in the DSA for this difference.

- Controls on combustible materials are not protected at a level commensurate with their importance to the safety strategy.

- Analysis related to the efficacy of the safety-class FSS includes non-conservative assumptions that should be better justified with a defensible technical basis.

- Previous Board concerns related to modeling uncertainties still apply. Further, LANL's use of several interconnected models create opportunities for further uncertainty.

- Non-conservative airborne release fractions and respirable fractions are sometimes used for dose consequence calculations.

DOE should consider making improvements in these areas to better align with consensus nuclear safety requirements.

Plutonium Facility Safety System Upgrades. While the staff team's review focused primarily on the revised DSA and other written safety analysis, the team took the opportunity to discuss with LANL personnel the status of projects meant to upgrade or refresh engineered controls important to the Plutonium Facility. This section summarizes those discussions and highlights some key projects that DOE should consider prioritizing. Much of this information is taken from the Project Execution Strategy, a LANL-owned document updated annually [22]. The projects tracked in the most recent update are listed in the Appendix to this report.

Prior to the issuance of Recommendation 2009-2, DOE had committed to invest in the Plutonium Facility infrastructure under a series of line-item projects collectively titled Technical Area 55 (TA-55) Reinvestment Project (TRP), which initially consisted of multiple phases (TRP-I, -II, and -III).[9] As part of the plan to implement the Board's recommendation, DOE leveraged aspects of these projects.

The scope of TRP-III initially consisted of three items. The first, replacement of the fire alarm system, is still ongoing and is still separately tracked as a line-item; a fire alarm control panel is shown in Figure 8. The second, separation of non-nuclear facilities from the fire water loop serving the Plutonium Facility, is still ongoing, but is no longer tracked as a separate line-item and is managed at the facility level through operating funds. The third, upgrades to the confinement ventilation system, was downgraded in 2016 from a line-item project to a series of separate projects managed with operating funds, with the same end goal of an overall safety-class system; however, DOE then subsequently determined that upgrading the safety classification of the system would no longer be the overall goal of that series of projects. Instead, DOE stated that the intent of these expenditures (which would be managed at the facility level using operating funds) would be to manage obsolescence and achieve a more "robust" ventilation system. An example of a fan slated for eventual replacement is shown in Figure 8.

[9] Technical Area 55, or TA-55, is the location of the Los Alamos Plutonium Facility, along with other nuclear and non-nuclear facilities.

Figure 8: Left: fire alarm control panel installed as part of the TA-55 Reinvestment Project. Right: typical exhaust fan used in the ventilation system.

The staff team acknowledges that facility personnel are making meaningful upgrades to safety systems within the facility, even though the aggregate may not change the formal safety classification of the systems. These efforts, many of which are tracked under LANL's TA-55 Project Execution Strategy, are especially important given (1) the analytical non-conservatisms highlighted earlier in this paper, and (2) the vital national security missions planned for the Plutonium Facility during the next several decades.

Ventilation and Support System Upgrades—In a letter dated November 20, 2023, the NNSA Administrator responded to a Board reporting requirement and provided an overview of ongoing work to upgrade safety systems at the Plutonium Facility [23]. The letter included a list of "specific and targeted modifications to provide a robust and reliable ventilation system…some of which have been completed and others planned." At the time the letter was written, several subprojects had been completed, including but not limited to:

- Installation of seismically qualified variable frequency drives for controlling ventilation fans.

- Installation of seismically qualified pressure differential transmitters, also for controlling ventilation fans.

- Removal of legacy equipment to clear space for future installations of modern fans and other equipment.

- Bracing of some ventilation ductwork to improve survivability after seismic events.

In a recent conversation with the staff team, facility personnel discussed progress on several other items, including:

- Installation of a second (redundant) uninterruptible power supply, which will charge using electrical power from the grid during normal operations and ensure smooth power delivery to several safety systems during electrical outages.

- Construction of a concrete pad that will hold modern, seismically qualified fans used for the Zone 2 Bleedoff ventilation subsystem.

However, facility personnel also noted that some projects have been paused or delayed due to funding issues, including:

- Procurement of additional modern, seismically qualified fans, which would have been used in other ventilation subsystems.

- Installation of a replacement diesel generator for the auxiliary power system, which would have increased reliability and seismic performance.

- Replacement of the first (now obsolete) uninterruptible power supply, despite much of the equipment needed for the work being already procured and present onsite at Los Alamos.

Further, the staff notes that several projects that would be beneficial for maintenance (such as replacement of electrical equipment in the Plutonium Facility basement) are still in planning stages. Given the decision to pursue a passive confinement approach for the Plutonium Facility—a strategy with significant uncertainty, as discussed above—DOE and LANL should aggressively pursue upgrades to active engineered controls, even if they are not formally credited in the DSA, to help ensure adequate protection of public health from potential accidents.

Emergency Light Upgrades—The Plutonium Facility has emergency lighting fixtures to assist workers with evacuation in the event of an emergency. While this type of engineered feature is not usually credited with any formal nuclear safety function,[10] the Board's staff had previously identified that because the Plutonium Facility's passive confinement strategy includes assumptions about how long evacuation takes following an accident, the time workers take to exit the building could have a direct effect on the dose consequences for members of the public. Consequently, it would be appropriate to consider whether at least some emergency lights should be qualified to withstand design basis seismic events (i.e., PC-3) to protect those assumptions.

Following discussions with the Board's staff, facility personnel elected to proceed with procurement, testing, and installation of emergency lights along key egress paths that would withstand design basis seismic events. Over half of the new emergency lights have been

[10] This is typical for many life safety controls, even in nuclear facilities. Just because a control is important to safety does not necessarily mean it must be formally credited per the requirements in DOE Standard 3009-2014, which are specific to nuclear safety management as defined in Title 10 Code of Federal Regulations, Part 830.

installed, with the remaining units potentially being installed later in 2025, pending schedules and funding. Installing robust emergency lighting is a cost-effective measure to help mitigate risk and support safe nuclear operations in the Plutonium Facility.

Glovebox Stand Analysis and Upgrades—Most hazardous radiological work in the Plutonium Facility is performed using gloveboxes, which provide an engineered barrier to confine radiological material. While gloveboxes are mostly credited to protect workers, gloveboxes that are expected to contain molten plutonium present a significant enough risk in a post-seismic environment (i.e., the molten plutonium itself can serve as an ignition source) that they must be credited with a higher level of seismic resistance. In 2015, facility personnel upgraded the glovebox support stands (shown in Figure 9) associated with this (relatively small) subset of gloveboxes as part of TRP-II, such that all gloveboxes that may contain molten plutonium are credited to withstand design basis seismic events are now expected to do so.

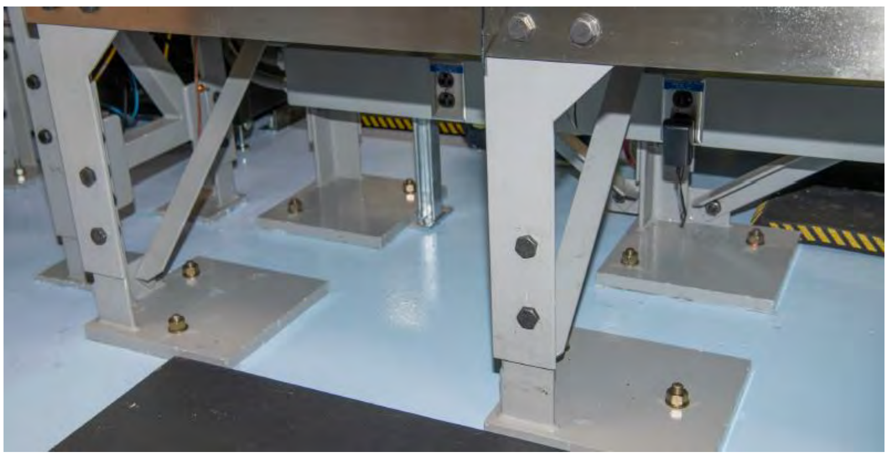

Figure 9: Seismically qualified glovebox stand used for operations with molten plutonium.

Apart from these, there are hundreds of other gloveboxes in the Plutonium Facility, most of which are only credited to withstand certain lesser seismic events to protect workers. Until recently, many of the gloveboxes associated with this (much larger) subset were unanalyzed such that their expected post-seismic performance was unknown. However, in conversations with the staff team, facility personnel reported that calculations for the seismic performance of all gloveboxes on the first floor of the facility are either complete or in the review stage; analysis for gloveboxes in the basement will follow when the first-floor analysis is finished.

While newly installed gloveboxes meet seismic requirements, and facility modifications associated with the pit production mission prioritize upgrades for some gloveboxes, others have known seismic vulnerabilities and will not be able to perform their credited post-seismic function. Many of these deficient gloveboxes are associated with processing heat source plutonium, a high-hazard material which accounts for much of the facility's overall safety risk. The currently implemented DSA relies on engineered features that are not formally credited as safety-significant to account for this known vulnerability, such as the seismic power shutoff system, which reduces the likelihood that multiple fires could be initiated in laboratory gloveboxes. The DSA also includes formally credited administrative restrictions, such as on the quantity of heat source plutonium that may reside in a glovebox at any one time. Upgrading glovebox support stands is important to return the facility to a safety posture more reliant on credited engineered features as opposed to administrative or other hazard controls.

Fire Water Supply Loop Upgrades—As mentioned above, one ongoing project in TA-55 involves the supply of fire suppression water to the Plutonium Facility and other buildings. Many structures in TA-55, including nuclear and non-nuclear facilities, are connected to the same water supply. This creates a seismic vulnerability (demonstrated in Figure 10), since a break in the supply lines to non-nuclear facilities—which are not seismically qualified—could prevent water from being delivered to the Plutonium Facility. Personnel are working to install an alternate supply to non-nuclear buildings. Work on this project, which is tracked under facility operating funds, was expected to be completed in 2026; however, facility personnel stated that there were complications associated with the planned routing of the feed lines to the Plutonium Facility, which may cause delays. In the interim, preparatory work to facilitate separation of non-nuclear buildings from the common feed can still proceed. The final separation will not occur until after the new feed line is completed.

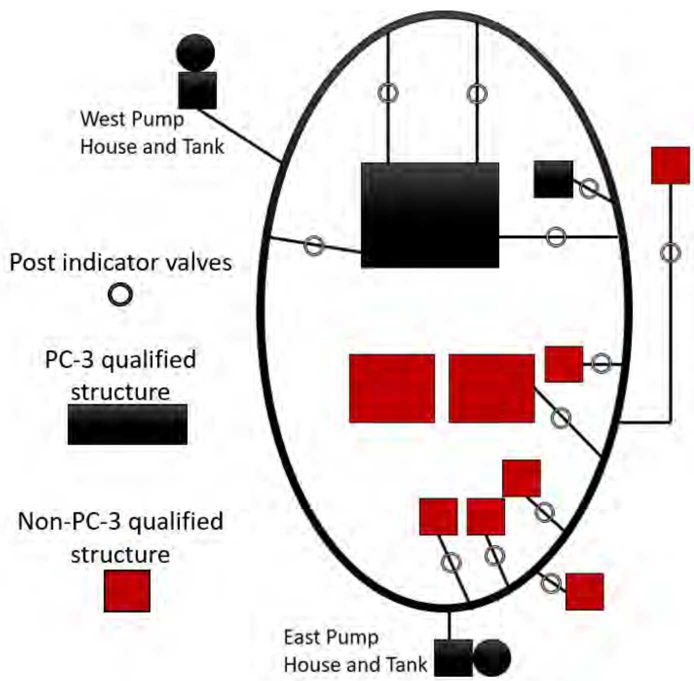

Figure 10: Simplified diagram of the fire loop in TA-55. Following seismic events, non-nuclear buildings with lower seismic pedigrees must be separated from the loop to ensure water is delivered to nuclear facilities.

Currently, the Plutonium Facility DSA has administrative compensatory measures in place to account for this known vulnerability. Following seismic events, facility personnel are required to manually turn off the water supply to non-nuclear structures by closing a series of post-indicator valves located outside, in the TA-55 yard. While this action may ensure that the Plutonium Facility receives the required flow of fire suppression water, it is only appropriate as a short-term solution as it (1) requires administrative actions by personnel in a post seismic environment which are less reliable than engineered systems, and (2) hampers the ability to fight fires in important non-nuclear buildings.

Administrative Measures for Increasing Safety. Separately from control and facility upgrades, there are several administrative measures towards that are commendable and deserve enhancement and continued application for improving safety.

Enhanced Combustible Limit Compliance—In addition to the pit production mission, DOE is also planning to use the Plutonium Facility to receive and repackage large amounts of heat source plutonium currently located at INL. The analysis showed the potential for very high mitigated offsite dose consequences for certain seismic accident scenarios that could not be mitigated with existing safety class controls, necessitating special risk acceptance documentation from DOE Headquarters. In granting this approval, DOE established an expectation—in alignment with language from the Board's 2022 letter—that these specific operations be accompanied by an enhanced surveillance of facility combustibles, to lessen the risk from fires and ensure alignment with facility procedures [24]. The staff team appreciates this more rigorous operating posture and, given the previously noted issues with housekeeping in the Plutonium Facility, believes general operations would benefit from more rigorous application of combustible controls.

Receptiveness to Board Staff Comments—Both DOE and LANL personnel were receptive to staff comments and concerns and took some actions to disposition some of them. NA-LA proactively agreed to formally adopt almost half of the Board staff's comments and include them in the list transmitted to LANL for formal disposition as part of the normal safety basis review and approval process. Additionally, LANL personnel stated during interactions that they would revise the combustible loading analysis to include further technical justification for key assumptions, incorporate analysis of additional accident scenarios, and clarify aspects of the calculations that were previously unclear. While these revisions may not fully address the Board staff's concerns, any progress towards a clearer and more defensible safety strategy should be encouraged.

Conclusion. The Board's staff reviewed LANL's draft submittal of a DSA authored to comply with DOE Standard 3009-2014. While the staff concluded that the overall safety strategy makes use of an adequate set of controls, there are several areas of analysis that are non-conservative or not well justified. DOE and LANL should consider ways to improve the analysis to ensure that future revisions of the DSA better document potential hazards and the reasoning behind the effectiveness of the control set.

While LANL facility personnel continue to make important upgrades to the Plutonium Facility's safety systems, many of those projects have encountered delays due to inconsistent funding and other reasons. DOE and LANL should consider prioritizing safety-related infrastructure projects to ensure that the Plutonium Facility safety strategy adequately protects the public, as the facility takes on new and expansive national security missions.

Appendix

Several projects related to safety controls at the Los Alamos National Laboratory's Plutonium Facility are contained in the laboratory's Project Execution Strategy, a document updated annually. The projects tracked in the most recent update of this document are listed below:

- Glovebox Support Stand Seismic Analysis Prioritization
- Glovebox Fire Hazard Evaluation Prioritization
- Ventilation System Modifications
  - Zone 1 Exhaust Fan Replacement
  - Zone 2 Bleed Off Fans Replacement
  - Generator and Power Supply Upgrades
- Fire Alarm System Replacement
- Non-Seismic Building Separation
  - High Pressure Feed
  - Fire Suppression Water Line Installation for Program Expansion
  - Fire Suppression Water Line Installation for Security within the Secure Area
- Laboratory Fire Barriers
- Instrument Air System Upgrade
- Fire Rated Containers

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