



Department of Energy
Under Secretary for Nuclear Security
National Nuclear Security Administration
Washington, DC 20585



September 15, 2023

The Honorable Joyce L. Connery
Chair, Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004

Dear Chair Connery:

The Department of Energy (DOE) received your June 20, 2023, letter to Secretary Granholm regarding safety of the Plutonium Facility at the Los Alamos National Laboratory (LANL). I am responding on her behalf. In your letter, you requested additional information and analysis from DOE's National Nuclear Security Administration (NNSA) in addition to what was previously communicated at the November 16, 2022, Defense Nuclear Facility Safety Board (Board) public hearing on LANL activities, through responses to the questions taken for the record, and in my March 15, 2022, letter regarding the strategy for safety systems at Technical Area (TA)-55 and Plutonium Facility 4 (PF-4).

DOE/NNSA appreciates the discussion we had with your staff to help clarify the details and expectations of the Board's request. NNSA is actively addressing the Board's request. LANL anticipates submitting a revision of the TA-55 Documented Safety Analysis (DSA) to NNSA by the end of March 2024. The DSA is being revised to comply with DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*. Given that LANL is in the process of developing the data and analyses to support the DSA, NNSA will share the relevant data and analysis for emergency egress and the fire suppression system with the Board as they are completed. We expect to provide the crosswalk for the PF-4 confinement ventilation system and support systems by the end of October 2023. The enclosure to this letter provides currently available information as well as a list of future deliverables and dates when NNSA expects to provide them to the Board.

Should you have any questions, please contact Mr. Ahmad M. Al-Daouk, Associate Administrator for Environment, Safety, and Health, at (505) 845-4607.

Sincerely,

A handwritten signature in black ink that reads "Jill H".

Jill Hruby

Enclosure

**Defense Nuclear Facilities Safety Board June 20, 2023, Letter
Follow-up Questions Regarding Technical Area 55 Plutonium Facility 4**

This attachment provides the current Department of Energy's National Nuclear Security Administration's (DOE/NNSA) information available in response to the Defense Nuclear Facility Safety Board (DNFSB) letter to the Secretary, dated June 20, 2023, requesting responses to three bulleted topics related to the Los Alamos National Laboratory (LANL) Technical Area (TA)-55 Plutonium Facility 4 (PF-4) safety basis, fire protection system, and Zone 1 ventilation system. As described in the responses below, NNSA will provide calculations or analyses to the DNFSB as they are completed to fully answer the request. A table of deliverables is provided below.

LANL anticipates submitting an update of the TA-55 Documented Safety Analysis (DSA) compliant with DOE Standard (STD) 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, to NNSA by the end of March 2024. NNSA will ensure that DNFSB staff have full access to and engagement with the development of the Leak Path Factor (LPF) calculation and its incorporation into the DSA. Other calculations and models will be used to support determining the proper control set, including the following:

- Protocol and Input Parameters for LANL Dispersion Analysis, RPT-SBD-384;
- Computational Fluid Dynamics (CFD) Model Calculation – Calculation that supports atmospheric modeling input that varies wind direction and speed to determine differential pressures across PF-4;
- MELCOR Baseline Report – Validation of MELCOR model against actual plant data and CFD model;
- MELCOR Parametric Study – Report that will develop a LPF for various accident conditions, spills, fire in various rooms, fire energy based on Consolidated Model of Fire and Smoke Transport (CFAST) calculations, wind speeds and directions, ventilation system status, number and relative position of door openings and others model variations;
- LPF and Chi/Q Selection Report – As LPF and Chi/Q are inversely proportional, this calculation will be used to determine appropriate and conservative LPFs and Chi/Qs;
- CFAST Calculation – Calculation to determine fire heat release rate and room temperatures based on conservative combustible loading configurations

Bullet Topic 1. *Data (e.g., results of modeling, evacuation drills, emergency response exercises, responses to actual events, and timing studies) supporting the laboratory's conservative assumptions related to evacuation of the entire facility in five minutes, emergency responder ingress and egress in one minute, and the cumulative time the Plutonium Facility exterior doors are assumed to remain open during accident conditions. The response should also discuss whether these data account for post-accident conditions, such as failure of emergency lights or shifting of obstacles in the hallways and egress pathways.*

Past drill sets have established the five-minute evacuation time as reasonably conservative for use in modeling PF-4 accidents that could be affected by personnel evacuating, as well as emergency response personnel reentering the facility. This was based on LANL management observations of multiple drills, although drill records were not specifically capturing this data in

the drill records. Evacuation time will be recorded for future drills and initial information related to the most recent drill (FY-0183) held on June 28, 2023, is consistent with the evacuation times from past drills. TA-55 Criticality Operations-Based Emergency Drill Plan (EMD-TEMP-030 R1) established the parameters of the drill. To ensure facility safety and security, precautions in drill plans include personnel contamination monitoring out of laboratory areas into the corridor to prevent contamination spread and ensuring that nuclear materials are placed in a safe and secure configuration prior to the drill. While these precautions are necessary for drill conditions, we acknowledge they introduce a degree of artificiality to the drill response time. However, the evacuation times observed during the recent and past drills provide a degree of confidence that the current five-minute assumption for facility evacuation seems to reasonably bound uncertainties in the evacuation time.

Conclusions from drill FY-0183 are being formally documented and are expected to be released by September 2023. NNSA will provide this documentation to the Board when it is completed. As additional drills are run in the future, new information will be gathered to continually evaluate the amount of time and number of pathways from PF-4 to the environment that are used in the safety basis analysis. The following types of information will be gathered during future drill sets:

- Amount of time a release pathway exists from PF-4 directly to the environment for each exit point;
- Number of persons evacuating;
- Number of persons exiting each exit point;
- Amount of time of each door on exit point being open; and
- Validation of evacuation procedure compliance.

MELCOR is a software tool used to model the confinement and ventilation systems of a facility and is used to determine LPF values for accident scenarios associated with PF-4. Evacuation time is one input to the MELCOR model. Important parameters for this evaluation include the amount of time and number of pathways from PF-4 to the environment are unobstructed. The duration that exit points will be open, postulated for the updated DSA, will be based on a combination of conservative values determined by drill times, evacuation procedure (varies based on emergency), occupancy loading, a PF-4 evacuation model (using Pathfinder, a software that models evacuations from facilities) that utilizes methodologies consistent with Society of Fire Protection Engineers, and a need to reenter the facility. Occupancy values will be based on RPR-TA55-740, *PF-4 Basement and Mezzanine Occupancy Study*, and LA-CP-22-20386, *Maximum Expected FY24 PF-4 Occupancy*. The Pathfinder calculation is in progress and is expected to be completed in September 2023. NNSA will provide this report to the Board when it is completed.

While NNSA believes the five-minute PF-4 emergency evacuation time is reasonably conservative, additional modeling will be performed using longer evacuation times to evaluate the sensitivity of the LPF modeling and ensure there are no “cliff-edge” effects in the event of longer evacuation times. This sensitivity will be one of the parameters evaluated in the

MELCOR Parametric Study. NNSA expects to provide the completed report by the end of October 2023.

Regarding conditions affecting evacuation times after a seismic event, LANL has installed over 300 emergency lights in PF-4, including fully rated seismic lights (Performance Category-3) in the corridors of the first floor. Additionally, Safety Class (SC) confinement doors close automatically after an evacuation and are verified closed procedurally. Reentry times (supplemental emergency response after evacuation) and their effect on LPF will be evaluated during parametric studies based on the drill information. This analysis will be contained in the MELCOR Parametric Study. Additional modeling may be performed to determine the effect of an unsuspected evacuation route being blocked.

Bullet Topic 2. *Analysis regarding the specific mechanisms by which the fire suppression system, when upgraded, will perform the safety function described in the March 15, 2023, [sic] letter from the Administrator of the National Nuclear Security Administration (NNSA) to the Board (i.e., “much of the source term associated with the post fire is eliminated”).*

Qualitatively, the Fire Suppression System (FSS) mitigates dose by reducing the size, spread, temperature, and duration of operational fires. As described in the March 15, 2022, letter to the Board, the decision to cancel the SC Active Confinement Ventilation System (ACVS) subproject was based on a qualitative evaluation that the increased safety benefit provided would be minimal and was not necessary given the increased safety benefit that would be achieved by the SC FSS.

Although no quantitative analysis was developed to specifically calculate the dose reduction from a seismically qualified FSS during the 2016 decision to cancel SC ACVS from TA-55 Reinvestment Project III (TRP III), dose reduction was assumed to be achieved via physical phenomena:

- Source term impacted is reduced via reduction in fire size, temp, and duration;
- Source term impacted is reduced by limiting fire spread;
- Protection of containers achieved via reduced temperature;
- Radiological particles may be filtered by water spray droplets; and
- The FSS would reduce energy of fire and reduces the release from the building (LPF).

The PF-4 DSA is currently being updated to meet the requirements of DOE-STD-3009-2014 and will include a thorough analysis to derive the appropriate safety controls. The updated DSA will evaluate the PF-4 hazards and accidents and identify the necessary suite of controls to ensure safe operations at PF-4. This will include specifying the functional requirements for SC and Safety Significant (SS) controls. As such, the DSA will specify the functional requirements of the seismically qualified FSS. LANL is scheduled to provide the draft PF-4 DOE-STD-3009-2014-compliant DSA to NNSA for formal review and approval by March 2024. Although it is an interim step of the DSA development and is still under preparation, the functional requirements for the seismically qualified PF-4 FSS are expected to be specified by December 2023.

Bullet Topic 3. *A crosswalk between the current status of the Plutonium Facility’s confinement ventilation system and support systems and the planned end-state, the improvements that would be necessary to designate it as a safety class, Seismic Design Category 3 control, and the improvements that would be necessary to designate it as a safety significant, Seismic Design Category 3 control. The Board is interested in this final point of comparison because NNSA has stated that the safety class reliability criteria (e.g., redundancy to eliminate single points of failure) are the primary contributor to the cost of upgrading the active confinement ventilation system to safety class.*

NNSA will be compiling the necessary information for the requested detailed crosswalk between the current PF-4 confinement ventilation system and system upgrades and reconfigurations that would be required to attain a Seismic Design Category (SDC) 3 SC system. Due to the fundamental differences between the pre-conceptual TRPIII SC ACVS subproject (descoped from the project in 2016) and the current ventilation system, the crosswalk will detail how the current ventilation system will not attain an SC or SS SDC-3 level of control.

The deliverable will also delineate that a complete retrofit of the ventilation system to SDC-3 was neither part of the SC ACVS or the current proposed path. The descoped TRPIII SC ACVS project focused on the use of the Zone 2 bleed-off system as the active exhaust, as the Zone 1 exhaust system may not survive a seismic event and would potentially fail to maintain airflow. The control scheme and power infrastructure of that proposed alternative differs vastly from the current ventilation control system and proposed future upgrades.

The proposed path forward focuses on proactively managing the obsolescence of the system by replacing the individual components with modern equivalents and upgrading their seismic performance which ultimately provides a more robust ventilation system.

NNSA expects to provide the crosswalk deliverable for this third bullet by the end of October 2023, using this time to thoroughly analyze the revised requirements, make any necessary adjustments, and ensure the accuracy and quality of the final deliverable.

Deliverable List

| | Deliverable | Expected Delivery Date |
|---|---|------------------------|
| 1 | PF-4 Drill FY-0183 report | September 2023 |
| 2 | PF-4 Pathfinder calculation | September 2023 |
| 3 | MELCOR Parametric Study | October 2023 |
| 4 | Ventilation System Crosswalk between current state, end state, and SC ACV | October 2023 |
| 5 | PF-4 FSS DSA Functional Requirements | December 2023 |