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

March 15, 2022

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's National Nuclear Security Administration (DOE/NNSA) received your letter, dated November 24, 2021, regarding the Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55) Plutonium Facility 4 (PF-4) ventilation system. The letter established a 90-day reporting requirement to address DOE/NNSA's planned end-state of the PF-4 ventilation system.

NNSA remains committed to strong and effective safety systems at TA-55 and PF-4. The current path forward includes modifying individual components to achieve a more robust ventilation system but will not achieve Safety Class Active Confinement Ventilation. The enclosed report provides a summary of the strategy, estimated cost ranges, general scope, and high-level schedule to complete these upgrades, modifications, and maintenance activities at PF-4.

If you have any questions, please contact Mr. James McConnell, Associate Principal Deputy Administrator, at (202) 586-5555.

Sincerely,

Jill Hruby

Enclosure

Los Alamos National Laboratory Technical Area 55 Plutonium Facility 4 Ventilation System
Report to the Defense Nuclear Facilities Safety Board

The Los Alamos National Laboratory (LANL) Plutonium Facility 4 (PF-4) within Technical Area 55 (TA-55) is a Hazard Category 2 Nuclear Facility. PF-4 is currently the only National Nuclear Security Administration (NNSA) facility authorized to produce plutonium pits for the enduring stockpile.

The TA-55 Reinvestment Project Phase III (TRP III) effort is the final phase of a three-phase project to upgrade PF-4 within the TA-55 boundary at LANL. One of the subprojects initially proposed for TRP III was the upgrade of the existing Active Confinement Ventilation (ACV) system to Safety Class Active Confinement Ventilation (SC ACV).

The National Nuclear Security Administration's (NNSA) Implementation Plans initially included the upgrade to the SC ACV in response to Defense Nuclear Facility Safety Board (DNFSB) Recommendations 2004-2 and 2009-2 [1,2]. DNFSB's recommendations indicated specific conditions of concern, such as fires potentially initiated inside the facility as a result of a maximum design basis seismic event. A post-seismic fire in this scenario would present a motive force to drive contamination outside the facility.

In 2014, before implementation of the June 2015 Secretarial guidance requiring federal Analyses of Alternatives (AoAs), Los Alamos National Security, LLC (LANS) completed an AOA for TRP III [3]. The AoA determined that the marginal benefits of upgrading to SC ACV in a single line-item project did not justify the cost, which was estimated to be as high as $400 million in 2015. As a result, SC ACV was formally descoped from the TRP III project in a 2016 NNSA Memorandum [4]. LANS determined that the current ACV system would be upgraded incrementally.

NNSA descoped the SC ACV subproject from TRP III based on the gains achieved from completing the safety class fire suppression system and the modest reduction in calculated total effective dose equivalent to a Maximally Exposed Individual (MEI) in a post seismic fire accident scenario with the SC ACV. The safety class fire protection system will suppress post-seismic fires such that the calculated total effective dose equivalent to the MEI will be reduced to approximately seven rem. For the same scenario, the SC ACV would reduce the MEI calculated dose to approximately one rem. Due to multiple seismic upgrades to the PF-4 structure over the last decade, PF-4 also already has a safety class passive confinement function.

The path forward, as outlined in the TA-55 Project Execution Strategy (PES) [5], is the modification of individual components of the existing PF-4 ventilation systems to manage obsolescence and to improve the ACV. Individual components will be upgraded and installed as replacements are needed. While these incremental upgrades could

support the ACV being credited as Safety Class (e.g. seismic qualification installation to Physical Containment-3 criteria) in the future, these upgrades alone will not achieve Safety Class Active Confinement Ventilation.

Project #	Functional Upgrade	Cost[δ] ($M)	Completion Date †
1	12 VFDs – 6 High Risk VFD Fan Safety Upgrades and 6 Medium Risk VFD Fan Safety Upgrades	8.6	Complete
2	6 PDT's - Zone 1 Damper Controls and Actuators Safety Upgrades	8.4	Complete
3	Remove Bleed-Off Fans - Disconnect and Removal of Two Inoperable Fans	1.2	Complete
4	Z2 Ductwork Bracing - Safety Systems Two Over One Upgrade	9.9	FY 2022
5	New HVAC FCS Equipment - Controls Systems Component Replacement	17.4	FY 2024
6	Power Distribution to Loads - Controls Systems Component Replacement	17.4	FY 2024
7	UPS field load centers (Lighting Panel (LP) 15,16,14 & 45) - Controls Systems Component Replacement	17.4	FY 2024
8	New Zone 1 Fans (8) - Exhaust Fan Replacement[†]	14.3	FY 2025
9	New Zone 2 (BO) Fans (4) - Bleed Off Fans Replacement [†]	12.1	FY2025
10	Installation of second UPS & associated support systems (maintenance)	TBD[ε]	TBD[ε]
11	N Diesel Generator (DG) (maintenance)	TBD	TBD

[δ] Cost subject to change as design definition increases

[†] Unknown budget for FY23 and beyond may require a balanced approach between funding and institutional demands. The ongoing COVID-19 pandemic might also affect these dates

[ε] TBD is To Be Determined

The TRP III AoA provided the analytical basis for selecting an incremental component upgrade approach, performed outside the TRP III project, when and if needed.

Planned modifications currently in the PES

- Ventilation system structural upgrades to the ductwork.
- Controls Systems Upgrades: This project will replace the HVAC portion of the existing facility controls system (FCS) with modernized, seismically qualified components.
- Generator and Power Supply Upgrades: This project is separated into several subcomponents that improve the auxiliary power system, the uninterruptible power system, and the electric distribution system. All three systems support the ventilation system and are necessary for proper ventilation operation under normal and accident conditions:

  - A replacement backup diesel generator will be installed for the auxiliary power system. The new generator is a replacement to the original 45-year-old generator that is out of service. This will add redundancy and provide increased reliability over the current single generator in service.
  - A second uninterruptable power supply (UPS).
  - Power distribution to loads will be improved. UPS load distribution within PF-4 for FCS is via four Lighting Panels (LP): LP-15, LP-16, LP-45, and LP-14. LP-15 and 16 serve as the primary load center. These are being modernized with qualified replacements in the FCS design as power redundancy improvements are made in the UPS power distribution infrastructure.
- Zone 1 Exhaust fan project to replace all eight Zone 1 exhaust fans with seismically qualified, safety class fans.
- Zone 2 Bleed-off Exhaust fan project to replace all four Zone 2 Bleed-off exhaust fans with seismically qualified, safety class fans.
- Instrument Air System Upgrades project replaces the instrument air compressors, and associated components necessary for proper operation of the Ventilation System.

Recently Completed Ventilation Upgrades

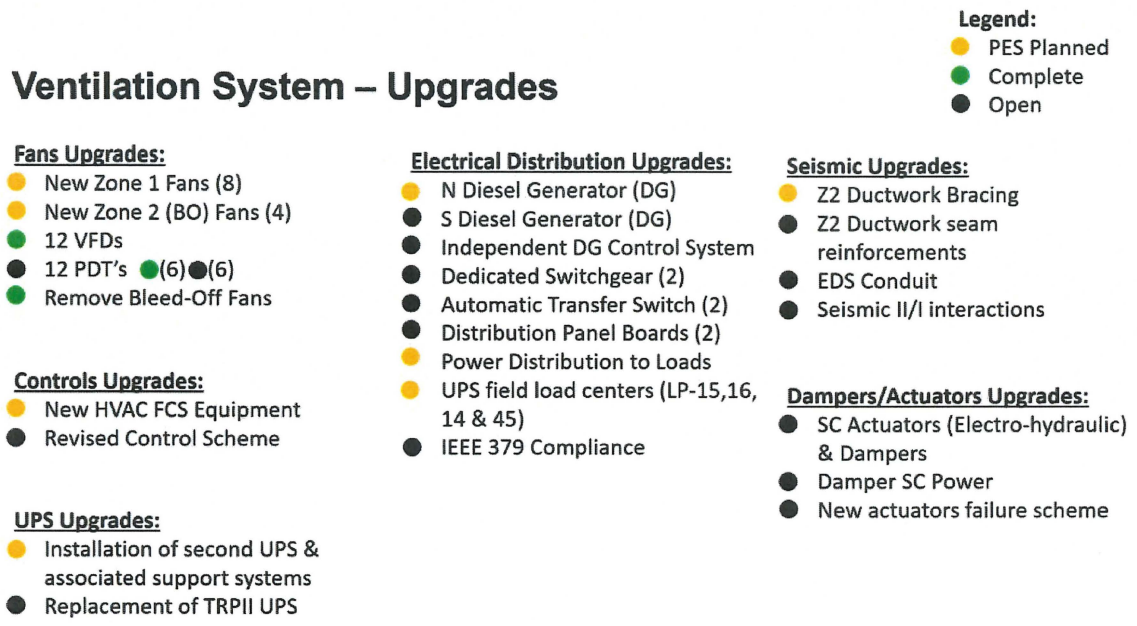
Several key upgrades have been completed since the 2020 presentation to the DNFSB:

- Removal of unused Zone 2 bleed-off fans. These fans were originally designed as standby units, but due to commissioning issues during initial PF-4 startup, they were never used. Removing these fans eliminates a potential vulnerability and provides physical room for the installation of Variable Frequency Drives (VFDs).
- Installation of VFDs on all Zone 1 Exhaust and Zone 2 Bleed-off fans. ZFDs provide control of PF-4 pressure differentials during normal and abnormal conditions and are seismically qualified to Physical Containment Level 3 (PC-3). Prior to the VFDs, pressure control was achieved through pneumatically-actuated bypass dampers in the ventilation ductwork. This project enhanced performance and reliability of the Zone 1 and Zone 2 exhaust subsystems.
- Obsolete Pressure Differential Transmitters (PDTs) have been replaced with modern units. The new units are seismically qualified to PC-3 and provide reliable pressure differential information to the pressure differential indicating controllers.

Safety Class Active Confinement Ventilation Upgrades Scope

A safety class ACV would require substantial facility upgrades far in excess to those that are currently planned in the PES. The ventilation system and associated support systems would need to meet safety class redundancy requirements of DOE Order 420.1c [6]. Requirements would include installing redundant systems, controls, power sources, etc., as well as separating safety and non-safety systems and minimizing nonessential system interfaces. Co-located major components would require separation to avoid common cause failure. The ventilation system and supporting systems would also need to be seismically qualified and modified, as necessary, to meet the design basis seismic event currently defined as PC-3, which will include two-over-one analyses and potential retrofits. Finally, a new control scheme with safety class actuators would be required for

the system to operate. The table below provides a graphical representation between the modifications required for SC ACV, what has been completed, what is being actively planned, and what is still open under the current version of the PES. Not all open items will be performed.



Safety Basis

The confinement strategy, and therefore the credited safety function for the ventilation system will remain unchanged at the end of the proposed planned upgrades.

PF-4 will have a robust active confinement ventilation system many PC-3 seismically qualified components. Completed and planned upgrades will maintain the facility at negative pressure with respect to the outside environment during normal operations. If the ventilation system were to cease operating (passive safe shutdown), confinement would remain intact.

Given the large investment necessary to fully implement a SC ACV, NNSA's plan for other modifications, such as the improvements to the fire suppression system, are a more cost-effective means to reduce dose consequences to the public.

The Documented Safety Analysis (DSA) will continue to be the driving document in assessing and assigning controls (SS, SC). The upcoming DSA analysis, which is being revised to meet DOE-STD-3009-2014 [7] requirements, will continue to analyze hazards, assign controls, and accurately reflect current system configuration.

References

[1] TA55-PES-11-001, *TA-55 Project Execution Summary*, Los Alamos National Laboratory, Revision 10, December 2021.

[2] Conway, John. *DNFSB Letter to the Secretary of Energy: Recommendation 2004-2, Active Confinement*. Washington, D.C.: Defense Nuclear Facilities Safety Board, 7 December 2004.

[3] SP-14-TA55-002, *TRP III Active Confinement Ventilation Alternatives Study*, Los Alamos National Laboratory, Revision 1, April 2015.

[4] Thompson, Michael. *DOE Memorandum Reducing the TRP III Scope*, Washington, D.C.: Department of Energy, National Nuclear Security Administration, 22 June 2016.

[5] TA55-PES-11-001, *TA-55 Project Execution Summary*, Los Alamos National Laboratory, Revision 10, December 2021.

[6] DOE Order 420.1c, *Facility Safety*, U.S. Department of Energy, Washington, D.C., Change 3, Approved 11-14-2019.

[7] DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, Approved November 2014.