

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Nuclear Safety at Los Alamos National Laboratory

Presented to

Princeton Program on Science and Global Security
&
Los Alamos Study Group

September 24, 2020



Agenda

- Overview of the Board
- LANL defense nuclear facilities supporting pit production
- Nuclear safety at LANL
 - Plutonium Facility
 - Analytical support facilities
 - Solid transuranic waste facilities
 - Liquid waste treatment facilities
- Savannah River Plutonium Processing Facility



Board Overview

- Established by Congress in 1988
- Five Presidentially-appointed, Senate-confirmed members
- Statutory mission: *Provide independent analysis, advice, and recommendations to the Secretary of Energy to inform the Secretary, in the role of the Secretary as operator and regulator of the defense nuclear facilities of the Department of Energy, in providing adequate protection of public health and safety at defense nuclear facilities, including with respect to the health and safety of employees and contractors at such facilities*
- The Secretary of Energy determines how best to apply the information provided by the Board

Current Board Members



Acting Chairman
Thomas A. Summers



Board Member
Jessie Hill Roberson



Board Member
Joyce Connery



Vacant



Vacant



Board Overview—Scope of Oversight

Nuclear safety oversight of:

- Complex, high-hazard operations involving nuclear weapons
- Remediation of nuclear wastes and legacy facilities from more than 70 years of DOE defense nuclear operations
- Design and construction of new DOE defense nuclear facilities
- Aging and deteriorating mission critical infrastructure at DOE defense nuclear facilities/sites
- Adequacy of DOE safety standards related to design, construction, operations, and decommissioning of defense nuclear facilities

Resident Inspectors perform near-continuous oversight at Hanford, Los Alamos, Pantex, Savannah River Site, and Y-12



Y-12 National Security Complex



Board Overview—Major Statutory Powers

Statutory safety oversight activities:

- Review and evaluation of the content and implementation of standards
- Analysis of design and construction data
- Review of facility design and construction

Statutory powers:

- Issue formal Recommendations to the Secretary of Energy
- Levy reporting requirements on the Secretary of Energy
- Conduct public or closed hearings and meetings, and subpoena witnesses
- Conduct investigations and special studies

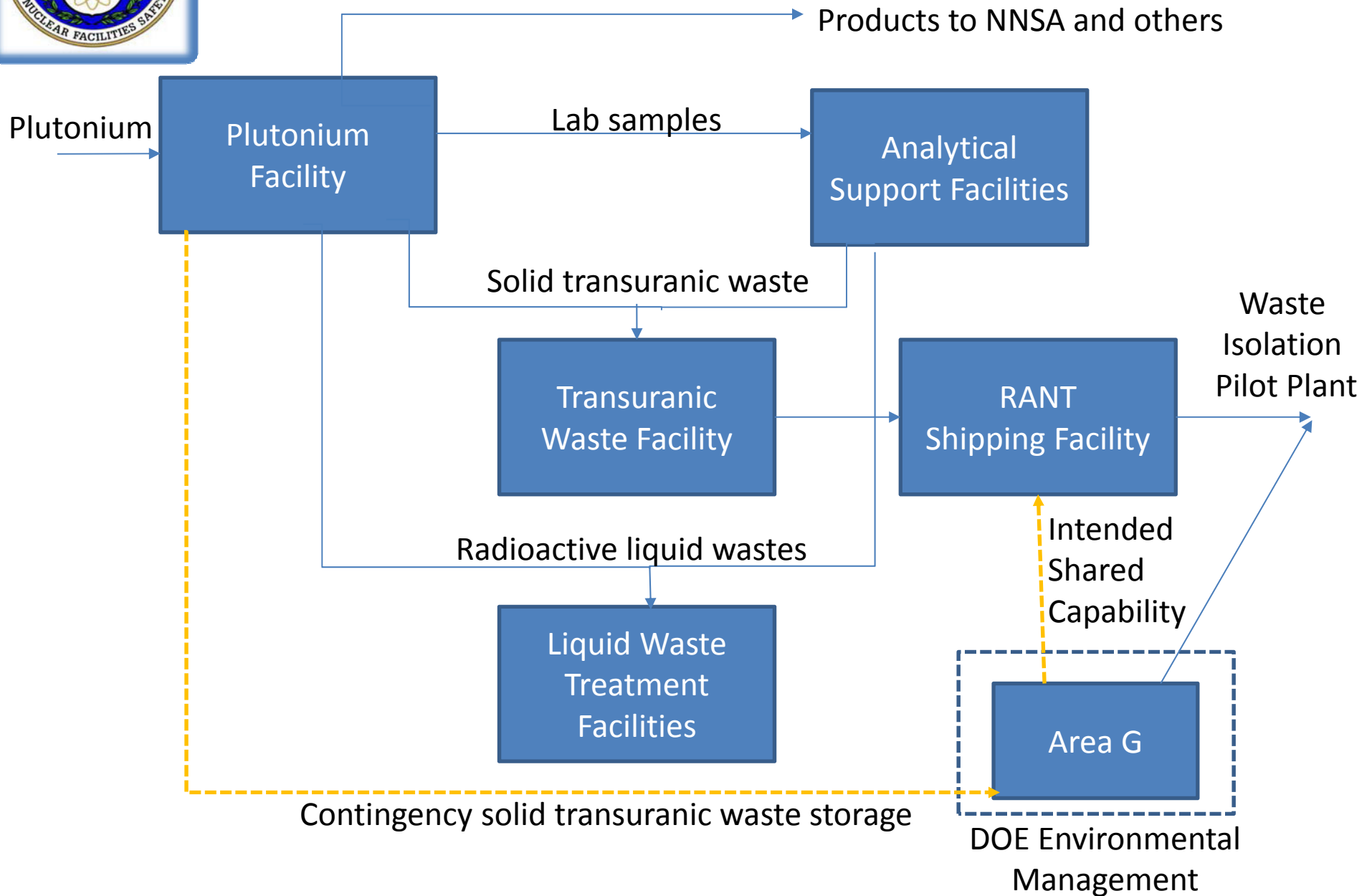


Glovebox Operations at Savannah River Site

DOE is required by law to grant the Board “prompt and unfettered access to such facilities, personnel, and information as the Board considers necessary to carry out its responsibilities.”



LANL Facilities Supporting Pit Production





Plutonium Facility Safety Challenges



Plutonium Facility within Technical Area 55

Safety challenges identified by the Board:

- November 15, 2019—Safety systems and safety basis
- November 12, 2019—Leak path factor methodology
- November 28, 2018—Nuclear criticality safety
- January 3, 2017—Seismic safety
- May 12, 2016—Fire suppression system



Plutonium Facility Seismic Analysis and Structural Upgrades



Column Capital Testing



Reinforcing Roof Girders with Carbon Fiber Wrap

- LANL completed structural reinforcement of short columns, roof girders, and stands for certain gloveboxes
- LANL expects results in 2023 from column testing and analysis of the ultimate seismic performance of the facility using a sophisticated model
- LANL working to complete analysis and upgrade of the stands for the remaining higher-hazard gloveboxes



Reinforced Glovebox Stand



Plutonium Facility Fire Suppression and Active Confinement Ventilation

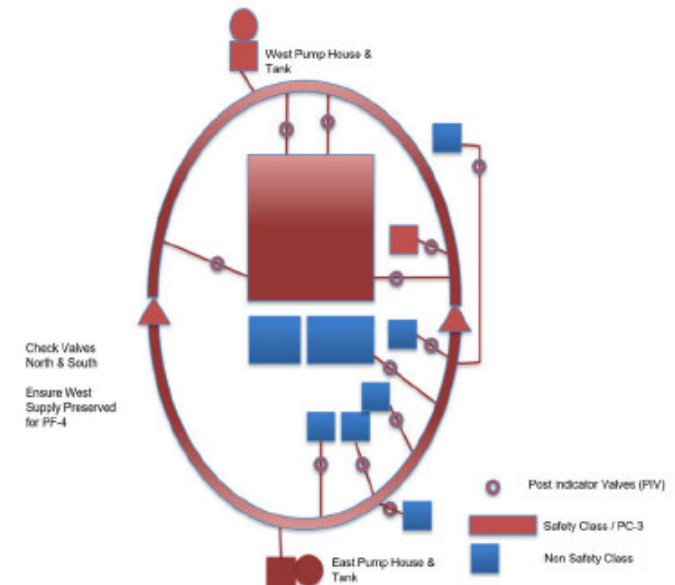
- Re-analysis and possible additional bracing of fire suppression system piping to account for cast iron fittings (LANL projects completion in 2024)
- Establishing a safety class active confinement ventilation system to eliminate reliance on passive confinement (LANL projects completion in 2025)
- Removal of non-seismically qualified buildings from the firewater loop (LANL projects completion in 2026)
- The expected completion dates all represent multi-year delays from LANL's initial projections



Fire Suppression System Piping



Ventilation System Equipment



Seismically Unqualified Buildings Share Firewater Loop with Plutonium Facility



Plutonium Facility: Other Challenges

- LANL projects completion by 2022 of a new safety basis that complies with DOE's modern standard; additional time will be needed for DOE review and subsequent implementation
- LANL projects completion of modern criticality safety analyses for all Plutonium Facility equipment and processes by 2023
- LANL will need to be vigilant to continue and sustain improvements to conduct of operations, particularly given the expected large number of new employees
- Production operations will generate process residues at much higher rates—LANL has struggled to manage residues and the resulting transuranic waste stream even under the current limited tempo



Transuranic Waste Containers Staged Outside



Process Residues



Analytical Support Facilities

- LANL plans to transform Radiological Laboratory Utility Office Building into PF-400, a hazard category 3 nuclear facility, by September 2021
 - Eliminates reliance on seismically unsound Chemistry and Metallurgy Research Building
- LANL has a four year plan to resolve deficiencies in the fire protection and ventilation systems, including many improperly installed or non-existent fire barriers
- The proposed safety basis for PF-400 indicates low consequences to the public and collocated worker from bounding accident scenarios



Chemistry and Metallurgy Research Building



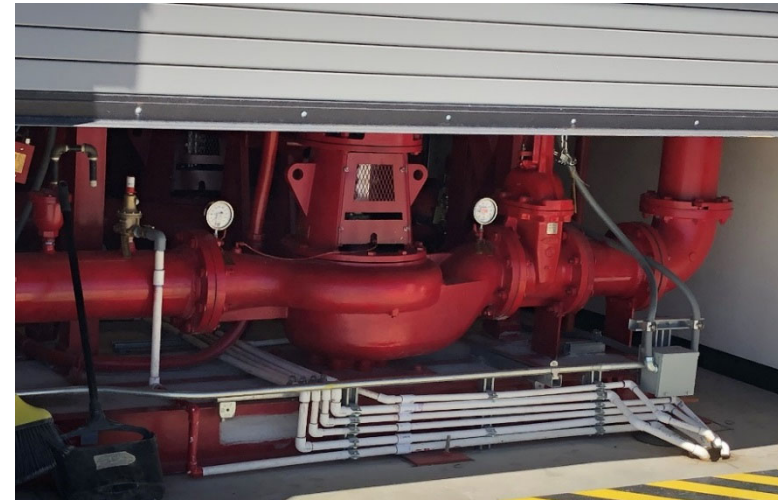
Fire Barrier Deficiencies in the Radiological Laboratory Utility Office Building



Transuranic Waste Facility



Receiving Areas and Storage Buildings



Fire Suppression System Upgrades Remain Incomplete



Seismic Power Cutoff Switches
Redesigned and Replaced in Late 2019

- The Board is evaluating resolution of concerns from its November 9, 2017, letter
- LANL increased utilization of TWF in the past year, alleviating waste accumulation in Plutonium Facility
- Optimal use awaits fire suppression system upgrade, startup of characterization equipment, and development of additional contingency procedures



RANT Shipping Facility

- NNSA resolved the concerns from the Board's December 17, 2014, letter largely by reducing the material-at-risk limit for RANT
- The reduced MAR limit will necessitate using alternative means for loading a small number of containers for shipment
- DOE Office of Environmental Management and NNSA continue to develop the arrangements needed to load legacy waste from Area G—legacy waste shipments have been hindered in the interim
- Reliance on RANT as LANL's enduring shipping capability, rather than TWF as originally intended, creates an additional step for waste shipments



Transuranic Waste Shipment Departing RANT



Crane Operations in RANT



Area G



Dome 49



Aerial View Looking East from Dome 49

- DOE Office of Environmental Management's efforts to reduce the legacy waste inventory remain crucial to the success of LANL national security missions, including pit manufacturing
- In the past year, DOE prioritized shipping newly generated wastes over legacy wastes
- DOE acknowledges that the safety basis requires updating to effectively support the intended waste disposition activities



Radioactive Liquid Waste Treatment Facilities

- LANL remains reliant on the Radioactive Liquid Waste Treatment Facility built in 1963
- Replacement low-level liquid waste facility was completed in 2018, but requires additional modifications to support radiological operations
- Replacement transuranic liquid waste facility remains in the design phase



Existing Radioactive Liquid Waste Treatment Facility



New Low-Level Influent Storage Tanks



Savannah River Plutonium Processing Facility

- On October 10, 2018, NNSA issued termination notice for the Mixed Oxide Fuel Fabrication Facility (MOX) at the Savannah River Site
- NNSA is repurposing MOX as the Savannah River Plutonium Processing Facility to produce 50 pits/year by 2030
- Project is currently in the conceptual design phase—NNSA forecasts facility startup by late fiscal year 2026
- Board staff plans to review key safety basis documentation as it develops





Questions?

Board communications, Resident Inspector weekly reports, Public Hearing information and other agency information are available at www.DNFSB.gov

Defense Nuclear Facilities Safety Board

ABOUT US | DOCUMENTS | BOARD ACTIVITIES & RECOMMENDATIONS | PUBLIC HEARINGS & MEETINGS | DOE SITES | CAREERS | TOPICS

The Defense Nuclear Facilities Safety Board is an independent organization within the executive branch of the United States Government, chartered with the responsibility of providing recommendations and advice to the President and the Secretary of Energy regarding public health and safety issues at Department of Energy defense nuclear facilities.