



U.S. DEPARTMENT OF
ENERGY

NNSASM
National Nuclear Security Administration

Responsibility for Los Alamos Plutonium Facility- 4 and Oxide Production Options

Report to Congress
July 2021

**National Nuclear Security Administration
United States Department of Energy
Washington, DC 20585**

Message from the Acting Administrator

Together with support facilities located at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, LANL's Plutonium Facility (PF)-4 provides the full range of production, processing, research, and development capabilities necessary to execute diverse plutonium missions on behalf of the Department of Energy's National Nuclear Security Administration (DOE/NNSA), and other government agencies.

As PF-4's unique capabilities support multiple missions within a constrained operating environment, coordination of programmatic efforts is paramount to ensure the continued success of the priority pit production mission. DOE/NNSA has made significant efforts to deconflict pit production and surplus plutonium oxide production operations and established a multi-disciplinary body of senior DOE/NNSA executives charged with expeditiously resolving programmatic, operational, financial, or regulatory issues that threaten to impact successful execution of the pit production mission.

Pursuant to the legislative request, this report is being provided to:

- **The Honorable Patrick Leahy**
Chairman, Senate Committee on Appropriations
- **The Honorable Richard Shelby**
Vice Chairman, Senate Committee on Appropriations
- **The Honorable Jack Reed**
Ranking Member, Senate Committee on Armed Services
- **The Honorable James Inhofe**
Ranking Member, Senate Committee on Armed Services
- **The Honorable Dianne Feinstein**
Chairman, Subcommittee on Energy and Water Development
Senate Committee on Appropriations
- **The Honorable John Kennedy**
Ranking Member, Subcommittee on Energy and Water Development
Senate Committee on Appropriations
- **The Honorable Angus King**
Chairman, Subcommittee on Strategic Forces
Senate Committee on Armed Services
- **The Honorable Deb Fischer**
Ranking Member, Subcommittee on Strategic Forces
Senate Committee on Armed Services
- **The Honorable Rosa L. DeLauro**
Chairwoman, House Committee on Appropriations

- **The Honorable Kay Granger**
Ranking Member, House Committee on Appropriations
- **The Honorable Adam Smith**
Chairman, House Committee on Armed Services
- **The Honorable Mike Rogers**
Ranking Member, House Committee on Armed Services
- **The Honorable Jim Cooper**
Chairman, Subcommittee on Strategic Forces
House Committee on Armed Services
- **The Honorable Michael Turner**
Ranking Member, Subcommittee on Strategic Forces
House Committee on Armed Services
- **The Honorable Marcy Kaptur**
Chairwoman, Subcommittee on Energy and Water Development
House Committee on Appropriations
- **The Honorable Mike Simpson**
Ranking Member, Subcommittee on Energy and Water Development
House Committee on Appropriations

If you have any questions or need additional information, please contact Dr. Howard Dickenson, Acting Associate Administrator for External Affairs, at (b)(6)

Sincerely,

(b)(6)

Charles P. Verdon
Acting Under Secretary for Nuclear Security
and Administrator, NNSA

Executive Summary

Plutonium Facility (PF)-4, located at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, began operations in 1978 and today serves as the Nation's Plutonium Center of Excellence. In concert with support facilities located in LANL's Technical Area 55 and elsewhere across the laboratory, PF-4 provides the full range of production, processing, research, and development capabilities necessary to execute diverse plutonium missions on behalf of the Department of Energy's National Nuclear Security Administration (DOE/NNSA), and other government agencies.

PF-4 is the only operational facility in the Nation with the full suite of capabilities necessary to execute plutonium missions essential to national security, materials disposition, and nuclear energy. In addition to DOE/NNSA's pit production mission, other programs of national and international significance currently housed in PF-4 include surplus plutonium disposition, stockpile surveillance, nuclear forensics, and heat source production for space exploration and defense applications. While PF-4's unique capabilities support many programs, plutonium pit production is DOE/NNSA's top priority for work in the facility.

All programmatic activities conducted in PF-4 share finite facility resources, including laboratory floor space, vault space, shipping and receiving support, waste management capacity, and analytical chemistry services, in addition to key construction, maintenance, security, and safety personnel. As a consequence of PF-4 supporting multiple missions within a constrained operating environment, coordination of programmatic efforts is paramount to ensure the continued success of the pit production mission. To facilitate coordination between multiple organizations and efforts, DOE/NNSA established the Matrixed Execution Team (MET) framework, a multi-disciplinary body of senior DOE/NNSA executives charged with resolving programmatic, operational, financial, or regulatory issues that threaten to impact successful execution of the pit production mission. As the Chair of the MET, the Principal Assistant Deputy Administrator for Defense Programs is the single DOE/NNSA official responsible for coordinating and deconflicting programmatic operations in PF-4.

DOE/NNSA will also conduct an analysis of alternatives (AoA) that will evaluate relocating surplus pit disassembly and oxide production operations to alternate locations, including the Savannah River Site, to evaluate options for managing the future programmatic profile of PF-4. Upon completion of the AoA, DOE/NNSA will provide a separate report to Congress documenting the results of the AoA, to include the requested cost and schedule information.



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I. Legislative Language

This report responds to language set forth in the Senate Report (S. Rept. 116-236) accompanying the *National Defense Authorization Act for Fiscal Year 2021* (Public Law 116-283), wherein it states:

“... the committee directs the Administrator of the NNSA to provide a report to the congressional defense committees no later than March 1, 2021, on options for continued plutonium oxide operations, including continuing the mission in PF-4 and moving it to the SRS. In the analysis of continuing operations in PF-4, the Administrator shall list estimated annual costs as well as the expected impact to the priority PF-4 mission of plutonium pit production of 30 pits per year and at a surge level of 50 pits per year. In the analysis of moving the ARIES mission to the SRS, the Administrator shall include the estimated timeline and costs for doing so and estimated annual cost of operations. Either option should also include consideration of the need to meet the requirements to remove a certain amount of plutonium from the state of South Carolina by the end of next year.

Finally, the report shall also include the designation of one official at the NNSA to coordinate and approve all programmatic operations in PF-4, including weapons programs and nonproliferation programs, in order to deconflict valuable space. That individual shall be below the Deputy Administrator level and shall also consider other facilities in Technical Area 55 related to Plutonium science, including the Radiological Laboratory Utility Office Building.”

II. Introduction

Located at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, Plutonium Facility (PF)-4 began operations in 1978 and today serves as the Nation’s Plutonium Center of Excellence. In concert with support facilities located in LANL’s Technical Area 55 and elsewhere across the laboratory, PF-4 provides the full range of production, processing, research, and development capabilities necessary to successfully execute diverse plutonium missions on behalf of the Department of Energy’s National Nuclear Security Administration (DOE/NNSA), and other government agencies.

As a Security Category 1/Hazard Category 2 nuclear facility, PF-4 is authorized to securely house and safely handle significant quantities of plutonium in the service of national security missions and scientific exploration. The PF-4 facility includes plutonium processing laboratories, material shipping and receiving infrastructure, transuranic and low-level waste handling capabilities, and a vault structure to stage special nuclear material awaiting programmatic use or offsite transfer. Figure 1 depicts the layout of PF-4 and supporting infrastructure within Technical Area 55 at LANL.

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Figure 1: PF-4 and supporting infrastructure at LANL’s Technical Area 55

PF-4 is the only operational facility in the Nation with the full suite of capabilities necessary to execute plutonium missions essential to national security, materials disposition, and nuclear energy. Key manufacturing and science capabilities located in PF-4 include metal purification, casting, machining and component fabrication; nuclear materials separation, processing, and recovery; surplus plutonium pit disassembly and oxide production; and actinide chemistry and metallurgy.

While PF-4’s unique capabilities support many programs, plutonium pit production is DOE/NNSA’s top priority for work in the facility. PF-4 is a cornerstone of DOE/NNSA’s two-site approach to establish an enduring capability to produce no fewer than 80 War Reserve¹ pits per year (ppy). In 2018, the Nuclear Weapons Council endorsed the two-site strategy for pit production that includes expanding PF-4 capabilities to produce at least 30 ppy and repurposing the former Mixed Oxide Fuel Fabrication Facility at the Savannah River Site (SRS) near Aiken, South Carolina, to produce no fewer than 50 ppy. In accordance with DOE/NNSA strategy, Federal law,² and Department of Defense requirements, pit manufacturing operations in PF-4 are currently on track to fabricate a first production unit (FPU) War Reserve pit in 2023 and demonstrate the capability to produce no fewer than 30 War Reserve ppy during 2026.

Other programs of national and international significance currently housed in PF-4 include surplus plutonium disposition, stockpile surveillance, nuclear forensics, and heat source production for space exploration and defense applications. All programmatic activities conducted in PF-4 share finite facility resources including laboratory floor space, vault space, shipping and receiving support, waste management capacity, analytical chemistry services, in

¹ War Reserve pits have been certified for use in the U.S. nuclear weapons stockpile.

² [50 U.S.C. 2538a](#), *Plutonium pit production capacity*.

addition to key construction, maintenance, security, and safety personnel. As a consequence of PF-4 supporting multiple missions within a constrained operating environment, coordination of programmatic efforts is paramount to ensure the continued success of the priority pit production mission. As requested in S. Rept. 116-236, and the ongoing need to coordinate and deconflict competing missions to ensure national priorities are achieved, this report:

- Describes DOE/NNSA’s efforts to deconflict pit production and surplus plutonium oxide production;
- Details DOE/NNSA’s pending actions to analyze alternative locations for the oxide production mission; and
- Identifies the single DOE/NNSA official (below the level of Deputy Administrator) responsible for coordinating and deconflicting programmatic operations in PF-4.

III. Efforts to Analyze Alternatives for Surplus Plutonium Oxide Production

In PF-4, plutonium oxide production activities are conducted alongside pit production in support of DOE/NNSA’s Surplus Plutonium Disposition (SPD) program. The purpose of the SPD program is to securely dispose of 34 metric tons of weapon-grade plutonium that has been declared excess to national security needs. Much of this surplus plutonium exists in metal or pit form that must be processed into oxide prior to dilution and ultimate disposal. Pit disassembly and metal oxidation in support of this mission is currently conducted at PF-4 (see Figure 2).

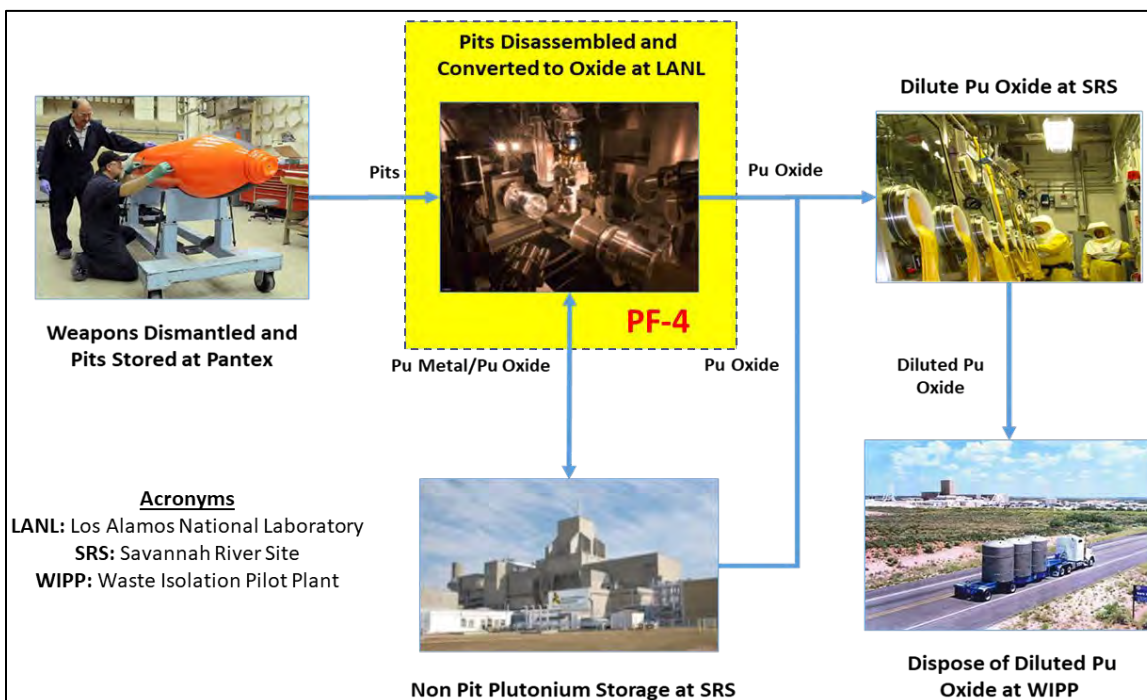


Figure 2: Role of Plutonium Facility-4 in Surplus Plutonium Disposition

Pit disassembly and oxide production activities in PF-4 to support the SPD program began in 1998 with the installation of a technology demonstration test bed called the Advanced Recovery and Integrated Extraction System (ARIES). In 2008, DOE/NNSA transitioned ARIES from a research and development role to a production mission. To date, ARIES equipment in PF-4 has produced over one metric ton of plutonium oxide from surplus pits and metal.

SPD activities in PF-4 must be carefully coordinated with other programs, including pit production. One critical example of programmatic coordination involves PF-4 laboratory space. As a result of coordinated planning, DOE/NNSA designs expanding pit production in PF-4 will not require use of any laboratory floor space currently occupied by ARIES or related equipment. Similarly, based on efforts to avoid programmatic conflicts, conceptual plans to increase oxide production for the SPD mission do not propose using any PF-4 laboratory space needed to expand pit production capacity. As programmatic plans mature and evolve, potential conflicts will continue to be monitored and addressed using laboratory and DOE/NNSA management processes, including through the Matrixed Execution Team (MET) framework described later in Section IV of this report.

To implement DOE/NNSA's strategy for SPD, the nuclear security enterprise's pit disassembly and oxide production capacity must increase beyond current levels. Existing ARIES equipment in PF-4 is capable of producing roughly 500-700 kg of oxide per year. To achieve SPD mission objectives, a throughput capacity of 1,500 kg per year is needed by the mid-2030s.

To expand plutonium oxide production to required levels, DOE/NNSA planning is underway to establish a new capital line-item acquisition called the Pit Disassembly and Processing (PDP) project. In accordance with the process defined by DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, the Surplus Plutonium Disposition program is preparing a Mission Need Statement to support Critical Decision (CD)-0, *Approve Mission Need*. Upon approval of CD-0, DOE/NNSA will initiate an analysis of alternatives (AoA) that will systematically evaluate options ranging from expanding existing ARIES capabilities in PF-4 to fielding new capabilities at other DOE/NNSA sites, including SRS.

The AoA will be conducted in accordance with DOE/NNSA directives that implement Government Accountability Office best practices. Cost, schedule, and impact evaluations for plutonium oxide options developed as part of the AoA are expected to address the remainder of the legislative requested information established in S. Report 116-236. Upon completion of the AoA, DOE/NNSA will provide a separate report to Congress documenting the evaluation of alternative locations for the oxide production mission, including SRS, as well as the requested cost and schedule information.

IV. Responsibility for Coordinating Programmatic Operations in LANL's PF-4

Reestablishing the Nation's capability to produce pits at a rate of no fewer than 80 War Reserve pits is a vital national security imperative and DOE/NNSA priority. To facilitate successful execution of this essential mission, DOE/NNSA has established a new management framework called the MET. The following sections describe the role of the Plutonium Pit Production MET and the responsibility of the MET Chair for coordinating and deconflicting programmatic activities in LANL's PF-4 facility.

Matrixed Execution Team (MET)

In 2019, to support execution of DOE/NNSA's two-site approach to modernize U.S. plutonium pit production capabilities, DOE/NNSA's Office of Defense Programs established the MET management framework. The MET is a multi-disciplinary body of senior DOE/NNSA executives charged with resolving programmatic, operational, financial, or regulatory issues that threaten to impact successful execution of the pit production mission. The MET functions as a collaborative forum to review and synchronize resources, schedules, and ongoing activities; identify future activities and actions to be undertaken and tracked; and facilitate communication between stakeholders supporting the pit production mission. With purview over the entire pit production mission, the MET deliberates on issues involving both LANL and SRS.

The MET is chaired by the Principal Assistant Deputy Administrator for Defense Programs. Principal Members advise the MET Chair and includes senior leaders from the DOE/NNSA organizations responsible for providing essential support functions and enabling pit production mission objectives, such as:

- Office of Safety, Infrastructure and Operations;
- Office of Defense Nuclear Security;
- Office of Acquisition and Project Management;
- Office of Management and Budget;
- Los Alamos Field Office; and
- Savannah River Field Office

The MET also includes Standing Members representing contractor leadership from key laboratories and sites, and Associate Members representing other enabling organizations and programs (including the Office of Defense Nuclear Nonproliferation responsible for the SPD program) whose work must be coordinated and deconflicted to ensure success of the priority pit production mission.

The MET Principals meet at least bi-monthly to support the decision-making process. The MET Chair ensures that the forum remains focused on the overall pit production mission and drives resolution of identified issues and resource conflicts. If MET engagement does not produce an acceptable resolution to an issue with potential adverse impacts to pit production, the MET Chair will elevate the issue to the NNSA Administrator.

Single NNSA Official Responsible for Coordinating Programs in LANL's PF-4 Facility

Pit production is the highest priority mission conducted in LANL's PF-4 facility. The function of the MET is to facilitate resolution of issues that could threaten success of the pit production mission at either LANL or SRS. Consequently, by serving as the Chair of the MET, the Principal Assistant Deputy Administrator for Defense Programs is the single DOE/NNSA official responsible for coordinating and deconflicting programmatic operations in PF-4 (and supporting facilities in Technical Area 55 at LANL) to ensure pit production mission objectives are achieved as DOE/NNSA's highest priority.

V. Summary

The PF-4 facility at LANL anchors the Nation's Plutonium Center of Excellence and houses diverse DOE/NNSA missions, including pit production and surplus plutonium oxide production. Considering physical space constraints and finite operational support resources, programmatic coordination in PF-4 is imperative to ensure priority mission objectives are accomplished. To facilitate coordination, DOE/NNSA established the MET framework to support the highest priority pit production mission. As the Chair of the MET, the Principal Assistant Deputy Administrator for Defense Programs is the single DOE/NNSA official responsible for coordinating and deconflicting programmatic operations in PF-4.

To evaluate options for managing the future programmatic profile of PF-4, DOE/NNSA is undertaking an AoA that will evaluate relocating surplus pit disassembly and oxide production operations to alternate locations, including SRS. Upon completion of the evaluation, DOE/NNSA will provide a separate report to Congress documenting the results of the AoA.