



Material Management and Minimization

Surplus Plutonium Disposition Program Requirements Document for the Proposed Dilute and Dispose Approach

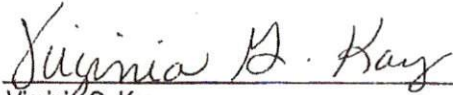
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United States Department of Energy
National Nuclear Security Administration

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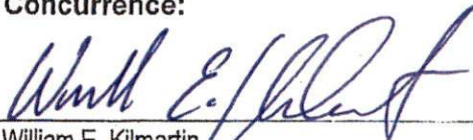


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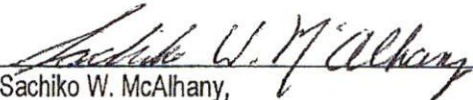
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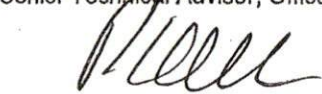
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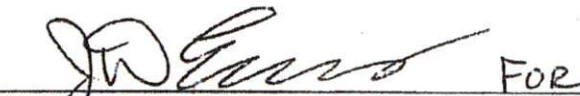
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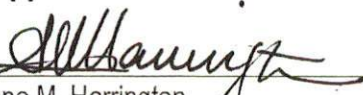


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CONFIGURATION CONTROL LOG

Revision No.	Date	Summary of Revision
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ACRONYMS

ANS	American Nuclear Society
AoA	Analysis of Alternatives
ASME	American Society of Mechanical Engineers
CCO	Criticality Control Overpack
CD	Critical Decision
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE-EM	DOE Office of Environmental Management
EIS	Environmental Impact Statement
FY	Fiscal Year
FNYSF	Future Year Nuclear Security Plan
HEU	Highly Enriched Uranium
KPP	Key Performance Parameter
LANL	Los Alamos National Laboratory
M ³	NNSA Office of Material Management and Minimization
MFFF	MOX Fuel Fabrication Facility
MOX	Mixed Oxide
MT	Metric Ton (1,000 kilograms)
NDA	Non-Destructive Assay
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NQA	Nuclear Quality Assurance
OST	Office of Secure Transportation
PMDA	Plutonium Management and Disposition Agreement
PME	Project Management Executive
PRD	Program Requirements Document
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SPD	Surplus Plutonium Disposition
SRS	Savannah River Site
TBD	To Be Determined
TRU	Transuranic (i.e., atomic number > 92)
WBS	Work Breakdown Structure
WSB	Waste Solidification Building
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION AND PURPOSE

The purpose of this Program Requirements Document (PRD) is to define the requirements, assumptions, constraints, and key interfaces associated with implementation of the proposed Dilute and Dispose approach. The National Nuclear Security Administration (NNSA) Office of Material Management and Minimization (M³) is responsible for reducing the threat of nuclear weapons proliferation worldwide by managing and disposing of excess weapons-useable nuclear material from both domestic stockpiles and material returned from abroad. Key elements of the M³ program are focused on blending surplus weapons-usable Highly Enriched Uranium (HEU) for disposition as commercial reactor fuel and establishing the capability to dispose of surplus plutonium consistent with provisions of the United States (U.S.)-Russian Plutonium Management and Disposition Agreement (PMDA)¹.

This PRD translates the Mission Need Statement into technical, managerial, and programmatic requirements for the proposed Dilute and Dispose approach. These requirements identify the programmatic objectives for the projects and provide the framework for building the respective project acquisition strategies. If NNSA decides to implement the proposed Dilute and Dispose approach, in lieu of the Mixed Oxide (MOX) fuel approach, the requirements of this document will be incorporated into the M³ Material Disposition PRD. The decision to implement the Dilute and Dispose Approach would be made pursuant to NEPA.

2.0 BACKGROUND

In April 2014, the Department of Energy (DOE) issued a Plutonium Disposition Working Group report which evaluated options for disposal of surplus plutonium, including both MOX fuel and Dilute and Dispose alternatives. Congress subsequently directed NNSA to conduct an independent review of the Plutonium Disposition Working Group report, which was completed by The Aerospace Corporation, in April 2015. Again in 2015, Congress requested a “Red Team” review of plutonium disposition options, which was completed in August 2015. The conclusions reached in each of these evaluations support selection of the Dilute² and Dispose approach as a more cost effective methodology for disposition of surplus plutonium. Consistent with the Explanatory Statement for the Consolidated Appropriations Act of 2016, NNSA is initiating planning of the Dilute and Dispose approach, including the pre-conceptual design of additional plutonium dilution capability, and the development of a lifecycle cost and schedule estimate. This PRD sets forth the planning basis for these preliminary program objectives.

In December 2015, DOE issued a preferred alternative to prepare 6 metric tons (MT) of surplus non-pit plutonium for eventual disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. In April 2016, DOE announced a Record of Decision (ROD) to implement the preferred alternative, which uses the Dilute and Dispose approach.

A portion of the 6 MT of surplus non-pit plutonium should be acceptable for disposition under the existing PMDA criteria, once conditions for a third party verification are established. In order to achieve the PMDA objectives (i.e., disposition 34 MT of surplus weapons-useable plutonium),

¹ *The Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation* was entered into force on July 13, 2011.

² The terms dilute and down-blending are used interchangeably by DOE and NNSA to describe the process for mixing surplus plutonium with an adulterant to ensure plutonium is not recoverable without extensive processing. DOE Office of Environmental Management (DOE-EM) uses the term down-blending to describe this process. Whereas, dilution is the international nomenclature for using an adulterant to provide proliferation resistance and is in no way intended to avoid any applicable regulatory requirements.

additional National Environmental Policy Act (NEPA) reviews are necessary to implement the Dilute and Dispose approach for processing surplus pit plutonium.

The DOE Office of Environmental Management (DOE-EM) is responsible for disposition of surplus non-pit plutonium, including materials consolidated at the Savannah River Site (SRS). However, NNSA and DOE-EM are working collaboratively to identify a means to disposition as much non-pit plutonium as possible within the context of the PMDA.

3.0 MISSION NEED

The Justification of Mission Need for the program and associated projects was approved in October 1997 as:

The end of the Cold War has created a legacy of surplus weapons-usable fissile materials both in the U.S. and the former Soviet Union. The global stockpiles of weapons-usable fissile materials pose a danger to national and international security in the form of potential proliferation of nuclear weapons and the potential for environmental, safety and health consequences if the materials are not properly safeguarded and managed.

In September 1993, President Clinton issued a *Nonproliferation and Export Control Policy* in response to the growing threat of nuclear proliferation. The President's policy states "the U.S. will seek to eliminate where possible the accumulation of stockpiles of highly enriched uranium or plutonium"...Furthermore, at the Moscow Nuclear Safety Summit, April 19-20, 1996, the President agreed to a statement including the following: "we are determined to identify appropriate strategies for the management of fissile materials designated as no longer required for defense purposes..."

Since approval of the Mission Need, in September 2000 the U.S. and Russian governments signed the PMDA, which commits the U.S. and Russia to dispose of at least 34 MT of weapon-grade plutonium by irradiating as MOX fuel or by other methods "as may be agreed by the Parties." The M³ Material Disposition Program implements this mission by disposing of surplus weapons-usable plutonium and surplus HEU in an environmentally sound manner, ensuring these materials can never again be readily used in nuclear weapons.

4.0 MISSION REQUIREMENTS DEVELOPMENT

The NNSA Business Operating Procedure [BOP-06.02] for establishing program requirements documents for construction projects was used as a guide to prepare this PRD. The key documents which define the basis for the Program requirements include:

- United States-Russian Plutonium Management and Disposition Agreement (PMDA)
- *Report of the Plutonium Disposition Working Group: Analysis of Surplus Weapon-Grade Plutonium Disposition Options*
- Surplus Plutonium Disposition Supplemental Environmental Impact Statement (SEIS).

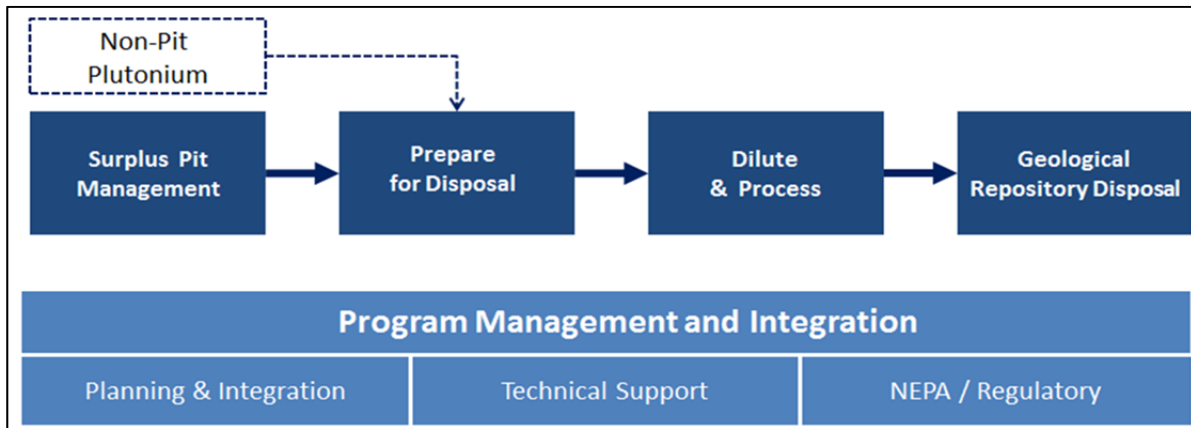
The key process steps identified by the Plutonium Disposition Working Group as part of the Dilute and Dispose approach are presented in section 4.1, and a summary of the associated Work Breakdown Structure (WBS) is presented in section 4.2. The WBS is used to provide a structured approach for defining program requirements.

4.1 KEY PROCESS STEPS

Figure 1 illustrates the key process steps and program support functions associated with the proposed Dilute and Dispose approach. Non-pit plutonium feed is included to illustrate

the integration of the NNSA and DOE-EM scope.

Figure 1: Plutonium Dilute and Dispose Approach Functional Diagram



4.2 WORK BREAKDOWN STRUCTURE

The requirements identified in this PRD are aligned with the Material Disposition Program WBS provided in Attachment 1. The WBS identifies the work necessary to accomplish program mission objectives, and provides a framework for developing required program management functions. Table 1 provides a brief description of each WBS element used in preparation of this PRD. Note that requirements for HEU Disposition and International Program are not addressed as part of this PRD.

Table 1: Material Disposition Program WBS Element Descriptions

WBS	Title	Description
23.3.1	Program Management and Integration	Facilitating planning and integration, technical support, and regulatory activities for the Material Disposition Program.
23.3.2.1	Surplus Pit Management	Providing surveillance, monitoring and packaging necessary for managing the surplus pit inventory.
23.3.2.2	Prepare for Disposal	Processing both pit and non-pit plutonium to provide feed materials for Dilute and Dispose operations.
23.3.2.3	MOX Fuel	Supporting close-out and disposition of the MOX Fuel Fabrication Facility (MFFF) and Waste Solidification Building (WSB) projects.
23.3.2.4	Dilute and Process	Providing incremental facility upgrades to increase the dilution capacity, and processing / packaging of surplus plutonium for disposition.
23.3.2.5	Geological Repository Disposal	Providing facility upgrades and operations for receipt and disposal of surplus plutonium.

The Material Disposition Program is also responsible for processing the Japan Fast Critical Assembly materials returned to the United States as part of the M³ Gap Removal Program. The requirements for processing these materials are not addressed in this PRD.

5.0 PROGRAM ASSUMPTIONS, CONSTRAINTS, AND KEY INTERFACES

The following assumptions and constraints are used in defining the Program requirements for the proposed Dilute and Dispose Approach and are consistent with NNSA direction provided to DOE contractors supporting the Program. The assumptions, constraints, and interfaces identified below will be refined as planning for the Dilute and Dispose approach continues to mature.

5.1 ASSUMPTIONS AND CONSTRAINTS

- i. Disposal of surplus plutonium at a geologic repository, assumed to be WIPP, using the proposed Dilute and Dispose approach will be approved contingent on negotiation with Russia, NEPA review, DOE, NNSA and Congressional authorization, and appropriation of funds.
- ii. The Final Surplus Plutonium Disposition SEIS and associated 2016 ROD for disposition of non-pit plutonium constitute the environmental review supporting the DOE decision to authorize the proposed SPD Project at SRS.
- iii. Future NEPA reviews are required for processing greater than 6 MT of surplus non-pit plutonium using the Dilute and Dispose approach. These reviews include developing new Environmental Impact Statements (EIS) or Programmatic EIS and updates such as supplement analysis or SEIS to site-specific NEPA documents, as necessary.
- iv. Monitoring and inspection requirements associated with third party verification for surplus plutonium disposition will be defined by FY 2020, subject to PMDA negotiation.
- v. Third party inspection and monitoring activities for PMDA verification at the repository will be limited so as not to interfere with the nominal processing timeline for placement of waste underground following receipt.
- vi. There is a Departmental priority to remove certain plutonium inventories from the State of South Carolina. Expediting removal of plutonium from SRS for final disposition is a key objective of the program.
- vii. New projects shall maximize the use of existing facilities to minimize capital investments required for the program execution. The use of existing capabilities for the project(s) will be evaluated based on alternative selected by the Project Management Executive (PME) following completion of the Analysis of Alternatives (AoA).
- viii. EM sites will use performance based security, as appropriate, to support SPD project scope.
- ix. Los Alamos National Laboratory (LANL) facilities will remain available to support pit disassembly, conversion, and storage operations required to achieve feed production rate and program objectives for the full duration of the Dilute and Dispose approach.
- x. Shipments of surplus plutonium into South Carolina will begin no later than FY 2023 following start-up of the new permanent ventilation system at the WIPP and start of routine surplus plutonium TRU waste shipments.
- xi. Transportation of surplus plutonium TRU waste packages to the repository will begin no later than FY 2023, at a rate sufficient to support continuing operations and based on criteria for repository shipping priorities. [Note: Routine shipments are constrained by completion of ventilation upgrades at the repository].

-
- xii. Potential constraints associated with waste capacity of the geological repository will be resolved by FY 2020 in parallel with NEPA reviews required for disposition of additional pit and non-pit plutonium using the Dilute and Dispose approach.
 - xiii. Repository operations are conditionally projected through FY 2050 with 5 years for decommissioning and dismantlement. Surplus Pit Management and Prepare for Disposal shall finish processing operations on a schedule which supports completion of Dilution Operations by FY 2047 to support Repository closure beginning in FY 2050.
 - xiv. DOE-EM will complete scope needed to support expansion of the repository footprint and extend operations through FY 2050. This scope is intended to support the WIPP Performance Assessment required for implementing the proposed disposition of surplus pit plutonium beginning in FY 2026.
 - xv. Program funding for execution of the Dilute and Dispose approach is expected to reach approximately \$400M annually in FY 2022 (FY 2017 constant dollars). The funding profile for the Dilute and Dispose approach, prior to FY 2022, is defined by the Material Disposition Program Future Year Nuclear Security Plan (FYNSP).
 - xvi. NNSA will fund incremental facility operations and infrastructure required for the Dilute and Dispose approach. Integration of Dilute and Dispose approach into DOE-EM facilities and associated incremental funding of facility operations and infrastructure will be addressed in the *Program Execution Plan*.
 - xvii. Costs for base facility operations and infrastructure in DOE-EM facilities (i.e., SRS and Geological Repository) are not included in the annual program funding. Incremental funding from NNSA will support increases in facility staffing, infrastructure, security, and maintenance associated with addition of the Dilute and Dispose approach work scope.
 - xviii. Cost for incremental operations and infrastructure at LANL, Y-12, or Pantex are based on agreements with Defense Programs for scope performed at these NNSA sites.
 - xix. The DOE-EM will provide licensed TRUPACT-II Type B packages and TRUPACT-II transporters for shipping Criticality Control Overpack (CCOs) as authorized content. NNSA will fund certification of the TRU waste packaged for shipment to WIPP for the proposed Dilute and Dispose Approach.
 - xx. Deactivation and disassembly of infrastructure added to support program execution will be based on site specific criteria and defined as part of the *Program Execution Plan*.

5.2 KEY INTERFACES

NNSA partners with U.S. agencies, international organizations, and others to achieve nonproliferation objectives. Program interfaces are managed in accordance with the Material Disposition Program interface control procedures. Key interfaces include:

- United States Department of State
- International Partners
- DOE/NNSA Program Offices (e.g., DOE-EM and NNSA Defense Programs)
- DOE/NNSA Site and Field Offices (e.g., NNSA Production Office, DOE Savannah River, Savannah River Field Office, Los Alamos Field Office, Carlsbad Field Office, etc.)
- Management and Operating Contractors
- National Laboratories
- Federal/State Regulatory Agencies and Programs

6.0 REQUIREMENTS

Requirements are divided into multiple categories consistent with the NNSA business operating procedure BOP-06.02 for developing a program requirements document. Mission requirements identify what the program must provide to satisfy the mission need. Program requirements are organized according to the Material Disposition WBS, and include technical requirements, management requirements and preferences, principles, and goals. Key Performance Parameters (KPPs) are provided as initial guidance for projects supporting implementation of the Dilute and Dispose approach.

6.1 MISSION REQUIREMENTS

Requirement M1: The United States shall dispose of at least 34 MT of surplus weapon-grade plutonium, consistent with provisions of PMDA, using the Dilute and Dispose approach.

Requirement M2: The United States shall implement the following provisions of the PMDA for feed materials and operations associated with the Dilute and Dispose approach:

- Limit Pu-240/Pu-239 ratio to no greater than 0.10
- Limit Pu-238 to no more than 7 kg and Pu-240 to no more than 2210 kg, in total
- Process no less than 1.3 MT surplus plutonium per year for disposition
- Provide third party, independent verification, as agreed upon by the parties

6.2 PROGRAM REQUIREMENTS

The following paragraphs identify constraints associated with implementation of mission requirements. Section 6.2.1 is cross cutting to all sites and supports Program execution, while Sections 6.2.2 through 6.2.6 apply to specific Program elements.

6.2.1 PROGRAM MANAGEMENT AND INTEGRATION (WBS 23.3.1)

Program Management and Integration scope includes coordination of program activities across the Material Disposition performing organizations. This scope includes Program Planning and Integration, Technical Support, and NEPA/Regulatory activities which apply to all sites supporting the Program.

Requirement P1: The Program shall use existing Hazard Category 2 facilities with plutonium oxide processing capabilities and the required security infrastructure to handle Category 1 quantities of plutonium for the dilute and dispose process.³

Requirement P2: Program Management and Integration shall manage the program baseline consistent with Planning, Programming, Budgeting and Evaluation best practices and Government Accountability Office Program Baseline guidelines. A common WBS shall be used for program elements.

Requirement P3: All program elements shall implement configuration management and change control as defined by the Program Office. Details of these processes will be defined as part of the *Program Execution Plan*.

Requirement P4: Program elements shall comply with DOE Orders, state and federal regulations, and facility requirements for nuclear materials processing (i.e., operating procedures, criticality controls, etc.), as applicable. [Note: This requirement is not intended to void or otherwise change existing waivers, exemptions, or agreements

³ This requirement is the basis of the 2014 Plutonium Disposition Working Group report that identifies a more cost effective approach for surplus plutonium disposition, rather than continuing to pursue the MOX approach, and minimizes the potential of creating additional departmental environmental liabilities.

between sites supporting the Material Disposition program and associated regulatory agencies.]

Requirement P5: The M³ Program shall conduct NEPA reviews needed to inform decisions dealing with surplus plutonium, and issue applicable ROD(s).

Requirement P6: All capital asset acquisition projects shall conform to DOE Order 413.3B Ch2, *Program and Project Management for the Acquisition of Capital Assets*.

Requirement P7: The M³ Program shall implement a quality assurance program in accordance with DOE Order 414.1D and American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA)-1-2008/-2009a Quality Assurance Requirements for Nuclear Facilities Application, in addition to 10 Code of Federal Regulations (CFR) 830.120, Subpart A, *Quality Assurance Requirements*, as applicable.

Requirement P8: The Material Disposition Program shall have a record management system integrated with SRS Records Management and Document Control, as applicable.

Requirement P9: Program Management and Integration shall establish interface controls (e.g., Interface Control Documents, etc.) between performing organizations to assure performance standards are maintained. These interface controls will be identified as part of the *Program Execution Plan*.

Requirement P10: Program Management and Integration shall implement a formal Risk Management Program to address risk and opportunities impacting the scope, cost or schedule for the Dilute and Dispose approach.

Requirement P11: Program Management and Integration shall evaluate programmatic assumptions and perform a Technology Readiness Assessment to support development of technology maturation plans, as needed.

Requirement P12: Program Management and Integration shall maintain a Dilute and Dispose Feed Table, as a classified addendum to the PRD. Periodic updates to the feed table will be provided based on production rates and actual plutonium inventories.

6.2.2 SURPLUS PIT MANAGEMENT (WBS 23.3.2.1)

Surplus Pit Management provides surveillance, monitoring and packaging for interim storage and disposition of surplus pits. The scope includes packaging and transportation of surplus pits, and provision / maintenance of Type-B transportation packages. All activities shall be designed with sufficient capacity to support rates provided in the Dilute and Dispose Feed Table. [Note: Identification of surplus pits is based on the NNSA Production and Planning Directive.]

Requirement P13: Surplus Pit Management shall provide the capability for safely staging surplus pits in accordance with design agency criteria (e.g., environmental conditions).

Requirement P14: Surplus Pit Management shall provide the capability for surveillance and monitoring of all pit types in the surplus inventory and implement surveillance in accordance with Design Agency requirements.

Requirement P15: Surplus Pit Management shall provide the capability to safely package surplus pits and load secure transport vehicles.

Requirement P16: Surplus Pit Management shall coordinate transportation of the Special Nuclear Materials with the NNSA Office of Secure Transportation (OST).

Requirement P17: Surplus Pit Management shall provide licensed Type-B packages for safely transporting surplus pits. Procurement of MD-2 packages and associated licensing required for use shall be implemented prior to retirement of the FL package.

Requirement P18: Surplus Pit Management shall maintain the inventory of Type-B packages required for transportation of surplus pits and provide the support needed to achieve program objectives (e.g., licensing and annual maintenance). [Note: This includes procurement and facility upgrades for implementation of the MD-2 packages.]

6.2.3 PREPARE FOR DISPOSAL (WBS 23.3.2.2)

Prepare for Disposal supports the processing of both pit and non-pit plutonium required for disposition. Processing of non-pit plutonium includes the operations required to convert surplus plutonium into an oxide feed suitable for dilution. The processing of surplus pit plutonium includes disassembly and operations required to convert surplus plutonium into an oxide feed. Additional steps in the Prepare for Disposal (irrespective of starting materials) include: receipt, interim storage, characterization, packaging, and transportation. All operations shall provide capability to support rates provided in the Dilute and Dispose Feed Table.

Requirement P19: Prepare for Disposal shall provide licensed Type-B packages (e.g., 9977, 9975 or ES3100) for safely transporting plutonium oxide feed.

Requirement P20: Prepare for Disposal shall maintain the inventory of Type-B packages required for transportation of plutonium oxide and provide the support needed to achieve program objectives (e.g., licensing and annual maintenance).

Requirement P21: Prepare for Disposal shall provide the capability to receive Office of Secure Transportation (OST) shipments, unload Type-B packages, and return empty packages.

Requirement P22: Prepare for Disposal shall provide the capability for disassembly and conversion of all pit types in the surplus inventory.

Requirement P23: Prepare for Disposal shall provide the capability to safely produce plutonium oxide which conforms to feed specifications established for Dilute and Dispose operations and packaging limits. (TBD-1)

Requirement P24: Prepare for Disposal shall provide laboratory analysis of plutonium oxide product and Non-Destructive Assay (NDA), as required, to demonstrate conformance with feed specifications and packaging limits for the Dilute and Dispose approach (e.g., moisture, Pu-240/Pu239 ratio, etc.).

Requirement P25: Prepare for Disposal shall provide the capability to package plutonium oxide based on storage and transportation requirements (e.g., contents authorized by the 9975 Safety Analysis for Packaging, or equivalent, and Interim Safe Storage Criteria).

Requirement P26: Prepare for Disposal shall provide capacity for on-site interim storage sufficient to support anticipated shipping delays and to manage production requirements based on a nominal Dilute and Dispose process schedule.

Requirement P27: Prepare for Disposal shall package oxide feed for the dilution process that meets transportation and storage criteria. Packaging of plutonium oxide also requires conformance with conditions defined by interface control document(s).

Requirement P28: Prepare for Disposal shall coordinate transportation of the Special Nuclear Materials required for program execution with OST.

Requirement P29: Prepare for Disposal shall provide oxide feed which reveals no classified attributes of the starting material following dilution operations.

Requirement P30: Prepare for Disposal shall provide capability for sanitization, as required, and disposal of all byproducts associated with disassembly and conversion.

Requirement P31: HEU from disassembly and conversion operations (both surplus and national security materials) shall be processed and packaged in accordance with requirements established by the HEU Interface Control Document.

6.2.4 MOX FUEL (WBS 23.3.2.3)

Material Disposition Program scope includes activities required for termination of the MFFF Project and associated WSB Project.

Requirement P32: The Material Disposition Program shall maintain the WSB in lay-up mode until facility disposition is determined.

Requirement P33: The Material Disposition Program shall support termination of the MFFF project, as required.

6.2.5 DILUTE AND PROCESS (WBS 23.3.2.4)

Dilute and Process includes activities required for termination of safeguards, characterization of the waste form, and packaging surplus plutonium for disposal at the repository. The key dilute and process steps include receipt, interim storage, blending with adulterant, canning, assay, packaging, transportation, monitoring and inspection. All activities shall be designed with capability to support rates provided in the Dilute and Dispose Feed Table.

Requirement P34: Dilute and Process shall perform activities required for termination of safeguards prior to shipping to the Repository. However, the appropriate level of security shall be maintained during interim storage of the diluted plutonium prior to shipping.

Requirement P35: Dilute and Process shall limit shipments to the repository to nominally three per week with only two shipments in transit at a time, based on repository shipping priorities. [Note: Processing of DOE-EM non-pit plutonium materials will increase shipments to about 4 per week].

Requirement P36: Dilute and Process shall provide the capability to receive OST shipments, unload Type-B packages, and return empty packages.

Requirement P37: Dilute and Process shall provide CCOs, or approved equivalent, for packaging diluted plutonium.

Requirement P38: Dilute and Process shall provide the capability and capacity to safely handle and provide interim storage for plutonium oxide feed.

Requirement P39: Dilute and Process shall provide the capability and capacity to process plutonium oxide using a dry blending operation to mix plutonium oxide with adulterant material(s) and package the diluted product with third party monitoring and inspection, as required, to support implementation of PMDA verification criteria. (TBD-2)

Requirement P40: Dilute and Process shall demonstrate that the diluted plutonium conforms to Safeguards Criteria for a maximum attractiveness level "D".

Requirement P41: Dilute and Process shall maximize loading (fissile gram equivalent) of CCOs, or approved equivalent packages, based on criteria defined for interim storage, transportation, and repository receipt.

Requirement P42: Dilute and Process shall provide NDA and monitoring, as required, to support both Nuclear Material Control and Accountability and third party monitoring and inspection of diluted plutonium and packages.

Requirement P43: Dilute and Process shall limit measurement system error, as required, to enable nominal fissile isotope loading of at least 300 FGE per CCO.

Requirement P44: Dilute and Process shall provide capability and capacity for interim safe storage of diluted plutonium prior to shipment to the repository. The capacity for on-site storage shall be sufficient to accommodate a two-year shipping delay.

Requirement P45: Dilute and Process shall comply with all WIPP waste acceptance criteria and document acceptable knowledge for TRU waste packaging.

Requirement P46: Dilute and Process shall comply with all requirements for repository acceptance, including certification of TRU waste packages (e.g., characterization and packaging, NDA, headspace gas, and radiography).

Requirement P47: Dilute and Process shall provide capability for packaging CCOs in TRUPACT-II and loading TRUPACT-II transporter for shipment to repository.

6.2.6 GEOLOGIC REPOSITORY DISPOSAL (WBS 23.3.2.5)

The Geological Repository Disposal scope provides incremental upgrades and facility operations for disposal of the TRU waste packages. All activities shall be designed with capability to support rates provided in the Dilute and Dispose Feed Table.

Requirement P48: Geological Repository Disposal shall support the DOE-EM and Carlsbad Field Office with any regulatory changes necessary for authorization of the TRU waste packaged for disposal using CCOs.

Requirement P49: Geological Repository Disposal shall provide the capability to receive shipments, unload CCOs, and return the empty TRUPACT-II or equivalent shipping container for reuse.

Requirement P50: Geological Repository Disposal shall provide security required to support roll-up of attractiveness level "D" materials associated with unplanned outages of the waste handling systems.

Requirement P51: Geological Repository Disposal shall provide monitoring capability to support third party verification of surplus plutonium disposal.

6.3 KEY PERFORMANCE PARAMETERS

Multiple projects may be required to implement the Program and enable NNSA to achieve nuclear nonproliferation objectives by processing surplus pit plutonium and other weapon-grade plutonium for disposal. These projects support the overall program objective to complete disposition of surplus plutonium from pits, existing oxides, and/or clean metal by building on existing process capabilities. The technical, cost, and schedule objectives for these Material Disposition projects are presented in sections 6.3.1 through 6.3.4. Once the Dilute and Dispose approach is authorized to proceed, and the execution strategy for the projects is further matured, KPPs will be further refined for each project or subproject.

6.3.1 PROJECT KPPs AND TECHNICAL OBJECTIVES

Requirement K1: The Material Disposition Program shall initiate projects needed to expand the existing capacity to process plutonium from pits, existing oxides, and clean metal and to increase capacity for dilute and disposal to achieve rates needed to support the program requirements. Processing capability shall be demonstrated as part of Operational Readiness Reviews and production capacity validated using process models.

Requirement K2: The Material Disposition Program shall design and construct projects in a manner that allows for efficient and cost effective operation, shutdown, deactivation, and decommissioning at the end of the mission.

Requirement K3: The Material Disposition Program shall design, construct, and operate projects as DOE regulated facilities.

Requirement K4: The Material Disposition Program shall design, construct, and operate projects in compliance with applicable Federal, State, and local regulations.

Requirement K5: The Material Disposition Program shall complete modifications necessary to safely package surplus pits and load secure transport vehicles for shipment at the rate(s) defined in the Dilute and Dispose Feed Table by FY 2026.

Requirement K6: The Material Disposition Program shall complete modifications needed to disassemble and convert plutonium from all surplus pit types to an unclassified oxide at the rate(s) defined in the Dilute and Dispose Feed Table by FY 2027.

Requirement K7: The Material Disposition Program shall complete modifications needed for dilution of plutonium oxide at the rate(s) defined in the Dilute and Dispose Feed Table by FY 2026.

Requirement K8: The Material Disposition Program shall complete modifications needed to provide interim storage, characterization, and packaging of diluted plutonium at the rate(s) defined in the Dilute and Dispose Feed Table by FY 2026.

Requirement K9: The Material Disposition Program shall complete modifications needed for WIPP to receive the TRU waste packages at the rate(s) defined in the Dilute and Dispose Feed Table by FY 2026 and consistent with criteria for WIPP shipping priorities.

6.3.2 KEY COST OBJECTIVES TO MANAGE PROJECTS

Requirement K10: The Material Disposition Program shall manage all projects within the DOE approved cost performance baseline defined as part of Critical Decision (CD)-2.

Requirement K11: The Material Disposition Program shall employ EIA-748 certified Earned Value Management System for reporting and monitoring progress, variances and trend analysis, and for initiating mitigation/recovery actions as necessary.

Requirement K12: The Material Disposition Program shall use a disciplined change control process to manage all changes to the project which impact the DOE approved performance management baseline.

6.3.3 KEY SCHEDULE OBJECTIVES TO MANAGE PROJECTS

Requirement K13: The Material Disposition Program shall establish a resource loaded, fully Integrated Project Schedule at CD-2 for each project or subproject.

Requirement K14: The Material Disposition Program shall manage all projects within the DOE approved schedule performance baseline established at CD-2. Prior to CD-2, management will follow the low range schedule.

Requirement K15: The Material Disposition Program shall use a disciplined change control process to manage all changes to the project which impact the DOE approved schedule performance baseline.

6.3.4 KEY SAFETY OBJECTIVES TO MANAGE PROJECTS

Requirement K16: The Material Disposition Program shall design and construct projects to provide safe work places and processes.

Requirement K17: The Material Disposition Program shall achieve zero fatalities and a Total Recordable Case rate of less than four per 200,000 work-hours during construction.

Requirement K18: The Material Disposition Program shall rigorously evaluate occurrences during start-up to assure incidents do not escalate or repeat.

7.0 SUMMARY OF REQUIREMENTS

This document establishes the requirements associated with execution of the proposed Program scope. This PRD is a “living document” that is essential for communicating expectations for implementation of the Material Disposition Program to multiple performing organizations. If NNSA decides to implement the Dilute and Dispose approach in lieu of the MOX Fuel approach, the requirements of this PRD will be incorporated into the M³ Material Disposition PRD. The PRD identifies and presents the following mission critical information:

- Key assumptions, operating constraints, and key interfaces
- Both mission and program requirements
- Program expectations for execution of scope
- KPPs associated with project planning and execution

At this stage of program development, there are a number of requirements identified that need further definition. Appendix I provide a list of residual technical requirements (i.e., TBDs). Other elements of the program are required to provide “sufficient capacity to achieve the processing rate defined in the Dilute and Dispose Feed Table.” Although an initial feed table is provided as part of this document, for planning purposes, the annual update will need to address decisions on integration of NNSA and EM scope, annual funding targets, and constraints on program completion.

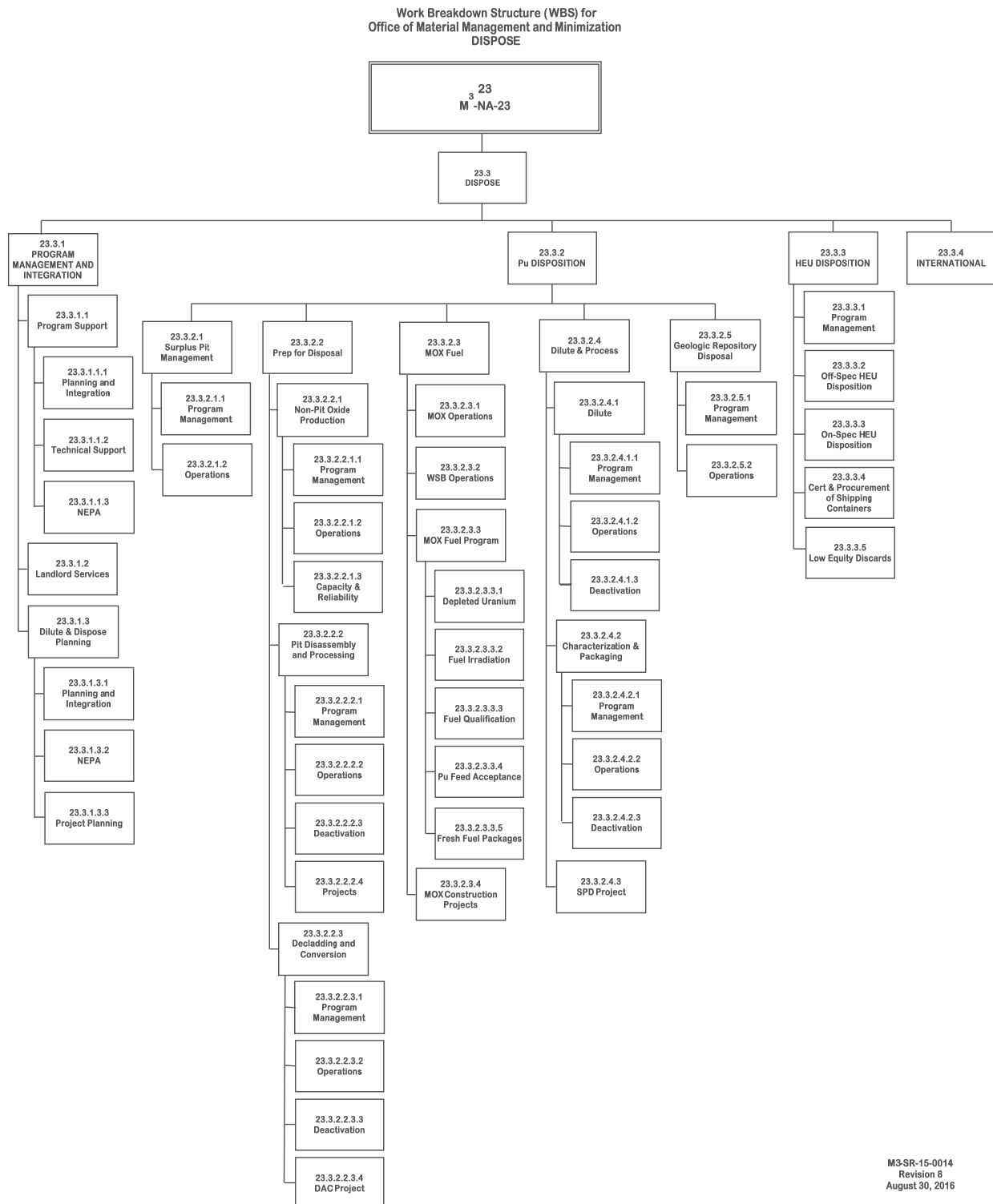
8.0 REFERENCES

The following documents provide context for implementation of the program requirements. Not all references are used in this PRD. The latest revision of the following references shall be used in planning program implementation, unless a specific version is contractually required.

1. PMDA, Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation, signed at Moscow and Washington on August 29 and September 1, 2000, as amended by the Protocols of September 15, 2006 and April 13, 2010, all three of which entered into force together on July 13, 2011.
2. NNSA Memorandum, Kilmartin to Distribution, *Planning Assumptions for the Development of the Dilute and Dispose Lifecycle Baseline*, with Attachment, *Dilute and Dispose Lifecycle Baseline Preliminary Proposed Inputs, Assumptions and Constraints*, April 2016.
3. DOE, *Report of the Plutonium Disposition Working Group: Analysis of Surplus Weapon-Grade Plutonium Disposition Options*, April 2014.
4. NNSA Business Operating Procedure, BOP-06.02, *Program Requirements Document for Construction Projects*.
5. NNSA Business Operating Procedure, BOP-03.07, *Analysis of Alternatives*.
6. Office of Material Management and Minimization Interface Control Procedure, OFMD-PGM-1.6, Revision 3, September 2014.
7. G-ESR-H-00189, *MFFF-H-Area/K-Area Plutonium Oxide Powder Interface Control Document*, (ICD-11-032-01), Rev. 2, October 2015.
8. G-ESR-K-00039, *Los Alamos National Laboratory – Savannah River Site Plutonium Dioxide Powder Interface Control Document*, (ICD-08-025-02), Rev. 3, January 2013.
9. M3-SR-16-0009-Addendum, *Classified Dilute and Dispose Feed Table*, August 2016.
10. DOE/EIS-0283, Office of Fissile Materials Disposition, *Surplus Plutonium Disposition Final Environmental Impact Statement*, November 1999.

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11. DOE/EIS-0283-S2, Office of Materials Management and Minimization and Office of Environmental Management, *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement*, April 2015.
 12. DOE Record of Decision for Surplus Plutonium Disposition, April 2016.
 13. DOE/EIS-0229, *Final Programmatic Environmental Impact Statement Storage and Disposition of Surplus Weapons-Usable Fissile Materials*, December 1996.
 14. DOE Record of Decision for the Storage and Disposition of Surplus Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement, January 1997.
 15. DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.
 16. DOE-STD-1189-2008, *Integration of Safety into the Design Process*.
 17. DOE Order 414.1D, *Quality Assurance*.
 18. DOE Order 470.3B, *Graded Security Policy*.
 19. DOE Order 470.4A, *Safeguards and Security Program*.
 20. ASME NQA-1A-2009, Addendum to ASME NQA-1-2008, *Quality Assurance Requirements for Nuclear Facilities Application*.
 21. ASME NQA-1-2008, *Quality Assurance Requirements for Nuclear Facilities Application*.
 22. EIA-748-B, *Earned Value Management Systems*.

ATTACHMENT I – MATERIAL DISPOSITION PROGRAM WBS



APPENDIX I – RESIDUAL TECHNICAL REQUIREMENTS

Residual Requirements	Program Requirements	Descriptions
TBD-1	P23	Feed specifications for Dilute and Dispose operations and packaging limits have not been defined.
TBD-2	P39	Requirements for third party independent monitoring and inspection required, to support PMDA implementation.

APPENDIX II – MISSION NEED CORRELATION MATRIX

Mission Requirements	Need Statements	PRD Sections	Program Requirements
M1	Dispose 34 MT	6.2.2 6.2.3 6.2.5 6.2.6	P15, P16 P21, P22, P23, P24, P25, P26, P27, P28 P34, P36, P38, P39, P40, P42, P44, P45, P46 P48, P49, P50
M2	Dispose 1.3 MT per Year	6.2.2 6.2.3 6.2.5 6.2.6	P15, P16 P21, P22, P23, P24, P25, P26, P27, P28 P34, P36, P38, P39, P40, P42, P44, P45, P46 P48, P49, P50
M2	Limit Pu-240/Pu-239 ratio to no greater than 0.10	6.2.3	P24
	Limit Pu-238 to 7 kg, and Pu-240 to 2210 kg, in total	6.2.5	P42
M2	Provide Independent Verification	6.2.5 6.2.6	P39, P42 P51