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Supplement Analysis for Disposition of Additional Non-Pit Surplus Plutonium



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1.0 INTRODUCTION

On April 19, 2002, the Department of Energy's National Nuclear Security Administration (DOE/NNSA) issued a federal register notice (FRN) that announced an amended Record of Decision (AROD) (67 Federal Register [FR] 19432) for the *Surplus Plutonium Disposition Environmental Impact Statement* (SPD EIS, DOE/EIS-0283, November 1999). DOE/NNSA decided, among other things, to cancel the immobilization portion of the plutonium disposition strategy. This amended decision, in combination with a subsequent AROD (68 FR 20134), reaffirmed DOE/NNSA's previous decision to dispose of 34 MT using the Mixed Oxide (MOX) Fuel Alternative, but left approximately 5.1 MT of non-pit surplus plutonium, originally planned for immobilization, without a disposition strategy.

In April 2015, DOE/NNSA issued the *Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (SPD SEIS, DOE/EIS-0283-S2) (DOE 2015). The SPD SEIS evaluated the environmental impacts of alternatives to disposition 13.1 MT of surplus plutonium with no assigned disposition path (refer to the *SPD SEIS*, Figure S-7 "Disposition Path for Surplus Plutonium"). The 13.1 MT of surplus plutonium was comprised of 6 MT of non-pit plutonium (5.1 MT of non-pit plutonium originally planned for immobilization and 0.9 MT of additional non-pit plutonium from foreign sources or future quantities of plutonium declared excess) and 7.1 MT of additional pit plutonium declared excess in 2007. The SPD SEIS also evaluated the impacts of various options for providing the capability to disassemble surplus pits and convert the plutonium from pits into a form suitable for disposition. All of the disposition alternatives DOE/NNSA evaluated in the SPD SEIS required that the plutonium be in oxide form.

On December 24, 2015 (80 FR 80348), DOE/NNSA issued a FRN that announced its preferred alternative for disposition of the 6 MT of surplus non-pit plutonium was preparation at the Savannah River Site (SRS) near Aiken, South Carolina, for disposal as contact handled transuranic (CH-TRU) waste at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico using the WIPP Disposal Alternative, also known as dilute and dispose or plutonium downblending. DOE/NNSA uses the terms "dilute and dispose," or "plutonium downblending," to refer to the process of diluting plutonium oxide with a dry mix adulterant blend. The technique involves using the adulterant to prevent or inhibit future recoverability of plutonium. DOE/NNSA did not state a preferred alternative for dispositioning the 7.1 MT of pit plutonium or for pit disassembly and conversion.

On April 5, 2016, DOE/NNSA issued a FRN announcing the Record of Decision (ROD) (81 FR 19588) to implement the preferred alternative to use existing SRS facilities to prepare 6 MT of surplus non-pit plutonium for disposal at WIPP. DOE/NNSA also stated in the ROD that it would install and operate new gloveboxes in K-Area or HB-Line to prepare the surplus plutonium for disposition. DOE/NNSA resumed processing operations on September 30, 2016, to downblend 6 MT of plutonium oxide for disposition as CH-TRU waste in K-area.

DOE/NNSA now proposes to prepare additional non-pit plutonium for disposition at WIPP as CH-TRU waste using the WIPP Disposal Alternative. This non-pit plutonium,¹ up to 7.1 MT, is included in the 34 MT of surplus plutonium DOE/NNSA previously decided to fabricate into MOX fuel (68 FR 20134). DOE/NNSA would process this non-pit plutonium to a suitable oxide form, if necessary, at either Los Alamos National Laboratory (LANL) or SRS, then downblend it with an adulterant material at SRS in preparation for transport and disposal as CH-TRU waste at WIPP. Because this material was previously intended for fabrication into MOX fuel, it was not specifically included in the SPD SEIS analysis. However, as discussed in greater detail under *3.0 Proposed Action*, the potential environmental impacts of downblending this 7.1 MT of non-pit plutonium are addressed and bounded by that analysis.

DOE/NNSA prepared this Supplement Analysis to determine whether implementing this proposed action requires additional NEPA review in accordance with DOE's NEPA Implementing Procedures at Title 10 Code of Federal Regulations Section 1021.314(c). Additional NEPA documentation (i.e., a supplemental or new EIS) would be required if the proposed action analyzed herein involves substantial changes to the proposed action analyzed in the SPD SEIS that are relevant to environmental concerns, or any significant new circumstances or information relevant to environmental concerns and bearing on the proposed action analyzed in the SPD SEIS or its impacts.

2.0 PURPOSE AND NEED

DOE/NNSA's purpose and need for action is to reduce the threat of nuclear weapons proliferation worldwide by dispositioning surplus plutonium in an environmentally safe and timely manner, ensuring that it can never again be readily used in nuclear weapons. DOE/NNSA must move forward with the Surplus Plutonium Disposition Program to comply with legislation regarding removal of the quantity of defense plutonium brought into the state of South Carolina since April 2002. Taking this action would allow DOE/NNSA to use existing facilities, as described in the April 2016 ROD (81 FR 19588, April 5, 2016). Implementing this proposal would allow DOE/NNSA to prepare surplus plutonium, in addition to the 6 MT (covered by the 2016 ROD), to be processed through SRS.

The *Bob Stump National Defense Authorization Act* (NDAA) for Fiscal Year 2003 (Public Law 107-304, enacted December 2, 2002) imposes requirements for the disposition of weapons-usable plutonium at SRS, including schedules for MOX fuel production and removal of plutonium from the state of South Carolina. Congress amended this Act in the NDAA for Fiscal Year 2013 (Public Law 112-239, enacted January 2, 2013), which changed the date for achieving MOX fuel production and plutonium removal to January 16, 2016. These Congressional actions reinforce the urgency and need to process, remove, and disposition surplus plutonium.

¹ The 7.1 MT of non-pit surplus plutonium that is the subject of this SA is currently in non-pit form and does not require pit disassembly. However, some of this material may have been in the form of pits prior to this SA being developed.

3.0 PROPOSED ACTION

DOE/NNSA proposes to prepare up to 7.1 MT of non-pit plutonium for disposal as CH-TRU waste at WIPP, in addition to the 6 MT that DOE/NNSA previously decided to disposition using the WIPP Disposal Alternative. This would increase the amount of plutonium proposed for disposal as CH-TRU waste at WIPP to up to 13.1 MT, the amount previously analyzed in the SPD SEIS. However, this proposed action involves only non-pit plutonium, instead of a combination of pit and non-pit plutonium as analyzed in the SPD SEIS. The additional 7.1 MT of non-pit material comprises a portion of the 34 MT of surplus plutonium DOE/NNSA previously decided to disposition by fabricating into MOX fuel. While the proposed action does not involve disassembly and conversion of any pit plutonium, it does involve some non-pit plutonium metal that requires conversion to oxide prior to preparing the plutonium for disposal as CH-TRU waste at WIPP. This conversion to oxide may be performed at either LANL or SRS, and is included in the proposed action.

DOE/NNSA would use dilute and dispose processes in K-Area at SRS to prepare up to an additional 7.1 MT of non-pit plutonium, totaling up to 13.1 MT of non-pit plutonium, for disposal as CH-TRU waste at WIPP. DOE/NNSA would rely on the existing single glovebox and installation and operation of additional future gloveboxes to increase capacity and throughput of operations. DOE/NNSA analyzed these actions to support processing of 13.1 MT in the SPD SEIS and referenced the analyses and capability in the subsequent 2016 ROD to disposition 6 MT of surplus plutonium.

For the 7.1 MT of non-pit plutonium, containers of plutonium oxide would be opened in K-Area gloveboxes. Plutonium oxide would be repackaged into suitable containers, mixed/blended with a dry adulterant to inhibit plutonium recovery, and loaded into criticality control overpacks (CCOs).² Loaded CCOs would be characterized for WIPP disposal in E-Area or K-Area at SRS using non-destructive assay, digital radiography, and headspace gas sampling. CH-TRU waste packages that have been successfully characterized and meet the WIPP Waste Acceptance Criteria would be placed in the queue of waste to be shipped to WIPP. The packages would be shipped to WIPP in certified and approved shipping containers, likely TRUPACT-II or HalfPACT containers.

4.0 IMPACT ANALYSIS

In the SPD SEIS, DOE/NNSA evaluated the impacts of preparing 13.1 MT of surplus plutonium for disposition using the WIPP Disposal Alternative. Included in the SPD SEIS analysis was 6 MT of non-pit metal and oxide, and 7.1 MT of pits. In the case of the pit material, pit disassembly must take place first. The remainder of the process steps are the same as those for non-pit metal and oxide. For both sets of material, disposition requires the plutonium to be in an oxide form suitable for disposition. Where conversion to oxide is needed, the metal may be

² Similar to the disposition of 6 MT of non-pit surplus plutonium, DOE/NNSA plans to use CCO containers in lieu of pipe overpack containers (POC) to maximize the amount of plutonium that can be packaged in each container in compliance with WIPP Waste Acceptance Criteria and transportation shipping limits, thereby reducing the number of shipments and the number of disposal containers emplaced at WIPP.

converted to oxide at SRS or LANL, transported to SRS to be blended with an adulterant and stored pending transport to WIPP, then disposed of as CH-TRU waste in the WIPP underground.

In the SPD SEIS, DOE/NNSA also evaluated the impacts of disassembling pits, converting 7.1 MT of plutonium metal from disassembled pits to oxide, mixing it with an adulterant, storing it at SRS, transporting it to WIPP, and disposing it as CH-TRU waste in the WIPP underground. To implement the proposed action described in this SA, DOE/NNSA would not have to perform the pit disassembly step; the remaining steps are the same to disposition either pit plutonium (as analyzed in the SPD SEIS) or non-pit plutonium in metal and oxide forms, which is the subject of this SA. Because the processes and the materials are substantially the same (or fewer), the impacts of processing 7.1 MT of non-pit surplus plutonium are bounded by the impacts of processing 7.1 MT of metal from surplus pit plutonium. The following sections will describe the analysis DOE/NNSA performed and presented in the SPD SEIS. In this SA, DOE/NNSA refers to the relevant sections of the SPD SEIS for a full description of the impacts.

4.1 SPD Supplemental EIS Analysis: Description of Process Steps

In the SPD SEIS, DOE/NNSA evaluated *alternatives* for disposition of surplus plutonium, and *options* for pit disassembly and conversion to oxide suitable for disposition. DOE/NNSA uses this terminology in this SA. DOE/NNSA evaluated options to use facilities at SRS and LANL for converting plutonium metal to oxide. Each disposition alternative included one or more options for pit disassembly and conversion. The proposed action described in this SA does not require pit disassembly but does require conversion of non-pit plutonium in a metal form to an oxide form suitable for disposition. In this regard the process steps are the same as those for the 7.1 MT of pit plutonium DOE/NNSA evaluated in the 2015 SPD SEIS for disposition using the WIPP Disposal Alternative, but without pit disassembly. DOE/NNSA decided in April 2016 to use these process steps to disposition 6 MT of surplus non-pit plutonium using the WIPP Disposal Alternative. DOE/NNSA presented the impacts of the WIPP Disposal Alternative in the Summary (Table S-3) and Chapter 4 of the SPD SEIS.

4.1.1 Conversion to Oxide and Mixing with Adulterant Material

DOE/NNSA evaluated the impacts of Pit Disassembly and Conversion (PDC) Options in Appendix F of the SPD SEIS. DOE/NNSA evaluated³ the impacts of disassembly and conversion at a rate of 3.5 MT annually for a total of 35 MT in PDC in K-Area at SRS⁴ and also evaluated the impacts of disassembly and conversion at a maximum rate of 2.5 MT annually for a total of 35 MT at LANL. Conversion to oxide is required for all metals prior to mixing the plutonium with the adulterant material using the WIPP Disposal Alternative.

³ Table B-3 of the SPD SEIS (Appendix B describes the facilities involved in the options and alternatives).

⁴ In the SPD SEIS, DOE/NNSA states that the impacts of preparing surplus plutonium for disposition using the WIPP Disposal Alternative are bounded by the impacts of the Pit Disassembly and Conversion Option. DOE/NNSA described the impacts in detail in Appendix F. The WIPP Disposal Alternative as described in the SPD SEIS would involve conversion of 7.1 MT of metal and oxide and preparing 13.1 MT of surplus plutonium in K-Area for disposition. The PDC option in K-Area and in PF-4 at LANL would involve preparing up to 35 MT of surplus plutonium for disposition, including the 7.1 MT of metal and oxide that are the subject of this SA.

DOE/NNSA also evaluated⁵ the impacts of using H-Canyon/HB-Line⁶ at SRS to disposition 0.6 MT annually and a total of 13.1 MT (6 MT of non-pit plutonium and 7.1 MT of plutonium oxide converted from pits) for the WIPP Disposal Alternative. The resultant plutonium oxide would be mixed with an adulterant and packaged in CCOs. The adulterant would be added to reduce the plutonium content to less than 10 percent by weight, to meet the WIPP waste acceptance criteria, and to inhibit plutonium recovery and could include dry mixtures of commercially available materials. The throughput rate of 0.6 MT per year, and the associated impact analysis, is based on using additional glovebox lines on a single shift operation for preparing plutonium for disposal at WIPP. DOE/NNSA estimated that preparing 6 MT of surplus plutonium for disposition as CH-TRU waste disposed at WIPP, at a rate of 0.6 MT per year, would require about 13 years.

In this SA, DOE/NNSA considers downblending up to an additional 7.1 MT of plutonium oxide, using the additional gloveboxes. With additional future gloveboxes, DOE/NNSA estimates that the processing rate could increase from approximately 1 MT per year to 1.5 MT per year and would require about 11 - 16 years. In the SPD SEIS, DOE/NNSA evaluated the impacts of processing a total of 13.1 MT of plutonium oxide. If DOE/NNSA chooses to downblend the 7.1 MT of non-pit plutonium that are the subject of this SA, the impacts would be no greater than those DOE/NNSA described in the SPD SEIS.

4.1.2 Storing and Characterizing at SRS

DOE/NNSA describes the impacts of using E-Area facilities for storage and characterization of packages for shipment to WIPP in Appendix B.1.5 of the SPD SEIS. DOE may perform the storage and characterization of packages for shipment to WIPP in K-Area in lieu of E-Area. Characterization and storage would require the same processes, capabilities, and staffing in K-Area or E-Area and the impacts would be equivalent. In the SPD SEIS, DOE/NNSA evaluated characterization and storage, pending shipment to WIPP, of 13.1 MT of surplus plutonium downblended to CH-TRU waste.

4.1.3 Transportation

The SPD SEIS also presents the impacts of the transportation aspect of the WIPP Disposal Alternative.⁷ The table includes the impacts of both the Pit Disassembly and Conversion (K-Area and LANL options) and the H-Canyon/HB-Line (or K-Area) option for preparing plutonium oxide and blending in with adulterant. The conversion of metal to oxide may be performed at either LANL or at SRS. Shipments of plutonium materials would be made from SRS to LANL and from LANL to SRS, depending on the pit disassembly and conversion options.⁸ The SPD SEIS shows per-shipment risk factors (incident-free and accident) for “pieces- parts” from SRS to LANL and plutonium oxide powder from LANL to SRS, both in

⁵ Table B-3 of the SPD SEIS.

⁶ The SPD SEIS analysis for the PDC in K-Area option includes the impacts from possible operations where surplus plutonium would be prepared for disposal as CH-TRU waste at WIPP, using the same processes as those described for H-Canyon/HB-Line. See section B.1.2.2.2 of the SPD SEIS.

⁷ In Table E-10, SPD SEIS.

⁸ As noted in Table E-1, footnote (c) of the SPD SEIS.

Secure Transport Assets.⁹ The transportation analysis DOE/NNSA presented in the SPD SEIS evaluated all the transportation required to prepare 13.1 MT of plutonium as CH-TRU waste and dispose of it at WIPP. It also presents the impacts of shipping up to 13.1 MT using both the POC and CCO packages under the WIPP Disposal Alternative.¹⁰

4.1.4 Emplacement in the WIPP Underground

In Appendix B.3 of the SPD SEIS, DOE/NNSA shows that the impacts of CH-TRU waste disposal at WIPP are described in the *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement (DOE/EIS-0026-02)(DOE 1997)*, and subsequent supplement analyses. As described in the SPD SEIS, disposal of 13.1 MT of plutonium at WIPP using the WIPP Disposal Alternative would not exceed the WIPP unsubscribed capacity.

5.0 CONCLUSION

DOE/NNSA proposes to prepare additional non-pit plutonium, up to 7.1 MT, for disposal as CH-TRU waste at WIPP. DOE/NNSA prepared the SPD SEIS, and among other alternatives evaluated the impacts of disposing of downblended plutonium oxide from 13.1 MT of surplus pit (7.1 MT) and non-pit (6 MT) at WIPP (the WIPP Disposal Alternative). DOE/NNSA subsequently decided to dispose of the 6 MT of non-pit plutonium as CH-TRU waste at WIPP. The WIPP alternative required pit disassembly and conversion of the pit and non-pit plutonium to oxide suitable for blending with adulterant and disposal at WIPP. DOE/NNSA described the impacts of each step in this process in the SPD SEIS.

Implementing the WIPP Disposal Alternative to dispose of 7.1 MT of non-pit plutonium (rather than the 7.1 MT of pit plutonium that was evaluated in 2015) would involve the same process steps and impacts, but removes the pit disassembly step described in the SPD SEIS, given that the 7.1 MT is in non-pit form.

Some non-pit plutonium metal requires conversion to oxide, as described in the SPD SEIS, prior to preparing the plutonium as CH-TRU waste for disposal. This conversion to oxide may be performed at either LANL or at SRS.

DOE/NNSA must move forward with the Surplus Plutonium Disposition Program to comply with legislation regarding removal of defense plutonium from South Carolina. Taking this action would allow DOE/NNSA to use existing facilities, as described in the April 2016 ROD (81 FR 19588). In addition, implementing this proposal would allow DOE/NNSA to prepare additional surplus plutonium for disposition using a safe and demonstrated method, and accelerate removal from South Carolina.

In accordance with the NEPA, and CEQ's and DOE's implementing NEPA regulations, DOE/NNSA prepared this SA to evaluate whether the proposed action analyzed herein requires DOE/NNSA to supplement the existing EIS, prepare a new EIS, or prepare no further NEPA documentation. DOE/NNSA concludes that the proposed action is not a substantial change

⁹ Table E-5, SPD SEIS.

¹⁰Table E-10, SPD SEIS

relative to the proposed action analyzed in the SPD SEIS, and there are no significant new circumstances or information relevant to environmental concerns and bearing on the proposed action and its impacts analyzed in the SPD SEIS. Therefore, no further NEPA review is required.

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