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DEPARTMENT OF ENERGY

National Nuclear Security Administration

Disposition of Fast Critical Assembly Plutonium

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Amended record of decision.

SUMMARY: The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the Department of Energy (DOE), is amending its prior decision to disposition up to 350 kilograms (kg) of foreign Gap Material Plutonium from preparation for emplacement in the Waste Isolation Pilot Plant (WIPP) to disposition using an electrolytic dissolver in H-Canyon, vitrification with high level radioactive waste (HLW) at the Defense Waste Processing Facility (DWPF), and storage at Savannah River Site (SRS) until a geologic repository is available. NNSA has determined through feasibility and process technology studies that this disposition path could be performed at a substantially lower cost than preparation for disposal at WIPP. NNSA has prepared a Supplement Analysis (SA) to inform this amended decision and has determined that no additional National Environmental Policy Act (NEPA) review is necessary.

FOR FURTHER INFORMATION CONTACT: For further information on this Amended Record of Decision (ROD) or the Fast Critical Assembly (FCA) SA, or to receive related NEPA documents, please contact: Ms. Amy Miller, NEPA Compliance Officer, National Nuclear Security Administration, Office of General Counsel, (505) 845-5090; or by email to *amy.miller@nnsa.doe.gov*. This Amended ROD and the FCA SA (DOE/EIS-0283-S2-SA-02, Supplement Analysis for the Disposition of Fast Critical Assembly Plutonium, January 2021) will be available on the internet at *http://energy.gov/nepa*. For further information on FCA disposition, contact Ms. Lisa McGuire, Office of Material Management and Minimization, National Nuclear Security Administration, (803) 952-6921 or email at *lisa.mcguire@nnsa.srs.gov*.

SUPPLEMENTARY INFORMATION:

Background

In the Surplus Plutonium Disposition Supplemental Environmental Impact Statement (SPD Supplemental EIS) (DOE/EIS-0283-S2, April 2015), NNSA evaluated disposition options for 13.1 metric tons (MT) of surplus plutonium consisting of 6 MT of non-pit material and 7.1 MT of pit material. The 6 MT of surplus non-pit plutonium included 0.9 MT (900 kg) of excess capacity to allow for the possibility that the NNSA might identify additional quantities of surplus plutonium that could be processed for disposition using the facilities and capabilities analyzed in the SPD Supplemental EIS.

NNSA assessed the impacts of shipment, receipt, treatment, storage, and disposition of up to 900 kilograms (kg) of foreign Gap Material Plutonium, of which the FCA fuel is a subset, in an Environmental Assessment (EA) for Gap Material Plutonium – Transport, Receipt, and Processing (DOE/EA-2024, December 2015), with a subsequent Finding of No Significant Impact (FONSI). In the 2015 EA, NNSA noted that up to 375 kg of the Gap Material Plutonium may require stabilization prior to disposition. NNSA further stated that interim storage and disposition of the Gap Material Plutonium would be in accordance with decisions made for disposition of U.S. surplus plutonium in the SPD Supplemental EIS.

In a 2016 ROD (81 FR 19588, April 5, 2016), NNSA announced its decision to implement the preferred alternative, the Waste Isolation Pilot Plant (WIPP) (Dilute and Dispose) Alternative, for disposition of 6 MT of surplus, weapons-usable, non-pit plutonium. In the 2016 ROD, NNSA refers specifically to the 2015 Gap Material Plutonium EA. In the SPD Supplemental EIS, NNSA evaluated five alternatives for disposition of 6 MT of plutonium, which includes the 900 kg of Gap Material Plutonium, including the H-Canyon/HB-Line to DWPF Alternative and WIPP (Dilute and Dispose) Alternative.

Based on an international agreement, the Japan Atomic Energy Agency (JAEA) is providing funding to NNSA to disposition the FCA plutonium (FCA fuel), a subset of the Gap Material

Plutonium. The United States received the FCA fuel from Japan for nonproliferation purposes to disposition it safely and securely, and it is currently stored at SRS awaiting further processing for final disposition.

The FCA fuel is different from the rest of the 6 MT because it is clad in stainless steel, whereas the majority of the 6 MT is not clad in stainless steel. The stainless-steel cladding must be removed prior to processing the plutonium. As described in the 2015 Gap Material Plutonium EA, NNSA intended to separate the FCA fuel from its stainless-steel cladding and convert it to an oxide form[1] for dilution at SRS to meet the waste acceptance criteria for disposal at WIPP near Carlsbad, New Mexico. Because of the high cost to install and operate a decladding and oxide conversion process, NNSA initiated an evaluation of alternative processing technologies. Based on these feasibility and process technology studies, NNSA determined that electrolytic dissolution could be performed at SRS at a substantially lower cost than the mechanical decladding and oxidation process.

Based on results of studies and experiments conducted by Savannah River Nuclear Solutions in 2017 and 2018, NNSA is changing the disposition path for up to 350 kg of FCA fuel. Instead of using the WIPP Alternative, NNSA will employ the H-Canyon/HB-Line Alternative, using a dissolver in H-Canyon, vitrification with HLW at the Defense Waste Processing Facility (DWPF), and storage at SRS until a geologic repository is available, as described in the SPD Supplemental EIS. However, NNSA will use an electrolytic dissolver rather than a chemical dissolver in H-Canyon to dissolve the FCA fuel to prepare it for transfer to DWPF.

Disposition Process

The material will be dissolved using an electrolytic dissolver in H-Canyon. The DOE Office of Environmental Management (DOE/EM) categorically excluded replacement of a failed electrolytic dissolution unit in H-Canyon with a spare electrolytic dissolution unit. (OBU-H-2019-

[1] The majority of FCA fuel is stainless-steel clad alloy and requires conversion to an oxide prior to dilution. A small portion of the FCA fuel is stainless-steel clad oxide and, therefore, would not require conversion prior to dilution. This AROD applies to both the stainless-steel clad alloy and the stainless-steel clad oxide.

0006, January 14, 2019, available at *https://www.energy.gov/nepa/downloads/cx-019585-electrolytic-dissolution-fast-critical-assembly-material*).

The FCA fuel will be transported to H-Canyon where containers of the FCA fuel will be removed from the shipping packages and placed in or attached to a charging device for transport to the dissolver. After preparing the electrolytic dissolver with a cold chemical solution of nitric acid, the cans will be charged to (placed in) the dissolver. Electrical power will be applied to the dissolver resulting in the dissolution of the FCA cladding and fuel. The only difference between the H-Canyon process used to dissolve the FCA fuel with an electrolytic dissolver rather than a chemical dissolver is the application of the electrical current. NNSA estimates that dissolution will be complete in less than 24 hours per charge. After each dissolution cycle is complete, solution samples will be obtained to ensure complete dissolution of the FCA fuel. If necessary, a subsequent heating step will be performed to complete the dissolution process. NNSA estimates that 18 batches would be required to complete processing of the FCA fuel. After completion of each batch, the material will be transferred to an accountability tank in H-Canyon and then to a canyon vessel for storage and eventual transfer to the H-Tank Farm. Immobilization and storage of the material will occur at DWPF pending disposal in a geologic repository. NNSA estimates that vitrification of the FCA fuel along with HLW at DWPF will result in three waste canisters.

The electrolytic dissolution process is very similar to the chemical dissolution process as described in Appendix B, section B.1.3, of the SPD Supplemental EIS. Dissolved FCA fuel solutions will be very similar to those resulting from chemical dissolution, and compatible with transfer to the H-Area Tank Farm pending immobilization in DWPF. FCA dissolution operations would be scheduled in conjunction with other H-Canyon operations and coordinated with tank farm and DWPF operations.

In the SPD Supplemental EIS, NNSA evaluated disposition of 6 MT of plutonium using both the H-Canyon/HB-Line to DWPF Alternative and the WIPP Alternative. The impact assessment of

both alternatives includes up to 350 kg of FCA fuel. In the Supplement Analysis for Disposition of FCA Plutonium, NNSA compared the impacts of processing 350 kg of FCA fuel using both alternatives.

Differences in doses and potential latent cancer fatalities to workers and the public between the WIPP Alternative and the H-Canyon/HB-Line Alternative are minor. In the case of electrolytic dissolution, worker dose would be lower than the H-Canyon/HB-Line chemical dissolution and WIPP alternatives. Both would require handling and de-cladding of the fuel prior to processing. In the SPD Supplemental EIS (Tables 4-3 and 4-4), NNSA estimated radiation doses and impacts, in terms of latent cancer fatalities (LCFs), from operations for the H-Canyon/HB-Line Alternative (including the material evaluated in the SA) to workers and the public. Worker doses were estimated to be less than the SRS administrative limit of 500 millirem (mrem) per year, resulting in no LCFs on an annual basis. Over the life of the H-Canyon/HB-Line to DWPF Alternative (13 years), NNSA estimated that operations could result in an estimated 2 LCFs to involved workers and none to members of the public or the maximally exposed individual. The proposed action was included in the estimates for the H-Canyon/HB-Line Alternative. No LCFs in addition to those NNSA previously estimated would result from implementation of the proposed action.

Vitrification of the FCA fuel in DWPF would result in an estimated three HLW glass canisters. Less CH-TRU waste would be generated using the H-Canyon/HB-Line Alternative because WIPP alternative processing results in TRU waste for disposal at WIPP. Other differences in waste generation are minor.

To ensure safe and secure operations, NNSA, in conjunction with DOE/EM, which owns the facilities, would review and revise, as needed, safety basis documents for all involved facilities at SRS.

Basis for Decision

To disposition the FCA fuel the H-Canyon/HB-Line Alternative can be implemented at a substantially lower cost than the WIPP Alternative. The SRS H-Canyon has used electrolytic dissolution in the past. The process is well known and can be implemented with little technology maturation. The impacts from activities related to the disposition of FCA fuel have been evaluated in the SPD Supplemental EIS. There are no substantial differences in environmental impacts between using the electrolytic dissolver and the standard H-Canyon dissolver for this amount of material (up to 350 kg). All processes downstream of the dissolver are the same as those analyzed in the H-Canyon/HB-Line to DWPF Alternative. The FCA fuel would be prepared for disposition and safely stored at SRS in existing facilities pending the availability of a geologic repository.

Amended Decision

NNSA has decided to change the disposition pathway for up to 350 kg FCA fuel from the WIPP Disposal Alternative to the H-Canyon/HB-Line to DWPF Alternative, as described and evaluated in the SPD Supplemental EIS. NNSA will use electrolytic dissolution instead of chemical dissolution because the FCA fuel is clad in stainless steel.

FCA fuel comprises less than half of the 0.9 MT of gap material plutonium evaluated in DOE/EA-2024, and less than 6 percent of the 6 MT NNSA decided to disposition using the WIPP Disposal Alternative. NNSA remains committed to dispositioning 6 MT of surplus plutonium using the WIPP Disposal Alternative, as NNSA previously decided (81 FR 19588, April 5, 2016).

Signing Authority

This document of the Department of Energy was signed on March 1, 2021, by Charles P. Verdon, Acting Under Secretary for Nuclear Security and Administrator, NNSA, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for

publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on March 3, 2021.

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Treena V. Garrett,
Federal Register Liaison Officer,
U.S. Department of Energy.

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