



March 10, 2017
ACO 17-0018

ATTN: Document Control Desk
Mr. Marc L. Dapas, Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

American Centrifuge Lead Cascade Facility
Docket Number 70-7003; License Number SNM-7003

**Supplemental Information for Shipment of American Centrifuge Lead Cascade Facility
Classified Matter and/or Contaminated Waste for Disposal**

Dear Mr. Dapas:

Purpose

The purpose of this letter is to provide supplemental information to a letter submitted to the U.S. Nuclear Regulatory Commission (NRC) on February 24, 2017 (Reference 1) regarding the shipment of American Centrifuge Lead Cascade Facility (Lead Cascade) classified matter and/or contaminated waste.

Background

On February 24, 2017 (Reference 1), American Centrifuge Operating, LLC (ACO) notified the NRC of the intended actions for the shipment of American Centrifuge Lead Cascade Facility (Lead Cascade) classified matter and/or contaminated waste.

On March 9, 2017, NRC Staff requested additional documentation to facilitate their review effort.

Discussion

Enclosure 1 of this letter provides additional environmental documentation related to the transportation of radioactive waste from the Lead Cascade that further supports radioactive shipments pursuant to the NRC materials license and in accordance with the Lead Cascade license application and applicable NRC and DOT regulations.

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Contact

If you have any questions or concerns regarding this matter, please contact me at (740) 897-2887.

Sincerely,



Jonathan K. Corrado
Director, Regulatory Affairs

Enclosure: As stated

cc: R. DeVault, DOE ORO
M. Diaz, NRC HQ
K. Everly, NRC HQ
Y. Faraz, NRC HQ
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O. Siurano-Perez, NRC HQ
T. Smith, NRC HQ
A. Snyder, NRC HQ
M. Sykes, NRC Region II
T. Vukovinsky, NRC Region II

References:

1. Letter ACO 17-0012 from J.K. Corrado to M.L. Dapas (NRC) regarding Shipment of American Centrifuge Lead Cascade Facility Classified Matter and/or Contaminated Waste for Disposal, dated February 24, 2017.

Enclosure 1 of ACO 17-0018

**Environmental Information Related to American Centrifuge Lead Cascade Facility
Classified Matter and/or Contaminated Waste Shipments**

**Information Contained Within
Does Not Contain
Export Controlled Information**

Reviewing

Official: _____ ECI Reviewer #152

Date: _____ 3/9/17

**Environmental Information Related to American Centrifuge Lead Cascade Facility
(Lead Cascade) Classified Matter and/or Contaminated Waste Shipments**

The Licensee (American Centrifuge Operating, LLC [ACO]) is confident that activities related to dismantling, decontamination, packaging, and shipment can be accomplished within the bounds of the License Application. Changes to current activities or procedures are evaluated using 10 *Code of Federal Regulations* (CFR) 70.72 to ascertain if prior U.S. Nuclear Regulatory Commission (NRC) approval is required.

Additionally, a proposed Derived Concentration Guideline Level (DCGL) of 5,000 dpm/100 cm² to be included in the Decommissioning Plan (DP) is consistent with the commitments stated in the currently approved Lead Cascade License Application and Supporting Documents; therefore, remediation work activities will be performed under current Lead Cascade programs. The Licensee acknowledges remediation work or validation surveys done before NRC approval of the DP are done "at risk" and may have to be repeated at the Licensee's expense if the proposed DCGL is not accepted.

I. Worker Radiological Impacts of Waste Packaging During Decommissioning Efforts

Personnel doses at the Lead Cascade have been consistently less than 100 mrem/year total effective dose equivalent (TEDE). The Radiation Protection (RP) program outlined in Chapter 4.0 of the Lead Cascade License Application was constructed to protect personnel entering the Lead Cascade buildings/facilities from unnecessary exposure to ionizing radiation and radioactive materials. This program is based upon the following principles and is implemented through currently approved operating procedures.

- Personnel radiation exposures and the release of radioactive effluents shall be maintained in accordance with the ALARA principle.
- No individual shall receive a radiation dose in excess of any regulatory limit.
- The established personnel monitoring program objectives are:
 - < 500 mrem per year TEDE per person
 - < 10 milligram (mg) per week soluble uranium

Specifically, a review of Fixed Nuclear Accident Dosimeters (FNAD) and area monitoring Thermo-luminescence Dosimeters (TLD) data indicates radiation levels at the Feed Cart have been 0.012 mrem/hour; with all other FNADs and area monitoring indicating <0.001 mrem/hour. Recent surveys indicate background at the Lead Cascade is approximately 0.006 mR/hour; prior to cylinder removal at the Feed Cart, levels were 0.04 mR/hour. Elsewhere in the X-3001 Process Building Train 3 area, average levels were in the 0.008 to 0.010 mR/hour range. Levels in the X-7726 Centrifuge Training and Test Facility (CTTF) are typically < 0.01 mR/hour. The estimated dose rate from 1 kg of natural uranium is 4E-5 rem/hour (0.04 mrem/hour) at 30 cm. Since Lead Cascade items are relatively large compared to a point source and there are no individual components or pieces expected to contain or exceed 1 kg of material, special dose monitoring is not required.

Chapter 4.0 of the Lead Cascade License Application defines restricted areas as areas to which access is limited by ACO to protect individuals against undue risk from exposure to radiation and radioactive materials. Personnel working in restricted areas (Radioactive Material Area (RMA) or higher level of posting) are required to be monitored with a National Voluntary Laboratory Accreditation Program (NVLAP) accredited TLD. This is consistent with the requirements of the Dosimetry Program procedures. Since decommissioning activities will be performed in areas currently posted as an RMA, no changes to current practices are warranted.

Due to the small amount of material within the Lead Cascade equipment, personnel external doses are expected to remain less than 100 mrem/year. The RP requirements that will be used during decommissioning are the same requirements currently implemented at the Lead Cascade. The program elements were developed to ensure worker radiological safety with the risks associated with the hazards at the Lead Cascade. These requirements are implemented by currently approved operating procedures developed in accordance with the requirements of Section 11.4 of the Lead Cascade License Application.

II. Public Radiological Impacts of Waste Shipments During Decommissioning

In accordance with currently approved operating procedures, the exterior of each waste shipping container will be surveyed prior to loading on the conveyance. Each shipping container will contain items that are internally contaminated with uranium.

Of the total amount of uranium being shipped, most of the activity will be contained in the centrifuge casings. The remainder of the radioactive material (solid radwaste and mixed waste) will be shipped in B-25 containers and Intermodal Freight Transport (IFT) containers.

Uranium daughters ^{231}Th , ^{234}Th , and $^{234\text{m}}\text{Pa}$ are expected to be present in a 1 to 1 ratio to the parent radionuclides.

Based on HP surveys, minimal exposure from shipping containers is anticipated. In the bounding case, recent HP surveys indicated a maximum contact reading of 220 $\mu\text{R}/\text{hour}$. These components will be placed in shipping containers for shipment. The disposal of these components will be limited to one per container. Assuming a distance of 18 inches from the 220 $\mu\text{R}/\text{hour}$ reading, using a line source calculation ($I_1 \times D_1 = I_2 \times D_2$), the expected exposure rate is estimated to be between 3 and 6 $\mu\text{R}/\text{hour}$. A further reduction of the exposure rate is expected due to the wall of the shipping container (12 gauge steel or 7/64 inch). Based on this information, the expected levels would be statistically indistinguishable from background.

It is expected that each container will meet the Radioactive White – I labeling requirements; a maximum radiation level at any point on the external surface of ≤ 0.5 mrem/hour. However, since the shipments will be consigned as Exclusive Use, labeling requirements are outlined in 49 CFR 173.427(a)(6)(vi).

Assuming the maximum container exposure rate (contact reading) is 50 $\mu\text{R}/\text{hour}$ (rather than the current survey data which are much lower); shipment radiation levels will be significantly less than both DOT and NRC limits. The radiation limits for radioactive shipments (found in 49 CFR 173.441 and 10 CFR 71.47) are:

- 200 mrem/hr at any point on the outer surface of the vehicle, including upper and lower surfaces; or, in the case of a flat-bed style vehicle, at any point on the vertical planes projected from the outer edges of the vehicle
- 10 mrem/hr at any point two meters (6.6 ft) from the vertical planes represented by the outer lateral surfaces of the vehicle
- 2 mrem/hr in normally occupied spaces of the vehicle; this provision does not apply to carriers if they operate under the provisions of a State or Federally regulated radiation protection program and if personnel under their control in such an occupied space wear radiation dosimetry devices

Therefore, dose to drivers and the potential exposure to the general public are anticipated to be negligible.

Additionally, unclassified, low-level contaminated liquid waste is anticipated to be handled as an on-site transfer for processing to the U.S. Department of Energy's (DOE's) Prime Contractor for the Decontamination and Decommissioning (D&D) activities at the former Portsmouth Gaseous Diffusion Plant, Fluor-B&W Portsmouth LLC in Piketon, Ohio. Therefore, there will be no dose to drivers and no potential exposure to the general public.

III. Anticipated Waste Types and Volumes

a. Solid Radioactive Waste (Radwaste)

Table 1. Solid Radwaste to be Generated During Decommissioning Activities

Type of Solid Radwaste	Radionuclides Present
Sealed centrifuge casings filled with centrifuge internal components, other contaminated cascade component, and possible dry active waste to fill voids	UF ₆ , UF ₄ , UO ₂ F ₂ , oxides, metals, and other compounds may be present. Each container is expected to contain less than 1,000 g of uranium and less than 15 g of U ²³⁵ .
IFT containers filled with sectioned service modules, other contaminated cascade components, and possible dry active waste to fill voids	
B-25 containers filled with the centrifuge assemblies other than the casing/internals, remaining parts from the cascade, and possible dry active waste	

As depicted in Table 1 above, Class A solid radwaste is estimated to be approximately 180,000 ft³. No Class B, C, or Greater than Class C solid radwaste is anticipated to be generated during the Lead Cascade decommissioning efforts.

Section 9.2.2.3.3 of the Lead Cascade License Application details the current storage capabilities and commitments. These storage requirements are flowed into currently approved operating procedures. Additional classified matter storage requirements are documented within Chapter 2.0 of the Security Program and applicable security plans.

Process equipment will be dismantled and handled as contaminated waste. The waste will be consolidated and containerized to minimize the volume. Containers with access closures installed will be stored in a Security approved interim staging area until ready for shipment. Waste can be shipped from any Lead Cascade facility as necessary. Approved waste handling methods will be utilized to ensure that safety, security, and regulatory requirements are maintained.

The solid radioactive waste removed from the Lead Cascade will be handled and packaged in accordance with Section 9.2.2.3 of the Lead Cascade License Application and activities will be performed in accordance with currently approved operating procedures and/or new procedures developed in accordance with Section 11.4 of the Lead Cascade License Application. Additional handling and packaging requirements may be augmented by the disposal facility selected for final processing.

Additionally, the Lead Cascade does not currently have any volumetrically contaminated solid radwaste and does not expect to generate any during the decommissioning activities.

b. Liquid Radwaste

Table 2. Liquid Radwaste to be Generated During Decommissioning Activities

Type of Liquid Radwaste	Radionuclides Present
Oils generated from process equipment	UF ₄ or UO ₂ F ₂ . Each container is expected to contain less than 1,000 g of uranium and less than 15 g of U ²³⁵ .

No Class B, C, or Greater than Class C liquid radwaste is anticipated to be generated during the Lead Cascade decommissioning efforts.

Section 9.2.2.3.3 of the Lead Cascade License Application details the current storage capabilities and commitments. These storage requirements are flowed into currently approved operating procedures.

The oils removed from the Lead Cascade process equipment will be handled and packaged in accordance with Section 9.2.2.3 of the Lead Cascade License Application and activities will be performed in accordance with currently approved operating procedures and/or new procedures developed in accordance with Section 11.4 of the Lead Cascade License Application. Additional handling and packaging requirements may be augmented by the disposal facility selected for final processing.

Unclassified, low-level contaminated liquid waste from centrifuge and component disassembly is anticipated to be handled as an on-site transfer for processing to the DOE's Prime Contractor for

the D&D activities at the former Portsmouth Gaseous Diffusion Plant, Fluor-B&W Portsmouth LLC in Piketon, Ohio.

c. Mixed Waste

It is anticipated that only solid low level mixed waste (LLMW) will be present during decommissioning of the Lead Cascade. Examples of this solid LLMW include various electronic components from the Lead Cascade such as the Distributed Control System, Digital Acquisition System, mass spectrometer electronic components (e.g., servers, modules, switches, PCs, monitors, etc.), and Machine Cooling Water/Purge Vacuum/Evacuation Vacuum panel views.

It is estimated that Class A solid LLMW will be packaged within B-25 containers for disposal during the Lead Cascade decommissioning efforts. No Class B, C, or greater than Class C mixed waste is anticipated to be generated during the Lead Cascade decommissioning efforts.

It is anticipated that there will be minimal radioactive contamination for the solid LLMW identified above.

Prior to shipment to the disposal site, solid LLMW will be stored onsite in an area approved for radioactive material within the Material Balance Area and also approved/designated as a 90 day storage area for hazardous waste.

The solid LLMW generated during Lead Cascade decommissioning efforts will be shipped off site to a treatment facility that will macro-encapsulate the waste prior to being shipped for final disposal. ACO intends to contract EnergySolutions to perform this treatment at their Bear Creek Facility in Oak Ridge, Tennessee. Once the treatment is completed, the LLMW will be repackaged in accordance with EnergySolutions procedures and then shipped for permanent burial.

No other agencies have jurisdiction over the solid LLMW at the Lead Cascade.

Currently, the Lead Cascade is an Ohio Environmental Protection Agency (EPA) conditionally exempt small quantity generator. Storage of the hazardous waste with respect to the EPA requirements is defined within currently approved procedures and processes. No treatment will be performed at the Lead Cascade; therefore, no permits are needed.