



February 27, 2014
ACO 14-0009

ATTN: Document Control Desk
Ms. Catherine Haney, 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
Change in Commitment Related to Decommissioning of the American Centrifuge Lead
Cascade Facility**

Dear Ms. Haney:

Purpose

The purpose of this letter is to request U.S. Nuclear Regulatory Commission (NRC) approval of changes to Chapter 10.0, Decommissioning and the Decommissioning Funding Plan (DFP) for the American Centrifuge Lead Cascade Facility (Lead Cascade), in accordance with 10 *Code of Federal Regulations* (CFR) 70.25(e) and 40.36(d).

Background

A description of the plans for decommissioning of the Lead Cascade is provided in Chapter 10.0 of the License Application. In addition, a DFP has been prepared and updated in accordance with the guidance contained in NUREG-1757, Volume 3, *Consolidated NMSS Decommissioning Guidance, Financial Assistance, Recordkeeping, and Timeliness*. The DFP provides an estimate to decommission the facility to the criteria specified in the lease with the U.S. Department of Energy (DOE).

In addition, during initial licensing of the Lead Cascade, a commitment in Chapter 10.0 was made to develop a Decommissioning Plan (DP) for the Lead Cascade and submit it to the NRC for review to facilitate termination of the license.

Discussion

At some time in the future, American Centrifuge Operating, LLC (ACO) will shut down the Lead Cascade. Shutdown options include termination of the license or transition of the facility and materials to the license for the American Centrifuge Plant (ACP).

Under either scenario, based on our review of the regulations in 10 CFR 70.38, a DP is not required for the Lead Cascade. Accordingly, ACO is proposing changes to Chapter 10.0 of the License Application and the DFP to delete the specific commitment to a formal DP. The basis for our proposed change and justification is provided in Enclosure 1 of this letter.

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3930 U.S. Route 23 South - P.O. Box 628
Piketon, OH 45661

NM5501

Ms. Catherine Haney
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Enclosure 2 of this letter contains the proposed changes for Chapter 10.0 of the License Application and the DFP for the Lead Cascade. Changes from the previously approved documents are depicted with a revision bar in the right margin.

Action

ACO requests NRC review and approval of the proposed changes at its earliest convenience to support our strategic planning. Timely approval will significantly aid ACO in its future planning efforts.

Contact

If you have any questions regarding this matter, please contact me at (301) 564-3470 or Vernon Shanks at (740) 897-2343.

Sincerely,



Peter J. Mirer
Director, Nuclear Safety and Safeguards

Enclosures: As stated

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Enclosure 1 of ACO 14-0009

Detailed Description, Justification for Change, and Significance Determination

Information contained within
does not contain
Export Controlled Information

Reviewer: Gregg Peed
Date: February 25, 2014

At some time in the future, American Centrifuge Operating, LLC (ACO) will shut down the American Centrifuge Lead Cascade Facility (Lead Cascade). Shut down options include: (1) termination of the license and removal of equipment and materials as described in Chapter 10.0 of the License Application and de-lease to the U.S. Department of Energy (DOE), or (2) relocation of centrifuges and removal of equipment and materials to accommodate construction of the American Centrifuge Plant (ACP) and incorporation of all or a portion of such equipment and materials into the ACP, with transition of the facility to the ACP license.

Chapter 10.0 of the License Application states that centrifuges and other installed equipment would be removed and the Lead Cascade decommissioned in accordance with the lease agreement with DOE. This results in an estimate that is very conservative and bounds either scenario. Specifically, as stated in Chapter 10.0,

... the Lead Cascade would likely be included in the Commercial Plant license and would be decommissioned as part of the Commercial Plant construction efforts. If no Commercial Plant is deployed, then at the end of Lead Cascade operation, the Lead Cascade would be decommissioned prior to being de-leased and returned to DOE. For conservatism, it was assumed that centrifuges and other installed equipment would be removed and the Lead Cascade decommissioned in accordance with the lease agreement with DOE.

Under either scenario, based on a review of the regulations in 10 *Code of Federal Regulations* (CFR) 70.38, ACO does not believe that a Decommissioning Plan (DP) is required. Moreover, a DP is unnecessary for the scope of work that would be undertaken to safely remove equipment and radioactive materials from the Lead Cascade regardless of which option is chosen. In particular, these work activities would be essentially identical to the activities conducted safely during the operational phase of the Lead Cascade, utilizing the Radiation Protection (RP) Program requirements described in Chapter 4.0 of the License Application, which included several construction campaigns to modify the facility to accommodate the various centrifuge cascade configurations that were operated. These work activities included removal of equipment, both process and balance of plant, relocation of centrifuges, packaging of waste, and construction of infrastructure and process gas systems, including service modules. This work was performed by qualified contractors utilizing approved procedures under the oversight of USEC Inc. and/or ACO.

Additionally, due to the nature of operation of gas centrifuges, which operate under vacuum, there is no significant contamination that must be remediated, external to the process systems. Health Physics (HP) routine survey data indicates that contamination levels in the Lead Cascade footprint are less than the Free Release Limits stated in the Lead Cascade License Application (Section 4.8.2.4). ACO has maintained the process area free of contamination and fully accessible by individuals in street clothes. Additionally, radiation protection precautions have been taken for any work activities potentially involving radioactive materials or potentially contaminated equipment. These same radiation protection requirements would be utilized during equipment and materials removal activities. The programmatic elements of the RP

Program were developed to protect personnel entering the Lead Cascade facilities from unnecessary exposure to ionizing radiation and radioactive materials. This program is based upon the following principles and is implemented through written procedures.

- Personnel radiation exposures and the release of radioactive effluents shall be maintained in accordance with the As Low As Reasonably Achievable (ALARA) principle.
- No individual shall receive a radiation dose in excess of any regulatory limit.

The established personnel monitoring program objectives are:

- Limit personnel doses to 500 millirem (mrem) per year Total Effective Dose Equivalent (TEDE) per person, and
- Limit intakes of soluble uranium to less than 10 milligram (mg) per week.

The program elements to ensure worker safety with the risks associated with dismantling activities include the following:

1. The Workplace Air Sampling Program is outlined in Lead Cascade License Application Section 4.7.5 and implemented by approved procedures. During dismantling activities, air sampling performed would consist of a combination of general area, grab, and breathing zone samples. Action levels are set at 10 percent of the Derived Air Concentration (DAC). The DAC (1×10^{-10} $\mu\text{Ci}/\text{ml}$) and posting level were selected to protect personnel from the chemical toxicity hazards associated with soluble uranium.
2. The Respiratory Protection Program is outlined in Lead Cascade License Application Section 4.6.2 and implemented by approved procedures. The program is consistent with 29 CFR 1910.134 and 10 CFR Part 20 for use, issuance, training, and qualifications for respirator users. Where practical, engineering controls (i.e., ventilation) would be used to control airborne concentrations of soluble uranium. National Institute for Occupational Safety and Health and Mine Safety and Health Administration approved devices are utilized for respiratory protection.
3. Internal Exposure Determination is outlined in Lead Cascade License Application Section 4.7.4 and implemented by approved procedures. Since the primary hazard of UF_6 is exposure to soluble uranium, personnel performing dismantling activities would be placed on a four week urine sample submission frequency to verify intakes do not exceed 10 mg/week. In addition, if air sampling indicates an exposure of greater than 0.8 DAC-hours/day the individual would be required to submit special sample(s) for analysis. In addition, the administrative "See and Flee" program (outlined in an approved procedure) requires workers to expeditiously exit the area in the event of an uncontrolled release of UF_6 , further reducing the likelihood of internal exposure.

4. External Exposure Determination is outlined in Lead Cascade License Application Section 4.7.3 and implemented by approved procedures. Personnel performing dismantling activities would be assigned personal thermoluminescent dosimeters (TLDs) which would be read at least quarterly. TLDs are provided and processed by a vendor who is accredited by National Voluntary Laboratory Accreditation Program. Investigations are performed if an individual's TLD indicates greater than 250 mrem/quarter.
5. Internal and External Exposures are summed and an individual's TEDE is recorded. Monitoring data is submitted annually for the Radiation Exposure Information Reporting System report based on the personnel exposure database. Dose reports are completed as required for personnel monitored in accordance with 10 CFR 20.1502(a).
6. The Contamination Control Program is outlined in Lead Cascade License Application Sections 4.4.2, 4.7.1, 4.8.1, and 4.8.2. Contamination control requirements are implemented by approved procedures. Contamination control program elements consist of:
 - a. Radiation Work Permits – provide information to the worker concerning protective clothing, job/task identification, and special instructions such as radiological hold points.
 - b. Posting (refer to Lead Cascade License Application Table 4.8-1 for Posting Criteria) is used to alert personnel to the presence of radiation and radioactive materials, aid in minimizing exposures, and prevent the spread of contamination.
 - c. The limits established for contamination control (surface and airborne) are based on the toxicity of soluble uranium.
 - d. Routine, work support, and material release surveys are conducted to support dismantling activities. Surveys ensure radiological hazards associated with each activity are properly identified, and relative radiation levels and concentrations of radioactive material are determined. In addition:
 - i. HP surveys would be used to quantify waste packaging contents.
 - ii. Samples would be collected for isotopic analysis.
 - e. Dismantling activities would be performed by personnel trained to the requirements of the Lead Cascade RP program, outlined in Lead Cascade License Application Section 4.5.
7. The RP Instrumentation Program is outlined in Lead Cascade License Application Section 4.8.4 and calibration requirements are implemented by approved procedures. Instrument use procedures are in place for HP instruments (alpha/beta count rate and scaler instrumentation plus ion chambers used to evaluate shallow dose and deep dose equivalent readings) used to document HP survey results.
8. HP Audits, Inspections, and Recordkeeping Programs are outlined in Lead Cascade License Application Sections 4.8.1 and 4.8.5. HP records are stored in the electronic records management database. Scheduled Internal Assessments and Inspections performed include:

- a. Annual RP Program Report (required by 10 CFR Part 20) summarizes the radiological conditions at the facility (requirement found in an approved procedure).
- b. Annual Assessment of Airborne Radioactivity Monitoring
- c. Annual Assessment Routine Survey Program
- d. Annual Assessment of Respiratory Protection Program
- e. Monthly Boundary Assessment to ensure radiological posting and housekeeping are acceptable.
- f. In addition, Quality Assurance audits the program and or program elements in accordance with the integrated audit and assessment schedule.

Based on the information above, ACO is proposing changes to Chapter 10.0 of the License Application and the DFP to delete the specific commitment to a formal DP. There is no impact to the materials license since there is no condition related to the submittal of the DP for the Lead Cascade. Rather, ACO will develop a plan for: removal of equipment and materials from the facility; disposition of the equipment and materials, either as suitable for reuse, salvage, or waste, as appropriate; decontamination (if any); radiation surveys that will be performed to facilitate de-lease to DOE or construction of the ACP; and finally, provide an updated cost estimate for the removal of equipment and materials from the Lead Cascade based on our actual plans, rather than the hypothetical and conservative methodology currently employed in the DFP.

This request is based on an evaluation of the criteria specified in 10 CFR 70.38(g)(1) which specifies the requirements for determining when the preparation of a formal DP is required. After evaluating the two options for shutdown and termination of the Lead Cascade license, it is concluded that equipment and material removal, including radioactive materials, at the Lead Cascade would not meet any of the specified criteria, and as such, no formal DP is required. The evaluation of each of the criteria is discussed below:

- **10 CFR 70.38(g)(1)(i) – Procedures would involve techniques not applied routinely during cleanup or maintenance operations**

During the operational period of the Lead Cascade since 2007, there were several construction campaigns which involved removal of existing piping, equipment, and materials and reconfiguration of the piping and centrifuge machines to accommodate a series of demonstration cascades. In addition, during normal cleanup and/or maintenance operations, low level radioactive materials and waste have been routinely handled safely in accordance with existing procedural guidance. The removal of piping, equipment, and materials from the Lead Cascade would not involve techniques not previously applied on a routine basis relating to construction, deconstruction, equipment and material removal, and radioactive material and waste handling. Moreover, prior to operation of the Lead Cascade, the Gas Centrifuge Enrichment Plant Clean-up project was conducted which removed legacy piping, equipment, and materials from the Lead Cascade footprint and successfully packaged it for disposal, including centrifuges. Based on these historical activities, USEC Inc. and/or its affiliates have considerable experience with removal of, and disposal of piping, equipment, and materials from a centrifuge plant. Importantly, approved radioactive material handling practices will be employed as described in Chapter 4.0, Radiation Protection, of the License

Application. These requirements are flowed down to procedures and provide adequate protection for the anticipated activities that will be conducted when removing equipment and radioactive materials from the facility. These procedures have been demonstrated to be effective during operations and during several construction campaigns already conducted at the Lead Cascade. Should additional procedures be required specific to the removal and disposition activities, they will be developed in accordance with the Procedure program described in Section 11.4, *Procedures*, of the License Application.

- **10 CFR 70.38(g)(1)(ii) – Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation**

The Lead Cascade facility is fully accessible during normal operations. There are no areas that would be entered during post-shutdown piping, equipment, and material removal activities that are not normally accessible. Due to the nature of centrifuge operations, which operate under vacuum, there is no significant contamination that must be remediated, external to the process systems. Health Physics routine survey data indicates that contamination levels in the Lead Cascade footprint are less than the Free Release Limits stated in the Lead Cascade License Application (Section 4.8.2.4). ACO has maintained the process area free of contamination and fully accessible by individuals in street clothes during operations. Additionally, radiation protection precautions have been taken for any work activities on potentially contaminated systems. Radiation levels will not be significantly higher during piping, equipment, and material removal, again by the very nature of the operation. There are no high radiation areas at the facility either during operation or shutdown. Any contamination, which is expected to be insignificant, would be localized as identified by radiation surveys, and corrected in an expedient manner to minimize potential for spreading and exposure to workers. To ensure the safety and protection of workers, approved radioactive material handling practices will be employed as described in Chapter 4.0 of the License Application.

- **10 CFR 70.38(g)(1)(iii) – Procedures could result in significantly greater airborne concentrations of radioactive materials than are present during operation**

No airborne radioactive materials are expected during equipment and material removal. Work activities will be evaluated in advance in accordance with Work Control and Safety and Health procedures to ensure the safety and protection of workers. Approved radioactive material handling practices will be employed as described in Chapter 4.0 of the License Application and an ALARA plan will be developed to minimize the dose to workers, including consideration of minimizing airborne radioactive materials.

- **10 CFR 70.38(g)(1)(iv) – Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operation**

There would be no greater risk for releases of radioactive material to the environment during equipment and materials removal than during operation because the only material at risk is associated with the contaminated equipment. During work activities, radioactive material handling and waste packaging will be controlled by the requirements of Chapter 4.0 of the License Application. The Lead Cascade only possesses up to 250 kilograms of UF₆ and this

material, which is not enriched, will be safely stored in approved cylinders following removal of the process gas from the centrifuges. Fire poses the greatest potential risk to the facility and those risks would not be increased due to adherence to the requirements in Chapter 7.0, Fire Protection, of the License Application. Moreover, UF₆ containers, which are the source of the greatest risk, would be segregated from the bulk of the equipment and materials removal activities. In addition, compliance with Chapter 9.0, Environmental Protection, of the License Application will minimize the risk of radioactive material release to the environment.

Detailed Description of Change

The proposed change to Chapter 10.0 of the License Application and the DFP for the Lead Cascade revises the commitment for submittal of a detailed Decommissioning Plan in accordance with 10 CFR 70.38.

The proposed change is contained in Enclosure 2 of this letter and is identified by the following method:

- **Blue Strikeout** - Identifies text to be removed
- **Red underline** – Identifies text to be added

Justification for Change

The proposed change is required to remove an unnecessary commitment to a DP made during initial licensing of the Lead Cascade. Review of the regulations demonstrate that there is no regulatory requirement for such a DP based on an analysis indicating none of the criteria of 10 CFR 70.38(g)(1)(i)-(iv) are met and operating experience demonstrates that there is no functional need. RP requirements described in Chapter 4.0 of the License Application, which are flowed down to procedures, provide adequate protection for the anticipated activities that will be conducted when removing equipment and radioactive materials from the facility. These procedures have been demonstrated to be effective during operations and during several construction campaigns already conducted at the Lead Cascade. Accordingly, the proposed change does not result in undue risk to public health and safety, to the common defense and security, or the environment.

Significance Determination

ACO has reviewed the proposed change associated with this request and provides the following Significance Determination for consideration.

1. No significant change to any condition to the License.

Existing provisions for a DFP and decommissioning financial assurance will not be impacted by the proposed change, including those conditions to the License relating to

decommissioning. Accordingly, the proposed change does not make any significant change to any condition to the License.

2. No significant increase in the probability of occurrence or consequences of previously evaluated accident.

There will be no increase in the likelihood of occurrence of any evaluated accidents since the proposed change is administrative in nature and only deletes a formal DP. The consequences to workers and the public is not increased since adequate RP controls will be in place based on the requirements in the License Application and implementing procedures. Moreover, the proposed change will not change any accident scenarios identified in the Integrated Safety Analysis (ISA) Summary or cause the results of an accident sequence to exceed the performance requirements of 10 CFR 70.61. Therefore, there is no significant increase in the probability of occurrence or consequences of the previously evaluated accident.

3. No new or different type of accident.

The proposed change is administrative in nature and only deletes a formal DP. There is no change to the way the facility is operated or to the way radioactive material is handled. In addition, the proposed change does not create new or different types of accident sequences that, unless mitigated or prevented, would exceed the performance requirements of 10 CFR 70.61 and that have not previously been described in the ISA Summary for the Lead Cascade. Therefore, there is no new or different type of accident created.

4. No significant reduction in margins of safety.

The proposed change is administrative in nature and only deletes a formal DP. There will be no increase in consequences or reduction in protection to workers and the public since adequate RP controls will be in place based on the requirements in the License Application and implementing procedures. Moreover, the proposed change does not decrease the margin of safety associated with any Items Relied On For Safety that are being credited to ensure the performance requirements of 10 CFR 70.61 are met. Therefore, there is no significant reduction in margins of safety.

5. No significant decrease in the effectiveness of any programs or plans contained in the licensing documents.

The proposed change will not decrease the overall level of security system performance needed to protect against the loss or compromise of classified matter. Other than the DFP and Chapter 10.0 of the License Application, the proposed change does not affect any other plant safety, safeguards, or security programs or other programs or plans contained in the License Application and its supporting documents for the Lead Cascade. The proposed change will not decrease the effectiveness of the Emergency Plan, Security Program/Plans, Fundamental Nuclear Material Control Plan, or Quality Assurance Program Description.

6. The proposed changes do not result in undue risk to: 1) public health and safety; 2) common defense and security; and 3) the environment.

Since this is an administrative change to delete the commitment to a formal DP, there is no increase in the probability of occurrence or consequences of a previously evaluated accident or malfunction of equipment important to safety. The proposed change does not alter the way the facility is operated or the way radioactive material is handled. The proposed change will not increase the likelihood the protected material or special nuclear material will be accessible to unauthorized personnel. There are no new accident initiators, increases in hazardous materials or waste streams. Additionally, the consequences to the public health and safety and environment is not increased since adequate RP controls will be in place based on the requirements in the License Application and implementing procedures. Therefore, the proposed change does not result in undue risk to public health and safety, to the common defense and security, or the environment.

7. There is no change in the type or significant increases in the amounts of any effluents that may be released off-site.

The proposed change is administrative in nature and only deletes the commitment for a formal DP. There is no change to the way the facility is operated or to the way radioactive material is handled. The proposed change does not create any new or unusual sources of hazardous substances, hazardous waste, or new waste streams that could be generated or used in unacceptable levels that exceed applicable regulatory requirements. Radioactive material handling and waste management activities will continue to be conducted in accordance with the requirements in the License Application and implementing procedures. Moreover, the change will not increase radiological or chemical releases beyond applicable regulatory limits and will not create any new or unusual sources of radioactive waste. Therefore, there is no change in the type or significant increases in the amounts of any effluents that may be released off-site.

8. There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed change is administrative in nature and only deletes the commitment for a formal DP. There could be an increase in individual or cumulative occupational radiation exposure over current operating levels due to equipment removal and radioactive material handling activities. These activities are currently authorized under the License. Notwithstanding, any increase will not be significant and will remain a small fraction of regulatory limits. This is based on our experience during previous construction campaigns. Therefore, the proposed change will have no significant increase in individual or cumulative occupational radiation exposure.

9. There is no significant construction impact.

The proposed change is administrative in nature by deleting the commitment for a formal DP. It does not change the way the facility is operated or the way radioactive material is handled. Moreover, the removal of equipment and radioactive materials from the Lead Cascade would occur after operations have ceased. Therefore, the proposed change cannot have any significant construction impact on the Lead Cascade.

Enclosure 2 to ACO 14-0009

**Changed Pages for License Application, Chapter 10.0 and Decommissioning Funding
Plan for the American Centrifuge Lead Cascade Facility**

Information contained within
does not contain
Export Controlled Information

Reviewer: Gregg Peed
Date: February 25, 2014

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10.0 DECOMMISSIONING

The Lead Cascade is located on the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) reservation. The Licensee has operated the Lead Cascade since June 6, 2007. Materials License SNM-7003 provides the expiration date for the license. Information on the Licensee, the location of the site, and the types and authorized uses of licensed material is provided in Section 1.2, Institutional Information, and a description of the site and immediate environs is provided in Section 1.3, Site Description.

Consistent with the Agreement between USEC and the DOE, any Commercial Plant would be sited either at the PORTS or the Paducah Gaseous Diffusion Plant. PORTS was chosen as the location for the Commercial Plant. Consequently, the Lead Cascade would likely be included in the Commercial Plant license and would be decommissioned as part of the Commercial Plant construction efforts. If no Commercial Plant is deployed, then at the end of Lead Cascade operation, the Lead Cascade would be decommissioned prior to being de-leased and returned to DOE. For conservatism, it was assumed that centrifuges and other installed equipment would be removed and the Lead Cascade decommissioned in accordance with the lease agreement with DOE.

Centrifuges, service modules, process headers, vacuum pumps, and traps are the typical equipment to be removed by the Licensee; only the building shells and the facility infrastructure, including equipment that existed at the time of lease (e.g., rigid mast crane, utilities, etc.) will remain. The cascade area floor will be monitored for contamination, and will be decontaminated, if required. The remaining facilities will be decontaminated where needed to comply with lease turnover requirements. Confidential and Secret Restricted Data material, components, and documents will be transferred to the Commercial Plant or dispositioned in accordance with the Security Program for the American Centrifuge Plant, Chapter 2: Security Plan for the Protection of Classified Matter. Uranium hexafluoride (UF₆) material will be transferred to an authorized facility. Radioactive wastes will be disposed of at licensed low-level waste disposal sites. Hazardous wastes will be treated or disposed of at licensed hazardous waste facilities. Following the Licensee's decommissioning activities, the facilities will be de-leased and returned to DOE in accordance with Lease Agreement requirements.

Activities required for decommissioning have been identified and decommissioning costs have been estimated. Costs projected were developed based on the experience at PORTS during the transition to Cold Standby operation. Other activities and estimated costs for decommissioning were developed based on an evaluation prepared by USEC concerning removal of the DOE centrifuges that previously remained at the PORTS site in the former Gas Centrifuge Enrichment Plant (GCEP) process buildings. Additionally, USEC has performed dismantling and decontamination work at the gaseous diffusion plants; data and experience from these activities allowed a realistic estimation of decommissioning financial expenditures. Using the cost data as a basis, financial arrangements are made to cover costs required for returning the Lead Cascade facilities to DOE in accordance with the terms of the Lease Agreement. Updates on cost and funding will be provided periodically as costs or funding mechanisms change significantly. ~~A more detailed Decommissioning Plan for the Lead Cascade will be submitted in accordance with 10 Code of Federal Regulations (CFR) 70.38 in order to terminate the license.~~ At the time of termination, the Licensee will develop a plan for: removal of equipment and

materials from the facility; disposition the equipment and materials, either as suitable for reuse, salvage, or waste, as appropriate; decontamination (if any); radiation surveys that will be performed to facilitate de-lease to DOE or construction of the American Centrifuge Plant; and finally, provide an updated cost estimate for the removal of equipment and materials from the Lead Cascade based on the Licensee's actual plans.

There are two locations that have been identified for the machine Decontamination Service Area (DSA).

The first option is to utilize the centrifuge assembly area as the disassembly area. The result would be that the X-7726 facility would become potentially contaminated and would need subsequent decontamination. The second machine decontamination option is to utilize the south half of X-3001 building for simplicity, but a machine dismantling stand would have to be fabricated. The rigid mast crane would be used to transport the centrifuge machines from the cascade area to this decontamination area.

The following assumptions were utilized in this decommissioning plan:

- Machine dismantling and decontamination activities would occur in the X-7726 facility (i.e., option one), which are concurrently utilized for machine assembly and disassembly activities today.
- Although the Commercial Plant can use Lead Cascade equipment (e.g., centrifuge machines), the plan conservatively assumes that this equipment is dismantled and disposed of at the end of the Lead Cascade's useful life. No credit is taken for salvage value of this equipment or materials. Likewise, no credit is taken for reduced taxes that might result from payment of decommissioning costs or site control and maintenance costs.
- No Lead Cascade activity and no decontamination liability are anticipated other than the cascade area in the X-3001 building and its associated utility bay area including the mezzanine (i.e., two floors), the anticipated DSA, and the X-7726 facility.
- No decontamination effort should be required in other Lead Cascade leased buildings/facilities, such as: X-7725, X-7727H, and X-3012, but for conservatism, these areas are used in the estimate in labor calculations.

The remaining subsections describe decommissioning plans and funding arrangements, and provide a detailed examination of the decontamination aspects of the program. The information here was developed in connection with the decommissioning cost estimate and is provided for information. Specific elements of the planning may change with the submittal of the decommissioning plan required at the time of license termination.

10.1 Decommissioning Program

The plan for decommissioning is to promptly decontaminate or remove materials from the facilities that are required under the Lease Agreement to return the facilities to DOE.

Decommissioning planning begins by incorporating special design features into the facility. These features will simplify eventual dismantling and decontamination. The plans are implemented through proper management and Radiation Protection and Industrial Safety programs. Decommissioning policies address radioactive waste management, physical security, and nuclear materials control and accountability. Each of these areas of the decommissioning program is discussed in the remainder of this section.

10.1.1 Decommissioning Design Features

Specific features are incorporated into the facility design to accommodate decontamination and decommissioning activities. The major features are described below.

10.1.1.1 Radioactive Contamination Control

The following features primarily serve to minimize the spread of radioactive contamination during operation, and simplify the eventual facility decommissioning. As a result, worker exposure to radiation, and radioactive waste volumes are minimized as well.

- Areas of the facility are sectioned off into clean areas and potentially contaminated areas, called Contamination Control Zones (CCZs) that have access control requirements. CCZs are essentially buffer zones established where discrete areas of contamination may be occasionally encountered as a result of facility size. Areas that are contaminated are called Contamination Areas (CAs). These CAs have additional access controls, and a number of requirements are imposed on work procedures for contamination control. Figure 10.1-1 (located in Appendix B of this license application) provides a floor plan showing the CCZ boundary. Procedures for these areas are encompassed by the Radiation Protection program, and serve to minimize the spread of contamination and simplify eventual decommissioning.
- Non-radioactive process equipment and systems are minimized in locations subject to likely contamination. This limits the size of the CCZs, and limits the activities occurring inside these areas.

10.1.1.2 Worker Exposure and Waste Volume Control

The following features primarily serve to minimize worker exposure to radiation and minimize radioactive waste volumes during decontamination activities. As a result, the spread of contamination is minimized as well.

- Ample access is provided for efficient equipment dismantling and removal of equipment that may be contaminated. This minimizes the time of worker exposure.

- Connections in the process systems are provided for thorough purging at facility shutdown. This removes a significant portion of radioactive contamination prior to disassembly.
- Design drawings prepared for the facility, simplify the planning and implementing of decontamination procedures.
- Worker access to contaminated areas is controlled to assure that workers wear proper protective equipment and limit their time in the areas.
- The centrifuge machine casing is to be utilized as the internally contaminated waste disposal “cask.” This eliminates the purchase of other expensive, but approved waste disposal process equipment and minimizes the total waste disposed. This method also simplifies the waste disposal process and minimizes decontamination efforts.

remains in the facility will be treated as scrap and disposed of appropriately. Smaller amounts of steel, copper, and other metals can be recovered at market price. However, no credit is taken for salvage value in the Decommissioning Funding Plan (DFP), which is submitted separate from this license application. Likewise, no credit is taken for reduced taxes that might result from payment of decommissioning costs or site control and maintenance costs.

Other items are considered waste. Wastes have no intrinsic salvage value.

10.2.6 Disposal

Wastes produced during decommissioning will be collected, handled, and disposed of in a manner similar to that described for those wastes produced during normal operation. Wastes will consist of normal industrial trash, non-hazardous chemicals and fluids, radioactive wastes and very small amounts of hazardous materials. The radioactive waste will primarily be accumulated centrifuge components, trash, and citric cake. Citric cake consists of uranium and metallic compounds precipitated from citric acid decontamination solutions. It is estimated that approximately 4,600 cubic meters (m³) of radioactive waste will be generated during the decommissioning operation. This waste may be subject to further volume reduction prior to disposal.

Radioactive wastes will ultimately be disposed of in licensed low-level radioactive waste disposal facilities. Hazardous wastes will be disposed of in hazardous waste disposal facilities. Non-hazardous and non-radioactive wastes will be disposed of in a manner consistent with good industrial practice and in accordance with applicable regulations. A more complete estimate of the wastes and effluent to be produced during decommissioning will be ~~provided~~ identified in the equipment removal and disposition plan developed at the time of license termination. ~~in~~ The Licensee's ~~plan~~ revised cost estimate for completion of decommissioning will, ~~to~~ be submitted to NRC prior to the time of license termination.

Confidential and Secret Restricted Data components and documents at the facility not transferred to the Commercial Plant will be dispositioned in accordance with the requirements of 10 Code of Federal Regulations (CFR) Part 95 and the Security Program.

10.2.7 Final Radiation Survey

A final radiation survey is performed to verify proper decontamination to allow the facilities to be returned to DOE in accordance with Lease Agreement requirements. The evaluation of the final radiation survey is based, in part, on an initial radiation survey performed prior to operation. The initial survey determines the background radiation of the area; providing a datum for measurements that determine any increase in levels of radioactivity.

The final survey will systematically measure radioactivity over the Lead Cascade. The intensity of the survey will vary depending on the location (i.e., the buildings/facilities, the immediate area around the buildings/facilities, the controlled fenced area, and the remainder of the site). The survey procedures and results will be documented in a report. The report will include a map of the survey site, measurement results, and the site's relationship to the surrounding area. The results will be analyzed and shown to be below allowable residual radioactivity limits; otherwise, further decontamination will be performed.

The centrifuges will be processed and the following operations will be performed:

- Removal of external fittings;
- Removal of bottom flange, motor and bearings, and collection of contaminated oil;
- Removal of top flange, and withdrawal and disassembly of internals;
- Weld flanges to casing to make the casing a permanent disposal “cask”; and
- Destruction of classified parts by burial.

10.8.3 Results

Recoverable items will be externally decontaminated and suitable for reuse except for a very small amount of intractably internal contaminated material that severely limits potential customers. Other than centrifuge machines, there is potentially a small amount of salvageable scrap material (i.e., service modules, etc.). Material requiring disposal will primarily be process piping, trash, and residue from the effluent treatment systems. No problems are anticipated which will prevent the Lead Cascade facilities from being released to DOE in accordance with Lease Agreement requirements.

10.9 Agreements with Outside Organizations

~~This d~~Decommissioning planning activities and the funding arrangements described below, provide for decontamination of the Lead Cascade for turnover to DOE. As such, no agreements with outside organizations are required for control of access to the facility following shutdown and decommissioning.

10.10 Arrangements for Funding

This section provides an estimate of decommissioning costs and explains the arrangements made to assure funding is available to cover these costs.

10.10.1 Decommissioning Costs

Table 10.10-1, provides a summary listing of the estimated costs of the major decommissioning activities described in Section 10.2. A more detailed breakdown of the cost estimates is provided in Section 3.0 of the DFP submitted with this application. Costs are in 2012 dollars and a 7.5 percent general and administrative cost, a 15 percent contractor profitability factor, and a 25 percent contingency factor is added based on the NRC guidance of NUREG-1757, Volume 3, Consolidated NMSS Decommissioning Guidance, Financial Assistance, Recordkeeping, and Timeliness, dated September 2003. As shown in the table, the estimated total cost is \$15.98 million. Costs may change between the time of license

application and decommissioning. The cost estimate will be adjusted periodically and no less frequent than every three years consistent with the requirements of 10 CFR 70.25(e) and recent NRC changes to financial assurance amendments for materials licensees (Federal Register, Volume 68 Number 192, October 3, 2003). The method for adjusting the cost estimate will consider the following:

- Changes in general inflation (e.g., labor rates, consumer price index)
- Changes in price of goods (e.g., packing materials)
- Changes in price of services (e.g., shipping and disposal costs)
- Changes in facility condition or operations
- Changes in decommissioning procedures or regulations

Costs are estimated as explained below:

Planning and Preparation: \$0.34 million

This is based upon utilizing exempt workers at the current average cost distribution amounts for 586 man-days of exempt and 34 man-day of non-exempt work to be completed in a three-month duration. Scope includes developing Project Execution Plan and schedule (including organization and staffing plan and needed services); developing and submitting to the U.S. Nuclear Regulatory Commission (NRC), a ~~detailed~~ revised decommissioning ~~plan~~ cost estimate; development of an equipment removal and disposition plan; developing/implementing Site Characterization Plan; if needed, developing/implementing decommissioning activity procedures; and designing DSA.

Decontamination or Dismantling of Radioactive Facility Components: \$1.96 million

This is based upon utilizing both exempt and non-exempt workers at their respective current average cost distribution for 1,820 man-days of exempt and 3,200 man-days of non-exempt work over a five-month duration. This does not include any costs associated with cranes, platforms, fencing, etc. because they would already exist and be in place. Scope includes erecting DSA; decontamination of facilities – internals; dismantling centrifuge machines; waste segregation/staging; and dismantling facilities/components.

Restoration of Contaminated Areas on Facility Grounds: \$0.11 million

This is based upon utilizing both exempt and non-exempt workers at their respective current average cost distribution for 69 man-days of exempt and 180 man-days of non-exempt work over a five-month duration. This also assumes the contamination of the facility grounds from the Lead Cascade operations will be minimal. Scope includes decontamination of facilities; performing health physics surveys; and removal of fixed contamination.

Final Radiation Survey: \$0.10 million

This is based upon utilizing both exempt and non-exempt workers at their respective current average cost distribution for 65 man-days of exempt and 135 man-days of non-exempt work over a three and a half-month duration. Scope includes developing/implementing survey plans; collecting/analyzing data; performing confirmatory surveys; developing final survey report; and terminating license.

Decommissioning Costs: The Licensee has prepared a revised site-specific decommissioning cost estimate for the ultimate decommissioning of the Lead Cascade for de-leasing and return to DOE. This cost estimate utilizes current information regarding the activities and associated costs of decommissioning. The estimate and associated funding mechanisms will be adjusted over time, in accordance with the applicable provisions of 10 CFR Part 70.

Decommissioning Funding: As set forth in this DFP, the Licensee presently intends to utilize a surety bond and/or letter of credit to provide reasonable assurance of the availability of decommissioning funds when needed. These funding mechanisms are intended to satisfy the provisions of 10 CFR Part 70 with respect to decommissioning financial assurance for license applicants under those provisions.

3.0 DECOMMISSIONING COST ESTIMATE

Pursuant to 10 CFR 70.25(e) and the guidance provided by the NRC in NUREG-1757, *Consolidated Decommissioning Guidance*, the Licensee has evaluated the estimated costs of decommissioning the Lead Cascade. The facility will be decommissioned such that the facilities may be de-leased and returned to the DOE. The estimated costs of decommissioning, patterned after NRC guidance in Appendix A of NUREG-1757, Volume 3, *Consolidated NMSS Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness*, Final Report, September 2003 is set forth in the tables contained in Appendix C and D of this DFP and noted below. (Note: To maintain consistent table sequence numbers with those presented in Appendix A of NUREG-1757, Tables 3.1 through 3.3 are not used):

- Facility Description Summary (Table C3.4 and Table C3.4A)
- Number and Dimensions of Facility Components (Table C3.5 and Table C3.5A)
- Planning and Preparation (Table C3.6)
- Decontamination or Dismantling of Radioactive Facility Components (Table C3.7)
- Restoration of Contaminated Areas on Facility Grounds (Table C3.8)
- Final Radiation Survey (Table C3.9)
- Site Stabilization and Long-term Surveillance (Table C3.10)
- Total Work Days by Labor Category (Table C3.11)
- Worker Unit Cost Schedule (Table D3.12)
- Total Labor Costs by Major Decommissioning Task (Table D3.13)
- Packaging, Shipping, and Disposal of Radioactive Wastes (Table C3.14)
- Equipment/Supply Costs (Table C3.15)
- Laboratory Costs (Table C3.16)
- Miscellaneous Costs (Table C3.17)
- Total Decommissioning Costs (Table C3.18)
- Total Labor Distribution (Table C3.19)

Currently, the Licensee does not have an estimate of potential levels of contamination at the time of decommissioning. Chapter 10.0 of the License Application for the American Centrifuge Lead Cascade Facility describes specific features that serve to minimize the level and spread of radioactive contamination during operation that simplify the eventual facility decommissioning and minimize worker exposure. The total estimated cost of decommissioning the facility in 2012 dollars is \$15.98 million (see Table C3.18).

Key assumptions used in the decommissioning cost estimate are as follows:

- Details of planned surveys to be taken and decontamination efforts
- Release criteria to be used for the licensed material
- Information on facility building and grounds, dimensions, type, and number of components that will require decontamination
- Costs for labor and non-labor
- Levels of effort for decontamination activities; and volumes and types of wastes generated
- Decommissioning Cost Estimate unit quantities were developed based on actual USEC Gas Centrifuge Enrichment Plant (GCEP) Cleanout data. Costing of unit quantities used industry standard costs escalated to 2012 dollars, and 2012 estimated costs for services and materials, resulting in a Decommissioning Cost Estimate that reflects independent third-party costs to perform Lead Cascade decommissioning activities.

There are no decommissioning costs associated with disposition of UF₆ since the Licensee intends to utilize this material in future enrichment operations.

Finally, the Licensee recognizes the need to adjust cost estimates and funding levels periodically, pursuant to 10 CFR 70.25(e). These measures are in Section 5.0 of this DFP. The **Additionally, the** Licensee ~~also recognizes that, pursuant to 10 CFR 70.38(g)(4)(v), it must~~will update its detailed cost estimate at the time of license termination and provide, if necessary, additional assurance of the availability of adequate funds for completion of decommissioning.

**Table C3.6 Planning and Preparation
(Productive Work Days)**

Group	Type	# Workers	Dur (#y)	Avail Factor	Total (wd)
Supervision	Exempt	1	34	219	34
Engineering	Exempt	3	92	219	276
Operations	Exempt	0	0	219	0
	Non-Exempt	0	0	219	0
Maintenance	Exempt	2	69	219	138
	Non-Exempt	0	0	219	0
Support	Exempt	2	69	219	138
	Non-Exempt	1	34	219	34
Totals		9			620

Assumptions:

- Anticipated duration = 1-3m or 22-92d
- Availability Factor = average annual work days = 219 md/y = 260 - 41(Paid Absences)

Anticipated tasks considered:

- Develop Project Execution Plan and Schedule (including organization and staffing plan and needed services)
- Develop/Revise Decommissioning Plan Cost Estimate
- Develop an Equipment Removal and Disposition Plan
- Develop/Implement Site Characterization Plan
- Review/Approve Site Decommissioning Plan Cost Estimate by NRC; Regulatory/License issues
- If needed, Develop/Implement Decommissioning Activity Procedures
- Design Decommissioning Service Area (DSA)
- Initial Project Support/Organization
- Initial Plant Security

Table C3.17 Miscellaneous Costs

Other Direct Costs

Cost Item	Total Cost
Miscellaneous Material for DeCon ¹	\$140,000
Total	\$140,000
Total (Rounded, M)	\$0.14

Note 1: Estimate based upon percentage of Decommissioning Cost subtotal (1.5% * Total Other Indirect Costs [Table C3.18 = Indirect Services + Packaging/Shipping & Waste Disposal + Equipment + Laboratory + Other Direct + Other Indirect Costs]) [0.015 * (Total Other Indirect costs); factor then rounded].

Other Indirect Costs

Cost Item	Total Cost
NRC Staff Review and Approval DPC ²	\$84,392
NRC Fees ³	\$612,500
DOE Lease	\$516,990
Business Insurance	-
Taxes ⁴	\$37,197
Total	\$1,251,079
Total (Rounded, M)	\$1.25

Note 2: Estimate based upon review and approval ~~for of~~ Decommissioning ~~Plan-Cost~~ ~~Estimate~~ (DCEP).

Inflation Index = CY2009 (1.1%) * CY2010 (1.2%) * CY2011 (1.5%) * CY2012 (1.2%)
[See Reference A in Table C3.15].

Note 3: Estimate based upon 6 months of NRC Annual Operational Fees for plant.

Note 4: Estimate based upon procured items
[Total Table C3.15 * 7% tax rate].