# U. S. NUCLEAR REGULATORY COMMISSION SAFETY EVALUATION REPORT ON CENTRUS ENERGY CORP. AMENDMENT REQUEST FOR APPROVAL OF AMERICAN CENTRIFUGE LEAD CASCADE FACILITY DECOMMISSIONING PLAN AND ASSOCIATED SUPPORTING DOCUMENTS

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## 1.0 Introduction

This Safety Evaluation Report documents the U.S. Nuclear Regulatory Commission (NRC) staff's safety and financial reviews of Centrus Energy Corp.'s (Centrus') Decommissioning Plan (DP) for the American Centrifuge Lead Cascade Facility (LCF) located near Piketon, Ohio.

According to Title 10 of the *Code of Federal* Regulations (10 CFR) 70.38(g)(1), a DP must be submitted if there is a license condition requiring its submittal. Condition 10.a of the LCF's updated NRC license (Amendment 14) (Agencywide Documents Access Management System (ADAMS) Accession No. ML17163A297) requires Centrus to conduct activities in accordance with statements, representations, and conditions contained in its current License Application (ADAMS Accession No. ML17107A403). In Chapter 10 entitled "Decommissioning" of its License Application, Centrus provides the following commitment: "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." In accordance with this commitment and Title 10 of the *Code of Federal Regulations* (10 CFR) 70.38(d)(2), by letter dated January 5, 2018, Centrus submitted its "more detailed" DP for the LCF (ADAMS Accession No. ML18025B308). By letter dated February 14, 2018 (ADAMS Accession No. ML18046A081), Centrus clarified that the NRC's approval of its January 5, 2018, request would involve an amendment to NRC Materials License No. SNM-7003. By letter dated February 21, 2018 (ADAMS Accession No. ML18030A442), the NRC accepted for detailed technical review Centrus' LCF DP license amendment request.

The staff reviewed the DP to determine that the DP met the requirements of 10 CFR 70.38(g)(4), 10 CFR 70.38(g)(5), and Subpart E of 10 CFR Part 20. The staff used the guidance in NUREG-1757, Volume 1, Revision 2, "Consolidated Decommissioning Guidance, Decommissioning Process for Materials Licensees," dated September 2006 (ADAMS Accession No. ML063000243), and NUREG-1757, Volume 2, Revision 1, "Consolidated NMSS Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria," dated September 2006 (ADAMS Accession No. ML063000252), to assess whether Centrus had met these regulatory requirements. Adherence to these guidance documents is not required to meet the regulations, but such adherence is one means of demonstrating that the regulatory requirements have been met.

This review was limited in scope to those portions of the DP not previously completed under the authority of the license. Specifically, the NRC staff reviewed: (a) Centrus' radiological characterization of the site to identify what parts of the facility, if any, required remediation and the extent of such remediation; (b) Centrus' description of the dose model to determine compliance with the dose criteria of 10 CFR 20.1402; (c) the LCF decommissioning cost estimate to ensure Centrus has set aside sufficient funds to complete the decommissioning of the LCF; and (d) the design of the Final Status Survey (FSS) to ensure Centrus demonstrates that the site can be released for unrestricted use upon license termination.

## 1.1 Background

### 1.1.1 Facility Licensing, Operation, and Decommissioning

In the early 1980s, the U.S. Department of Energy (DOE) initiated its construction of the Gas Centrifuge Enrichment Plant (GCEP) at the Portsmouth Gaseous Diffusion Plant (PORTS) site in Piketon, Ohio. After installing and operating several hundred centrifuges, the DOE terminated the GCEP project in 1985. Approximately 15 years later, USEC, Inc. decided to use

and expand the existing GCEP facilities for deploying its own commercial centrifuge plant. In 2004, USEC, Inc. signed a lease agreement with DOE to use certain GCEP facilities for testing and eventual commercial production as part of its overall gas centrifuge uranium enrichment project.

The NRC issued Materials License No. SNM-7003 for the LCF to USEC, Inc. on February 24, 2004 (ADAMS Accession No. ML062630432). At that time, USEC, Inc., under contract with the DOE, dismantled and packaged for transport for offsite disposition, the DOE's contaminated and non-contaminated GCEP classified waste, comprising of centrifuges and equipment. After licensing by the NRC, USEC, Inc. began to install its own centrifuges in a portion of one of the two existing GCEP process buildings and began operating the LCF as a test facility in August of 2006. The LCF's purpose was to obtain “reliability, performance, cost, and other data” for use in the decision whether to construct and operate a commercial uranium enrichment plant, commonly referred to as the American Centrifuge Plant (ACP). To govern any future commercial operation of the ACP, the NRC issued Materials License No. SNM-2011 on April 13, 2007 (ADAMS Accession No. ML070400284). To date, no significant construction activities have occurred at the ACP. These NRC licenses were subsequently modified to reflect USEC, Inc.’s change of name to Centrus. The LCF lies completely within the ACP site, occupying about 10 percent of the space reserved for the ACP. The ACP site, in turn, lies completely within DOE's controlled access area, where an adjoining uranium enrichment facility using a gaseous diffusion process previously operated for several decades. Currently, DOE is decommissioning this facility. The layout of the Piketon site with the existing ACP and LCF buildings (circled) is provided in the figure below.

Overflight photo of the Piketon site with the existing ACP and LCF buildings circled

On March 2, 2016, Centrus notified the NRC, in accordance with paragraph 70.38(d)(2) of 10 CFR of its decision to permanently cease operation of the LCF and to terminate Materials License No. SNM-7003 following decontamination and decommissioning activities (ADAMS Accession No. ML16074A405).

On May 17, 2016, Centrus submitted a license amendment request to the NRC to downgrade licensed activities at the LCF to "limited operations" and to remove enrichment capability from the license (ADAMS Accession No. ML16162A194). The NRC approved the amendment on December 23, 2016 (ADAMS Accession No. ML16330A248).

After notifying the NRC by letter dated March 2, 2016, of its intent to decommission the LCF (ADAMS Accession Number ML16074A405), under the authority of its existing Materials License No. SNM-7003, Centrus began to remove the process gas in the form of $UF_6$ and other materials, and package all LCF classified equipment, including all LCF centrifuges and piping. Starting in June 2017, Centrus transferred the materials and equipment packages for offsite disposition. The equipment packages were shipped to the DOE's National Nevada Security Site (NNSS) for disposal, over a period of about six months. Soon after that, the NRC verified that all classified matter had been shipped offsite for appropriate disposition, and withdrew Centrus' authorization to possess classified information or material/equipment at the LCF and ACP in Piketon, Ohio. Although the NRC had not yet approved the DP, under the authority of its LCF license, Centrus completed the majority of the physical activities necessary for decommissioning the LCF prior to June 2018.

On March 1, 2017, Centrus submitted its DP for the LCF (ADAMS Accession No. ML17262A075). On October 11, 2017, the NRC provided Centrus with Requests for Supplemental Information (RSI) (ADAMS Accession No. ML17262A075) on the March 1, 2017, DP submittal. On October 30, 2017, the NRC met with Centrus to discuss the RSI (ADAMS Accession No. ML17321A081). As a result of the RSI and subsequent meeting, by letter dated November 8, 2017 (ADAMS Accession No. ML17324A264), Centrus withdrew the DP Amendment Application submitted on March 1, 2017. In the letter, Centrus committed to submit an updated DP reflecting the current decommissioning status and incorporating the information requested in the RSI. Centrus submitted the revised DP on January 5, 2018 (ADAMS Accession No. ML18025B285).

### 1.1.2 Decommissioning Funding

On February 12, 2016, Centrus submitted a decommissioning cost update (ADAMS Accession Number ML16057A249). By letter dated July 21, 2016, Centrus notified the NRC of its intent to submit a DP to meet the commitment made within Chapter 10.0 of the License Application and recommended the NRC suspend its review of Centrus' decommissioning cost estimate update (ADAMS Accession No. ML16211A062). The NRC acknowledged Centrus' intent to submit a DP, and agreed to suspend the cost estimate review until the DP was submitted. On March 1, 2017, Centrus submitted the decommissioning cost estimate update as part of its DP amendment request (ADAMS Accession No. ML17067A183).

## 2.0 Facility Operating History

The staff has reviewed the information in the "Facility Operating History" Section of the DP according to NUREG-1757, Volume 1, Section 16.2. Based on this review, the staff has determined that the licensee, Centrus, has provided the information required under 10 CFR

70.38(g)(4), and that information is sufficient to aid the NRC staff in evaluating Centrus' determination of the radiological status of the facility and Centrus' planned decommissioning activities to ensure that the decommissioning can be conducted in accordance with the NRC's requirements. 10 CFR 70.38(g)(4) identifies the information that must be included in a DP.

During LCF's operation as a test facility, the cascade operated on "recycle," where the enriched product stream was recombined with the depleted stream prior to being re-fed to the cascade. As a result, very little waste was produced during operations. Only small volume samples of $UF_6$ (<10 grams [g]) were removed from the process for laboratory analysis.

Table 1.2-2 of the License Application for the LCF provides the Authorized Uses of NRC-Regulated Materials (ADAMS Accession No. ML17107A403). Prior to December 23, 2016, the facility was licensed to enrich uranium up to 10 weight percent U-235. On December 23, 2016, Amendment 9 of the NRC Materials License SNM-7003 authorized the removal of enrichment of uranium from Table 1.2-2 of the License Application (ADAMS Accession No. ML16330A248). At the time of granting of the amendment, the equipment needed to enrich uranium was either de-inventoried of gaseous $UF_6$ and/or was removed from the operating portions of the LCF such that conducting any enrichment of $UF_6$ was not physically possible.

During operations, the licensed material was primarily used in a section of one of the two existing process buildings (X-3001 Process Building, Train 3) for centrifuge machine demonstration and testing. As needed, used centrifuge machines containing small quantities of uranium were transferred to the X-7726 Centrifuge Training and Test Facility, located adjacent to X-3001, for rebuild and transfer back to Train 3 for operation via the X-7727H Transfer Corridor.

The total amount of licensed material that was received by the LCF over the course of its operation was approximately 318 kilograms (kg) of $UF_6$ at natural assay (approximately 0.711 weight percent U-235). The amount of licensed material that was present in the LCF never exceeded 205 kg of $UF_6$. Uranium compounds encountered at the LCF were primarily within the highly soluble (Class "D") uranium compounds; namely $UF_6$ and uranyl fluoride. Additionally, there were instrument calibration sources as addressed in Section XV.a of the DP.

Prior to the initial issuance of the NRC Materials License SNM-7003 in February 2004, the processing of uranium occurred intermittently within these buildings/facilities under a DOE approved Safety Basis. Additionally, there was some PORTS gaseous diffusion plant (GDP) waste stored in certain areas of the buildings/facilities. Therefore, there is a potential for DOE legacy contaminants in the form of uranium and its decay products in areas where the DOE machines were operated and handled and where DOE waste was stored. In addition to uranium and its decay products, very small quantities of technetium may be present as a result of storage of DOE waste from the PORTS GDP in various empty areas of the buildings that housed the LCF. The goal of Centrus' FSS and NRC's confirmatory surveys will be to identify any elevated levels of radioactivity in areas where the LCF operated. After the LCF license is terminated and once Centrus' lease for the ACP is terminated, the buildings/facilities housing the LCF would return to DOE. Unless extended, the lease for the buildings/facilities that comprise the ACP is due to expire by the end of June 2019.

The location of use and storage of radionuclides is described in Section II.c of the DP.

## 2.1 Previous Decommissioning Activities

As mentioned in Section 1.1, all LCF process materials and equipment have been removed, packaged, and dispositioned offsite. The equipment packages were shipped to NNSS under authorizations granted through the original license.

## 2.2 Spills

In Section II.d of the DP, Centrus states that while Centrus has not had access to DOE occurrence reports made before the LCF License was approved, there is no record of spills or uncontrolled releases to the environment from the GCEP facilities in any of the environmental reports prepared since GCEP was constructed. According to the DP, some spills did occur inside of these facilities while under DOE regulation. However, these contaminated areas were remediated to less than the limits of 10 CFR Part 835, Appendix D, before the NRC assumed regulatory responsibility for the LCF buildings/facilities. Decontamination of any such areas to below NRC guidelines would be confirmed as part of Centrus' FSS and NRC's confirmatory surveys.

Review of Centrus' Corrective Action program confirms that during the life of the NRC Materials License SNM-7003 there have been no significant spills or uncontrolled releases of radioactive material to the environment. There were, however, minor events during maintenance activities that led to the contamination of two relatively small areas (each less than 10 $m^2$) in the X-3001 building. These areas have been remediated. Decontamination of these areas to below NRC guidelines would be confirmed as part of Centrus' FSS and NRC's confirmatory surveys.

## 3.0 Facility Description

Chapter 3 of Centrus LCF DP provides: detailed descriptions of the site location; the population distribution surrounding the site; current and future land use of the site; and the physical characteristics of the site including meteorology, climatology, geology, seismology, hydrology, and natural resources. The staff has reviewed this information and, in accordance with guidance in NUREG-1757, Volume 1, Section 16.3, has found it to be acceptable. Since Centrus has dismantled and dispositioned offsite all LCF material and equipment under its existing license authorizations, the majority of the activities normally reviewed during the approval of a DP were not required to be addressed in the DP nor reviewed by the NRC as part of its DP review.

## 4.0 Radiological Status of Facility

The staff has reviewed the information in the "Facility Radiological Status" section of Centrus' DP according to NUREG-1757, Volume 1, Section 16.4. This section identifies information that can be submitted by the licensee to allow the NRC staff to fully understand the types and activity of radioactive material in the structure, as well as the extent of this contamination. This information should include summaries of the types and extent of radionuclide contamination in all media at the facility including buildings, systems and equipment, surface and subsurface soil, surface water, and groundwater. In Section IV, "Radiological Status of the Facility," of its DP, Centrus provided a historical perspective of activities involving radioactive material conducted at the LCF. This information allowed the NRC staff to independently assess the potential for any significant radiological contamination at the LCF.

Based on this review, the staff has determined that Centrus has sufficiently described the types and activity of radioactive material contamination at its facility. Therefore, the NRC staff finds that the information in the "Facility Radiological Status" section is sufficient to meet the recommendations contained in NUREG-1757, Volume 1, Section 16.4.

## 5.0 Dose Analysis

Subpart E to 10 CFR Part 20, "Radiological Criteria for License Termination," establishes criteria for the release of sites for unrestricted use. Specifically, the residual radioactivity, that is distinguishable from background radiation, must result in a total effective dose equivalent to the average member of the critical group[1] of less than 25 millirem per year (mrem/yr), and the residual radioactivity must also be reduced to levels that are as low as reasonably achievable (ALARA).

Centrus has chosen to develop derived concentration guideline levels (DCGL) to demonstrate compliance with the 10 CFR Part 20, Subpart E, dose-based criteria. The DCGL approach assumes that the entire site is contaminated with uranium at the concentration that corresponds to a dose of 25 mrem/yr to the average member of the critical group. Because of the conservative assumption that the entire site is at the calculated DCGL, this compliance approach provides the NRC staff with reasonable assurance that the exposure will not exceed the regulatory limit of 25 mrem/yr.

This Chapter describes the NRC staff's review of the dose analysis portion of the Centrus DP for the LCF. This includes a review of the source term, building site conceptual model, exposure scenario, and DCGL calculations associated with decommissioning the site.

### 5.1 Building Surfaces

#### 5.1.1 Source Term

The LCF was licensed to enrich uranium up to 10 weight percent U-235. The closed process involved recombining the enriched $UF_6$ stream at the top end of the cascade with the depleted stream at the bottom end of the cascade, essentially reforming near-natural uranium to be re-fed into the cascade. As a result, any residual contamination present is considered to be from naturally occurring uranium (0.72 percent U-235). Centrus indicates that the modeling results from RESRAD-BUILD[2] analyses indicate that nearly 100 percent of the project dose is due to the uranium isotopes associated with the site. As a result, concentrations of uranium and its daughter products were included in the RESRAD-BUILD dose modeling calculations.

#### 5.1.2 Building Site Conceptual Model

The licensed material was primarily used for centrifuge machine testing in the Train 3 area of the X-3001 Process Building. The modeling and dose assessment evaluation focused on the interior of the X-3001 building, specifically the concrete floor, as no radiological work was

[1] The critical group is defined as the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.
[2] The RESRAD family of codes was developed at Argonne National Laboratory to analyze potential human and biota radiation exposures from the environmental contamination of RESidual RADioactive materials. RESRAD-BUILD is used to assess radiation exposures of a human receptor in a building with contaminated structures and surfaces or a building housing contaminated furniture or equipment.

performed or effluents released from the LCF that could affect the exterior of the building. The building geometry was considered as a single square room with an area of 676.4 $m^2$ and a ceiling height of 2.5 m. Assuming a much smaller than actual set of dimensions for the purpose of dose calculation is conservative since this assumption results in a smaller mixing zone for the inhalation dose pathway. Centrus' initial analyses considered a circular source area of 531.2 $m^2$ within the square room. Following discussions with the NRC staff, Centrus updated its analyses to include the entire square room as an area source and submitted the analysis to the NRC via an e-mail on May 9, 2018 (ADAMS Accession No. ML18157A298).

Initial reviews of the building by Centrus found two discrete areas with minimal contamination within the building. Since the dose evaluation assumes a hot spot to be uniformly distributed over an area, Centrus conservatively considered an area of 9.313 $m^2$, which was the larger of the two areas, when evaluating the hot spots and corresponding DCGL Elevated Measurement Comparison ($DCGL_{EMC}$)[3] for the site.

### 5.1.3 Exposure Scenario

Centrus proposes that the LCF facilities will continue to be used as industrial facilities following decommissioning and release of the site for unrestricted use. Since the decommissioning of the LCF does not involve demolition of the existing building structures resulting in greenfields, the most likely future exposure scenario would involve a worker occupying the building following license termination. Therefore, Centrus proposes that the reasonably foreseeable exposure scenario is an industrial worker who works an 8-hour work day, 5 days per week, and 50 weeks per year in the building, which corresponds to an indoor fraction of 0.23. Despite the fact that minor levels of contamination were only identified in two relatively small areas, for its dose calculations, Centrus assumed the entire 676 $m^2$ building to be contaminated at these levels.

### 5.1.4 DCGL Calculations

Centrus used RESRAD-BUILD and site-specific parameter values to calculate a $DCGL_W$[4] of 50,000 disintegrations per minute per 100 square centimeters (dpm/100 $cm^2$) based on the peak dose, which occurs in the first year. Centrus performed sensitivity analyses described in the DP to evaluate the impact of varying certain parameters within the RESRAD-BUILD models on the calculated DCGLs. These included the removable fraction, resuspension rate, and indoor fraction. Results of the sensitivity analyses showed that the $DCGL_W$ did not vary significantly from the established $DCGL_W$ when these parameters were modified. The biggest change to the $DCGL_W$ occurred when the indoor time fraction, the fraction of time the individual spent indoors and exposed to contaminated material, was increased from 0.23 for an industrial scenario to 0.5 for a residential scenario. In this case, the dose increased from 2.5 mrem/yr to 5.45 mrem/yr, which is still well within the 25 mrem/yr
10 CFR Part 20 dose criterion.

[3] The $DCGL_{EMC}$ is the concentration of a radionuclide which, if distributed uniformly across a smaller limited area within a survey unit, would result in an estimated dose equal to the applicable dose limit.

[4] The $DCGL_W$ is the concentration of a radionuclide which, if distributed uniformly across a survey unit, would result in an estimated dose equal to the applicable dose limit.

## 5.2 Conclusion Dose Assessment Review

The NRC staff has reviewed the dose modeling analyses for the LCF as part of the review of the DP using Section 5.2 of NUREG-1757, Volume 2. The staff concludes that the exposure scenario, building site conceptual model, and source term are appropriate for assessing risks to individuals associated with future uses of the site, and for demonstrating compliance with the decommissioning criterion of 25 mrem/yr contained in 10 CFR Part 20.

## 5.3 Environmental Protection Agency (EPA) Consultation

On October 9, 2002, the NRC and the U.S. EPA entered into a Memorandum of Understanding (MOU) on "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites" (ADAMS Accession Number ML022830208). In accordance with the MOU, consultation with the EPA is not required for decommissioning sites which do not result in any radiological or non-radiological contamination of the environment or groundwater. Since the decommissioning of the LCF did not trigger this criterion of the MOU, the NRC did not consult with EPA for the present action.

## 6.0 Environmental Information

The NRC staff prepared an Environmental Assessment (EA) (ADAMS Accession No. ML18204A294) for this action in accordance with 10 CFR 51.30. Based on its review documented in the EA, the NRC staff determined that review and approval of the DP will not significantly affect the quality of the human environment. Therefore, a finding of no significant impact (FONSI) is appropriate. The draft EA was sent to the Ohio Department of Health for review and comment on June 12, 2018 (ADAMS Accession No. ML18130A468). The Ohio Department of Health responded on July 6, 2018, that it had no comments on the draft EA (ADAMS Accession No. ML18193A742). The final EA and FONSI were published in the *Federal Register* on August 1, 2018 (83 FR 37530).

## 7.0 ALARA Analysis

The NRC's regulations at 10 CFR 20.1402 provide, among other things, that before a site may be considered acceptable for unrestricted use, the residual radioactivity must be reduced to levels that are ALARA. The staff utilized the guidance in NUREG-1757, Volume 1, specifically Section 6 and Appendix N, to assess whether Centrus had met this regulatory requirement. This guidance indicates that the ALARA evaluation for compliance with decommissioning criteria should include quantitative analyses, when appropriate, and typical good practice efforts. Centrus has adopted a clean-up action level that is a factor of ten times below the release criteria in 10 CFR 20.1402, as determined by the DCGLs. The staff has determined that additional measures to further reduce the residual radioactivity would not be reasonably achievable. Accordingly, Centrus has adequately demonstrated that it meets the ALARA requirements.

## 8.0 Planned Decommissioning Activities

Centrus previously completed the removal, packaging, and offsite dispositioning of LCF licensed material, equipment, and piping in accordance with its existing license and under the NRC's safety and safeguards oversight. Two relatively small areas of minor contamination were identified which, according to Centrus, have been decontaminated under its current license authorization to below the proposed DCGLs. The decontamination to below the DCGLs will be

confirmed by reviewing Centrus' FSS and conducting NRC's confirmatory surveys as part of the LCF license termination process.

## 9.0 Project Management and Organization

As all LCF process material and equipment has been removed, packaged, and dispositioned offsite, there is no need for Centrus to provide, nor for the NRC staff to review, the Project Management and Organization portion of the DP.

## 10.0 Radiation Safety and Health Program

As all LCF process material and equipment has been removed, packaged, and dispositioned offsite, there is no need for Centrus to provide, nor for the NRC staff to review, the Radiation Safety and Health Program portion of the DP.

## 11.0 Environmental Monitoring and Control Program

As all LCF process material and equipment has been removed, packaged, and dispositioned offsite, there is no need for Centrus to provide, nor for the NRC staff to review, the Environmental Monitoring and Control Program portion of the DP.

## 12.0 Radioactive Waste Management Program

As all LCF process material and equipment has been removed, packaged, and dispositioned offsite, there is no need for Centrus to provide, nor for the NRC staff to review, the Radioactive Waste Management Program portion of the DP.

## 13.0 Quality Assurance Program

As all LCF process material and equipment has been removed, packaged, and dispositioned offsite, there is no need for Centrus to provide, nor for the NRC staff to review, the Quality Assurance Program portion of the DP.

## 14.0 Facility Radiation Surveys

### 14.1 Release Criteria

As discussed above, Centrus has chosen to decommission the facility to meet the release criteria of 10 CFR 20.1402 for unrestricted use. The staff has reviewed the information in the DP according to the requirements of 10 CFR 20.1402 and guidance contained in NUREG-1757, Volume 2, Section 4.1. According to 10 CFR 20.1402, the LCF will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in the total effective dose equivalent to an average member of the critical group is less than 25 mrem/yr. The guidance in NUREG-1757, Volume 2, Section 4.1, recommends that DCGLs be used to design the FSS, and to demonstrate compliance with the radiological release criteria. Based on its review of the DP, the staff has determined that Centrus has adequately summarized the DCGLs and area factors used for survey design and for demonstrating compliance with the radiological criteria for license termination.

## 14.2 Characterization Surveys

Centrus completed Characterization Surveys as part of its normal licensed activities. As there are no planned decommissioning activities related to the Characterization Surveys, there is no need for Centrus to provide, nor for the NRC staff to review, the Characterization Surveys portion of the DP.

## 14.3 Remedial Action Support Surveys

Centrus performed the Remedial Action Support Surveys as part of its normal licensed activities. As there are no planned decommissioning activities related to the Remedial Action Support Surveys, there is no need for Centrus to provide, nor for the NRC staff to review, the Remedial Action Support Surveys portion of the DP.

## 14.4 Final Status Survey Design

An overview of Centrus' FSS design was provided in Section 14.4 of the DP. The primary objectives of the FSS were outlined in Section 14.4.1 as follows:

- select/verify survey unit classification;
- demonstrate that the potential dose from residual radioactivity is below the release criterion for each survey unit; and
- demonstrate that the potential dose from small areas of elevated radioactivity is below the release criterion for each survey unit.

The staff finds that the design of the FSS aligns with the guidance provided in NUREG-1575, Revision 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," dated August 2000 (ADAMS Accession No. ML003761445). The staff has determined that the FSS is based on DCGLs that are adequate and reasonable, and will allow the NRC to verify compliance with the requirements of unrestricted release of 10 CFR 20.1402.

The staff has determined that the proposed survey methodology is described in the DP in accordance with the Evaluation Criteria section of Chapter 4 of NUREG-1757 Vol. 2 and is consistent with the suggested approaches in NUREG-1575, Revision 1. The staff also determined that the minimum detection sensitivity of the instrumentation for alpha radiation at 3500 dpm/100 $cm^2$ is sufficiently below the action level of 5,000 dpm/100 $cm^2$, and DCGL of 50,000 dpm/100 $cm^2$ developed by Centrus. Together, this provides reasonable assurance that the requirements of 10 CFR 20.1402 will be met.

## 14.5 Final Status Survey Report

Section XIV.d of the DP includes an outline for the FSS Report. The purpose of the FSS Report is to provide the survey results and the overall conclusions to demonstrate that the site, or portions of the site, meet the radiological criteria for unrestricted use. Centrus submitted this report to the NRC on April 19, 2018 (ADAMS Accession No. ML18145A130).

The staff has reviewed Centrus' outline of the plan for the FSS Report against the criteria in NUREG-1757, Volume 2, Section 4.5, and has determined it to be acceptable. The staff will review the FSS Report as part of Centrus' request to terminate the LCF license, which is anticipated to be submitted immediately after the NRC approves the LCF DP.

## 15.0 Financial Assurance

On January 5, 2018, Centrus submitted the LCF decommissioning cost estimate (DCE) as part of the LCF decommissioning amendment request in the amount of $3,650,000 (ADAMS Accession No. ML18025B308). The DCE applies to decommissioning-related work that was to be conducted after its submittal date, such as the later portions of the FSS. 10 CFR 70.25(e) requires a DCE and its basis to be submitted with a DP and a description of the method of assuring the funds. Specifically, Centrus' DP submittal: (1) reflects the cost of an independent contractor to complete the FSS; (2) is based on the assumption that the LCF will be released for unrestricted use; (3) includes an adequate contingency factor; and (4) identifies and provides justification for key assumptions. At this time, Centrus has a surety bond and standby trust fund that exceeds the DCE. Therefore, the staff finds the DCE acceptable as it meets the regulatory requirements of 10 CFR 70.25(e).

## 16.0 Conclusion

The NRC concludes that the DP meets the requirements of the Atomic Energy Act of 1954, as amended, and the NRC's regulations, and is acceptable.