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OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS DIVISION OF FUEL  
CYCLE, SAFEGUARDS, AND ENVIRONMENTAL REVIEW

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED AMENDMENT OF  
U.S. NUCLEAR REGULATORY COMMISSION LICENSE NUMBER SNM-2011  
FOR THE AMERICAN CENTRIFUGE IN PIKETON, OHIO

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## ABBREVIATIONS AND ACRONYMS

ACO	American Centrifuge Operating, LLC
ACP	American Centrifuge Plant
ADAMS	Agency-wide Documents Access and Management System
CFR	<i>Code of Federal Regulations</i>
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
ESA	Endangered Species Act
FWS	U.S. Fish and Wildlife Service
ha	hectare(s)
HALEU	high-assay low-enriched uranium
HF	hydrogen fluoride
IPaC	Information for Planning and Consultation
ISA	Integrated Safety Analysis
LAR	License Amendment Request
LCF	Lead Cascade Facility
LEC	Liquid Effluent Collection
LEU	low-enriched uranium
MEI	maximally exposed individual
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMSS	Office of Nuclear Material Safety and Safeguards
NRC	U.S. Nuclear Regulatory Commission
ODH	Ohio Department of Health
OH SHPO	Ohio State Historic Preservation Office
OSHA	Occupational Safety and Health Administration
PORTS	Portsmouth Gaseous Diffusion Plant Reservation
ROI	region of influence
SER	Safety Evaluation Report
SNM	special nuclear material
SWU	Separative Work Unit
UF <sub>6</sub>	uranium hexafluoride
USEC	United States Enrichment Corporation Inc.

# **ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED AMENDMENT OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NUMBER SNM-2011 FOR THE AMERICAN CENTRIFUGE IN PIKETON, OHIO**

## **1.0 INTRODUCTION**

By letters dated April 22, 2020 (ACO 2020a), May 7, 2020 (ACO 2020b), and May 25, 2021 (ACO 2021) the American Centrifuge Operating, LLC (ACO or the licensee) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to amend Special Nuclear Materials (SNM) License Number SNM-2011 (SNM-2011) for the American Centrifuge Plant (ACP) (NRC 2007). The amendment requests authorization to enrich uranium to a higher level necessary for new reactor designs. These new reactor designs will require advanced nuclear fuel, known as high-assay low-enriched uranium (HALEU), which is not commercially available. To support commercial development of this fuel, the U.S. Department of Energy (DOE) has entered into a contract with ACO to deploy a cascade of 16 operating centrifuges and two spare centrifuges to demonstrate the capability to enrich uranium to the necessary higher level.

The license amendment application currently under review is for operation of the HALEU cascade under a contract that expires on May 31, 2022. If operation of the cascade supports the feasibility of commercial production of HALEU, ACO anticipates requesting a license amendment for commercial production to meet the potential market demand. Although the commercial demand for HALEU is uncertain at this time, ACO has indicated an interest in operating the HALEU cascade beyond the 3-year DOE contract. To obtain approval for additional operation, ACO anticipates submitting a license amendment request (LAR) during calendar year 2021. While the time period for the extension is not certain, ACO has indicated that it would not be more than 10 years (ACO, 2021). Because this action is reasonably foreseeable, the impacts of operation beyond the expiration of the contract in May 2022 are considered during this review.

### **1.1 The American Centrifuge Plant's License History and the Proposed License Amendment**

The licensing of the ACP in Piketon, Ohio, was initiated by the United States Enrichment Corporation Inc. (USEC). During a business restructuring, USEC became Centrus Energy Corp. (Centrus). The license was later transferred to a subsidiary of Centrus, the American Centrifuge Operating, LLC. At this time, the license is maintained by Centrus (NRC 2017b). ACO currently has two approved licenses (SNM-7003 and SNM-2011) for different projects on leased portions of the DOE reservation in Piketon, Ohio. The HALEU cascade would operate in existing buildings on adjacent grounds owned by DOE and leased by USEC.

The ACP's license history, ACO's current licenses and the proposed license amendment request are described in the remainder of this section. Much of the historical information provided below can be found in a publicly available archive document that was developed by NRC staff, "Historical Licensing Documents for the American Centrifuge Plant" (NRC 2017b).

### **1.1.1 License SNM-7003 for Lead Cascade Facility (LCF) – Issued in 2004**

What the license authorized: In February 2004, SNM-7003 was issued to USEC to operate a demonstration LCF. The objective was to obtain data on uranium enrichment using a gas centrifuge process on a limited scale, a new technology that had not been tested. The LCF was designed to provide information about reliability, performance, cost, and other parameters to determine whether to construct and operate a full-scale enrichment facility, the ACP (NRC 2004a). The license allowed for enrichment of uranium-235 up to 10 percent.

NRC Licensing Actions: NRC Materials License SNM-7003 authorized USEC to refurbish facilities for the installation, startup, and operation of a cascade of up to 240 full-scale gas centrifuge machines. These facilities had previously been used as a DOE centrifuge facility, which was abandoned in the 1980s. The license authorized a closed-loop cascade for research and development. The NRC published an Environmental Assessment (EA) with a finding of no significant impact (FONSI) on January 27, 2004 (NRC 2004a). The Safety Evaluation Report (SER) for this facility was issued on January 28, 2004 (NRC 2004b). Both documents evaluated the potential impacts of the construction, operation, and decommissioning of the LCF. In March 2016, ACO notified the NRC of Centrus Energy Corp's decision to cease operation at the LCF and to terminate SNM-7003. In May 2016, ACO submitted a proposed license amendment to downgrade licensed activities at the LCF to "Limited Operations," which removed "enrichment" from the authorized uses of NRC-regulated materials. NRC issued an approval to the license amendment in December 2016 (NRC 2016).

In January 2018, Centrus submitted a revised decommissioning plan for the LCF. The final status survey report for the facility was submitted in April 2018 and independent confirmatory surveys were conducted in May 2018. The staff approved the decommissioning plan in August 2018. A request to terminate the LCF license was submitted in August 2018 but was withdrawn in June 2019. By letter, ACO stated that they were retaining the LCF license for programmatic purposes only (ACO 2019).

Licensed Activities: From 2007 to 2016, the LCF operated up to 240 centrifuges demonstrating the production of low-enriched uranium (LEU) using centrifuge technology. In 2018, the LCF was decommissioned and dismantled; however, the license was not terminated and remains in effect.

### **1.1.2 License SNM-2011 for ACP – Issued in 2007**

What the license authorized: In April 2007, a 30-year license (SNM-2011) was issued to USEC to construct, operate, and decommission the ACP, a commercial-scale gas centrifuge uranium enrichment facility. The proposed facility would use centrifuge technology for enrichment of uranium-235 up to 10 percent for commercial nuclear power reactor fuel fabrication. The license authorized possession and use of SNM, source material, and byproduct material for operation of up to 11,500 centrifuges to enrich uranium-235 up to 10 percent, although enrichment would typically be between 2.5 and 5 percent. Although the ACP was designed to produce enrichment product up to 5 percent, the license was issued for up to 10 percent to allow for anticipated process fluctuations.

*NRC Licensing Actions:* The environmental impacts for the proposed ACP were evaluated in an environmental impact statement (EIS) (NUREG-1834) issued in April 2006. The ACP EIS anticipated 1,100 shipments of feed cylinders per year would arrive at the proposed ACP (NRC 2006b). The initial license application requested a 3.5 million separative work unit (SWU) facility with the expectation of expansion to 7 million SWU per year. Therefore, the ACP EIS considered the impacts of operation at 7 million SWU capacity. The NRC documented the safety and security reviews in the SER for the ACP (NUREG-1851) that was issued on September 11, 2006. The staff issued the license on April 13, 2007 (last amended on May 24, 2017) (NRC 2017a).

A Separative Work Unit (SWU) is a unit that defines the level of effort required to separate uranium-235 from uranium-238 during the uranium enrichment process. It represents the level of energy required to raise the concentration of uranium-235 to a specific level and is an indicator of the amount of enriched uranium (NRC 2006a).

*Licensed Activities:* The licensee undertook no construction or operational activities under the ACP.

### **1.1.3 License Amendment Request for License SNM-2011 (HALEU LAR)**

Many of the reactor designs being prepared for future deployment will require fuel that has a higher enrichment than is currently commercially produced. ACO's current license authorizes the enrichment of uranium to less than 10 percent. To support the contract with DOE to produce HALEU, ACO has requested an amendment to authorize enrichment up to 25 percent (ACO 2020b). While higher than the enrichment level previously authorized, 25 percent is far below the level required to make weapons or to power U.S. submarines and aircraft carriers, and for these reasons the enrichment level does not raise any security or proliferation concerns. HALEU fuel has many advantages that improve reactor performance. Because the uranium-235 is more concentrated, the fuel assemblies and reactors can be smaller, which will allow many types of small modular reactor designs to run on HALEU. Small modular reactors do not need to be refueled as often because they have a higher uranium-235 concentration and therefore have more potential energy available or higher "burnup" rates, and thus require less fuel and produce less waste (Centrus website 2020).

Under the current LCF license (SNM-7003), the licensee is authorized to purchase, assemble, and install the 16-centrifuge cascade in existing buildings previously used for the LCF. However, possession of licensed material and production of HALEU is not currently authorized under the existing LCF or ACP licenses. To support this DOE contract, ACO submitted a LAR for SNM-2011 to use and possess SNM to produce HALEU.

### **1.1.4 Scope of NRC Environmental Review of HALEU LAR**

The NRC's procedures governing the evaluation of the proposed amendment to the ACP are contained in Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," and applicable guidance found in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS [Office of Nuclear Material Safety and Safeguards] Programs" (NRC 2003). The HALEU LAR, if approved, would authorize ACO to enrich uranium-235 up to 25 percent. The HALEU cascade would be assembled in an existing building used previously as part of the LCF. In this EA, the NRC staff evaluates whether the changes proposed in the HALEU LAR would result in any new or additional environmental impacts that have not been analyzed in the previous LCF and ACP environmental reviews.

For the three-year contract period, DOE assumes all liability for the decontamination and decommissioning of facilities and equipment installed (ACO 2020a). In addition, the shipment and disposal of radiological waste generated during operation of the HALEU 16-centrifuge cascade would be the responsibility of the DOE. Potential waste streams that could be generated include low-level radioactive waste, low-level mixed waste, Resource Conservation and Recovery Act hazardous waste, sanitary/industrial waste, recyclable waste, and classified/sensitive waste. Waste generated by the proposed HALEU cascade would be collected, handled, packaged, segregated, stored, and shipped for offsite treatment and disposal in accordance with plant procedures and applicable State and Federal regulations.

The environmental impacts due to the construction and operation of the LCF and ACP to produce LEU were assessed by NRC in the LCF EA and ACP EIS (NRC 2004a and NUREG-1834, NRC 2006b, respectively). The LCF was a 240-centrifuge facility and the ACP a full-scale commercial centrifuge facility, both designed to enrich uranium-235 up to 10 percent. This EA evaluates whether operation of the 16-centrifuge HALEU cascade would result in any new and significant environmental impacts not previously evaluated as part of NRC's environmental reviews for ACP and LCF. Section 4.0 of this EA identifies potential environmental impacts for the proposed action and Table 4-1 summarizes the impacts determined during the current and prior environmental reviews.

### **1.1.5 Potential Future Actions**

Although the LAR requests authorization to operate the HALEU cascade to enrich uranium-235 to a higher enrichment level over a three-year period, ACO has stated that it will submit an additional license amendment for authorization to operate the HALEU cascade for an additional period of up to 10 years. (2020 LAR, 2021 consolidated ER) Because this action is reasonably foreseeable, the environmental impacts from up to an additional 10 years of operation are considered in this EA. The future license amendment to authorize operation up to an additional 10 years would require an application and environmental report be submitted to the NRC for review and approval. The NRC staff would conduct a safety and environmental review of the license amendment request.

ACO has also indicated that if a commercial market for HALEU develops, it would consider the modular addition of one or more 120 centrifuge HALEU and/or LEU cascades within the X-3001 building, to accommodate demand; however, this is too speculative at this time to be included in this review. If ACO decides to expand the number of HALEU cascades, an additional LAR would need to be submitted and reviewed by the NRC.

## **1.2 Proposed Action**

The proposed action is to authorize ACO to enrich uranium-235 to a higher enrichment level. Specifically, the amendment would increase the enrichment limit to 25 percent instead of the current limit of less than 10 percent. The amendment would allow ACO to demonstrate the capability to enrich uranium-235 up to the level necessary to produce HALEU for advanced reactors pursuant to a contract with DOE. The contract stipulates that ACO would provide DOE with up to 600 kilograms (kg) of HALEU in the form of uranium hexafluoride (UF<sub>6</sub>) for use in research and development for the civilian nuclear energy sector (ACO 2020a). The HALEU LAR proposes the reuse of existing LCF buildings and would not involve ground-breaking construction (ACO 2020a).

HALEU is a component of advanced nuclear reactor fuel, which is not currently commercially available. DOE anticipates that HALEU will be required to fabricate fuel for a number of advanced reactor designs currently under development in the commercial and government sectors. The HALEU cascade process is designed to enrich uranium to enrichment levels of less than 20 percent, although enrichment levels of up to 25 percent would be authorized under the proposed license amendment. Operational experience in centrifuge facilities demonstrates that small amounts of higher enriched material can occur during the uranium enrichment process. For this reason, the variance of the uranium-235 enrichment level of up to 25 percent is authorized to factor in small process fluctuations (ACO 2020a).

### **1.3 Purpose and Need for the Proposed Action**

ACO entered into a contract agreement with DOE to enrich uranium and produce HALEU fuel product for nuclear reactor fuel development. The LAR would allow ACO to demonstrate the capability to enrich uranium-235 up to the level necessary to produce HALEU for advanced reactors pursuant to a contract with DOE. The proposed action would generate up to 600 kg of HALEU for DOE to use in its research and development activities. In addition, the operation of the cascade would provide a domestic source of HALEU for possible use in future advanced reactors (ACO 2020a).

### **1.4 Site Location and Process Description**

The DOE reservation is in Pike County, Ohio, a rural, sparsely populated area in south-central Ohio. The nearest residential center, Piketon, lies about 6 kilometers (km) (4 miles [mi]) north of the site on U.S. Route 23 (see Figure 1-1). Waverly, the largest town in Pike County is located approximately 13 km (8 mi) north of the site. The largest cities within a 50 mi radius of the DOE reservation are Portsmouth, Ohio, (approximately 33 km [20 mi] to the south) and Chillicothe, Ohio (approximately 43 km [27 mi] to the north) (see Figure 1-2). Two major four-lane highways serve the Portsmouth Gaseous Diffusion Plant Reservation (PORTS) industrial site; U.S. Route 23 runs north-south and State Route 32/124 runs east-west (ACO 2017a).

#### **1.4.1 Uranium Enrichment Process**

Uranium ore usually contains approximately 0.72 percent uranium-235. This percentage is significantly less than the 4 to 5 percent uranium needed to fabricate fuel for commercial nuclear power plants currently in operation. Therefore, uranium must be enriched as part of the nuclear fuel cycle. Enrichment is the process of increasing the percentage of the naturally occurring and fissile uranium-235 isotope and decreasing the percentage of uranium-238 (NRC 2006). The LCF, ACP, and HALEU operations are designed to use gas centrifuge technology for the purpose of enrichment. All three processes use a series (cascade) of centrifuges, each of which contains a large rotating cylinder (rotor) and piping to feed  $UF_6$  gas into the centrifuge. To fuel one of today's commercial nuclear reactors, the uranium must be enriched so that the uranium-235 concentration, or "assay," is raised to between 4 and 5 percent; this is called LEU. After being processed in a cascade of centrifuges, separate enriched and depleted  $UF_6$  gas streams are withdrawn (see Figure 1-3). HALEU cascade operations would use a substantially smaller number of centrifuges of similar design as those used in the LCF. The HALEU cascade would achieve a higher enrichment with fewer centrifuges and produce a smaller quantity of material than the LCF. The  $UF_6$  feed to the HALEU cascade would be LEU  $UF_6$  with an enrichment of less than or equal to 5 percent uranium-235. This LEU feed material would be shipped in U.S. origin 30-B series cylinders that have a 2.5-ton capacity. Both product and tails materials would be owned by DOE and stored at the Piketon site until DOE has them removed.

Product material would be stored in 5-series cylinders and the tails material would be stored in 12-series cylinders (ACO 2020b).

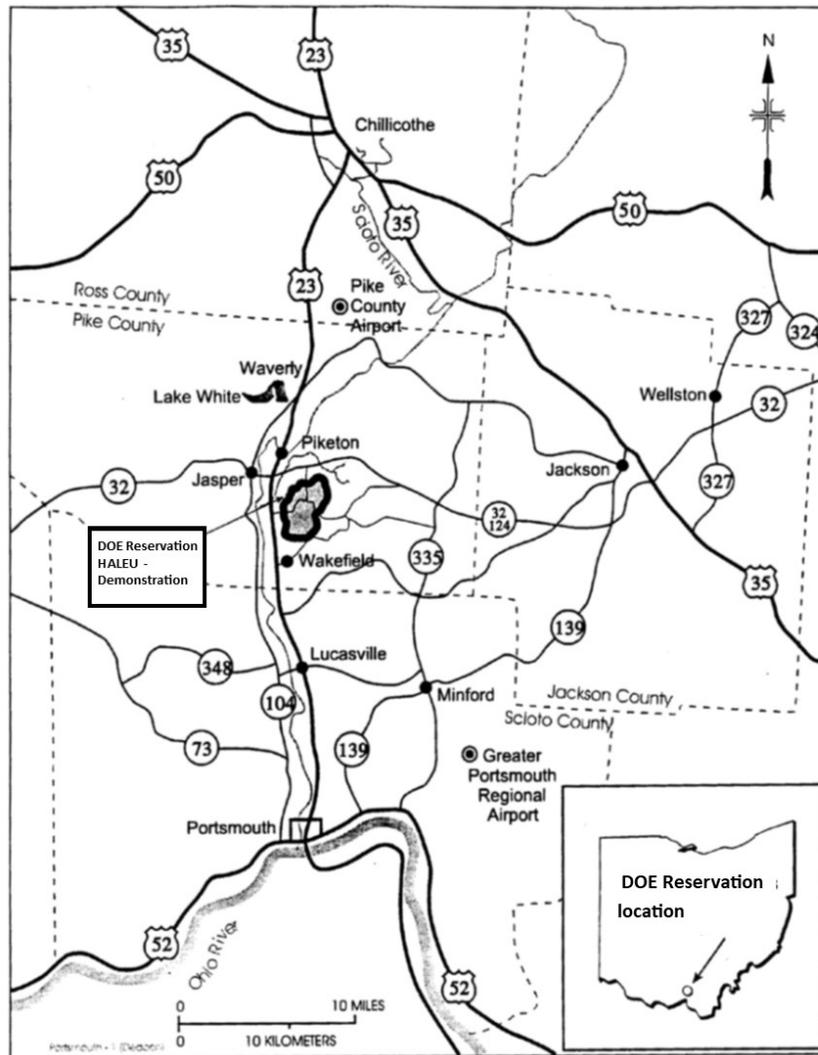


Figure 1-1 Location of the DOE Reservation, ACP, and HALEU Demonstration (ACO 2020a)

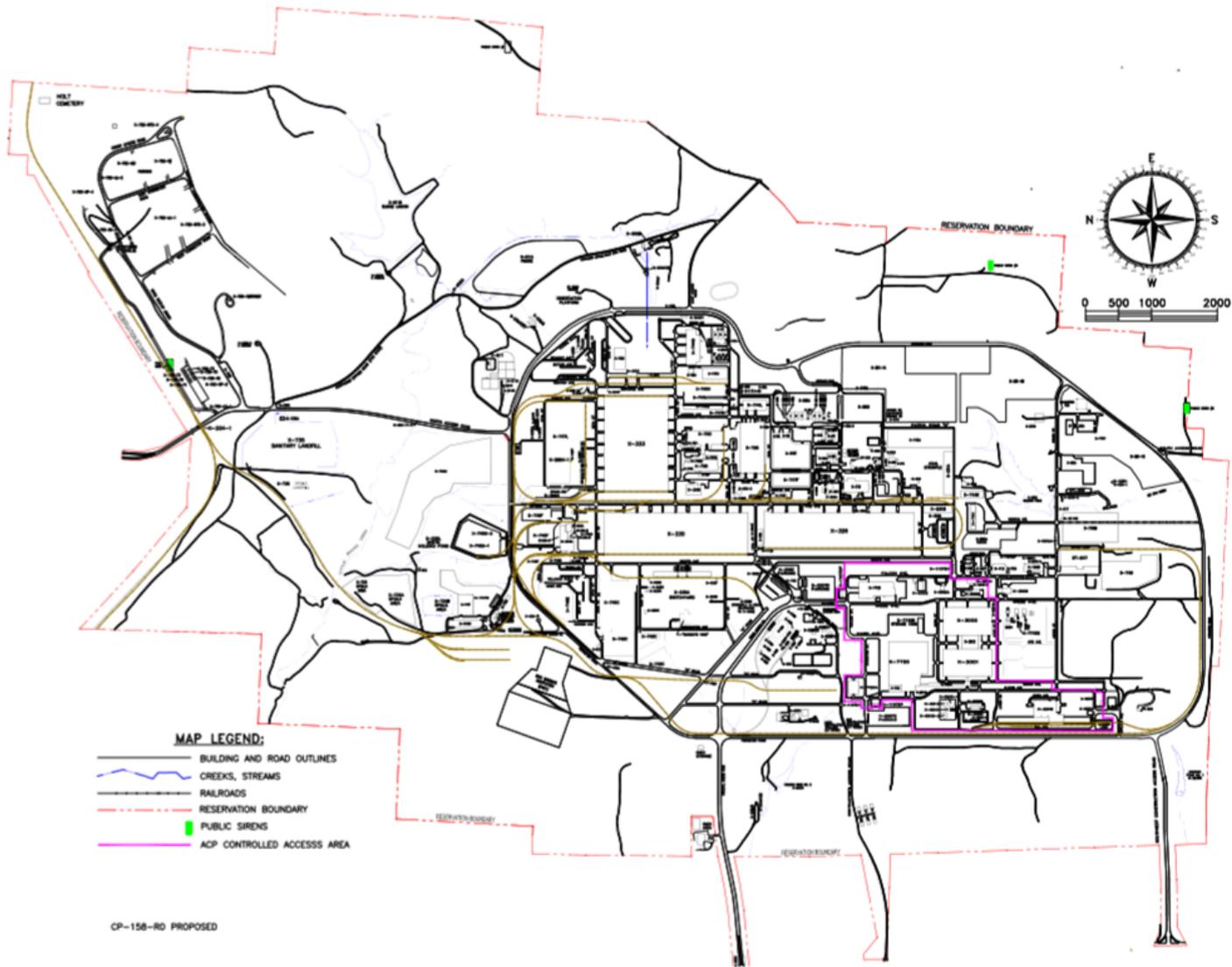
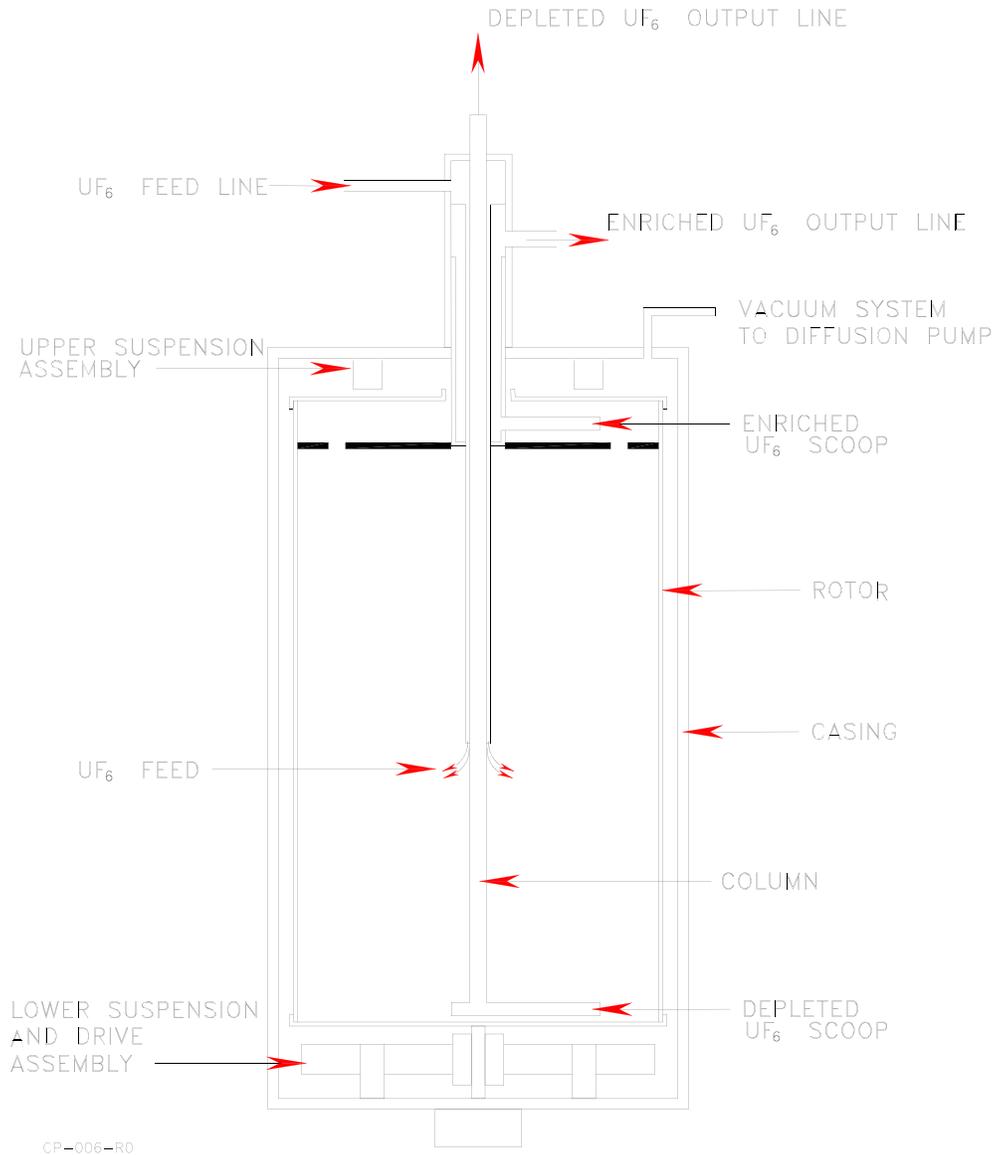


Figure 1-2 DOE Reservation – ACP-Controlled Access Area (ACO 2020a)



**Figure 1-3 Simplified Schematic of Centrifuges (ACO 2020a).** *Note: For the HALEU Demonstration, a molecular pump would be used instead of a diffusion pump.*

## 1.5 Scope of the Environmental Analysis

The NRC staff has addressed the potential environmental impacts of the proposed action to amend License SNM-2011, as well as the no-action alternative to the proposed action, and has documented the results of the assessment in this EA. The NRC staff performed this review in accordance with the requirements of 10 CFR Part 51 and staff guidance found in NUREG-1748 (NRC 2003).

The information contained in the following documents was reviewed and considered in the development of this EA:

- ACO's LAR, dated April 22, 2020 (ACO 2020a), which included the Environmental Report (ER), dated May 7, 2020 (ACO 2020b);

- the EA for decommissioning the LCF and terminating License SNM-7003, in which the NRC staff evaluated the potential environmental impacts associated with decommissioning (NRC 2018);
- ACP SER, which included the staff's review and safety and safeguards evaluation of USEC's application for a license to construct a gas centrifuge uranium enrichment facility and possess and use SNM source material and byproduct material;
- ACP EIS, which evaluated potential environmental impacts associated with the proposed ACP and its reasonable alternatives (NRC 2006a, 2006b);
- LCF SER, which included review and safety and safeguards evaluation of USEC's application for a license to possess and use SNM and source material in the American Centrifuge Lead Cascade Facility; and
- LCF EA, which evaluated potential environmental impacts associated with the proposed LCF and its reasonable alternatives (NRC 2004a, 2004b).

During both the LCF and ACP licensing actions, the NRC staff considered the impacts of the installation, construction, and operation of both the LCF and the ACP.

This EA evaluates whether changes in the proposed license amendment or new information regarding the affected environment would result in any new or significant environmental impacts. In conducting this review, the NRC staff considered the detailed resource descriptions in prior environmental review documents, including the ACP EIS (NRC 2006b) and the LCF EA (NRC 2004a).

## **2.0 ALTERNATIVE TO THE PROPOSED ACTION**

The alternative considered in this EA is the no-action alternative. Under the no-action alternative, the NRC would deny ACO's request to approve operation of the HALEU cascade. The no-action alternative would not meet the national energy goal and would provide no environmental advantage. Therefore, the NRC staff concludes that denying the amendment request is not a reasonable alternative.

### 3.0 AFFECTED ENVIRONMENT

The NRC staff evaluated the affected environment based on reviews of previous environmental reports (NRC 2004a, 2006b, 2018), subsequent operations, and current conditions. Although several environmentally sensitive areas lie within the larger DOE site, the areas where the HALEU cascade would operate are inside existing concrete-floored facilities previously used for the LCF process operations and are not near these environmentally sensitive areas. In addition, no new construction or land disturbance are expected (NRC 2004a; ACO 2020b).

Enrichment activities would occur primarily in a portion of Building X-3001, an approximately 28,242 square meter (303,994 square feet) building leased from DOE (NRC 2006b). Building X-3001 and the other buildings leased from DOE provide process and administrative support; centrifuge training and testing; centrifuge storage, handling, and assembly; and transporter storage and maintenance. An enclosed transfer corridor would be used to move the centrifuges between the process and testing buildings (ACO 2020a). These facilities compose approximately 10 percent of the 200-acre (ac) (81-hectare [ha]) ACP site. The site identified for the ACP is currently leased from the DOE and lies within the 3,700 ac (1,500 ha) DOE reservation. The DOE reservation is a highly developed industrial site identified by signs and fencing; gates are in place where public roads cross the site boundary. The area is largely treeless; grass and paved roadways cover most of the open space (ACO 2020b).

The licensee employed 67 workers at the time the LAR was submitted. The socioeconomic region of influence (ROI) consists of a four-county area in southern Ohio comprising Jackson, Pike, Ross, and Scioto Counties (ACO 2020b). This ROI has experienced negative growth over the last 10 years. The labor force decreased from 96,333 in 2008 to 84,186 in 2018, a growth rate of -12.6 percent for that period. Employment decreased less than the labor force, decreasing from 85,465 in 2008 to 82,108 in 2018, for a growth rate of -3.9 percent for that period. The ROI unemployment rate was 8.1 percent in 2008 and decreased to 6.0 percent as of 2018, which was higher than Ohio's average unemployment rate of 4.6 percent in 2018 (ACO 2020b). Using data from the 2019 American Community Survey (USCB 2020), the staff obtained a demographic profile of the population in the ROI (see Table 3-1).

Soil, surface water, sediment, groundwater, and air in and around the DOE reservation contain radionuclides and chemicals that are both naturally occurring and anthropogenic (i.e., human made), the latter from historical and current operations at the site (NRC 2006b). Humans are exposed to ionizing radiation from many sources in the environment. Radioactivity from naturally occurring elements in the environment is present in soil, rocks, and in living organisms. A major proportion of natural background radiation comes from naturally occurring airborne sources, such as radon. These natural radiation sources contribute approximately 300 mrem/yr total to the dose that everyone receives annually (NRC 2004a). Man-made sources also contribute to the average amount of dose a member of the U.S. population receives annually. These sources include x-rays for medical purposes (39 mrem/yr), nuclear medicine (14 mrem/yr), and consumer products (5 to 13 mrem/yr) (e.g., smoke detectors). A person living in the United States receives a current average dose of about 360 mrem/yr (NRC 2004a).

The site of HALEU cascade activities would be about 2200 feet (670 meters [m]) from the nearest member of the public (i.e., permanent residence) (ACO 2020a; NRC 2021a). At the DOE reservation, during normal operations, unrestricted areas are not exposed to any significant direct radiation sources. Gaseous effluents released to the air are the primary cause of public dose and are well within regulatory limits. The environmental radiological monitoring

program at the DOE reservation collects samples of air and conducts air modeling to detect releases of radionuclides and calculate the estimated maximum radiation dose (ACO 2020b). The average wind speeds are typically 3.6, 5.0, and 6.5 mph at the 10-, 30- and 60-meter levels, respectively, and the most frequent wind direction is from the south (ACO 2020b). Current air quality on the DOE site attains National Ambient Air Quality Standards (NAAQSs) for the criteria pollutants. Principal nonradiological NAAQS criteria pollutants would be limited to exhausts from four large (greater than 600 horsepower) stationary diesel engines, which would be used in the unlikely event of a power failure. Operation of the HALEU cascade would require that State and Federal regulations and/or permits for environmental monitoring of chemicals be followed (ACO 2020a).

In 2017 and 2018, air monitors located approximately 2.5 mi northeast of PORTS and adjacent to Zahn's Corner Middle School detected very low levels of two airborne radioactive isotopes, neptunium-237 and americium-241 (Columbus Dispatch 2021). According to press reports, enriched uranium was detected inside the school's air ducts and ceiling tiles. As a result, the middle school was closed in May 2019. In response to community concerns, DOE deployed a team of certified health physicists from DOE's National Laboratories and the National Nuclear Security Administration, accompanied by representatives of the Ohio Department of Health and interested members of the Piketon community. The team of radiation safety experts collected 44 surface samples, including specific areas requested by the community to be tested. Air samples also were collected from both inside and outside the school. Results from sample analyses showed no radioactivity detected above naturally occurring levels, and no cause for public health concern (DOE 2019). DOE stated that there was no public health or safety risk from radioactive material preventing Zahn's Corner Middle School from re-opening. DOE also committed to fund an independent third-party assessment for the Pike County community to include additional sampling and analysis to address community concerns; this assessment is expected to be completed by September 2021. At this time, Zahn's Corner Middle School remains closed (DOE website 2021).

The licensee maintains a log and summary of recordable occupational injuries and illnesses under the guidance of Occupational Safety and Health Administration 29 CFR Part 1904, "Recording & Reporting Occupational Injuries & Illnesses." There have been no industrial fatalities on the DOE reservation (ACO 2020b).

Potential waste streams generated include low-level radioactive waste, low-level mixed waste, Resource Conservation and Recovery Act hazardous waste, sanitary/industrial waste, recyclable waste, and classified/sensitive waste (ACO 2020b). Onsite sanitary wastewater is currently treated by the DOE Decontamination and Decommissioning contractor at the PORTS. Activities are coordinated by the licensee to minimize waste and prevent contamination. In the LAR, the licensee indicated that waste would be managed using existing DOE site-wide services. The management and disposal of radiological waste generated during the HALEU cascade operation is the responsibility of the DOE. Generated waste would be collected, packaged, and segregated into various waste streams for off-reservation disposal or treatment in accordance with applicable State and Federal regulations. Hazardous wastes generated onsite from operation of the HALEU cascade would not be stored on the site for more than a 90-day period. However, if waste requires onsite storage for more than 90 days, to enable the characterization, profiling, or scheduling of treatment or disposal, a Hazardous Waste Facility Permit would be required and must be requested at the appropriate time (ACO 2020a). Stormwater runoff currently flows to DOE reservation holding ponds and any future runoff from operation of the HALEU cascade would also flow to DOE reservation holding ponds (ACO

2020a). During normal operations, the HALEU cascade would have no impact on surface or groundwater resources (ACO 2020b).

Two major highways serve the DOE site: U.S. Route 23 runs north-south and State Route (SR) 32/124 runs east-west. The site is 5.6 km (3.5 mi) from the intersection of U.S. Route 23 and Ohio SR 32 interchange. Access from the site to U.S. Route 23 is via a four-lane interchange road that is closed to the public. On U.S. Route 23 at the entrance to the DOE site, the average daily traffic volume is 15,425 vehicles (ACO 2020b). U.S. Route 23 intersects Interstate (I)-270, I-70, and I-71 approximately 113 km (70 mi) north of the site. Access to I-64 is approximately 105 km (65 mi) southeast of the site, via U.S. Route 23 and U.S. Route 52 (ACO 2017b).

**Table 3-1 Demographic Profile of the Population in the Region of Influence (Data from U.S. Census Bureau, American Community Survey for 2019)**

	<b>Jackson County, OH</b>	<b>Pike County, OH</b>	<b>Ross County, OH</b>	<b>Scioto County, OH</b>	<b>State of Ohio</b>
Total Population	32,413	27,772	76,666	75,314	11,689,100
White	96.8%	95.8%	90.7%	94.4%	81.7%
Black or African American	0.7%	1.2%	5.6%	2.7%	13.1%
Asian	0.3%	0.3%	0.6%	0.4%	2.5%
American Indian and Alaskan Native	0.4%	0.6%	0.3%	0.5%	0.3%
Native Hawaiian and Other Pacific Islander	<0.1%	0.1%	<0.1%	<0.1%	0.1%
Persons Reporting Two or More Races	1.7%	2.0%	2.7%	1.9%	2.4%
Persons of Hispanic or Latino Origin	1.1%	1.1%	1.4%	1.4%	4.0%
White Persons not Hispanic	95.8%	95.0%	89.7%	93.2%	78.4%
Median Household Income (in 2018 dollars)	\$45,340	\$43,729	\$48,403	\$39,731	\$54,533
Per Capita Income in Past 12 Months (in 2018 dollars)	\$22,117	\$22,301	\$23,756	\$23,042	\$30,304
Persons in Poverty, %	16.8	20.5	18.4	22.6	13.9

## 4.0 ENVIRONMENTAL IMPACTS

In this section, the NRC staff presents its evaluation of the potential environmental impacts from the HALEU cascade operations. Staff reviewed the ER, LAR, and previous National Environmental Policy Act (NEPA) documents and NRC licenses related to ACP and LCF. The NRC staff independently evaluated changes in the proposed license amendment as well as new information regarding the affected environment that could result in new or significant environmental impacts from the proposed action on the various resources of the affected environment. The NRC staff used the guidelines outlined in NUREG-1748 (NRC 2003) in its evaluation of the environmental impacts from the proposed action on each resource. The NRC staff assessed whether the impact on resource areas from the changes in the proposed license amendment or new information regarding the affected environment is “significant” or “not significant” (NRC 2019).

Table 4-1 summarizes the impact determinations made by staff in the LCF EA (NRC 2004a), the ACP EIS (NRC 2006b), and the proposed action being evaluated in this EA. The environmental impact determinations from the LCF license (SNM-7003) and ACP license (SNM-2011) reviews are included in Table 4-1 because the HALEU cascade would use centrifuges and buildings authorized under the LCF license and because the operation of the HALEU cascade would be authorized under the ACP license. The NRC staff reviewed the previous environmental impacts determinations when assessing the changes requested in the HALEU LAR.

**Table 4-1 Impact Determination Summary for LCF, ACP, and HALEU Licensing Activities at DOE Piketon Facility**

Resource	2004 LCF EA Impact Determination	2006 ACP EIS Impact Determination	HALEU LAR Determination
Land Use	Small Impact	Small Impact	No Impact
Historic and Cultural	No Foreseen Impact	Small Impact	No Impact
Visual and Scenic	No Impact	Small Impact	No Impact
Air Quality	Not Significant	Small to Moderate <sup>(a)</sup> Impact	Not Significant – See Section 4.2 of this EA
Geology and Soils	No Foreseen Impact	Small Impact	No Impact
Water Resources	Little to No Impact	Small Impact	No Impact
Ecological Resources	No impact	Small Impact	No Impact
Socioeconomics	Small Impact	Small to Moderate <sup>(b)</sup> Impact	Not Significant – See Section 4.1 of this EA
Environmental Justice	No Input from 2004 EA	Small Impact	Not Significant – See Section 4.1 of this EA
Noise	No Input from 2004 EA	Small Impact	No Impact
Transportation	Minimal Impacts	Small to Moderate <sup>(a)</sup> Impact	Not Significant – See Section 4.3 of this EA

<b>Resource</b>	<b>2004 LCF EA Impact Determination</b>	<b>2006 ACP EIS Impact Determination</b>	<b>HALEU LAR Determination</b>
Public and Occupational Health and Safety	Dose within limits	Small	Not Significant – See Section 4.2 of this EA
Waste Management	Not significant	Small	Not Significant – See Section 4.2 of this EA
Cumulative Impacts	Not Significant	Small to Moderate Impact	Not Significant – See Section 4.4 of this EA

(a) Moderate impacts estimated during construction of facilities.  
(b) Moderate impacts due to cessation of the Paducah Gaseous Diffusion Plant.

The proposed action is described above in Section 1.2. The licensee would operate the HALEU cascade inside existing buildings, and no activities involving land disturbance are planned. As addressed in Table 4-1 and the sections below, the environmental impacts of the proposed HALEU cascade operation are not significant. The NRC staff finds that there would be no impacts from the proposed license amendment to the following resource areas: land use, geology and soils, water resources, ecology, meteorology, climate, noise, visual and scenic resources. Therefore, these resource areas are not covered below. The staff’s evaluation for each area where the staff found impacts to be “not significant” are described below.

#### **4.1 Demography, Socioeconomics, and Environmental Justice (EJ)**

Staff reviewed previous environmental evaluations, the licensee’s ER, and independent sources (e.g., Census Bureau data) and made an independent determination of the impacts of the HALEU LAR based on current socioeconomic and demographic information. In the ACP EIS, staff determined that there were 18 census tracts that had low-income populations and two census tracts that had minority populations using a 50-mile ROI from the site. Staff concluded that the EJ impacts of the proposed action would be small because the activities would not cause any disproportionately high and adverse impacts on minority or low-income populations (NRC 2006b).

The socioeconomic ROI for the HALEU LAR consists of a four-county area in southern Ohio comprising Jackson, Pike, Ross, and Scioto Counties (ACO 2020b). The NRC staff defined the socioeconomic ROI as the area in which almost 95 percent of the DOE reservation workforce and their families reside, spend their income, and use their benefits, thereby affecting economic conditions in the region.

A demographic profile of the population in the ROI was provided above in Table 3-1. These estimates show that minority populations in all four ROI counties are lower than the Ohio statewide average for the same population. The percentage of residents living below the poverty level for all four ROI counties is greater than the State average. However, to be considered an environmental justice population of interest, the percentage of the minority or low-income population in the census block group must either exceed 50 percent of the total population for that census block group or be at least 20 percentage points greater than the same minority or low-income population’s percentage in the respective State or county. The minority and low-income population percentage data were compared with the appropriate State and county counterparts. The analysis indicates that census block groups within the ROI do not have significant percentages of minority populations, nor do they have significant percentages of low-income households (ACO 2020b).

The licensee intends to transition employees from their current positions at the Piketon facility to support management, design, licensing, assembly, testing and evaluation, quality assurance, nuclear and radiological safety, and operational readiness assessment positions for the HALEU cascade. The transition of these employees would have little impact on local resources and earnings. The licensee level of effort would start with 30 full-time employees in the first year. Because these employees and their families are currently living in the ROI, the HALEU cascade would not significantly impact demand for K-12 educational infrastructure and services, or the local housing market (ACO 2020b). Therefore, the NRC staff does not expect any direct or indirect socioeconomic impacts and concludes that the demography and socioeconomic impact of the proposed action would not be significant.

For the anticipated license extension of up to 10 years, this determination is not expected to change because the licensee does not anticipate increasing the number of operating centrifuges and therefore would not need to significantly increase the number of employees living, working, and using local services in the immediate area.

## **4.2 Public and Occupational Health and Safety**

The Atomic Energy Act of 1954, as amended, requires the NRC to promulgate, inspect, and enforce standards that provide an adequate level of protection for public health and safety and the environment. The NRC has established multiple layers of radiation protection limits to protect the public against potential health risks from exposure to effluent discharges from nuclear facility operations. The activities authorized under the HALEU LAR must comply with NRC regulations and conditions specified in the license in order to operate, including 10 CFR Part 20, Subpart C, "Occupational Dose Limits for Adults," and 10 CFR Part 20, Subpart D, "Radiation Dose Limits for Individual Members of the Public." Atmospheric emissions of radionuclides from the DOE reservation are regulated under U.S. Environmental Protection Agency (EPA) regulations found under the National Emission Standards for Hazardous Air Pollutants, 40 CFR Part 61, Subpart H. The licensee committed to taking adequate environmental protection measures for the HALEU cascade, including (1) environmental and effluent monitoring, and (2) effluent controls to maintain public doses as low as reasonably achievable as part of the radiation protection program. ACO's proposed controls are adequate to protect the environment and the health and safety of the public and comply with the regulatory requirements.

### **4.2.1 Nonradiological Impacts from Normal Operations**

The NRC staff's previous environmental reviews considered the nonradiological impacts of the LCF and the ACP. The LCF EA found that operation of the lead cascade was not expected to significantly affect air quality. The NRC staff reached this finding based on the fact that air quality impacts resulting from operation of the PORTS site were within the regulatory requirements/emission standards and also because of the existence of construction and occupational safety management practices that were in place to limit impacts on air quality (NRC 2004a).

The ACP EIS found that full ACP operations would have a small nonradiological impact on public and occupational health and safety (NRC 2006b). The NRC staff reached this finding because air emissions that were expected to result from the operation of the 26 emergency diesel generators were well below the NAAQs for each criteria pollutant (NRC 2006b). The primary nonradiological air pollutant associated with the operation of the ACP was hydrogen fluoride (HF). Routine airborne emissions from the ACP were projected to result in a maximum

HF concentration of  $2.35 \times 10^{-3}$  micrograms per cubic meter at a building located onsite 555 m (1820 ft) from the proposed ACP buildings. This concentration is more than six orders of magnitude below the OSHA Permissible Exposure Limit (as an eight-hour average) of 2,500 micrograms per cubic meter for HF. (NRC 2006b).

For operation of the HALEU cascade, environmental monitoring of chemical parameters is required by State and Federal regulation and/or permits (ACO 2020b). The licensee states that exposures to chemical agents would be controlled by administrative and engineering methods and/or personal protective equipment. Extremely hazardous substances, such as fluorine or HF, would be stored and used in accordance with State regulations and permits. Precautions would be taken during the operations phase to avoid impacts from accidental discharges of fuel, waste, and sewage. These precautions, including the use of spill response plans, safety procedures, spill controls, countermeasure plans, and spill response equipment in accordance with Federal and State laws, would minimize the likelihood and severity of potential impacts from accidental discharges.

The area where the HALEU cascade would operate is inside existing concrete floor buildings enclosed with fencing and gates; consequently, public access to the site is limited. Therefore, direct exposure to chemicals is not a likely pathway of exposure for the public from the HALEU cascade under normal operations (ACO 2020b). The major nonradiological hazardous air emissions associated with the HALEU cascade would be HF. Offsite concentrations from projected airborne releases would be small and unlikely to affect the general public through dermal exposure or inhalation pathways (ACO 2020b).

The HALEU cascade operations could result in a slight increase in HF concentrations and a slight increase in emissions from standby electrical generators (ACO 2020b). An air dispersion model was used to calculate the annual average airborne emissions of HF (ACO 2020b; NRC 2021a). The annual average HF concentration for the HALEU cascade was calculated to be 0.00227 micrograms per cubic meter at the location of the maximally exposed individual (ACO 2020b). This is less than the 0.00235 micrograms per cubic meter that was evaluated for the full ACP at the same location (NRC 2006). The Occupational Safety and Health Administration (OSHA) has published a Permissible Exposure Limit for HF of 2500 micrograms per cubic meter for HF. The diesel generators would be used in the unlikely event of a power failure, and ACO estimates it would operate the diesel generators for no more than 500 hours per year for the HALEU cascade (ACO 2020b). The same estimate was used for the full ACP (NRC 2006). Therefore, the change in emissions from using the diesel generators in an emergency would have minimal, if any, impact on the affected environment. Therefore, based on the information reviewed, the NRC staff has determined that the nonradiological impacts of the proposed license amendment would not be significant.

For the anticipated license amendment request, no significant change in any annual HF concentrations or emissions are expected due to an additional period of operation of the HALEU cascade for up to 10 years. Therefore, continued operation would not result in any significant impact on air quality.

#### **4.2.2 Radiological Impacts from Normal Operations**

The NRC's previous reviews of the environmental impacts of the LCF and ACP considered the radiological impacts of operation of the lead cascade and a full commercial facility. The LCF EA determined that radiological impacts from operation of the lead cascade would not be significant. Specifically, the LCF EA found that radiological air emissions, onsite, and potential

offsite doses were well within the dose limits presented in 10 CFR Part 20 for workers (50 mSv/yr or 5000 mrem/yr) and members of the public (1 mSv/yr or 100 mrem/yr).

The ACP EIS found that the much larger, full-scale commercial ACP operations would have a small radiological impact on public and occupational health and safety (NRC 2006b). The NRC staff reached this finding based on the fact that the estimated doses to both workers and members of the public are well below the regulatory thresholds.

Operation of the HALEU cascade under the proposed amendment would result in similar but smaller amounts of radiological air emissions and doses than those evaluated for the LCF and ACP, because it would use a substantially smaller number of centrifuges of the same design as those used in the LCF. The HALEU cascade would achieve a higher enrichment with fewer centrifuges and produce a smaller quantity of material than the LCF. Therefore, the NRC concludes that operation of the HALEU cascade would not result in any greater radiological impacts than those evaluated in the LCF EA and the ACP EIS. Therefore, the NRC staff has determined that the radiological impacts from the proposed license amendment would not be significant.

The NRC has also considered new information regarding radiological impacts from operations at the DOE reservation on which the HALEU cascade would operate. Radiological environmental monitoring on the DOE reservation includes the monitoring of air, water, sediment, and biota (animals, vegetation, and crops), as well as the measurement of both radiological and chemical parameters. Environmental monitoring required by State and Federal regulations and/or permits has been conducted at the DOE reservation and provides information about radiological conditions at the site since the NRC staff's environmental reviews for the LCF and the ACP were conducted (ACO 2020b).

Based on the 2017 total radionuclide releases from DOE reservation operations, the radiation dose calculated to the maximally exposed individual (MEI) was 0.9 mrem/yr. This calculated MEI dose is much lower than the EPA standard of 10 mrem/yr and the NRC total effective dose equivalent limit of 100 mrem/yr. The maximum average uranium concentration at the ACP boundary was estimated to be a minimum of four orders of magnitude (i.e., ten thousand times) less than the occupational exposure standards (ACO 2020b). Based on this information, the NRC staff has determined that activities at the DOE reservation have not resulted in any new or significant circumstances affecting the proposed site where the HALEU cascade would operate.

For the anticipated license amendment request, impacts due to radiological emissions or potential onsite or offsite doses are not expected to change due to an additional period of operation of up to 10 years. Therefore, the extended period of operation would not result in a significant increase in estimated radiological doses or in emissions.

#### **4.2.3 Impacts from Accidents**

NRC regulations governing materials licensees authorized to possess a critical mass of special nuclear material, including the ACP, are designed to ensure that the high and intermediate accident scenarios would be highly unlikely. Under those regulations, ACO was required to prepare an Integrated Safety Analysis (ISA) for the ACP to demonstrate compliance with the performance requirements in 10 CFR 70.61 to limit the risk of credible high- and intermediate-consequence events, as well as nuclear criticality accidents. The NRC staff's SER for the ACP assessed the safety features and operating procedures required to reduce the risks from accidents. The combination of Items Relied on for Safety that mitigate emergency conditions,

and the implementation of emergency procedures and protective actions in accordance with the proposed Emergency Plan for the ACP, would limit the impacts of accidents that could otherwise extend beyond the proposed ACP boundaries. The Items Relied on for Safety include measures such as active and passive engineered controls. In the ACP EIS, the NRC staff analyzed a range of possible accidents selected for detailed evaluation from the ISA conducted by the licensee to assess the potential human health impacts associated with accidents. Based on this analysis, the staff determined that accidents at the proposed ACP would result in small to moderate impacts on workers, the environment, and the public.

ACO supplemented the ISA for the ACP in the LAR to address operation of the HALEU cascade. The NRC staff reviewed the supplemental information and did not identify any new types of accident sequences or increases in the likelihood or consequences beyond what had been previously evaluated for the ACP. Therefore, the NRC staff finds that the proposed amendment would not create a new or different type of accident or increase the risk of any accident previously evaluated. Accordingly, the proposed amendment will have no significant impact on potential releases. The NRC staff's ISA review is documented separately in the SER.

For the anticipated 10-year license extension, this is not expected to change as the licensee does not anticipate increasing the number of operating centrifuges and therefore would not need to significantly increase the number of employees living, working and using local services.

#### **4.2.4 Waste Management**

The NRC staff reviewed the environmental impacts of the LCF EA and the ACP EIS, which considered the waste management impacts of operation of the lead cascade and construction and operation of a full commercial facility, respectively. Both the LCF EA and the ACP EIS evaluated the environmental impacts of liquid waste, comprising sanitary waste and cooling water, both treated onsite, and radioactive and hazardous waste treated and/or disposed of at licensed facilities. In the LCF EA, the NRC staff found that the environmental impacts that could result from the proposed action for the LCF would not be significant. The ACP EIS stated that with the exception of depleted uranium, waste would be generated at volumes that are well within the site waste management capacities. Depleted uranium would be stabilized and shipped offsite. The ACP EIS identified that waste would be managed in accordance with existing procedures for controlling contaminant releases and exposures. Accordingly, the ACP EIS concluded that the environmental impacts of waste management would be small.

For both the lead cascade operation and the HALEU cascade operation, leakage or incidental spills of water are collected by the Liquid Effluent Collection (LEC) systems. The LEC systems consist of drains and underground collection tanks for the collection and containment of leaks and spills of chemically treated water. The tanks are monitored by liquid-level gauges mounted above grade. Water accumulated in the LEC tanks is sampled and analyzed prior to being disposed. If the contents meet the requirements of 10 CFR 20.2003, they may be pumped to the DOE reservation sanitary sewer system; otherwise the tank contents are containerized for off-reservation disposal. The laboratories used shall participate in appropriate performance testing programs and maintain appropriate certifications for the types of analyses requested. ACO is required to follow State and Federal regulations and/or permits for environmental monitoring of chemicals (ACO 2020b).

Potential waste streams that could be generated include low-level radioactive waste, low-level mixed waste, Resource Conservation and Recovery Act hazardous waste, sanitary/industrial waste, recyclable waste, and classified/sensitive waste. Waste generated by the proposed

HALEU cascade would be collected, handled, packaged, segregated, stored, and shipped for offsite treatment and disposal in accordance with plant procedures and applicable State and Federal regulations. The types of wastes generated during HALEU cascade operations are the same types generated during the LCF operation and evaluated in the LCF EA. Wastes from HALEU operations would be managed by the same or similar onsite waste management systems used during LCF operation. In addition, the license amendment would not result in any change in the type of or significant increase in the amounts of any effluents that may be released offsite (ACO 2020b). Therefore, the NRC staff concludes that the impacts of waste generated from the proposed license amendment would not be significant.

For the anticipated license amendment request, impacts of waste generated are not expected to change due to continued operation for an additional period up to 10 years. Therefore, continued operation would not result in a significant increase in the environmental impacts of waste generation at the site.

### **4.3 Transportation**

The NRC staff reviewed the environmental impacts of the LCF EA and ACP EIS, which considered the transportation impacts of operation of the lead cascade and a full commercial facility, respectively. The LCF EA estimated and evaluated 160 shipments to transport centrifuge components and determined the number of shipments were very small when compared to daily traffic volume (NRC 2004a). The ACP EIS estimated that 1100 feed shipments would be shipped annually to the ACP, evaluated that number of shipments, and determined transportation impacts from operation to be small. The ACP EIS also estimated there would be 2286 truckloads of construction-related material during the first 5 years of the license, evaluated that number of truckloads, and determined transportation impacts from construction to be small to moderate (NRC 2006b).

The potential transportation impacts during operation of the HALEU cascade would be due to feed shipments. The HALEU feed material would be shipped in U.S. origin 30-B series cylinders that have a 2.5-ton capacity. ACO would receive a very small fraction of the estimated feed shipments for the commercial ACP (NRC 2021a). The NRC staff evaluated the small number of additional feed shipments when compared to the 1100 feed shipments evaluated for the full ACP, as well as daily vehicular traffic, and concludes that there would not be a significant impact due to transportation activities from the proposed action.

For the anticipated license amendment request, seeking operation of the HALEU cascade for an additional period of up to 10-years, ACO estimates that three additional shipments of feed material per year would be necessary to meet the expected level of production. Transport of HALEU product is not expected to occur during the period of continued operation (NRC 2021a). Considering this small number of feed shipments, when compared to the daily vehicular traffic and the larger number of feed material shipments anticipated for the ACP, the NRC staff does not anticipate a significant impact due to transportation activities during the period of continued operation.

### **4.4 Cumulative Impacts**

The NRC staff evaluated the cumulative impacts of the proposed action and whether cumulative environmental impacts could result from the incremental impact of the proposed action when added to the past, present, or reasonably foreseeable future actions in the area. These actions principally included the LCF and ACP construction and operations. In 2004, the DOE

completed an EIS for the construction and operation of a conversion facility that converts tails for future off-reservation disposal (DOE 2004). The 2004 EIS considered ongoing activities on the DOE reservation, including construction and operation of the LCF and the ACP, as well as decontamination and decommissioning. The cumulative impacts determination found that exposure to potential releases would be within regulatory limits, and cumulative impacts identified for other resource areas evaluated could be small and positive, not present, or successfully mitigated using best management practices. The licensee expects to submit a LAR in 2021 to extend operation of the HALEU cascade for a period of up to 10-years. The purpose of this extension would be to continue to produce HALEU fuel product in preparation for commercial sales. ACO does not anticipate beginning commercial sales during the extended period of operation. Although the licensee is considering commercial production of HALEU in the future, it is uncertain whether the demonstration project would demonstrate that commercial production is feasible and whether there will be a need for this fuel product.

The full ACP, if built, would be located within existing buildings and possibly in newly constructed facilities on adjacent areas within the DOE reservation. Construction of new buildings was considered in the ACP EIS and impacts on land use, cultural and historic, scenic and visual resources were found to be small. Based on the analysis conducted as part of the ACP EIS, the NRC staff determined that impacts on air quality could exceed limits during a relatively short period of construction and were identified as being small to moderate. Fugitive dust emissions from excavation and grading during possible future construction would be mitigated using best management practices and dust suppression methods (e.g., water sprays and speed limits on dirt roadways), such that no significant air quality impacts are expected. Emissions from heavy equipment should not significantly affect air quality but would result in a temporary increase in volatile organic compound emissions (ACO 2020b).

In the ACP EIS, the NRC staff determined that impacts on water quality would be small during construction because standard soil erosion control methods (e.g., silt fencing) would be used. Work would be planned to minimize excavated or graded areas. No potential exposure pathway to workers or the public should occur (ACO 2020b).

The licensing of the ACP for commercial production of HALEU would follow NRC's licensing process and additional safety and environmental reviews would be undertaken as part of these future licensing actions. The NRC staff has determined that the proposed action would not have a significant impact on environmental resources. Therefore, the NRC staff concludes that the proposed HALEU cascade would not significantly contribute to potential cumulative impacts when added to the past, present, or reasonably foreseeable future actions.

## **5.0 AGENCIES AND PERSONS CONSULTED**

The NRC staff consulted with other agencies regarding the proposed action in accordance with NUREG-1748 (NRC 2003). These consultations were undertaken to (1) assure that the requirements of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and Section 7 of the Endangered Species Act (ESA) of 1973 were met, and (2) provide the designated Federal and State liaison agencies the opportunity to comment on the proposed action. On January 25, 2021, a copy of the draft EA was emailed to the Ohio Department of Health (ODH) and EPA Region V for comment (NRC 2021b and c, respectively). EPA responded in an email on February 24, 2021, stating that they had received and reviewed the draft EA and had no comments (EPA 2021). No response was received from ODH.

### **5.1 National Historic Preservation Act**

The NHPA was enacted to create a national historic preservation program, including the National Register of Historic Places and the Advisory Council on Historic Preservation. NHPA Section 106 requires Federal agencies to consider the effects of their undertakings on historic properties. NHPA implementing regulations at 36 CFR Part 800, "Protection of Historic Properties," define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license, or approval." Therefore, the NRC's approval of this proposed HALEU LAR constitutes a Federal undertaking. After reviewing the HALEU LAR, the NRC staff determined the proposed action would not involve any land disturbance on the DOE reservation and therefore will not have the potential to affect historic properties assuming such historic properties are present.

The NRC staff contacted the Ohio State Historic Preservation Office (OH SHPO) by email dated July 30, 2020, informing them of the undertaking and the NRC determination. The record of this email and the SHPO's acknowledgement is in the Agency-wide Documents Access and Management System (ADAMS) records management system (NRC 2020).

### **5.2 The Endangered Species Act**

Under ESA Section 7 and through its implementing regulations (50 CFR Part 402, Subpart B), prior to taking a proposed action, a Federal agency must determine whether (1) endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action, and, if so, whether (2) the proposed Federal action may affect listed species or critical habitats. If the proposed action may affect listed species or critical habitats, the Federal agency is required to consult with the U.S. Fish and Wildlife Service (FWS) and/or the U.S. National Marine Fisheries Service. The FWS has instituted a process that streamlines their environmental review process. The FWS implemented a web-based project planning tool, called Information for Planning and Consultation (IPaC). The IPaC tool provides information to Federal agencies, State agencies, and the public to assist in the assessment of how proposed Federal activities may affect sensitive natural resources, and when appropriate, suggests ways to address these impacts. After a Federal agency uses the IPaC website process, the local FWS office issues a letter to assist the agency's evaluation of the project's potential impacts on threatened and endangered species and critical habitats within the project area.

A project-specific official species list is attached to the letter. The project-specific list identifies the species and critical habitats that should be considered under ESA Section 7.

The NRC staff used the FWS's IPaC website to obtain an official species list for the DOE reservation area (FWS 2020). Table 5-1 lists species that may be present in the area of the proposed action.

**Table 5-1 Listed Species that May Be Present in the Area of the HALEU Cascade**

	Name	Status
Mammals	Northern Long-eared Bat	Threatened
	Indiana Bat	Endangered
Flowering Plants	Running Buffalo Clover	Endangered
	Small Whorled Pogonia	Threatened
	Virginia Spiraea	Threatened
Critical habitats	None	

In preparing the LCF EA, the NRC consulted with the FWS and determined that operation of the LCF would not affect listed species or critical habitat. As noted in the LCF EA, the LCF is in an industrial area, and a favorable habitat does not exist for species of concern as identified by the FWS (NRC 2004a).

The LCF EA (NRC 2004a) for construction and the LCF decommissioning EA (NRC 2018) both examined the same industrial area for the proposed action; each EA noted that a favorable habitat did not exist on the DOE site for species of concern. In addition, the proposed action would not result in construction activities or land disturbance. Accordingly, consistent with guidance provided in NUREG-1748, the NRC determined that even if listed endangered or threatened species or their critical habitats were now present in the vicinity of the HALEU cascade, the proposed action would not affect such species or their habitats. To confirm/update the most recent 2018 findings, the NRC staff obtained an official species list from FWS as discussed above. The result of that consultation effort was a *no effect determination* (FWS 2020). Therefore, the NRC has determined that no further consultation is required under Section 7 of the ESA.

## **6.0 CONCLUSION AND FINDING OF NO SIGNIFICANT IMPACT**

Based on its review of the proposed action, in accordance with the requirements of 10 CFR Part 51, the NRC staff has determined that amendment of NRC License SNM-2011, authorizing the operation of the HALEU cascade to enrich uranium-235 to a higher enrichment level, would not significantly affect the quality of the human environment. Approval of the proposed action is not expected to result in new construction. The HALEU cascade would be assembled and operated in existing buildings that previously housed a similar system under the LCF license.

The NRC staff determined that under 10 CFR 51.31, the preparation of an EIS is not required for the proposed action and that a FONSI is appropriate under 10 CFR 51.32.

## **7.0 LIST OF PREPARERS**

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- Jean Trefethen Office of Nuclear Material Safety and Safeguards, U.S. NRC

## 8.0 REFERENCES

10 CFR Part 20. Title 10 of the *Code of Federal Regulations*, Energy, Part 20, Standards for Protection Against Radiation. U.S. Nuclear Regulatory Commission, Washington, D.C.

10 CFR Part 51. Title 10 of the *Code of Federal Regulations*, Energy, Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions. U.S. Nuclear Regulatory Commission, Washington, D.C.

10 CFR Part 70. Title 10 of the *Code of Federal Regulations*, Energy, Part 70, Domestic Licensing of Special Nuclear Material. U.S. Nuclear Regulatory Commission, Washington, D.C.

29 CFR Part 1904. Title 29 of the *Code of Federal Regulations*, Labor, Part 1904, Recording and Reporting Occupational Injuries and Illnesses. Occupational Safety and Health Administration, Department of Labor, Washington, D.C.

36 CFR 800. Title 36 of the *Code of Federal Regulations*, Parks, Forests, and Public Property, Part 800, Protection of Historic Properties. Advisory Council on Historic Preservation, Washington, D.C.

40 CFR Part 61. Title 40 of the *Code of Federal Regulations*, Protection of Environment, Part 800, National Emission Standards for Hazardous Air Pollutants. U.S. Environmental Protection Agency, Washington, D.C.

50 CFR 402. Title 40 of the *Code of Federal Regulations*, Wildlife and Fisheries, Part 800, Interagency Cooperation—Endangered Species Act of 1973, As Amended. United States Fish and Wildlife Service, Department of the Interior, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, Washington, D.C.

ACO (American Centrifuge Operating, LLC). 2017a. Supplemental Information for Shipment of American Centrifuge Lead Cascade Facility Classified Matter and/or Contaminated Waste for Disposal, March 10, 2017. ADAMS Accession No. ML17087A285.

ACO (American Centrifuge Operating, LLC). 2017b. RAIs and Responses for Centrus ACP March 23, 2017. ADAMS Package Accession No. ML17107A384.

ACO (American Centrifuge Operating, LLC). 2019. *Request for Approval of the Final Status Survey Report*, June 2019. ADAMS Accession No. ML19172A105.

ACO (American Centrifuge Operating, LLC). 2020a. *License Amendment Request Application and Supporting Documents*, April 2020. ADAMS Accession Nos. ML20125A103, ML20125A108 and ML20125A116.

ACO (American Centrifuge Operating, LLC). 2020b. *Environmental Report for the American Centrifuge Plant in Piketon, Ohio*, May 2020. ADAMS Accession Nos. ML20139A098 and ML20139A097.

ACO (American Centrifuge Operating). 2021. Consolidated License Amendment Request Application and supporting documents, May 2021. ADAMS Accession No. ML21152A073.

Atomic Energy Act of 1954, as amended. 42 U.S.C. §§ 2011-2021, 2022-2286i, 2296a-2297h-13.

Centrus website. High-Assay Low-Enriched Uranium. Accessed on December 8, 2020 from: [https://www.centrusenergy.com/what-we-do/nuclear-fuel/high-assay-low-enriched-uranium/#:~:text=High%2Dassay%20low%2Denriched%20uranium%20\(HALEU\)%20has%20a,advantages%20that%20improve%20reactor%20performance](https://www.centrusenergy.com/what-we-do/nuclear-fuel/high-assay-low-enriched-uranium/#:~:text=High%2Dassay%20low%2Denriched%20uranium%20(HALEU)%20has%20a,advantages%20that%20improve%20reactor%20performance).

Columbus Dispatch website. 2020. *Pike school district asks feds to move middle school away from radiation*. Accessed on January 21, 2021 from: <https://www.dispatch.com/story/news/local/2020/09/01/pike-county-school-district-asks-feds-to-move-middle-school-away-from-radiation/113641168/>

DOE (U.S. Department of Energy). 2004. *Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility*, DOE/EIS-0360, June 2004.

DOE (U.S. Department of Energy). 2019. *U.S. Department of Energy Portsmouth/Paducah Project Office Sampling Analysis Report for Zahn's Corner Middle School Sampling Event*, July 2019. Accessed on January 21, 2021 from: <https://www.energy.gov/pppo/downloads/sampling-analysis-report-zahns-corner-middle-school-sampling-event>

DOE website. 2021. *Portsmouth Environmental Monitoring*. Accessed on January 21, 2021 from: <https://www.energy.gov/pppo/portsmouth-site/portsmouth-environmental-monitoring>

Endangered Species Act of 1973 (ESA), as amended. 16 U.S.C. ch. 35 § 1531 et seq.

EPA (U.S. Environmental Protection Agency). 2021. Email transmitting comments on the draft EA for Centrus HALEU Demonstration to NRC. ADAMS Accession No. ML21057A257.

FWS (U.S. Fish and Wildlife Service). 2020. *FWS List of Threatened and Endangered Species that May Occur with Respect to the ACO HALEU Demonstration Project License Amendment Request*, July 22, 2020. ADAMS Accession No. ML20205L357.

National Environmental Policy Act of 1969, as amended (NEPA). Public Law 91–190; 42 U.S.C. § 4321 et seq.

National Historic Preservation Act of 1966, as amended (NHPA). Public Law 102-575; 16 U.S.C. 470.

NRC (U.S. Nuclear Regulatory Commission). 2003. *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*. NUREG-1748, Office of Nuclear Material Safety and Safeguards, Washington, D.C. ADAMS Accession No. ML032450279.

NRC (U.S. Nuclear Regulatory Commission). 2004a. *Environmental Assessment of the USEC, Inc. American Centrifuge Lead Cascade Facility in Piketon, Ohio*. Washington, D.C. January 2004. ADAMS Accession No. ML040210751.

NRC (U.S. Nuclear Regulatory Commission). 2004b. *Safety Evaluation Report for the Lead Cascade Facility in Piketon, Ohio*. Washington, D.C. January 2004. ADAMS Accession No. ML040280554.

NRC (U.S. Nuclear Regulatory Commission). 2006a. *Safety Evaluation Report for the American Centrifuge Plant in Piketon, Ohio*. NUREG-1851, Office of Nuclear Material Safety and Safeguards, Washington, D.C. September 2006. ADAMS Accession No. ML062700087.

NRC (U.S. Nuclear Regulatory Commission). 2006b. *Environmental Impact Statement for the Proposed American Centrifuge Plant in Piketon, Ohio*, Final Report, NUREG-1834, Vol. 1. Office of Nuclear Material Safety and Safeguards, Washington, D.C. April 2006. ADAMS Accession No. ML061250131.

NRC (U.S. Nuclear Regulatory Commission). 2007. *License for the USEC Inc. American Centrifuge Plant (TAC Nos. L32306 Safety, L32307 Environmental, and L32308 Safeguards), with enclosure License SNM-2011*, April 13, 2007. ADAMS Accession No. ML070400284.

NRC (U.S. Nuclear Regulatory Commission). 2016. *Approval of License Amendment Request to Remove Authorization to Enrich Uranium at the American Centrifuge Lead Cascade Facility (Cost Activity Code: L34372)*, December 23, 2016. ADAMS Accession No. ML16330A249.

NRC (U.S. Nuclear Regulatory Commission). 2017a. *License for the American Centrifuge Operating, LLC, License Number SNM-7003, Amendment 12*, May 24, 2017. ADAMS Accession No. ML17136A383.

NRC (U.S. Nuclear Regulatory Commission). 2017b. *Historical Licensing Documents for the American Centrifuge Plant*, ADAMS Accession No. ML17102A995.

NRC (U.S. Nuclear Regulatory Commission). 2018. *Environmental Assessment for the Request for Review and Approval of an Updated Decommissioning Plan Under US NRC License Number SNM-7003 for the American Centrifuge Lead Cascade Facility in Piketon, Ohio*. July 2018. ADAMS Accession No. ML18204A294.

NRC (U.S. Nuclear Regulatory Commission). 2019. *Memo from S. Imboden, NRC, to C. Roman, NRC, regarding Clarification of Terms Used for Determining Significance of Environmental Impacts in Environmental Assessments and Environmental Impact Statements*. Washington, D.C. July 25, 2019, ADAMS Accession No. ML19071A033.

NRC (U.S. Nuclear Regulatory Commission). 2020. Email conversation between J. Trefethen, NRC and Diane Welling, Ohio SHPO, re: Courtesy notification of NRC review of American Centrifuge License Amendment request. July 30, 2020. ADAMS Accession No. ML20237F290.

NRC (U.S. Nuclear Regulatory Commission). 2021a. Centrus Energy Corp. Environmental Report Additional Information. ADAMS Accession No. ML21019A270.

NRC (U.S. Nuclear Regulatory Commission). 2021b. Email transmitting the draft EA for Centrus HALEU Demonstration to ODH. ADAMS Accession No. ML21048A032.

NRC (U.S. Nuclear Regulatory Commission). 2021c. Email transmitting the draft EA for Centrus HALEU Demonstration to EPA Region V. ADAMS Accession No. ML21047A242.

Resource Conservation and Recovery Act of 1976. 42 U.S.C. ch. 82 § 6901 et seq.

USCB (U.S. Census Bureau). 2020. 2019 QuickFacts for Pike County, Ohio; Ross County, Ohio; Scioto County, Ohio; and Jackson County, Ohio. Accessed on October 2, 2020, from [www.census.gov/quickfacts](http://www.census.gov/quickfacts).