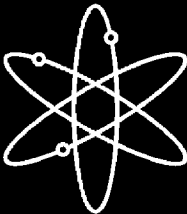




# **Environmental Impact Statement for the Proposed American Centrifuge Plant in Piketon, Ohio**



**Final Report**



**U.S. Nuclear Regulatory Commission  
Office of Nuclear Material Safety and Safeguards  
Washington, DC 20555-0001**



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## **Final Report**

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**Division of Waste Management and Environmental Protection  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**



## ABSTRACT

USEC Inc. (USEC) has submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a license to construct, operate, and decommission the American Centrifuge Plant (ACP), a gas centrifuge uranium enrichment facility located on the U.S. Department of Energy (DOE) reservation in Piketon, Ohio. The American Centrifuge Plant, if licensed, would enrich uranium for use in commercial nuclear fuel for power reactors. Feed material would be comprised of non-enriched uranium hexafluoride (UF<sub>6</sub>). USEC proposes to enrich uranium up to 10 percent by weight of uranium-235. The initial license application is for a 3.5 million separative work unit<sup>1</sup> (SWU) per year facility. Because USEC indicated the potential for future expansion to 7.0 million SWU per year, the environmental review looks at the impacts from a 7.0 million SWU per year facility. The proposed ACP would be licensed in accordance with the provisions of the *Atomic Energy Act*. Specifically, an NRC license under Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70 would be required to authorize USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP site.

This Environmental Impact Statement (EIS) was prepared in compliance with the *National Environmental Policy Act* and the NRC regulations for implementing the Act. This EIS evaluates the potential environmental impacts of the proposed action and its reasonable alternatives. This EIS also describes the environment potentially affected by USEC's proposal, presents and compares the potential environmental impacts resulting from the proposed action and its alternatives, and describes USEC's environmental monitoring program and mitigation measures.

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<sup>1</sup> SWU relates to a measure of the amount of work used to enrich uranium.

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## EXECUTIVE SUMMARY

### BACKGROUND

The U.S. Nuclear Regulatory Commission (NRC) is considering whether to issue a license, pursuant to Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70, that would allow USEC Inc. (USEC) to possess and use byproduct material, source material, and special nuclear material at a proposed gas centrifuge uranium enrichment facility near Piketon, Ohio. The scope of activities to be conducted under the license would include the construction, operation, and decommissioning of the proposed plant, which is called the American Centrifuge Plant (ACP). This licensing action would be taken in response to an application filed with the NRC by USEC by letter dated August 23, 2004. To support its licensing decision on the proposed ACP, the NRC determined that an Environmental Impact Statement (EIS) is required by the NRC's implementing regulations in 10 CFR Part 51 for the *National Environmental Policy Act* (NEPA).

The enriched uranium produced at the proposed ACP would be used to manufacture nuclear fuel for commercial nuclear power reactors. Enrichment is the process of increasing the concentration of the naturally occurring and fissionable uranium-235 isotope. Uranium ore usually contains approximately 0.72 weight percent uranium-235. In order to be useful in nuclear power plants as fuel for electricity generation, the uranium must typically be enriched up to 5 weight percent.

### THE PROPOSED ACTION

The proposed action considered in this EIS is for the NRC to issue a license that would authorize USEC to possess and use special nuclear material, source material, and byproduct material at the ACP, a gas centrifuge uranium enrichment facility proposed to be located on the U.S. Department of Energy (DOE) reservation near Piketon, Ohio. Piketon is between Chillicothe and Portsmouth, Ohio, approximately 113 kilometers (70 miles) south of Columbus, Ohio. If a license is issued, USEC would construct, operate, and decommission the proposed ACP. The ACP would be located at the same site as DOE's Portsmouth Gaseous Diffusion Plant, which has been shut down since May 2001. The ACP would consist of refurbished existing buildings, newly constructed facilities, and adjacent grounds owned by DOE and leased by USEC.

In its license application, USEC indicated that the proposed ACP would utilize centrifuge technology to enrich uranium-235 up to 10 weight percent, although enrichment would typically be between 2.5 and 5 weight percent uranium-235. The license application is for a 3.5 million separative work units (SWU) per year facility. However, because USEC indicated the potential for future expansion to 7 million SWU per year, this EIS examines the potential impacts of a full 7-million SWU facility. Depending on the timing of the NRC licensing process and other factors, USEC plans to start construction of the proposed ACP in 2007, begin commercial centrifuge operations in 2009, and ramp up to the 3.5 million SWU design capacity by 2011. The NRC license, if granted, would be for a period of 30 years. After the proposed ACP becomes operational, production of enriched uranium would ultimately cease at the gaseous diffusion plant in Paducah, Kentucky and be replaced by the proposed new gas centrifuge process at Piketon.

## **PURPOSE AND NEED FOR THE PROPOSED ACTION**

The purpose of the proposed action would be to allow USEC to construct and operate a plant to enrich uranium up to 10 percent by weight of uranium-235, with an initial production capacity of 3.5 million SWU per year potentially expandable to 7 million SWU per year, using gas centrifuge technology at the DOE reservation in Piketon, Ohio. The proposed action is intended to satisfy the overall need for an additional reliable and economical domestic source of enriched uranium and to replace existing aging and less efficient uranium enrichment facilities.

For the purpose of this EIS, the need for the proposed ACP can be organized more specifically into: (1) the need for enriched uranium to fulfill electricity requirements; (2) the need for domestic supplies of enriched uranium for national energy security; and (3) the need for upgraded uranium enrichment technology in the U.S. The proposed action fulfills each of these needs as explained below.

By 2020, the U.S. is estimated to need about 393 gigawatts or 393,000 megawatts of new generating capacity. To meet this growing demand, installed nuclear-generating capacity in the U.S. is projected to increase from approximately 98 gigawatts (98,000 megawatts) in 2001 to about 103 gigawatts (103,000 megawatts) in 2025, which is the equivalent of about five large nuclear power reactors. While this demand for enriched uranium is going up, the supplies of enriched uranium currently used in the U.S. are on the decline. In particular, the Megatons-to-Megawatts program, which currently supplies approximately 42 percent of the U.S.'s enriched uranium needs by "down blending" uranium from dismantled nuclear warheads from Russia, is only planned to continue until 2013. Enriched uranium will have to come from one or more new sources, such as the proposed ACP, to fulfill the shortfall in supply that may exist after that time.

Foreign sources currently provide as much as 86 percent of U.S. enriched uranium needs. This includes 42 percent from the Megatons-to-Megawatts program with Russia as noted above, along with 44 percent from other countries that produce and export enriched uranium to the U.S., including China, France, Germany, the Netherlands, and the United Kingdom. The only uranium enrichment facility currently operating in the U.S. is the Paducah Gaseous Diffusion Plant. The other gaseous diffusion plant ceased operation in 2001, and is currently in cold stand-by status. A supply disruption with the Paducah plant production could impact national energy security because domestic commercial reactors, which currently supply approximately 20 percent of the nation's electricity requirements, would be fully dependent on foreign sources for enriched uranium. The proposed ACP, therefore, would help decrease this dependence on foreign sources and improve the nation's national energy security.

In addition to advancing national energy security goals, development of the proposed ACP would help accomplish the goals of the June 17, 2002 DOE-USEC Agreement to "facilitate the deployment of new, cost effective advanced enrichment technology in the U.S. on a rapid schedule." It would enable USEC to construct and operate a modern, more efficient, less costly enrichment plant to supplement and replace its more than 50-year old gaseous diffusion plants. Gas centrifuge technology represents a more efficient and less energy intensive uranium enrichment technology than the gaseous diffusion technology currently in use. According to USEC, the energy requirements of a gas centrifuge plant are about five percent of that required by a comparably sized gaseous diffusion plant, resulting in considerably lower operating cost.

## **ALTERNATIVES**

This EIS evaluates the potential environmental impacts of several alternatives, including the no-action alternative. Under the no-action alternative, the proposed ACP would not be constructed, operated, and decommissioned at the DOE reservation in Piketon, Ohio. Enriched uranium needs would continue to be met with existing domestic and foreign uranium enrichment suppliers. Any future uses of facilities and grounds currently proposed for the ACP would be up to USEC and DOE, but would be expected to include similar activities within the nuclear fuel cycle, consistent with USEC's and the reservation's history and mission.

The NRC staff considered several alternatives to fulfill domestic enrichment needs:

- (1) Construct and operate the ACP at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky;
- (2) Construct and operate the ACP at alternative locations at the DOE reservation in Piketon, Ohio;
- (3) Down blend highly enriched uranium instead of constructing a domestic uranium enrichment plant;
- (4) Re-activate the Gaseous Diffusion Plant at the DOE reservation in Piketon; and
- (5) Purchase low-enriched uranium from foreign sources.

These alternatives were eliminated from further consideration in this EIS because they either did not offer any environmental advantage over the proposed action, or did not meet the need for a reliable, economical source of domestic uranium enrichment.

The NRC staff also considered alternative technologies to the proposed gas centrifuge process. These technologies included the electromagnetic isotope separation process, liquid thermal diffusion, atomic vapor laser isotope separation, and the separation of isotopes by laser excitation. These technologies, however, are not economically viable or remain at the research developmental scale and were thus eliminated from further consideration.

## **POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION**

Potential environmental impacts of the proposed action are evaluated in Chapter 4 of this EIS and summarized below. The environmental impacts from the proposed action are generally SMALL, although they could be as high as MODERATE in the areas of air quality, socioeconomics, and transportation. Methods for mitigating the potential impacts are described in Chapter 5. Environmental monitoring methods are described in Chapter 6.

### **Land Use**

Small Impact. Site preparation and construction activities would occur on approximately 22 hectares (55 acres) of land, which comprises about one percent of the total 1,497 hectare (3,700 acre) DOE reservation. These changes would convert previously disturbed land (e.g., managed lawns, fields, and forests) on the DOE reservation to developed areas. The land is not considered prime farmland, and changes would be consistent with current land use. It is anticipated that after decommissioning activities

are completed, existing buildings and structures would remain onsite and the site would remain categorized for industrial use.

### **Historic and Cultural Resources**

Small Impact. NRC identified the Portsmouth Gaseous Diffusion Plant historic district, thirteen historic farmsteads, and one prehistoric lithic scatter as being potentially eligible for inclusion on the National Register of Historic Places. In addition, NRC included three properties located around the perimeter in its consideration of potential effects. There would be no adverse indirect or direct effect on these sites. In addition, construction of new buildings and refurbishment of existing buildings would result in buildings of design, size, and function similar to the existing buildings, and therefore would not alter the historic setting of the existing Gaseous Diffusion Plant.

Any additional disturbance of the site during decommissioning is not anticipated to have impacts to historic and cultural resources that exceed those associated with construction of the proposed ACP. Any changes to or demolition of buildings or structures proposed to be conducted during decommissioning would be evaluated for historic and cultural resources impacts prior to any implementation.

### **Visual and Scenic Resources**

Small Impact. Construction of the proposed ACP would not alter the site's Bureau of Land Management Visual Resources Management rating system classification of Class III or IV (moderate to little scenic value). There are no scenic rivers, nature preserves, or unique visual resources in the proposed project area. While not anticipated, any changes to, or demolition of, buildings or structures proposed during decommissioning would be evaluated for visual and scenic resource impacts prior to any implementation.

### **Air Quality**

Small to Moderate Impact. Airborne emissions from site preparation and construction should not result in exceedances of air quality standards, with the possible exception of short-term increases in particulate matter that could exceed the applicable standard up to a distance of 1,000 meters (3,280 feet) beyond the fence line. Radiological releases from soil disturbances and from activities to refurbish existing buildings that would be used for the ACP would be small and controlled. Emissions from diesel generators would not cause air quality problems, and maximum predicted concentrations of hydrogen fluoride resulting from ACP operations are below safe levels. Based on the maximum radiological emission rates for the ACP, and the comprehensive site monitoring program, the expected impact to air quality from the plant's radiological emissions during operations is also expected to be small. The air quality impacts associated

### ***Determination of the Significance of Potential Environmental Impacts***

*A standard of significance has been established for assessing environmental impacts. Based on the Council of Environmental Quality's regulations, each impact is to be assigned one of the following three significance levels:*

- ***Small:*** *The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.*
- ***Moderate:*** *The environmental effects are sufficient to noticeably alter but not destabilize important attributes of the resource.*
- ***Large:*** *The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.*

with decontamination and decommissioning are expected to be less than the air quality impacts associated with site preparation and construction and proposed ACP operations; however, there is the potential for emission of solvents during the decontamination phase if solvent cleaning methods are used. These emissions would be of short duration (i.e., a few weeks) and would probably involve small amounts of solvent.

## **Geology and Soils**

Small Impact. Most of the site is an existing industrial facility with altered natural soils. The soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence and there are no unique mineral deposits or geologic resources that stand to be affected. The flat terrain where the ACP buildings would be located, and the dense soil, low moisture content, and vegetative cover in the area of a new 10 hectare (24 acre) cylinder storage yard to be located in another spot on the reservation make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland. There would be a potential for increased erosion and siltation of streams near the construction site of the new large cylinder storage yard, but both of these potential impacts should be minimized by the use of standard best management practices. Likewise, the potential for soil contamination resulting from ACP operations would be small. A plan would be in place to address any spills that might occur.

Impacts to geology and soils associated with the decommissioning of the proposed ACP are not anticipated to exceed the geology and soils impacts associated with construction of the ACP. There is potential for additional removal of contaminated surface soils from the site during decontamination and decommissioning; however, any such surface removal is anticipated to be limited in scope and not anticipated to affect the site terrain or the subsurface.

## **Water Resources**

Small Impact. Potential stream sedimentation from construction activities would be minimized by the use of silt fences and other best management practices. Any impacts to stream water quality would be of short duration. None of the proposed site preparation and construction activities would occur within a 100-year floodplain. Groundwater withdrawals would increase by 10 percent over current usage rates, but would still be only 31 percent of the total design capacity of the site's well fields, would not affect groundwater availability, and would not pose an increased risk of subsidence. Wastewater would continue to discharge from permitted National Pollutant Discharge Elimination System outfalls and discharge rates, though increased above current levels, would represent only 75 percent of the existing system's design capacity. USEC does not anticipate any liquid discharges of radioactive materials from the proposed ACP (i.e., from cooling water, storm water runoff, or sanitary water). The potential for leaks or spills that could contaminate water resources would be limited by an approved Spill Prevention Control and Countermeasures Plan.

## **Ecological Resources**

Small Impact. Construction of the new large cylinder storage yard referenced above in the section on geology and soils would result in increased erosion, stormwater runoff, and loss of 10 hectares (24 acres) of vegetation, but with planned best management practices, would result in small impacts to the flora and fauna in and around the tributaries of Little Beaver Creek. That same cylinder storage yard would also be located within 500 meters (1,640 feet) of suitable summer habitat for the endangered Indiana bat,

although studies have not documented the presence of this bat species on the DOE reservation. None of the site construction activities would occur in wetlands. However, some construction would occur adjacent to small wetlands, and standard erosion control measures would be used to limit sedimentation in these areas. Areas of reestablished vegetation may need to be cleared during site decommissioning (e.g., to conduct surface soil removal for site remediation). Any areas cleared of vegetation during decommissioning are anticipated to be small and vegetation could reestablish itself in cleared unpaved areas after decommissioning activities are completed.

## **Socioeconomics**

Small to Moderate Impact. In each year between 2006 and 2010, average annual employment as a result of site preparation, refurbishment, and construction activities is estimated at 3,362 full-time jobs in the region of influence. During the ACP operations phase between 2010 and 2040, 1,500 jobs would be created in the region of influence. These impacts to regional employment are considered moderate, based on existing employment levels in the region. All other socioeconomic impacts from site preparation and construction and ACP operations are estimated to be small. This includes a small increase in regional tax revenues as well as small impacts to population characteristics, housing resources, community and social services, and public utilities.

Cessation of operations at the Paducah enrichment plant (assumed to occur with start-up of operations at the ACP) would result in direct and indirect socioeconomic impacts associated with the termination of the operations workforce at the plant and associated reduction in payroll. The impacts to regional employment around the Paducah site are estimated to be moderate, but all other socioeconomic impacts in the region are expected to be small.

Decontamination and decommissioning of the proposed ACP also would generally have small impacts. As a result of such activities, an average of 841 direct and indirect jobs are expected to be created, of which 407 would be new (the others would be filled by transitioned USEC workers). It is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the decontamination and decommissioning phase of the proposed action. Likewise, decontamination and decommissioning activities are not expected to lead to a large influx of workers that could cause housing shortages or increases in rental rates in the region. The small influx of workers would also have a small effect on public utilities, fire, law enforcement, healthcare, and administrative levels of service.

## **Environmental Justice**

Small Impact. The environmental justice analysis focused on an area within 80 kilometers (50 miles) around the proposed ACP site. The analysis found that, within this area, there are 18 Census tracts that have populations qualifying as low-income and two Census tracts that have populations qualifying as minority. The closest of these tracts is 28 kilometers (17 miles) from the proposed site. Although the impacts to the general population were small to moderate as summarized elsewhere in this section, an examination of the various environmental pathways by which low-income and minority populations could be affected found no disproportionately high or adverse impacts from construction, operation, or decommissioning on any of these populations.



## Noise

Small Impact. Site preparation and construction activities are expected to generate a 53 day-night average noise level, which is below applicable land use compatibility guidelines. No adverse noise impacts from routine ACP operations are expected at the closest residence due to low operational noise, the attenuation provided by the building facade, and distance attenuation of over 900 meters (3,000 feet). Catastrophic failure of a centrifuge could cause a sudden but brief loud noise, due to the high rotational speed of the centrifuge. However, the likelihood of a single centrifuge catastrophically failing is very low. Noise levels during decontamination and decommissioning are also anticipated to be small and similar to those generated during construction of the proposed ACP.

## Transportation

Small to Moderate Non-radiological Impacts from Routine Transportation. Increased truck and vehicle traffic associated with proposed ACP operations should result in small changes in current levels of congestion and delays on U.S. Route 23 and Ohio State Road 32. Traffic associated with proposed operations should also result in small increases in the number of traffic accidents resulting in injuries or fatalities.

Substantially greater transportation requirements during the construction phase could result in moderate impacts during the five-year period in which most of the proposed construction activity is projected to occur. The NRC estimates that increased traffic during construction would temporarily decrease the level of service on U.S. Route 23 and, to a lesser extent, on Ohio State Road 32. The changes on U.S. Route 23 would temporarily increase traffic density, affect the ability to maneuver within the traffic stream, and reduce travel speeds somewhat. It is also expected that construction traffic accidents would result in about 18 injuries a year involving employees traveling to and from their jobs, and one fatality over the entire construction period. These same injury and fatality rates would be expected if the same employees were driving to different employers.

Small Radiological Impacts from Routine Transportation and Transportation Accidents. The transportation of materials containing radionuclides would result in some increased risk of cancer to both the occupational workers transporting and handling the material and to members of the public driving along the roads or living along the transportation routes. The transport of all materials is estimated to result in approximately 0.014 latent cancer fatalities per year of operation from exposure to direct radiation during “incident-free” transport (i.e., shipping that does not involve the breach of a shipping container and subsequent release of radioactive material), and an additional 0.008 latent cancer fatalities per year from accidents that result in the release of radioactive material into the environment. The total latent cancer fatalities is estimated to be 0.02 per year of operation or less than one cancer fatality over the 30 years of operation.

Moderate Non-Radiological Impacts from Transportation Accidents. Transportation accidents involving the release of uranium hexafluoride (UF<sub>6</sub>), which is the form of uranium that would be transported the most to and from the proposed ACP, could also result in chemical impacts to drivers and the surrounding public. When released from a shipping cylinder, UF<sub>6</sub> reacts with the moisture in the atmosphere to form hydrogen fluoride and uranyl fluoride, both of which can cause adverse effects due to chemical toxicity (as opposed to radiation hazards) if exposures are high enough. The analysis in Section 4.2.11.1 of this EIS shows that the probability of a severe transportation accident that releases sufficient quantities of UF<sub>6</sub> that could pose a health risk is low, but that the consequences of such an accident, should it occur, are

high. Based on this analysis, the impacts associated with such an accident as part of the proposed action are considered moderate.

Small Impact During Decontamination and Decommissioning. Traffic associated with material and equipment transportation to the site during this phase would be much lower than that during site preparation and construction. Decontamination and decommissioning activities, including waste generation and handling, would require almost 5,000 truck shipments for offsite disposal over the five-year decommissioning period proposed by USEC. Because this volume of truck traffic is far less than the estimated 17,870 truck trips needed during the five-year proposed ACP construction period, the transportation impacts associated with the decommissioning truck traffic should be far less than that described for site preparation and construction. The number of latent cancer fatalities from the incident-free transportation of all decontamination and decommissioning waste is estimated to be less than one, and there are no projected deaths resulting from the release of radioactive material as a result of accidents during such shipments.

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

Small Impact. The proposed action would result in small increases in the current number of occupational injuries and illnesses at the site, though still less than historical levels. Construction and process areas would be segregated, and personnel monitoring programs would be implemented, to minimize worker exposures to annual radiation doses of less than the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem). The maximum dose to members of the public resulting from routine radiation exposures is estimated to be 0.01 millisieverts (1 millirem) per year, for a hypothetical person living on the northern boundary of the DOE reservation. This predicted dose is significantly below the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. Analytical results also indicate that plausible radiological accidents at the proposed ACP pose acceptably low risks. In addition, public and occupational exposures to non-radiological contaminants are projected to be less than applicable limits.

Occupational exposures during onsite decontamination and decommissioning would be bounded by the potential exposures during operation. At the end of plant life, gas centrifuges containing residual uranium would be purged, leaving radioactive material in amounts significantly less than handled during operations. Because systems containing this residual contamination would be opened, decontaminated (with the removed radioactive material processed and packaged for disposal), and dismantled, an active environmental and dosimetry (external and internal) program would be conducted to maintain as low as reasonably achievable doses to workers and doses to individual members of the public as required by 10 CFR Part 20.

### **Waste Management**

Small Impact. Site preparation, construction, and operations would generate varying amounts of low-level radioactive, low-level mixed, hazardous, sanitary/industrial, and recyclable wastes. All of these wastes would be managed in accordance with existing procedures for controlling contaminant releases and exposures. With the exception of the depleted uranium, all of the wastes would also be generated at volumes that are well within existing management capacities. The ACP would generate approximately 41,105 cylinders of depleted UF<sub>6</sub>, containing approximately 512,730 metric tons (535,200 tons) of material. Production of depleted UF<sub>6</sub> for the 10 percent enrichment scenario would be less than this amount. All of this depleted UF<sub>6</sub> could be converted to a more stable chemical form at a new conversion

facility that DOE is constructing at Piketon, which would require DOE to significantly extend the life of this facility. The converted material would then be shipped by rail to an acceptable western disposal site, where sufficient capacity exists and where the disposal impacts should be small. The waste management and recycling programs used during operations would also apply to decontamination and decommissioning.

## **SUMMARY OF THE COSTS AND BENEFITS OF THE PROPOSED ACTION**

The proposed action would result in both direct and indirect costs. The direct costs can be categorized by facility life-cycle stages:

- Site preparation and construction is estimated to incur costs of \$1.5 billion (nominal dollars, i.e., dollars that are not adjusted for inflation) between calendar years 2006 and 2010;
- Centrifuge manufacturing and assembly is estimated to cost \$1.8 billion (nominal dollars) between calendar years 2004 and 2013;
- Operational costs are expected to accrue between 2011 and 2040. Operating costs are considered to be proprietary information and have been withheld here pursuant to 10 CFR 2.390. The ACP operating costs per SWU would be approximately 20 percent of the operating costs per SWU of a gaseous diffusion plant.
- Disposal of tails generated during the 30-year operations phase is estimated to cost \$1.8 billion (2004 dollars<sup>1</sup>) in total. Although the precise disposal plan is to be determined, these costs are likely to be incrementally accrued between 2011 and 2045.
- Decontamination and decommissioning is estimated to cost \$435 million (2004 real dollars, i.e., dollars stated in year 2005 price levels) over a period of six years, which are expected to begin 30 years after the commencement of ACP operations and are expected to occur from 2040 through 2045.

Indirect costs include the environmental impacts that are expected to be caused by the proposed action. As summarized in the preceding section, these impacts are generally considered small, although they could reach moderate levels in a few resource areas.

The primary benefit of the proposed action is that it would result in the production of 3.5-7 million SWUs of enriched uranium between 2010 and 2040. The ACP operating costs per SWU would be approximately 20 percent of the operating costs per SWU of a gaseous diffusion plant. This level of production would represent an augmentation of the domestic supply of enriched uranium and would meet the following needs:

- The need for enriched uranium to fulfill domestic electricity requirements and replace the shortfall in supply created by the end of the Megatons-to-Megawatts program planned in 2013;

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<sup>1</sup> In order to avoid the uncertainties associated with deflating or inflating the value of the dollar, and to simplify references to USEC's cost information, this document expresses costs and benefits in the units (real or nominal dollars) as they were provided in the USEC ER, license application, and responses to requests for additional information. A base year is always identified for real dollar estimates. Nominal dollar estimates are also clearly identified. In Chapter 7, for the purposes of the net present value analysis, the document presents costs in 2005 real dollars because when performing a net present value analysis it is essential that all costs and benefits be expressed in real dollars referenced to a common base year.

- The need for domestic supplies of enriched uranium for national energy security; and
- The need for upgraded uranium enrichment technology in the United States to replace the existing aging and less efficient gaseous diffusion plants.

At the same time, the proposed action would result in positive socioeconomic impacts in the region around Piketon. During the site preparation and construction phase between 2006 and 2010, these impacts include the creation of 3,362 full-time jobs, an increase of \$2.3 million in annual state income tax revenues, and an increase in \$3.7 million in annual state sales tax receipts. During the ACP operations phase between 2010 and 2040, 1,500 jobs would be created in the region and the State would benefit from \$1.8 million and \$2.4 million in additional annual income and sales tax receipts, respectively.

During the centrifuge manufacturing and assembly phase between 2004 and 2013, average annual employment is estimated at 2,130 full-time jobs and the State would benefit from \$1.5 million and \$2.4 million in additional annual income and sales tax receipts.

Overall, the costs of the proposed action are estimated to be small in comparison to the benefits for the proposed action. Therefore, the benefits of the proposed action are believed to outweigh the costs of the proposed action.

## **COMPARISON OF ALTERNATIVES**

The no-action alternative would consist of USEC not constructing, operating, or decommissioning the proposed ACP at Piketon. The buildings and land proposed to be used for the ACP at the DOE reservation in Piketon would therefore be available for some other use. At the same time, the uranium fuel fabrication facilities in the United States would continue to obtain low-enriched uranium from currently available sources, including the Paducah Gaseous Diffusion Plant and the down blending of highly enriched uranium under the Megatons to Megawatts program. In order to meet growing demands for enriched uranium, additional domestic enrichment facilities utilizing a more efficient technology in the future could be constructed. This could include the gas centrifuge facility proposed by Louisiana Energy Services near Eunice, New Mexico, as well as other possible facilities. The associated impacts associated with the existing uranium fuel cycle activities in the United States would continue as expected today if the proposed ACP is not constructed, operated, or decommissioned.

The no-action alternative would have small local impact on historic and cultural resources; visual and scenic resources; air, water, and ecological resources; geology and soils; environmental justice; transportation; public and occupational health; and waste management. For land use, the facilities currently leased to USEC for the ACP would remain leased to USEC. Some of these facilities would likely continue to be used for the Lead Cascade Demonstration Facility, which is currently scheduled to operate until the middle of 2008 in order to continue to provide a demonstration of the gas centrifuge enrichment process. Any future uses of the facilities currently proposed for the ACP would be up to USEC and DOE, but would be expected to include similar activities within the nuclear fuel cycle, not completely different uses. Nevertheless, the current program for examining and implementing reindustrialization alternatives at the DOE reservation would remain in place under the no-action alternative.

Adverse socioeconomic effects of the no-action alternative to the Piketon region would include a missed opportunity for approximately 1,500 direct and indirect jobs during the 30-year operations phase, 3,362 direct and indirect jobs during the five-year construction phase, and 2,130 direct and indirect jobs during the 10-year manufacturing phase that would have been created by the proposed action. The cessation of enrichment operations at Paducah and the corresponding socioeconomic impacts in that region would be postponed, but would likely occur sometime later when new enrichment facilities are expected to be built to meet the nation's growing demand for enriched uranium. Depending on the construction methods, design of any new facilities, and local demographics, the likely socioeconomic impacts would be similar to the proposed action, but at an alternate location.

In comparison to the no-action alternative, the proposed action would also have small impacts on land use; historical and cultural resources; visual and scenic resources; geology and soils; water resources; ecological resources; environmental justice; noise; public and occupational health; and waste management. Air quality impacts could be small to moderate due to short-term increases in particulate matter emissions from dust during construction. Transportation impacts of the proposed action are expected to be small to moderate, accounting for increased traffic during construction and the possibility of a severe accident releasing significant quantities of UF<sub>6</sub>, as described above.

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## ACRONYMS AND ABBREVIATIONS

ACP	American Centrifuge Plant
CFR	Code of Federal Regulations
DOE	Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
HF	hydrogen fluoride
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
RCRA	Resource Conservation and Recovery Act
SWU	Separative Work Unit
UF <sub>6</sub>	uranium hexafluoride
U <sub>3</sub> O <sub>8</sub>	triuranium octaoxide
UO <sub>2</sub>	uranium dioxide
USEC	USEC Inc.