



# **Environmental Impact Statement for the Proposed National Enrichment Facility in Lea County, New Mexico**

**Chapters 1 through 10 and  
Appendices A through G**

**Final Report**

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



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## **Chapters 1 through 10 and Appendices A through G**

## **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  
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## ABSTRACT

Louisiana Energy Services (LES) has submitted a license application to the U.S. Nuclear Regulatory Commission (NRC) to construct, operate, and decommission a gas centrifuge uranium enrichment facility near Eunice, New Mexico, in Lea County. The proposed facility, referred to as the National Enrichment Facility (NEF), would produce enriched uranium-235 ( $^{235}\text{U}$ ) up to 5 weight percent by the gas centrifuge process with a nominal production of 3 million separative work units per year. The enriched uranium would be used in commercial nuclear power plants. The proposed NEF 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 LES to possess and use special nuclear material, source material, and byproduct material at the proposed NEF site.

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

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## **EXECUTIVE SUMMARY**

### **BACKGROUND**

Pursuant to Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70, the U.S. Nuclear Regulatory Commission (NRC) is considering whether to issue a license that would allow the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility near Eunice in Lea County, New Mexico. The application for the license was filed with the NRC by Louisiana Energy Services, Limited Partnership (LES), by letter dated December 12, 2003. To support its licensing decision on LES's proposed National Enrichment Facility (NEF), the NRC determined that the NRC's implementing regulations in 10 CFR Part 51 for the *National Environmental Policy Act* (NEPA) require the preparation of an Environmental Impact Statement (EIS) .

The enriched uranium produced at the proposed NEF 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 (<sup>235</sup>U) isotope. Uranium ore usually contains approximately 0.72 weight percent <sup>235</sup>U. To be useful in nuclear power plants as fuel for electricity generation, the uranium must be enriched up to 5 weight percent.

### **THE PROPOSED ACTION**

The proposed action considered in this EIS is for LES to construct, operate, and decommission a uranium enrichment facility, the proposed NEF, at a site near Eunice in Lea County, New Mexico. By letter dated December 12, 2003, LES filed an application with the NRC for a license to possess and use special nuclear material, source material, and byproduct material at the site. The proposed NEF, if approved, would be situated on Section 32 approximately 32 kilometers (20 miles) south of Hobbs, New Mexico, 8 kilometers (5 miles) east of Eunice, New Mexico, and about 0.8 kilometer (0.5 mile) from the New Mexico/Texas State line on New Mexico Highway 234. The proposed NEF would be constructed on land owned by Lea County and leased to LES (as of December 8, 2004) for 30 years, after which LES would purchase the land from Lea County.

The proposed NEF would produce <sup>235</sup>U enriched up to 5 weight percent by a gas centrifuge process with a nominal production of 3 million separative work units per year. If the license is approved, facility construction would begin in 2006 and continue for 8 years through 2013. The proposed NEF would begin initial production in 2008. The facility peak production would be reached in 2013. Operations would continue at peak production until approximately 9 years before the license expired. Decommissioning activities would then begin and be completed by 2036.

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

The proposed NEF would provide an additional, reliable, and economical domestic source of enrichment services. This facility would contribute to the attainment of national energy security policy objectives by providing an additional source of low-enriched uranium to be used in commercial nuclear power plants. Nuclear power currently supplies approximately 20 percent of the Nation's electricity. The United States Enrichment Corporation (USEC) is the sole U.S. supplier of low-enriched uranium for nuclear fuel in the United States. USEC has one operating enrichment plant near Paducah, Kentucky, which can supply approximately 14 percent of the current U.S. demand for low-enriched uranium. USEC also imports

downblended (diluted) weapons-grade uranium from Russia to supply an additional 42 percent of the U.S. demand. The remaining 44 percent is imported from foreign suppliers. The dependence on a single U.S. supplier and foreign sources for low-enriched uranium imposes reliability risks for the nuclear fuel supply to U.S. nuclear power plants. The Administration's energy policy, which was issued in May 2001, recognized the importance of having a reliable source of enriched uranium for national energy security. The production of enriched uranium at the proposed NEF would be equivalent to about 25 percent of the current and projected demand for enrichment services within the U.S.

## ALTERNATIVES

The no-action alternative is considered in this EIS. Under the no-action alternative, the proposed NEF would not be constructed, operated, and decommissioned in Lea County, New Mexico. The proposed NEF site uses and characteristics would remain unchanged from current conditions. Enrichment services would continue to be performed by existing domestic and foreign uranium enrichment suppliers.

Before submitting the license application in December 2003, LES considered 44 alternative sites throughout the United States. LES evaluated these sites based on various technical, safety, economic, and environmental criteria. LES concluded that the site considered in the proposed action met all of the criteria. The NRC staff reviewed the site selection process and determined that none of the other candidate sites were obviously superior to LES's preferred site in Lea County, New Mexico. Therefore, no other site was further analyzed.

The NRC staff examined two reasonable alternatives to satisfy domestic enrichment needs: (1) reactivate the Portsmouth Gaseous Diffusion Facility near Piketon, Ohio, and (2) purchase low-enriched uranium from foreign sources. These alternatives were eliminated from further consideration based on costs, excessive energy consumption, and national energy security.

The NRC staff also evaluated several alternative technologies to the gas centrifuge process: 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 therefore were not further considered.

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

*A standard of significance has been established for assessing environmental impacts. Based on the Council on 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.*

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

The EIS evaluates the potential environmental impacts of the proposed action. The environmental impacts from the proposed action are generally SMALL to MODERATE and could be mitigated by the methods described in Chapter 5. Environmental monitoring methods are described in Chapter 6.

### **Land Use**

Small Impact. Construction activities would occur on about 81 hectares (200 acres) of a 220-hectare (543-acre) site that would be fenced. The land is currently undisturbed except for a gravel access road, cattle grazing, and the presence of a carbon dioxide pipeline. There is sufficient land around the proposed site for relocation of the pipeline and cattle grazing. The installation of the necessary municipal water supply piping, natural gas supply piping, and electrical transmission lines would result in only short-term impacts (due to construction), since they would be installed along existing county right-of-way easements.

### **Historical and Cultural Resources**

Small Impact. There are seven archaeological sites on the proposed site. These sites are considered eligible for listing on the National Register of Historic Places. Two sites would be impacted by construction activities and a third is along the access road. Based on the terms and conditions of a Memorandum of Agreement, a historic properties treatment plan would be fully implemented before construction of the proposed facility. A written plan for inadvertent discoveries has been developed.

### **Visual and Scenic Resources**

Small Impact. Impacts from construction activities would be limited to fugitive dust emissions that can be controlled using dust suppression techniques. The cooling towers could contribute to the creation of fog 0.5 percent of the total hours per year (44 hours per year). The proposed NEF site received the lowest scenic-quality rating using the U.S. Bureau of Land Management visual resource inventory process.

### **Air Quality**

Small Impact. Air concentrations of the criteria pollutants predicted for vehicle emissions and emissions of particulate matter of less than 10 microns (PM<sub>10</sub>) from fugitive dust during construction would all be below the National Ambient Air Quality Standards. Fugitive dust emissions would be temporary and localized. A National Emissions Standards for Hazardous Air Pollutants Title V permit would not be required for operations due to the low levels of estimated emissions. All stack emissions would be monitored.

### **Geology and Soils**

Small Impact. Construction-related impacts on the geology and soil would occur within the 81-hectare (200-acre) part of the site on which the proposed NEF structures would be built. Clay and gravel from a nearby site might be used during construction. No soil contamination would be expected during construction and operations. A plan would be in place to address any spills that might occur. There would be no construction or operational impacts on unique mineral deposits or geological resources.

### **Water Resources**

**Small Impact.** There are no existing surface water resources. National Pollutant Discharge Elimination System general permits for construction and operations would be required to manage stormwater. Retention basins (i.e., the Treated Effluent Evaporative Basin and the Uranium Byproduct Cylinder (UBC) Storage Pad Stormwater Retention Basin) would be lined to minimize infiltration of water into the subsurface. Infiltration from the Site Stormwater Detention Basin and septic system leach fields might form a perched layer on top of the Chinle Formation, but there would be limited downgradient transport because of the soil's storage capacity and upward flux to the root zone. Impacts on water use would be SMALL because of the availability of excess capacity in the Hobbs and Eunice water supply systems. The proposed NEF's indirect use of the Ogallala Aquifer's water through the Eunice and Hobbs water supply systems would constitute a small portion of the aquifer reserves in New Mexico.

## **Ecological Resources**

**Small Impact.** Construction, operation, and decommissioning of the proposed NEF would have SMALL impacts on ecological resources. There are no wetlands or unique habitats for threatened or endangered plant or animal species on the proposed NEF site. A large part of the site would remain undisturbed and in its natural state. The impacts of the use of water detention/retention basins would be SMALL because animal-friendly fencing and netting or other suitable material over the basins would be used to minimize animal intrusion. Revegetation using native plant species would be conducted in any areas impacted by proposed NEF activities. The design and construction of the electrical transmission lines would address the protection of birds from electric shock.

## **Socioeconomics**

**Moderate Impact.** During the 8-year construction period, an average of 397 jobs per year would be created (about 19 percent of the Lea, Andrews, and Gaines Counties' construction labor force). Employment would peak at 800 jobs in the fourth year. Spending on goods and services and wages would create about 582 new jobs per year on average. Construction would cost \$1.24 billion (in 2004 dollars). About 15 percent of the construction workforce would be expected to take up residency in the surrounding community, and about 15 percent of the local housing units are unoccupied. The impact on local schools would be minimal. During operation, the proposed NEF would employ a maximum of 210 people annually and would indirectly create an additional 173 jobs. The increase in demand for public services would be SMALL. Decontamination and decommissioning would generally have SMALL impacts. Use of a U.S. Department of Energy (DOE) conversion facility in Paducah, Kentucky, or near Portsmouth, Ohio, for disposition of depleted uranium hexafluoride (DUF<sub>6</sub>) could extend the operating life of the conversion facility and, therefore, the socioeconomic impacts of the operation. If a new private conversion facility were constructed, the resulting socioeconomic impacts would be similar to those expected for the construction and operation of the DOE conversion facility near Portsmouth, Ohio.

## **Environmental Justice**

**Small Impact.** The environmental justice study focused on an area within 80 kilometers (50 miles) of the proposed NEF site. Demographic data from the Year 2000 census data were analyzed to characterize minority and low-income populations near the proposed NEF site. In addition, State and local governments and representatives of the minority communities were contacted. The largest minority population within 80 kilometers (50 miles) of the proposed NEF site is the Hispanic/Latino population. Although the impacts to the general population were SMALL to MODERATE, an examination of the various environmental pathways by which low-income and minority populations could be affected found no disproportionately high and adverse impacts from construction, operation, or decommissioning on

minority and low-income populations living near the proposed NEF or along the transportation routes into and out of the proposed NEF.

## **Noise**

Small Impact. Noise would come predominantly from traffic. Construction activities could be limited to normal daytime working hours. The nearest residence is 4.3 kilometers (2.6 miles) from the proposed site, and noises from construction activities would be negligible at this distance. Noise levels during operations would be within the U.S. Department of Housing and Urban Development guidelines.

## **Transportation**

Small to Moderate Impact during Construction. Traffic on New Mexico Highway 234 would almost double during construction. Three injuries and less than one fatality might occur during the peak construction employment year due to workforce traffic and delivery of construction materials. Peak truck traffic during construction might cause less than one injury and less than one fatality.

Small Impact during Normal Operations; Small to Moderate during Accidents. Truck trips removing nonradioactive waste and delivering supplies would have a SMALL impact on the traffic on New Mexico Highway 234. Workforce traffic would also have a SMALL impact on New Mexico Highway 234 with less than one injury and less than one fatality expected annually due to traffic accidents. Truck shipments of feed, product, and waste materials (including DUF<sub>6</sub>) would result in two latent cancer fatalities to the general population over the life of the proposed NEF due to vehicle emissions and fewer than  $3 \times 10^{-2}$  latent cancer fatalities due to direct radiation. All rail shipments of feed, product, waste materials, and empty cylinders would result in fewer than  $8 \times 10^{-2}$  latent cancer fatalities to the general population over the life of the proposed NEF due to vehicle emissions and  $1 \times 10^{-1}$  latent cancer fatalities from direct radiation. If a rail accident involving the shipment of DUF<sub>6</sub> occurred in an urban area, up to 28,000 people could suffer adverse but temporary health effects with no fatalities due to chemical impacts. A truck accident involving the shipment of DUF<sub>6</sub> in an urban area could have temporary adverse chemical impacts on as many as 1,700 people.

Small Impact during Decommissioning. SMALL impacts would occur if DUF<sub>6</sub> were temporarily stored at the proposed NEF for the duration of operations. Assuming that all of the material were shipped during the first 8 years (the final radiation survey and decontamination would occur during the ninth year), the proposed NEF would ship approximately 1,966 truckloads per year. If the trucks were limited to weekday, non-holiday shipments, approximately 10 trucks per day or 2½ railcars per day would leave the site for the DUF<sub>6</sub> conversion facility.

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

Small Impact during Construction and Normal Operations. During construction, a fatality would be unlikely (the probability of fatality is less than one fatality per year). Construction workers could receive radiation doses of up to 0.05 millisievert (5 millirem) per year once the proposed NEF begins operations. During normal operations, there would be approximately eight injuries per year and no fatalities, based on statistical probabilities. A typical operations or maintenance technician could be exposed to 1 millisievert (100 millirem) of radiation annually. A typical cylinder yard worker could be exposed to 3 millisieverts (300 millirem) of radiation annually. All public radiological exposures are significantly below the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem) and the 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel cycle facilities. The nearest resident would receive less than  $1.3 \times 10^{-5}$  millisieverts ( $1.3 \times 10^{-3}$  millirem) due to proposed NEF operations.

Small to Moderate Impact for Accidents. The most severe accident is estimated to be the release of  $UF_6$  caused by the rupture of an overfilled and/or overheated cylinder, which could result in a collective population dose of 120 person-sieverts (12,000 person-rem) and seven latent cancer fatalities. The design of the proposed NEF would include certain features to significantly reduce the likelihood of this event.

## **Waste Management**

Small Impact. Solid wastes would be generated during construction and operations. Existing disposal facilities would have the capacity to dispose of the nonhazardous solid wastes. The proposed NEF would implement waste management programs to minimize waste generation and promote recycling where appropriate. In particular, impacts on the Lea County landfill would be SMALL. There would be enough existing national capacity to accept the low-level radioactive waste that would be generated at the proposed NEF.

Small to Moderate Impact for  $DUF_6$  Waste Management. Public and occupational exposures would be monitored and controlled to meet NRC regulations for radiation protection. LES identified two potential means for disposing of  $DUF_6$ : by private conversion and disposal facilities or by DOE through Section 3113 of the USEC Privatization Act. LES's preferred strategy is to use private facilities outside of the State of New Mexico to convert and dispose of the  $DUF_6$  byproduct. No final location has yet been determined for a private conversion facility. Alternatively, DOE would process the  $DUF_6$  by extending the operation of its conversion facilities. This would prolong the impacts of DOE's conversion facilities, as described in DOE's NEPA documentation. A private conversion facility would have much the same impacts as the planned DOE conversion facilities at Paducah, Kentucky, and Portsmouth, Ohio.

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

The costs of construction activities would be approximately \$1.24 billion (in 2004 dollars), excluding escalation, contingencies, and interest. About one-third of the cost of constructing the facility would be spent locally for goods, services, and wages.

During operations, about \$10.9 million in wages and benefits and \$9.9 million for local goods and services would be spent annually. Construction and operation of the facility would have additional indirect economic impacts by creating additional employment and economic activity. Tax revenues from gross receipts and income would go primarily to the State of New Mexico and would total between \$148 million and \$180 million (in 2004 dollars) over the life of the proposed NEF. Property taxes would total between \$10.4 million and \$14.5 million (in 2004 dollars) and go to Lea County, New Mexico.

Decontamination and decommissioning are estimated to cost approximately \$941.6 million (in 2004 dollars). Locating a private conversion facility near the proposed NEF would have a greater economic impact on the local community, creating approximately 180 jobs, than if the  $DUF_6$  were shipped to another location for conversion.

## **COMPARISON OF ALTERNATIVES**

In the no-action alternative, the proposed NEF would not be constructed, operated, and decommissioned in Lea County, New Mexico. The Paducah Gaseous Diffusion Plant in Paducah, Kentucky, and the downblending of highly enriched uranium under the "Megatons to Megawatts" program (both are managed by USEC) would remain the sole source of domestically generated low-enriched uranium for U.S. commercial nuclear power plants. Foreign enrichment sources would continue to supply more than 85 percent of U.S. nuclear power plants' demand until other new domestic enrichment facilities were

constructed and operated. In the long term, this could lead to increased reliance on foreign suppliers for enrichment services.

The no-action alternative would have no local impact on current land use; visual/scenic resources; air, water, and ecological resources; geology and soils; socioeconomics; environmental justice; transportation; and waste management. However, the failure to construct and operate the proposed NEF could have SMALL to MODERATE impacts on historical and cultural resources; historical sites identified at the proposed NEF could be exposed to further weathering and the possibility of human intrusion, unless applicable Federal and State historic preservation laws and regulations were followed. Additional domestic enrichment facilities could be constructed in the future with impacts expected to be SMALL to MODERATE, depending on the site-specific conditions.

In comparison to the no-action alternative, the proposed action would also have SMALL impacts on land use; historical and cultural resources; visual/scenic resources; air, water, and ecological resources; geology and soils; noise; and environmental justice. The most serious accident that might occur, the rupture of an overfilled and/or overheated cylinder, would have SMALL to MODERATE impacts. Waste management impacts could be SMALL to MODERATE if the uranium byproduct cylinders are temporarily stored on site until decommissioning begins, though this is not contemplated by LES. Transportation impacts are expected to be MODERATE during the construction period due to increased traffic on New Mexico Highway 234. Otherwise, transportation impacts are expected to be SMALL.

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## ACRONYMS AND ABBREVIATIONS

$^{235}\text{U}$	uranium-235
$^{238}\text{U}$	uranium-238
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as reasonably achievable
ASLB	Atomic Safety and Licensing Board
BLM	U.S. Bureau of Land Management
BMP	best management practice
$\text{CaF}_2$	calcium fluoride
CEDE	committed effective dose equivalent
CFR	<i>U.S. Code of Federal Regulations</i>
CO	carbon monoxide
$\text{CO}_2$	carbon dioxide
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
$\text{DUF}_4$	depleted uranium tetrafluoride
$\text{DUF}_6$	depleted uranium hexafluoride
EDE	effective dose equivalent
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
HEPA	high efficiency particulate air
HUD	U.S. Department of Housing and Urban Development
LCF	latent cancer fatality
LES	Louisiana Energy Services
MOX	mixed oxide fuel
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NEF	National Enrichment Facility
NEPA	<i>National Environmental Policy Act</i>
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	<i>National Historic Preservation Act</i>
NMDOT	New Mexico Department of Transportation
NOAA	National Oceanic and Atmospheric Administration

NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
RCRA	<i>Resource Conservation and Recovery Act</i>
SER	Safety Evaluation Report
SWU	separative work unit
TEDE	total effective dose equivalent
U <sub>3</sub> O <sub>8</sub>	triuranium octaoxide
UO <sub>2</sub> F <sub>2</sub>	uranyl fluoride
UBC	uranium byproduct cylinder
UF <sub>4</sub>	uranium tetrafluoride
UF <sub>6</sub>	uranium hexafluoride
USEC	U.S. Enrichment Corporation
USGS	U.S. Geological Survey
WCS	Waste Control Specialists