

**APPENDIX L:**

**RESPONSES TO COMMENTS RECEIVED DURING THE SCOPING PROCESS  
FOR THE PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT  
FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT  
AND USE OF DEPLETED URANIUM HEXAFLUORIDE**



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**NOTATION (APPENDIX L)**

The following is a list of acronyms and abbreviations used in this appendix.

**ACRONYMS AND ABBREVIATIONS****General**

CEQ	Council on Environmental Quality
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FR	<i>Federal Register</i>
HEU	highly enriched uranium
LEU	low-enriched uranium
MOX	mixed oxide (fuel)
NEPA	<i>National Environmental Policy Act</i>
NOI	Notice of Intent
NRC	U.S. Nuclear Regulatory Commission
PEIS	programmatic environmental impact statement
USEC	United States Enrichment Corporation

**Chemicals**

UF <sub>4</sub>	uranium tetrafluoride
UF <sub>6</sub>	uranium hexafluoride
UO <sub>2</sub>	uranium dioxide
U <sub>3</sub> O <sub>8</sub>	triuranium octaoxide (uranyl uranate)

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#### L.1 SCOPING PROCESS

The U.S. Department of Energy (DOE) issued a Notice of Intent (NOI) to prepare a programmatic environmental impact statement (PEIS) for depleted uranium hexafluoride (UF<sub>6</sub>) on January 25, 1996, in the *Federal Register* (61 FR 2239). In addition, a letter from the project manager, copies of the NOI, a scoping comment form, and a fact sheet entitled "Overview of the Programmatic Environmental Impact Statement" were mailed to 3,800 individuals. These individuals were identified by personnel at the three DOE sites currently used for storage of depleted UF<sub>6</sub> and through the DOE stakeholder mailing list. Two public scoping meetings were held in the vicinity of each current storage site — Paducah, Kentucky (February 13, 1996); Oak Ridge, Tennessee (February 15, 1996); and Portsmouth, Ohio (February 20, 1996).

Information relevant to both the project and the *National Environmental Policy Act* (NEPA) process was provided through development of an Internet Home Page that includes an overview of the project, fact sheets, NEPA and Council on Environmental Quality (CEQ) regulations, access to an Internet Environmental Law Library, and links to DOE's NEPA Web and CEQ's NEPA Net. Provision for commenting on the scope of the PEIS was provided in the overview presentation on the Home Page. The computer-based overview presentation is available on CD-ROM and was available on computers at the scoping meetings. The public was also provided with a mechanism for commenting directly while viewing the computer program.

Approximately 300 persons attended the scoping meetings. DOE staff were present at information tables to receive comments directly from the attendees. In addition, the public was able to provide comments on the scope of the PEIS by filling out the scoping comment form (hardcopy or via the CD-ROM program); by mailing or faxing comments to the program office; and/or by sending an electronic mail message via the Internet. The majority of the 235 individual comments received during the scoping period were received at the scoping meetings.

The public comments are discussed in detail in the next section. All comments received at the scoping meetings, both written and oral, have been categorized as to subject and made available over the World Wide Web at the following address: <http://www.ead.anl.gov/uranium.html>.

## L.2 ENVIRONMENTAL IMPACT ISSUES IDENTIFIED IN SCOPING

The purpose of the scoping process is to determine the range of actions, alternatives, and significant impacts to be considered in the PEIS. The comments provided by the public during this scoping process were reviewed and organized into several groups on the basis of the issues raised. The majority of comments focused on the range of technical options to be considered by DOE in constructing alternative strategies. The issues and their disposition are summarized below.

### L.2.1 Environment

General environmental issues relate to the need to consider a broad range of impacts to human health and safety, water, air, land, wildlife, and socioeconomics. More specific comments relate to the need to consider radioactive decay products, health effects of specific chemicals, and trace elements.

- **Comment:** The PEIS should evaluate in detail a broad range of impacts to water, air, land, wildlife, and socioeconomic resources from all options for storage, use, disposal, or conversion of depleted UF<sub>6</sub>.

**Response:** The PEIS will cover these technical areas at a level of detail appropriate for the programmatic analysis. Site-specific details related to potential locations for facilities will be provided in follow-on NEPA documents that will be prepared prior to any future siting decisions.

- **Comment:** The PEIS should use the TRIAD model developed by the National Oceanic and Atmosphere Administration for analyzing atmospheric dispersion and releases of depleted UF<sub>6</sub>.

**Response:** The TRIAD model was evaluated by the project team, who selected a more advanced model called HGSYSTEM for use in the PEIS.

- **Comment:** The PEIS should analyze the “worst-case scenarios” for health impacts to the public and workers from all options for storage, use, disposal, or conversion of depleted UF<sub>6</sub>.

**Response:** The PEIS will consider various accident scenarios based on preconceptual designs, including reasonably foreseeable low-probability, but potentially high-consequence, events. Accidents evaluated will include those with a probability of occurrence of 1 in 1 million ( $10^{-6}$ ) to 1 in 10 million ( $10^{-7}$ ).

- **Comment:** The PEIS should evaluate the risks to the public from unrestricted use of depleted uranium or fluoride materials.

**Response:** Due to U.S. Nuclear Regulatory Commission (NRC) radioactive material licensing requirements, among other things, commercial depleted uranium applications with limited public access are envisioned. The PEIS will evaluate the use of depleted uranium as shielding for radioactive materials for which public access is controlled. In the future, it may be possible to get an exemption from the NRC for certain depleted uranium applications. The PEIS will evaluate risks to the general public from conversion of depleted UF<sub>6</sub>, including production of hydrogen fluoride, which would be sold.

- **Comment:** The PEIS should compare and contrast health and safety risks from all options for depleted UF<sub>6</sub>.

**Response:** The PEIS will compare and contrast health and safety risks from representative options that encompass the types of health and safety impacts related to depleted UF<sub>6</sub> management. The range of parameters considered in the PEIS will encompass many specific technologies and commercial processes.

- **Comment:** The PEIS should address the trace elements and contaminants in depleted UF<sub>6</sub> and their potential impacts upon the environment.

**Response:** Depleted UF<sub>6</sub> is a very pure material. Decay products of uranium, which are in trace quantities, will be included in the analysis.

- **Comment:** The PEIS should evaluate the cumulative impacts upon the likely locations for all options for depleted UF<sub>6</sub>.

**Response:** Cumulative impacts for “no action” and for cylinder preparation at the three storage sites will be considered in the PEIS, as appropriate. Cumulative impacts at locations for use, conversion, storage, or disposal will be discussed qualitatively, with references to tiered NEPA reviews. Site-specific analyses of cumulative impacts at specific use, conversion, storage, or disposal locations will be presented in follow-on NEPA analyses prior to any future specific siting decisions for these activities.

- **Comment:** The PEIS should evaluate the impacts upon the DOE waste management system for all depleted UF<sub>6</sub> options.

**Response:** The PEIS will address disposal of depleted uranium as an oxide form at a low-level-waste facility. For options involving use or storage of

depleted uranium, waste management will be analyzed for disposal or recycle of empty cylinders or by-products, as appropriate. This discussion will be based, in part, on DOE's *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F).

- **Comment:** The PEIS should evaluate the long-term impacts from the changing chemistry and radioactive decay of uranium under the disposal options.

**Response:** The PEIS analysis of disposal will include the decay products of uranium. It will be assumed that these products have a geochemical behavior similar to uranium.

### L.2.2 Current Management of Depleted UF<sub>6</sub>

Numerous comments were made regarding current management of cylinders at the Paducah site, the Portsmouth site, and the K-25 site on the Oak Ridge Reservation. These comments are summarized as follows:

- **Comment:** The PEIS should explain and evaluate current management of the cylinders at all three locations (Portsmouth, Paducah, and Oak Ridge).

**Response:** The PEIS will provide a general discussion of cylinder management at the three sites and will consider the environmental impacts of "no action," which is continued cylinder management at the three sites.

- **Comment:** The PEIS should discuss the risks of current storage of the cylinders at all three locations.

**Response:** The risks of current cylinder storage will be included in the PEIS.

### L.2.3 Storage

A number of comments were received about alternative storage options, such as using old uranium mines or military installations. These comments are summarized below:

- **Comment:** The PEIS should evaluate a wide range of storage options, including storage in zinc mines in eastern Tennessee, transportation to a central location for consolidation, storage at retired military installations,

stringent monitoring processes, smaller size or different containers, and buildings and low-maintenance storage arrangements.

**Response:** The PEIS will consider a range of storage options, including storage in a mine, in yards, in buildings, and in vaults. The impacts associated with consolidating all the material at one location compared with dispersing the material at several locations will also be evaluated. The impacts of storage at specific sites, such as a retired military base, will be evaluated in follow-on NEPA analyses conducted prior to any future siting decisions.

- **Comment:** The PEIS should clarify how storage in a mine would work.

**Response:** Storage in a mine will be described at the level of a preconceptual design.

- **Comment:** The PEIS should clarify how building storage would work, particularly in terms of ventilation and air controls.

**Response:** The PEIS will consider a generic design for building storage. General assumptions about building performance will be made for the purpose of health and safety analysis. Particular designs for climate control and ventilation will be considered in follow-on NEPA analysis conducted prior to a decision on facility design.

- **Comment:** The PEIS should explain how the cylinders will be stored for all options.

**Response:** The PEIS will explain cylinder storage for each alternative, as appropriate.

#### L.2.4 Conversion

A number of suggestions for conversion were made for consideration in the PEIS, which are summarized as follows:

- **Comment:** The PEIS should consider technology-specific options for conversion, such as the Quantum-Catalytic Extraction Process™.

**Response:** The PEIS will conduct analyses of representative technologies in determining the impacts of various management strategy alternatives. The conversion technology options analyzed will have a sufficient technical basis to develop meaningful preconceptual designs and estimates of the

environmental data required for the PEIS analysis. After the decision is made on the long-term management strategy, specific technologies and sites will be considered in the second tier of the NEPA review process.

In response to the November 10, 1994, Request for Recommendations, a large number of promising conversion technologies were recommended that are in the early stages of design development or contain key aspects that are proprietary. In general, the proponents of these technologies believe that they offer process improvements and/or cost reductions compared with the more traditional processes. The Quantum-Catalytic Extraction Process™ is included in this category.

- **Comment:** The PEIS should consider other chemical forms for storage, such as metal, tetrafluoride, uranotile, and soddyite.

**Response:** The PEIS will consider storage of depleted uranium as UF<sub>6</sub> and as the oxides triuranium octaoxide (U<sub>3</sub>O<sub>8</sub>) and uranium dioxide (UO<sub>2</sub>). The rationale for selection of these chemical forms for analysis will be presented in the PEIS. In general, storage as metal would require substantially less storage space than the other chemical forms under consideration. This advantage must be weighed against disadvantages such as higher conversion cost, lower stability, and the uncertainty of the suitability of the metal form for eventual disposal. Uranium tetrafluoride (UF<sub>4</sub>), or greensalt, is an intermediate form in the process of converting UF<sub>6</sub> to metal or converting oxide to UF<sub>6</sub>. It is significantly more chemically reactive than uranium oxides, and no use has been identified for UF<sub>4</sub>. Conversion into uranium-bearing minerals such as soddyite and uranotile for subsequent storage or disposal would require development of the chemical conversion process as well as examination of the suitability of such forms for storage or disposal.

- **Comment:** The PEIS should evaluate only conversion options at existing facilities, not at new facilities.

**Response:** The PEIS is a programmatic-level document and will analyze conversion at representative facilities. The siting issues associated with building and operating conversion facilities at specific locations will be included in follow-on NEPA analyses conducted prior to any future siting decisions. The use of existing facilities would be evaluated when future siting decisions were made after the Record of Decision for this PEIS.

- **Comment:** The PEIS should consider shipping depleted UF<sub>6</sub> to Britain or France for processing.

**Response:** This PEIS addresses depleted UF<sub>6</sub> located in the continental United States and evaluates the transportation of all uranium products on a per-mile basis using U.S. national statistics. This could be applied to transport of the material to any port in the 48 contiguous states for shipment overseas. A decision as to vendors or processes for conversion of depleted UF<sub>6</sub> would be made after the Record of Decision for this strategic PEIS. At that time, NEPA analysis of international vendors or processes might be appropriate.

### L.2.5 Use of Depleted UF<sub>6</sub>

Many comments and suggestions were made about the use of depleted UF<sub>6</sub> after conversion, which are summarized as follows:

- **Comment:** The PEIS should consider the recovery (reenrichment) of uranium-235 from depleted UF<sub>6</sub>.

**Response:** Recovery of uranium-235 is a potential reason for storing depleted uranium. Long-term storage is a management option that would preserve some or all of the inventory of depleted UF<sub>6</sub> for use. The viability of refeeding depleted UF<sub>6</sub> is a function of the isotopic assay of depleted UF<sub>6</sub> and many uncertain factors in the future, such as uranium ore price, separative work cost, and demand. The PEIS will briefly discuss these factors.

- **Comment:** The PEIS should evaluate recycling cylinders as scrap steel.

**Response:** The PEIS will address the issue of including empty cylinders in ongoing studies related to DOE's Recycle 2000 initiative for recycle of scrap metals.

- **Comment:** The PEIS should include use of depleted uranium in concrete as aggregate, including use in Hanford reactors.

**Response:** Use of depleted uranium oxide in concrete for shielding purposes will be analyzed in the PEIS. The analysis of this technology at specific facilities will be addressed in follow-on NEPA analyses prior to any siting decisions.

- **Comment:** The PEIS should include use of depleted uranium for backfill material in spent nuclear fuel packages.

**Response:** The PEIS will evaluate the use of depleted uranium for spent nuclear fuel shielding applications.

- **Comment:** The PEIS should include use of depleted uranium for blending highly enriched uranium (HEU) to produce low-enriched uranium (LEU) or for use in mixed-oxide (MOX) fuels.

**Response:** The no action alternative and long-term storage alternatives preserve these options for later use of depleted uranium for blending HEU into LEU or in MOX nuclear fuels (see *Storage and Disposition of Weapons-Usable Fissile Materials, Final Programmatic Environmental Impact Statement*, DOE/EIS-0229, December 1996). The quantity of depleted uranium potentially used for these applications would be very small compared with the representative uses that will be considered in the Depleted UF<sub>6</sub> PEIS.

- **Comment:** The PEIS should evaluate separate uses for depleted uranium and fluorine.

**Response:** The PEIS will analyze representative uses for the depleted uranium from depleted UF<sub>6</sub> and will assume that the fluorine from depleted UF<sub>6</sub> has commercial value as anhydrous hydrogen fluoride and would be sold.

- **Comment:** The PEIS should evaluate only feasible and attainable uses.

**Response:** The representative options to be evaluated in the PEIS were selected because they are feasible and attainable in a reasonable time frame.

- **Comment:** The extent of uses in the general population and demands for such uses should be analyzed in the PEIS.

**Response:** The demand for depleted UF<sub>6</sub> is an economic issue that is outside the scope of the PEIS because the need for management of depleted UF<sub>6</sub> is based on prudent management, not on demand. Such issues as the demand for depleted uranium — including existing data on potential uses, percent of inventory for current or future uses, and optimal form of depleted uranium for use — are discussed in the engineering and cost analysis reports, which will also support the decision on management strategy.

- **Comment:** The PEIS should consider the assay level (e.g., 0.2% uranium-235 compared with 0.4% uranium-235) as a discriminator for uses.

**Response:** A homogeneous assay level is being assumed for this programmatic-level analysis. At a later time, when disposition of individual cylinders is decided, assay level will become an important consideration.

### L.2.6 Cost

A number of issues were expressed with regard to costs. Some indicated that DOE should not spend a lot of money on the problem of depleted UF<sub>6</sub> management, whereas others indicated that costs and benefits of the options should be considered. Specific comments were grouped into the following major issues:

- **Comment:** The PEIS should present and evaluate costs for all depleted UF<sub>6</sub> management options. Costs should be kept to a minimum by using proven processing procedures, selling by-products, and using competitive bid processes.

**Response:** A separate cost analysis report is being prepared, which will be considered in preparing the Record of Decision. The PEIS will discuss costs as they relate to socioeconomic impacts.

- **Comment:** The PEIS should explain the value of the materials in economic terms.

**Response:** The value of the materials is being addressed separately in a cost analysis report.

### L.2.7 Disposal

The disposal options for depleted UF<sub>6</sub> elicited comments regarding waste definitions and waste disposal options, as follows:

- **Comment:** The PEIS needs to evaluate the impacts of disposal in the event that depleted UF<sub>6</sub> were to be classified as a transuranic waste.

**Response:** Depleted UF<sub>6</sub> is a source material. For purposes of the disposal options, it is being assumed that depleted UF<sub>6</sub> will be converted into an oxide and, in oxide form, will be treated as a low-level waste. The PEIS will evaluate the health and environmental impacts of such disposal.

- **Comment:** The PEIS should consider additional options for disposal, such as disposal in sedimentary formations on the ocean floor, vitrification with the molten glass or other techniques, disposal in old missile silos, or returning UF<sub>6</sub> to its original state and to its original source (i.e., uranium mines).

**Response:** The PEIS will analyze a set of options that are anticipated to bound most possibilities for disposal. However, some options are subject to

institutional constraints, are speculative in nature, are in an unknown state of technical development, or have exorbitant costs. The PEIS will describe why certain options were considered in less detail or were judged to be unreasonable.

### L.2.8 Transportation

It was suggested that barge transportation be considered in the PEIS:

- **Comment:** The PEIS should fully evaluate the transportation impacts from all options for depleted UF<sub>6</sub>, especially barge transport (including shipping standards and emergency preparedness).

**Response:** Transportation impacts will be discussed generally in the PEIS for representative routes and representative sites. Decisions on the locations of potential conversion, manufacturing, storage, or disposal facilities would be made after the Record of Decision for this PEIS. At that future time, barge transportation might be appropriate and would be analyzed in any accompanying NEPA documentation. This PEIS will include a qualitative discussion of the results of analyses conducted for other NEPA documents that compare barge transport to truck and rail transport, and a statement that future studies or NEPA analyses supporting siting decisions for conversion, manufacturing, storage, or disposal facilities will consider the transport of depleted UF<sub>6</sub> by barge, as appropriate.

### L.2.9 Policy

Policy issues are higher level issues that could affect the whole PEIS structure and content. A number of these issues were included in the public comments, as follows:

- **Comment:** The PEIS should explain how its decisions fit within the context of other DOE decisions on materials.

**Response:** The PEIS will explain how the programmatic depleted UF<sub>6</sub> decision (how best to manage depleted UF<sub>6</sub> in the future) fits with other related DOE decisions and programs currently under consideration.

- **Comment:** The PEIS should evaluate treatment, storage, and disposal of depleted UF<sub>6</sub> as a waste material.

**Response:** Depleted UF<sub>6</sub> is a source material. The disposal options considered in the PEIS assume conversion of depleted UF<sub>6</sub> to an oxide, with subsequent disposal. Uranium oxides are generally suitable forms for storage (and disposal). The impacts associated with both storage and disposal of U<sub>3</sub>O<sub>8</sub> and UO<sub>2</sub> will be examined.

- **Comment:** The PEIS should explain the time frames for the options and provide some support for those time frames.

**Response:** Time frames for the various phases of the options will be discussed in general terms within the PEIS.

- **Comment:** The PEIS should evaluate all depleted UF<sub>6</sub> materials in the United States, both existing stocks and those for the foreseeable future.

**Response:** The PEIS will analyze a depleted UF<sub>6</sub> inventory accumulated by DOE and its predecessor agencies at Paducah, Kentucky; Portsmouth, Ohio; and Oak Ridge, Tennessee. The analysis will cover the period from 1945 through July 1, 1993, at which time the United States Enrichment Corporation (USEC), a government-owned corporation, was created to operate the Paducah and Portsmouth gaseous diffusion plants. Discussions between the Office of Management and Budget, USEC, and DOE are continuing regarding a Memorandum of Agreement, as provided in Section 3109(a)(2) of the USEC Privatization Act. This Memorandum of Agreement will allocate liabilities that arise from USEC's operations prior to privatization among DOE, USEC, the United States Government, and the new private corporation, including those liabilities arising from the disposal of depleted uranium, currently stored as UF<sub>6</sub>, that was generated by USEC. The draft PEIS will address DOE's role in the management of this depleted uranium consistent with the terms of the Memorandum of Agreement. Because the new corporation will be responsible for the management of depleted UF<sub>6</sub> that it generates after privatization, DOE's role in the future disposal of this material is uncertain and speculative at this time. DOE will fulfill its NEPA responsibilities, as appropriate, when decisions are made in the future regarding the disposition of depleted UF<sub>6</sub> generated by the private corporation.

- **Comment:** DOE should include the NRC, the U.S. Environmental Protection Agency (EPA), and the Nevada Test Site in the discussions of disposal options for depleted UF<sub>6</sub>.

**Response:** Other federal agencies, including NRC and EPA, will be consulted during the PEIS comment process. The Nevada Test Site, a DOE site, will be asked for comments.

- **Comment:** The PEIS should analyze options for privatizing all facilities considered in the options for depleted UF<sub>6</sub>.

**Response:** The privatization of facilities will be considered qualitatively in the PEIS.

- **Comment:** DOE needs to identify the sources of funds that will be used for this program.

**Response:** The issue of program funding is outside the scope of this NEPA analysis, which addresses impacts to the natural and human environment.

### L.2.10 Other Issues

Other issues are not easily categorized and therefore have been placed at the end of the discussion of topics brought up during public scoping. These issues are summarized as follows:

- **Comment:** The PEIS should consider what other nations such as Japan and France have done with regard to depleted UF<sub>6</sub>.

**Response:** Part of the engineering development for options considered technologies in other countries.

- **Comment:** The PEIS should fully explain the need for taking any actions for depleted UF<sub>6</sub>.

**Response:** The PEIS will explain the purpose and need for the action.

- **Comment:** The PEIS should have a smaller list of alternatives so that the decisions and impacts can be clearly understood.

**Response:** The PEIS will attempt to minimize the list of options and alternatives in order to clearly lay out the environmental effects for the decision makers and the public.