New Fuel Facility Licensing

Gas Centrifuge Enrichment

GE Laser Enrichment

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Uranium Deconversion Facility Licensing

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IIFP Fluorine Extraction and Depleted Uranium Deconversion Plant Licensing

On December 30, 2009, International Isotopes Fluorine Products (IIFP), Inc. (a subsidiary of International Isotopes, Inc.), submitted an application to the U.S. Nuclear Regulatory Commission (NRC), seeking a license to construct and operate a U.S. facility for deconversion of depleted uranium. Specifically, IIFP has selected a site in Lea County, New Mexico, for its proposed facility, which will be known as the Fluorine Extraction Process and Depleted Uranium Deconversion (FEP/DUP) Plant. As proposed, this facility will deconvert depleted uranium hexafluoride (DUF_6) into fluoride products (for commercial resale) and uranium oxides (for disposal). The proposed facility is projected to be capable of processing up to 22 million pounds of DUF_6 per year, or approximately one-quarter of the DUF_6 that is commercially produced in the United States.

For additional information, contact us or see the following topics on this page:

- Regulation and Legislation
- License Application
- Safety Evaluation Report
- Environmental Impact Statement
- Correspondence and Other Information
- Public Involvement
  - Meeting Schedule
  - Meeting Archive
- Related Information

Some links on this page are to documents in our Agencywide Documents Access and Management System (ADAMS). For additional information, see our Plugins, Viewers, and Other Tools.

Regulation and Legislation

Source material licensees, such as IIFP, are regulated under Title 10, Part 40, of the *Code of Federal Regulations* (10 CFR Part 40), in accordance with the Atomic Energy Act (AEA) of 1954. Although a formal adjudicatory hearing is not required for this type of license application, under the AEA any person whose interest may be affected by this proceeding may request a hearing. In addition to providing the opportunity for a hearing, the AEA requires the applicant to obtain public liability insurance for its facility. Further, the AEA requires the NRC to inspect the facility before operations begin to ensure that the plant is constructed to meet the license requirements.

Because licensing this type of facility is considered a Federal action, the NRC must meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The NRC staff will comply with NEPA in the present case by preparing an environmental impact statement (EIS) in accordance with agency regulations in 10 CFR Part 51.

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License Application

On December 30, 2009, INIS submitted a license application, seeking to construct and operate the proposed FEP/DUP Plant near Hobbs, New Mexico. That license application included the following documents:

- License Application, LA-IFP-001, "International Isotopes Inc. FEP/DUP Plant Public License Application" (Revision A)
- License Application, Appendix A, LA-IFP-002, "Quality Assurance Program"(Revision A)
- License Application Engineered Drawings

- Integrated Safety Analysis Summary, SA-IFP-001 (Revision A)
- Environmental Report, ER-IFP-001 (Revision A)

On February 24, 2010, the NRC accepted the application for formal review. A safety review team and environmental review team are conducting both technical and environmental reviews of the submittals, with the goal of developing a safety evaluation report and an environmental impact statement. As the reviews progress, the staff will issue requests for additional information (RAIs), as needed, to ensure that the proposed facility will be constructed and operated safely and compliance with agency regulations. Such RAIs will be listed on this page, along with the applicant's reponses.

The entire review is scheduled to be completed within 18–24 months.

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Safety Evaluation Report

The NRC staff conducts a technical review of the license application and integrated safety analysis summary against applicable regulations (e.g., 10 CFR Part 40) and guidance (e.g., NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility), and then prepares a safety evaluation report to document the review findings.

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Environmental Impact Statement

On December 30, 2009, INIS submitted an Environmental Report (ER) for the proposed IIFP FEP/DUP deconversion facility. The ER provides the applicant's assessment of the environmental impacts of the proposed commercial facility. As required by the National Environmental Policy Act (NEPA) and NRC regulations in 10 CFR Part 51, the NRC must develop its own assessment, which will be documented in an environmental impact statement (EIS).

For more information about NEPA and the environmental review process, see Frequently Asked Questions About NRC's Role under the National Environmental Policy Act. To learn more about environmental reviews for nuclear materials sites, see Materials Environmental Reviews Under the National Environmental Policy Act (NEPA).

The NRC staff plans to hold a public meeting on the scope of the EIS for the proposed IIFP FEP/DUP deconversion facility in the spring or early summer of 2010, in Hobbs, New Mexico. The public is encouraged to provide comments on the NRC's scoping process.

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Correspondence and Other Information

The NRC maintains IIFP-related documents in the Agencywide Documents Access and Management System (ADAMS). Publicly available documents may be located by entering the IIFP Docket Number (04009086) in the ADAMS Advanced Web Search. Some of these key documents are listed below.

Date	Description
04/05/2010	Federal Register Notice for Opportunity to Request a Hearing for IIFP Application
02/23/2010	Letter to J. Miller re: License Application for International Isotopes Fluorine Products, Inc. Facility - Acceptance Review (TAC L32739 and L32740)
01/14/2010	NRC Handout on FCSS Safety Review for the INIS Public Meeting on January 14, 2010
01/14/2010	NRC Slide Presentation for the INIS Public Meeting on January 14, 2010, regarding Facility Licensing for the INIS FEP/DUP Plant
12/30/2009	Cover Letter for the International Isotopes License Application — Fluorine Extraction Process Depleted Uranium Hexafluoride Deconversion Plant (FEP/DUP)
10/22/2009	Memorandum of Agreement Between International Isotopes, Inc., and the New Mexico Environment Department
05/26/2009	Letter to J. Miller re: Letter re: International Isotopes' Intent To Submit License Application for Depleted Uranium Hexafluoride Deconversion Facility

04/13/2009	Letter to Michael Weber (NRC) re: International Isotopes' Intent To Submit License Application for Depleted Uranium Hexafluoride Deconversion Facility

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Public Involvement

Meeting Schedule

For upcoming meetings, see our Public Meeting Schedule.

Meeting Archive

The following table lists, in chronological order, the public meetings that the NRC staff has conducted in regard to the application and licensing processes for the IIFP depleted uranium deconversion facility.

Meetings and Other Interactions Between IIFP and NRC	
Meeting Date	**Subject**
07/29/2010	Public Scoping meeting on the environmental review for the proposed International Isotopes Fluorine Products, Inc. fluorine extraction process and depleted uranium de-conversion plant in Hobbs, New Mexico • Meeting Notice • Transcript of Meeting • Slide Presentation from Scoping Meeting • Summary of Site Visit, Meetings with Public Officials, and the Public Scoping Meeting • Comments Received from Scoping Meeting
07/06/2010	Site visit to conduct Integrated Safety Analysis horizontal and vertical slice and discus draft requests for additional information with International Isotopes Inc. • Meeting Summary
07/01/2010	International Isotopes Inc. and agency management meet to discuss the ongoing licensing review for the proposed deconversion facility. • Meeting Notice • Meeting Summary
04/27/2010	Telephone call summary regarding the status of the International Isotopes Inc. land transfer, site characterization, and the detailed facility design. • Meeting Summary
02/17/2010	Conference Call To Discuss Environmental Report • Call Summary
01/20/2010	Conference Call To Discuss the Review Schedule for the License Application • Call Summary
01/14/2010	Public Meeting To Describe the Review Process for the International Isotopes Depleted Uranium Deconversion Application • Meeting Summary
11/03/2009	Conference Call To Discuss the Submittal Date of the License Application • Meeting Summary
03/07/2009	Closed Meeting: Discuss Security and Integrated Safety Analysis Requirements

	• Call Summary • Attachment: Meeting Summary • Attachment: Slide Presentation

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Related Information

- Frequently Asked Questions About Depleted Uranium Deconversion Facilities
- Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility (NUREG-1520)

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Wednesday, October 20, 2010

Frequently Asked Questions about Depleted Uranium Deconversion Facilities

Deconversion involves extracting the fluoride from the depleted uranium hexafluoride (DUF_6), or "tailings," produced during the uranium enrichment process. The questions and answers on this page provide information about deconverting DUF_6 into fluoride products (for commercial resale) and uranium oxides (for disposal).

On this page:

Index to all Frequently Asked Questions Pages

What role does depleted uranium play in the nuclear fuel cycle?

Depleted uranium is produced in the uranium enrichment process when uranium-235 (U^{235}) is extracted from natural uranium to concentrate this isotope into fuel for nuclear reactors.

For the types of nuclear power plants operating in the United States, uranium needs to be enriched. Natural uranium primarily contains two isotopes, uranium-238 (U^{238}) (99.3 percent) and U^{235} (0.7 percent). The concentration of U^{235}, the readily fissionable isotope in uranium, needs to be increased to between 3 and 5 percent for practical use as a nuclear fuel. Enrichment plants use various means to concentrate the U^{235}, including gaseous diffusion, gas centrifuge, or laser separation enrichment.

The U^{235} is increased in a portion of material by decreasing the U^{235} in the remainder of the material. For example, if an enrichment facility processes 1,000 kilograms (kg) of natural uranium to raise the U^{235} concentration from 0.7 percent to 5 percent, the facility would produce 85 kg of enriched uranium and 915 kg of depleted uranium. The amount of U^{235} in the bulk of the material decreases, or is depleted, to a concentration of 0.3 percent. Uranium with a concentration of U^{235} below that of natural uranium (0.7 percent) is called depleted uranium.

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What is the current method for disposing of depleted uranium?

Depleted uranium is primarily stored at the enrichment facilities in the form of uranium hexafluoride (UF_6), a chemical form required for enrichment but not optimal for long-term storage. This depleted uranium hexafluoride (DUF_6) is typically stored in 14-ton cylinders near the enrichment facilities. Processed depleted uranium may be sold for commercial uses such as counterweights, military penetrators, shielding, etc. Alternatively, material may be transferred to the U.S. Department of Energy (DOE) for a fee. It may also be disposed of at commercial disposal sites if the material meets the site's disposal criteria.

Depleted uranium can be disposed of as low-level radioactive waste if it is converted to chemically stable uranium oxide compounds, such as triuranium octoxide (U_3O_8) or uranium dioxide (UO_2), which are similar to the chemical form of natural uranium.

DOE currently has more than 700,000 metric tons (771,000 U.S. tons) of depleted UF_6 in storage EXIT. Under the U.S. Enrichment Corporation (USEC) Privatization Act, DOE is required to accept depleted uranium from a uranium enrichment facility licensed by the U.S. Nuclear Regulatory Commission (NRC) if the depleted uranium is determined to be low-level radioactive waste. Under the USEC Privatization Act, the licensee must reimburse DOE for its costs.

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Does the radioactivity of depleted uranium increase over time?

Yes and no. Uranium is a radioactive material with two primary isotopes, U^{235} and U^{238}. These isotopes decay at a constant rate that has a half-life (i.e., time for the activity to reduce by half) greater than 100 million years. No significant change would be observed in the radiation emitted from these isotopes during a typical 75-year lifetime. However, the buildup of daughter products from the decay of these isotopes does increase the total radiation emitted from the material.

In the radioactive decay process, an atom transforms by emitting radiation in the form of particles or energy. Uranium undergoes radioactive decay very slowly. The half-life for U^{238} is 4.5 billion years. After one half-life, a container that originally held 10,000 kg of pure U^{238} would be reduced to 5,000 kg of U^{238}, along with approximately 5,000 kg of associated daughter products. Many of these daughter products are also unstable and undergo further radioactive decay until they transform into a stable isotope of lead. As the U^{238} decays, the amount of daughter products increases which, in turn, increases the total radiation emitted from a container of U^{238}. The radioactivity of the daughter products continues to increase until it reaches equilibrium with the activity of the parent nuclide (i.e., U^{238} or U^{235}).

For illustrative purposes only, consider a storage cylinder of depleted uranium oxide which contains 10,000 kg of solid uranium dioxide. In the first year, the radioactivity at 1 meter from the cylinder would be approximately 0.26 mrem/hr (0.0026 mSv/hr). Standing in this position for approximately 37 hours would cause a person to receive the equivalent of one chest X-ray, 10 mrem (0.1 mSv). After 10,000 years, this radioactivity would rise to approximately 1.0 mrem/hr (0.01 mSv/hr), and a person standing in this position for 10 hours would receive the equivalent of one chest X-ray. After about 1 million years, the radioactivity would reach equilibrium at approximately 30 mrem/hr (0.30 mSv/hr), at a 1-meter distance. This radioactivity would result in the equivalent of one chest X-ray in approximately 20 minutes. [Note: The figures above were calculated using MicroShield v5.5, Grove Software, Inc. A cylinder with a 1.6-cm iron (7.8 g/cm^3) shell was assumed to contain 10,000 kg of solid uranium dioxide (11 g/cm^3). The radioactive isotopic content was projected to contain 99.7% U^{238}, 0.3% U^{235}, and 0.17kg of U^{234}, and buildup due to air was included.]

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What are the principal hazards at a depleted uranium deconversion facility?

Chemical exposure presents the dominant hazard at this type of facility. Uranium and fluoride compounds such as hydrogen fluoride (HF) are toxic at low chemical exposure levels.

When depleted UF_6 contacts moisture in air, it reacts to form HF and uranyl fluoride gas. Uranium is a heavy metal that can be toxic to the kidneys when taken internally. HF is a corrosive acid that can be very dangerous if inhaled; it represents the principal hazard at this facility. These hazards are controlled by plant design and administrative controls to reduce the likelihood and consequences of an accidental release of these compounds. Such measures include sealed vaults, water suppression systems, controlled ventilation system, and air scrubbers. The U.S. Department of Transportation and the NRC regulate the transportation of depleted UF_6 to and from the facility.

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What will happen to the waste products from the deconversion process?

Deconversion permits the recovery of fluoride compounds which have commercial value when processed and purified. Depleted uranium also has some commercial value as counterweights, shielding, military penetrators, etc. In the oxide form, uranium can be disposed of as low-level radioactive waste at an approved disposal facility.

Approximately 350,000 tons of anhydrous HF are used annually in the United States.[1] HF is used in the production of refrigerants, herbicides, pharmaceuticals, high-octane gasoline, aluminum, plastics, electrical components, and fluorescent light bulbs. Demand for HF for fluorocarbons, broadly used as refrigerants, is increasing as an alternative to ozone-depleting chlorofluorocarbons. Silicon tetrafluoride is used on a limited basis in microelectronics. Boron tetrafluoride is used for doping silicon chips and other purposes in the chemical industry.

As the fluorine is extracted, the uranium is converted to an oxide (either U_3O_8 or UO_2). These oxides are chemically stable compared to UF_6. They are generally suitable for near-surface disposal as low-level radioactive waste. Uranium exists in the oxide form in nature, but at significantly diluted concentrations. The specific radioactivity (radioactivity per mass of uranium oxide) of the depleted uranium oxides is less than natural uranium because of the reduction of U^{234}, U^{235}, and the majority of daughter products which are removed during the enrichment process. The majority of these daughter products return to natural levels over the course of several million years.

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What projects are currently planned for depleted uranium deconversion in the United States?

Currently, the United States has one operating deconversion facility, which is regulated by the State of Tennessee under an Agreement State license in accordance with Title 10, Part 40, of the *Code of Federal Regulations* (10 CFR Part 40), "Domestic Licensing of Source Material." At this facility in Jonesborough, Tennessee, Aerojet Ordnance Tennessee, Inc., fabricates uranium metal for the U.S. Army to use as antitank rounds. This fabrication involves deconverting depleted UF_4 using a process that does not produce significant quantities of fluorine or hydrogen fluoride as reaction products.

As directed by Congress, the U.S. Department of Energy (DOE) is constructing two depleted uranium deconversion facilities EXIT next to the existing gaseous diffusion uranium enrichment plants (GDP) in Paducah, Kentucky, and the Portsmouth GDP (near in Piketon, Ohio). The plants are projected to be completed in mid-year 2010.[2] Together, these plants will deconvert more than 700,000 metric tons (771,000 U.S. tons) of depleted UF_6 in storage EXIT in the DOE inventory. This inventory is projected to require 15–20 years to deconvert once the facilities become operational. DOE plans to dispose of the 551,000 metric tons of depleted uranium oxide as low-level radioactive waste at an estimated cost of about $428 million. See Depleted UF_6 Management EXIT for additional detail regarding the DOE program.

In addition, on December 30, 2009, International Isotopes Fluorine Products, Inc. (IIFP, a subsidiary of International Isotopes, Inc.) submitted an application to the U.S. Nuclear Regulatory Commission (NRC), seeking a license to construct and operate a Fluorine Extraction Process and Depleted Uranium Deconversion (FEP/DUP) Plant near Hobbs, New Mexico. If approved, the FEP/DUP Plant will be the first major commercial deconversion facility licensed by the NRC to convert depleted UF_6 to a uranium oxide for the purpose of recovering the fluoride products. The NRC's licensing safety review and development of the environmental impact statement are scheduled to be completed in 2012. This schedule may change based on the quality of the applicant's license application, its responsiveness to requests for additional information, and unanticipated higher-priority operational safety work.

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What is the NRC's role in the construction and operation of the deconversion plant?

Under the Atomic Energy Act (AEA) of 1954, as amended, the NRC licenses source material (e.g., natural and depleted uranium) under Title 10, Part 40, of the *Code of Federal Regulations* (10 CFR Part 40), among other regulations.

The NRC implements the National Environmental Policy Act (NEPA) in accordance with its own regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The environmental assessment (EA) or environmental impact statement (EIS) describes the potential environmental impacts of construction, operation, and decommissioning of the new facility.

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What will happen in the NRC's licensing process?

During the NRC's licensing process, the staff will conduct a thorough review of the application to ensure that it meets the technical, environmental, and security requirements under Federal law. There will be opportunities for stakeholder interaction at numerous steps throughout the process.

On receipt of a license application and environmental report, the NRC staff conducts an acceptance review of the application to ensure that it contains sufficient information to begin a review. The NRC staff also conducts a review of the application to ensure that sensitive information is identified and removed before making it publicly available. If the application is acceptable, the NRC formally dockets the submittal and makes nonclassified and nonsensitive portions publicly available in the Agencywide Documents Access and Management System (ADAMS) and on the NRC's public Web site (see IIFP Fluorine Extraction Process and Depleted Uranium Deconversion (FEP/DUP) Plant Licensing). Once the documents have been accepted for formal review, the NRC staff initiates the formal technical review and the environmental review. Shortly after accepting the application, the NRC also issues a *Federal Register* notice of opportunity to request a hearing. The term "hearing" refers to a formal judicial process before a panel of administrative law judges set up to address NRC licensing issues.

As part of a major EA or EIS, the NRC staff conducts a scoping meeting near the proposed site. This meeting affords the public an opportunity to suggest areas to be addressed in the environmental review. After the scoping process, the NRC prepares a "finding of no significant impact" for the EA or a draft EIS and offers a formal opportunity to comment on the draft. Again, the NRC staff meets with the public to accept comments on the draft EIS. Written comments are also accepted. The EIS process takes approximately 24 months.

The technical review of a new fuel cycle facility takes approximately 18–20 months to complete and determines whether the proposed project meets the NRC's safety and security requirements. The staff documents the technical review in a safety evaluation report (SER). The environmental review runs at the same time as the technical review. If a hearing is granted, the hearing process begins after issuance of the SER and EIS.

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How does this project relate to the National Enrichment Facility, located in Lea County, New Mexico?

The IIFP Fluorine Extraction Process and Depleted Uranium Deconversion (FEP/DUP) Plant will be designed to process up to 22 million pounds of commercially generated depleted UF_6 annually. Neither International Isotopes, Inc. (INIS), nor its subsidiary, International Isotopes Fluorine Products (IIFP), Inc., is associated with the National Enrichment Facility. INIS plans to develop independent agreements with commercial enrichment facilities to process the depleted UF_6. One of these facilities may be the National Enrichment Facility, located in Lea County, New Mexico

Where is the nearest office that will inspect this plant for safety?

The NRC's Region II Office in Atlanta, GA, will conduct routine inspections of the proposed facility because it is responsible for nuclear fuel cycle facilities. Headquarters staff from Rockville, Maryland, will also perform inspections. The nearest NRC office is the Region IV Office in Arlington, Texas.

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[1] "Toxicological Profile for Fluorides, Hydrogen Fluoride, and Fluorine," U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, September 2003.

[2] "Audit Report: Potential Uses for Depleted Uranium Oxide EXIT," U.S. Department of Energy, Office of the Inspector General, Office of Audit Services, DOE/IG-0810, January 2009.