



*Depleted Uranium Uses
Regulatory Requirements
and Issues*

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1

NOTES

Work Performed for: Office of Facilities (NE-40)
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<p><i>Draft PEIS Published 12/97</i></p>	<ul style="list-style-type: none"> • <i>Preferred Alternative = 100% Use Following Conversion to DU-oxide or DU-metal</i> • <i>Representative Large-scale Potential Use = Casks for Spent Fuel or HLW</i>
<p><i>Public Law 105-204 (7/21/98)</i></p>	<ul style="list-style-type: none"> • <i>Requires DOE to Prepare and Submit a Plan to Congress for Construction and Operation of Onsite Facilities at Portsmouth and Paducah to “treat and recycle depleted uranium hexafluoride”</i> • <i>Earmarks Funds Previously Collected by USEC</i>

NOTES

- The draft *Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (the “draft PEIS”) was published in December 1997.
- The draft PEIS identifies DOE’s preferred alternative for long-term management of the depleted uranium hexafluoride (DUF6) for which DOE is responsible as 100% use of depleted uranium (DU) following conversion from DUF6 to DU-oxide, DU-metal, or both.
- The draft PEIS evaluates use of concrete, in which DU-oxide has been substituted for aggregate, to make casks designed to contain spent nuclear fuel or high-level radioactive waste (HLW). In this use, DU-oxide provides radiation shielding with a smaller volume of material than could otherwise be achieved. The draft PEIS evaluated this use because it is considered to have potential environmental effects that are representative of most large-scale alternative uses of DU in either oxide or metal form.
- Public Law 105-204 requires DOE to prepare and present to Congress, a plan and proposed legislation to ensure that funds previously collected by the United States Enrichment Corporation (USEC) for the purpose of DUF6 dispositioning will be used to commence construction of and to operate an onsite facility to treat and recycle depleted uranium at each of the gaseous diffusion plants at Portsmouth, OH and Paducah, KY.
- In light of Public Law 105-204, which Congress enacted on July 21, 1998, the alternative management option of continued storage as DUF6 for the long term will probably be eliminated from further consideration for purposes of the Record of Decision.
- The DOE recognizes that actually achieving 100% use will require development of multiple applications for DU. Therefore, the DOE has initiated an analysis of regulatory requirements applicable to the activities comprising pathways to DU uses.
- The purpose of the analysis is to cooperate with industry in identifying regulatory requirements that are so burdensome or costly that they would diminish the likelihood that DU uses in the private sector will occur.
- Based on results of the regulatory analysis, the DOE plans to interact with responsible regulatory agencies to develop strategies for modifying or eliminating overly burdensome requirements when doing so would not compromise protection of public health or the environment.
- This presentation summarizes preliminary findings of the regulatory analysis.



Other Uses

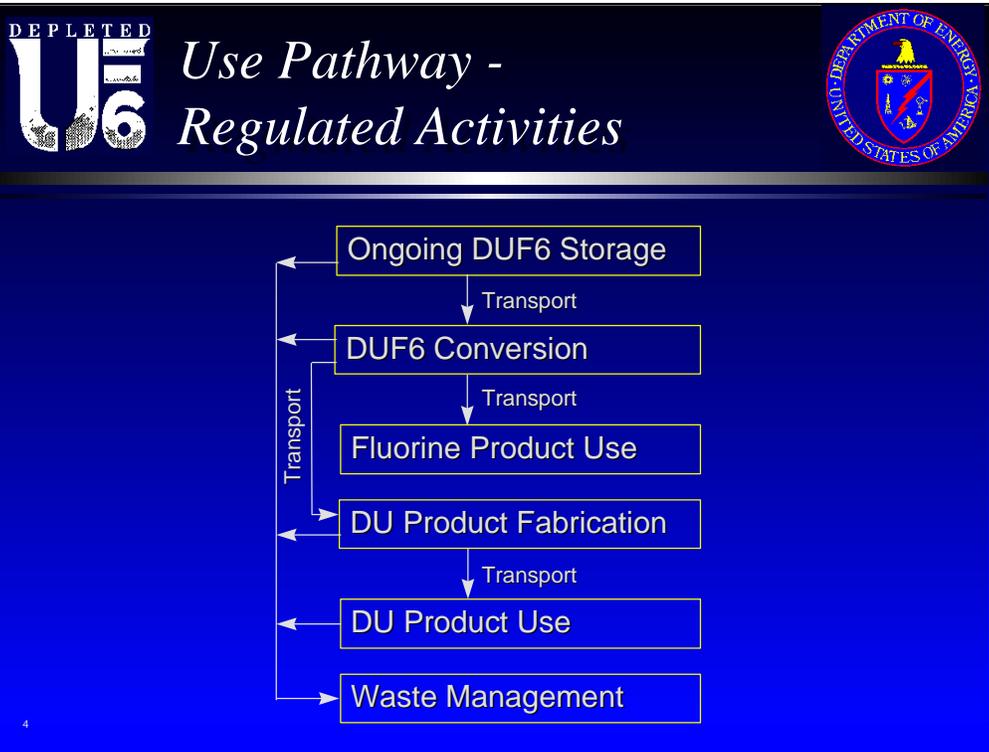


- *Other Existing Uses*
 - + *Ballast and Counterweights*
 - + *Military Vehicle Armor*
 - + *Armor-Piercing Munitions*
 - + *Medical & Industrial Source Shielding*
- *Other Potential Future Uses*
 - + *Petroleum Industry Applications*
 - + *Flywheels for Energy Storage*
 - + *Reactor Fuels*

3

NOTES

- In addition to the radiation shielding use of DU-oxide in concrete that was evaluated in the draft PEIS, a number of other existing and potential uses for both have been identified.
- DU-metal has seen limited past use as ballast and counterweights in commercial and military aircraft, rockets, and some industrial equipment.
- DU-metal alloys are used by the U.S. Army in tank armor plate and by both the U.S. Army and Air Force in a variety of kinetic energy cartridges designed for fire from tanks and aircraft.
- DU-metal and DU-metal alloys are commonly used as shielding and collimator material in industrial radiographic imaging and gauging devices and in medical diagnostic and therapeutic devices that contain radiation sources or generate radiation (e.g., linear accelerators).
- Potential future uses that have not yet been commercially developed include flywheels made of DU-metal or DU-metal alloys for energy storage at power plants, reactor fuels composed of a blend of DU-oxide and either enriched uranium or plutonium, and petroleum industry shape charges and drilling collars made of DU-metal or DU-metal alloys.



NOTES

- The pathway from current DUF6 storage to each use of DU consists of the same seven basic activities shown on this slide. They include:
- Ongoing DUF6 Storage
 - DUF6 Conversion
 - Fluorine Product Use
 - DU Product Fabrication
 - DU Product Use
 - Waste Management
 - Transportation



Regulated Activities - Ongoing DUF6 Storage



Regulation of DUF6 Storage

- Atomic Energy Act
 - + DOE Storage is Self-Regulated
- State of Ohio
 - + Exempt From Waste Characterization Requirements for 10 Years If Storage Complies With Approved Management Plan

NOTES

- Storage of DUF6 is ongoing at three DOE sites located near Portsmouth OH, Paducah KY, and Oak Ridge TN. DOE will retain responsibility for storage of legacy DUF6 at these sites. The United States Enrichment Corporation has responsibility for storage of newly generated DUF6 at the gaseous diffusion plants near Portsmouth and Paducah.
- As provided in the Atomic Energy Act, DOE self-regulates DUF6 storage for which the Department is responsible under DOE Orders and DOE regulations applicable to non-reactor nuclear facilities.
- The Defense Nuclear Facilities Safety Board (DNFSB) provides oversight of DOE's self-regulation.
- At the Portsmouth OH gaseous diffusion plant site, the Ohio Environmental Protection Agency (Ohio EPA) has asserted authority over DOE's DUF6 storage area under state solid waste laws and regulations that implement RCRA.
 - + Ohio EPA has issued an agreed order exempting DUF6 from waste characterization requirements during the next ten years, provided that it is managed according to an approved management plan.
 - + The Ohio EPA has shown no interest in regulating DUF6 as waste if it is being sent offsite for beneficial use.
 - + Other states and EPA have expressed no interest in applying RCRA to DUF6 storage.
- Regulation of DUF6 storage is not expected to negatively affect any pathway to commercial use of DU during the next ten years.



Regulated Activities - DUF6 Conversion



Regulation of DUF6 Conversion

- Atomic Energy Act - NRC/Agreement State
 - + Specific License for Source Material
- Clean Air Act
 - + PSD, Non-Attainment Area, Title V Permits for Industrial Furnace
 - + NESHAPs Compliance for Radionuclides
- Clean Water Act
 - + NPDES Permit for Point Source Discharges
 - + Section 404 for Dredge & Fill Activities
- National Environmental Policy Act

NOTES

- For the purpose of the regulatory analysis, private sector ownership and operation of a new DUF6 conversion facility located at a greenfield site is assumed.
- The conversion process is assumed to include an industrial furnace, although the nature of the furnace and the quantity and content of its emissions is not known.
- Atomic Energy Act regulations require a source material specific license from the NRC/Agreement State to receive, possess, use, transfer, and deliver depleted uranium.
- Clean Air Act requires:

- *Prevention of Significant Deterioration* (PSD) permit or *Nonattainment Area* permit for construction of a major source (i.e., source emits more than 100 tpy total of regulated air pollutants, 25 tpy total of hazardous air pollutants (HAPs), or 10 tpy of a single HAP).
- *Title V* permit for operation of any stationary source that is a major source, a source subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs), or a source subject to New Source Performance Standards (NSPS).
- Compliance with NESHAPs. (NOTE: No NESHAPs for radionuclides has been set that would apply to an industrial furnace at a non-DOE DUF6 conversion facility.)

Clean Water Act requires:

- *National Pollutant Discharge Elimination System* (NPDES) permit for construction and operation of point source discharges, including stormwater runoff, to waters of the United States.
- Section 404 permit for placing dredged or fill materials into waters of the United States, including areas designated as wetlands.

National Environmental Policy Act requires federal agencies to prepare an EIS before taking a major federal action significantly affecting the quality of the human environment. NEPA does not apply to state-issued permits or to permits issued by EPA under the Clean Air Act. The EPA and the U.S. Army Corps of Engineers would be required to fulfill NEPA responsibilities in issuing permits under the Clean Water Act, as would the NRC in issuing a source material specific license.



Regulated Activities - Fluorine Product Use



Regulation of Fluorine Product Use

- Potential Fluorine Products: HF, F₂, CaF
- Atomic Energy Act - NRC/Agreement State
 - + Specific Release Limits Must be Authorized, Unless Fluorine Products Are Not Known to Contain Residual Radioactive Material

NOTES

- Processes for converting DUF6 to DU-Oxide and DU-metal are assumed to produce potentially marketable fluorine products, which may include hydrogen fluoride (HF), fluorine gas (F₂), and calcium fluoride (CaF). However, the actual identity and quantity of fluorine products that will be produced are not yet known.
- The level of residual radioactive material in fluorine products depends on the conversion process used.
- At present, except in the case of license termination and for disposal, NRC regulations do not provide for release of materials for unrestricted use that are known to contain residual radioactivity at any level.
- If the DUF6 conversion process is not known to leave residual radioactive material in fluorine products, then the fluorine products may be released after an adequate survey demonstrating that radiation exposure levels produced by the fluorine products are not distinguishable from background.
- If the DUF6 conversion process is known to leave residual radioactive material in the fluorine products, then before releasing the fluorine products, the conversion facility must apply to the NRC/Agreement State for the addition of release limits and survey requirements to the facility's source material specific license.



Regulated Activities - Product Fabrication



Regulation of DU Product Fabrication

- Atomic Energy Act - NRC/Agreement State
 - + Specific License for Source Material
 - + Special Requirements When Products Will be Used Under General License
- Clean Air Act
 - + PSD, Non-Attainment Area, and Title V Permits for Industrial Furnace (DU-Metal)
 - + NESHAPs for Radionuclides
- Clean Water Act
 - + NPDES Permit for Point Source Discharges
 - + Section 404 for Dredge & Fill Activities
- National Environmental Policy Act

NOTES

- For the purpose of this slide, private ownership and operation of a new DU product fabrication facility at a greenfield site is assumed.
- The fabrication facility is assumed to include an industrial furnace for melting DU-metal, although the nature of the furnace and the quantity and content of its emissions is not known.
- Atomic Energy Act regulations require a source material specific license from the NRC/Agreement State to receive, possess, use, transfer, and deliver depleted uranium. Special requirements (addressing design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards) apply to manufacturers of industrial products containing DU that will be used under a general license.
- Clean Air Act requires:

- *Prevention of Significant Deterioration* (PSD) permit or *Nonattainment Area* permit for construction of a major source (i.e., source emits more than 100 tpy total of regulated air pollutants, 25 tpy total of hazardous air pollutants (HAPs), or 10 tpy of a single HAP).
- *Title V* permit for operation of any stationary source that is a major source, a source subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs), or a source subject to New Source Performance Standards (NSPS).

- Compliance with NESHAPs. (NOTE: No NESHAPs for radionuclides has been set that would apply to an industrial furnace at a non-DOE DUF6 conversion facility.)

Clean Water Act requires:

- *National Pollutant Discharge Elimination System* (NPDES) permit for construction and operation of point source discharges, including stormwater runoff, to waters of the United States.
- Section 404 permit for placing dredged or fill materials into waters of the United States, including areas designated as wetlands.

National Environmental Policy Act requires federal agencies to prepare an EIS before taking a major federal action significantly affecting the quality of the human environment. NEPA does not apply to state-issued permits or to permits issued by EPA under the Clean Air Act. The EPA and the U.S. Army Corps of Engineers would be required to fulfill NEPA responsibilities in issuing permits under the Clean Water Act, as would the NRC in issuing a source material specific license.



Regulated Activities - Product Use



Regulation of DU Product Use

- Atomic Energy Act - NRC/Agreement State
 - + **Exemption** for:
 - DU Counterweights in Aircraft, Rockets, Projectiles, and Missiles.
 - DU Shielding That Is A Component of Any Shipping Container.
 - + **General License** for Industrial Products or Devices Made from DU
 - + **Specific License** for All Other Uses
 - + End-of-Life Recycle or Appropriate Disposal

NOTES

- Because DU products contain source material, NRC regulations govern the use of DU products in the private sector.
 - Use of the following DU products is **exempt** from regulation:
 - + DU counterweights installed in aircraft, rockets, projectiles, and missiles, if:
 - (1) The counterweights are manufactured under a specific license; and
 - (2) The counterweights are impressed and labeled with information which the regulations specify.
 - + DU-metal shielding constituting part of any shipping container, if:
 - (1) The shipping container is impressed with the legend which the regulations specify; and
 - (2) DU-metal is encased by steel or another fire-resistant metal.
 - Use of industrial products and devices made from DU is authorized under a **general license** if:
 - (1) Product or device is manufactured under a specific license having special requirements regarding design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards.
 - The general license exempts the user from compliance with certain NRC/Agreement State regulations.
 - The general license requires the following actions by the user:
 - (2) File a registration certificate.
 - (3) Do not treat or process DU.
 - (4) Do not abandon DU.
 - (5) Transfer and dispose DU properly.
 - (6) Report transfer of DU.
- A **specific license** is required to use any DU product not covered by an exemption or general license.
- At the end of its useful life, a DU product or device must either be recycled, or disposed in an appropriate facility. [Note: Parties have disagreed in the past on the type of facility appropriate for DU disposal.]



Regulated Activities - Waste Management



Regulation of Waste Management

- Solid Wastes/Nonhazardous
 - + State Laws & Regs / RCRA Subtitle D
- Solid Wastes/Hazardous
 - + EPA Hazardous Waste Regs / RCRA Subtitle C
 - + Authorized State Hazardous Waste Laws & Regs / RCRA Subtitle C
- Radioactive Wastes/Low-Level (LLW)
 - + DOE Orders & Regs for DOE Wastes on DOE Sites
 - + NRC Regs
- Radioactive & Hazardous Wastes/Mixed
 - + EPA Hazardous Waste Regs/ Site-Specific Treatment Plans/ EPA Mixed Waste Storage Policy
 - + DOE Orders & Regs for DOE Wastes on DOE Sites
 - + NRC Regs

NOTES

- Wastes generated by regulated activities in any pathway to using DU may fall into one or more of the following waste categories: solid waste/nonhazardous, solid waste/hazardous, radioactive waste/low-level, radioactive and hazardous waste/mixed.
- Nonhazardous solid waste management is governed by State laws, some of which implement the mandates of RCRA Subtitle D, "State or Regional Solid Waste Plans."
- Hazardous solid waste management is governed by RCRA Subtitle C, "Hazardous Waste Management," as implemented by EPA regulations and State laws and regulations.
- Radioactive wastes produced by processing, handling, and using DUF₆, DU-oxide or DU-metal are classified under NRC regulations as low-level waste (LLW). Such wastes must be disposed in a NRC-licensed disposal facility that accepts waste in the form being sent for disposal. [Note: NRC-licensed LLW disposal capacity in the United States is currently extremely limited. Also, available facilities may not accept DU for disposal in the form of DUF₆ or DU-metal.]
- Mixed wastes (i.e., waste having both a radioactive component and a RCRA hazardous waste component) must be disposed in compliance with both NRC LLW requirements and RCRA hazardous waste requirements. [Note: Storage of mixed wastes is prohibited by RCRA. Also, mixed waste treatment and disposal capacity in the United States is currently extremely limited. Accordingly, EPA has adopted a policy of giving a reduced priority to civil enforcement of the RCRA storage prohibition at facilities that generate less than 1,000 cubic feet of mixed waste per year and are operated in an environmentally responsible manner.]



Regulated Activities - Transportation



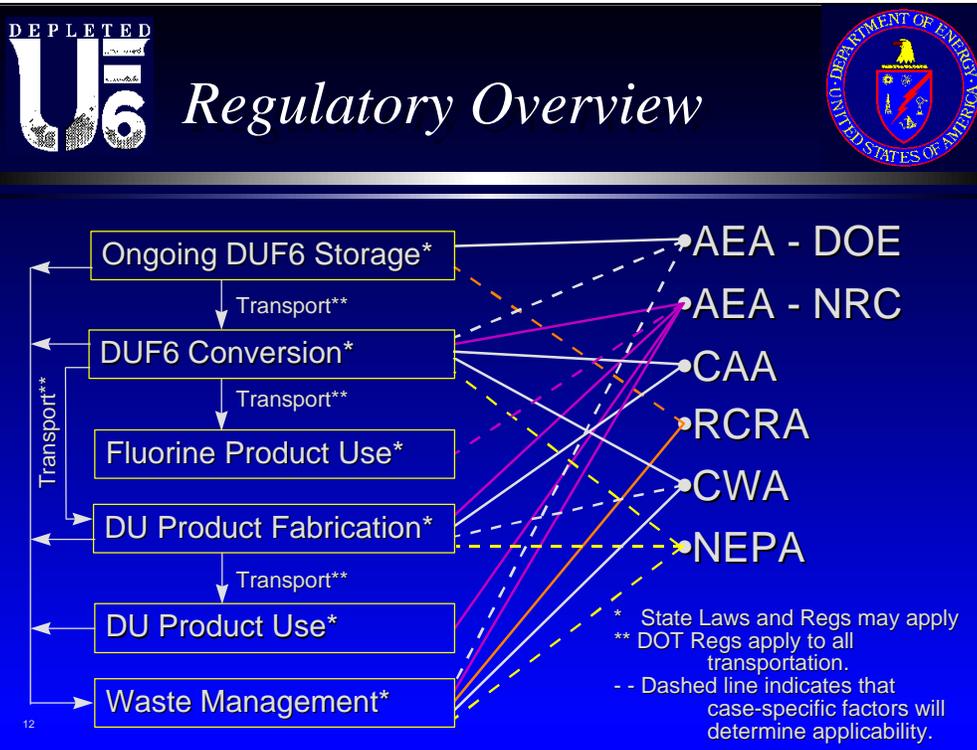
Regulation of DU Transportation

- DOE Orders Require Compliance With DOT Regs for Offsite DUF6 Shipments
- NRC Licensees Must Meet NRC and DOT Regs for DU Shipments
 - + DOT Regs = 49 CFR Parts 173 - 189
 - + NRC Regs = 10 CFR Part 71
- DOT Requires Most DU Shipments in Type A Packaging
- New IAEA Standards Add Design Requirements for DUF6 Packaging

11

NOTES

- The DOE Orders and the U.S. Department of Transportation (DOT) govern off-site shipments of radioactive materials from DOE sites. DOE Orders frequently reference the requirements of NRC regulations.
- The NRC and the DOT share responsibility for the control of radioactive material transport by NRC licensees based on a Memorandum of Understanding (MOU).
- The NRC and DOT regulations are based on standards developed by the International Atomic Energy Agency (IAEA).
- In general, DOT regulations (49 CFR 173 through 189) are more detailed. They cover all aspects of transportation, including packaging, shipper and carrier responsibilities, documentation, and all levels of radioactive material from exempt quantities to very high levels.
- The NRC regulations (10 CFR 71) are primarily concerned with special packaging requirements for higher level quantities of radioactivity.
- The NRC regulations require NRC licensees transporting radioactive material to comply with DOT regulations for packaging, marking and labeling, placarding, accident reporting, shipping papers, employee training, and shipper/carrier registration.
- Most shipments of DU in any form will be primarily concerned with DOT requirements for shipments in Type A containers, depending on the amount of radioactivity (microcuries per gram) to be shipped. Type A packaging requirements are based on performance requirements, which means the packaging must withstand or survive certain tests.
- Recently, the IAEA revised its advisory *Regulations for the Safe Transport of Radioactive Material* to include specific requirements for UF6 packages. Under the new requirements DUF6 packages would be required to meet standards for internal test pressure and thermal design. These requirements are likely to be adopted by DOT and NRC.



NOTES

- This summary slide illustrates that all of the activities in a pathway from DUF6 storage to use of DU products would be regulated to some extent. However, the most heavily regulated activities are expected to be DUF6 conversion, DU product fabrication, and waste management.



Conclusions - Next Steps



- Seek Industry Input
- Identify Unnecessarily Burdensome Requirements
- Interact With Regulators
- Develop Strategies

13

NOTES

- Having compiled the list of potential uses for DU, charted the pathways for implementing each use, and identified the laws and regulations applicable to these pathways, Argonne National Laboratory is ready to move forward to the next steps in the regulatory analysis process.
- First, ANL will seek input during the next week or two from representatives of industries who have been involved in developing commercial uses of DU in the past, or who have shown an interest by attending one of the meetings held by DOE during the past few months. The purpose of the input will be to help identify which regulatory requirements are viewed as unnecessarily burdensome such that the requirements would negatively affect development of DU use.
- Next, based on the information gained from industry and other sources, ANL will provide DOE with an assessment of regulatory barriers in the pathway to each existing and future DU use previously identified.
- Then, DOE plans to interact with responsible regulatory agencies to develop strategies for modifying or eliminating overly burdensome requirements in order to reduce or remove regulatory barriers.
- DOE expects the process of developing strategies to be iterative, and will, no doubt, be seeking additional input from all affected stakeholders from time to time.