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OFFICE OF THE SECRETARY  
OF ENERGY AND  
ADJUDICATIONS STAFF

**DEPLETED URANIUM HEXAFLUORIDE  
MANAGEMENT PROGRAM**

U.S. NUCLEAR REGULATORY COMMISSION  
In the Matter of Louisiana Energy Services L.P.  
Docket No. 70-3103-HL Official Exhibit No. Staff 18

**The Engineering Analysis Report  
for the Long-Term Management of  
Depleted Uranium Hexafluoride**

OFFERED by: Applicant/Licensee/Intervenor \_\_\_\_\_  
NRC Staff \_\_\_\_\_  
IDENTIFIED on 4/8/05 by NRC Staff/Panel Palmrose  
Action Taken: **ADMITTED** REJECTED WITHDRAWN  
Reporter/Clerk Bethany Egan

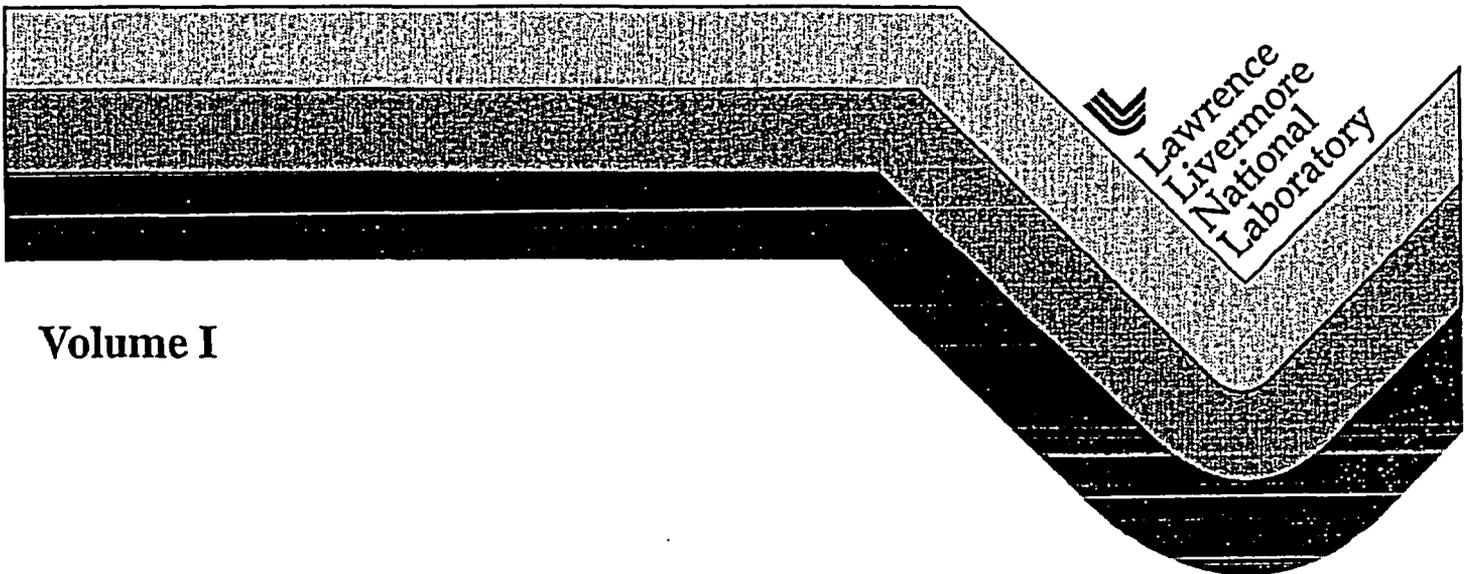
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Volume I

## Draft Engineering Analysis Report for the Long-Term Management of Depleted Uranium Hexafluoride - Rev. 2

nuclear fuel industry, the concentrated HF would be reacted with lime (CaO) to form CaF<sub>2</sub>. In the absence of regulatory constraints regarding the uranium content, the CaF<sub>2</sub> could be sold as a feedstock (i.e., a high quality fluorspar substitute for the commercial production of AHF). Here, the rationale is the avoidance of the potential hazards associated with the processing, general handling, storage, and transportation of large quantities of AHF. The by-product value of CaF<sub>2</sub> is less than that of AHF, and major quantities of lime would be required for the neutralization. Alternatively, the CaF<sub>2</sub> could be sent to a disposal facility. This case would result in a large waste stream (approximately 1 kg per kg uranium) and would bound the waste generation for defluorination.

The engineering analysis for this suboption assumes the basic two-step defluorination process described above (Section 3.2.1), but with the deletion of the HF acid distillation step and the addition of a neutralization step. The specific process parameters are largely based on data from a previous report.<sup>20</sup> That process includes the addition of hydrogen gas to the steam pyrolysis step to reduce the external heat requirements (Step 2'). Accordingly, with the exception of HF acid neutralization, this overall process parallels the defluorination process recommended by Cogema.

Cogema operates the world's only defluorination facility for converting depleted UF<sub>6</sub> to U<sub>3</sub>O<sub>8</sub> in Pierrelatte, France. Cogema stores the U<sub>3</sub>O<sub>8</sub> in buildings on the conversion plant site and sells the aqueous HF to a ready European market. The average purity of the HF is below the 0.1 ppm uranium instrument detection levels, well within the 5 ppm specification given for aqueous HF sales (there are no regulatory limits for free release in France). The aqueous HF is viewed as very pure and highly desirable by potential purchasers, and is readily marketed to outside buyers in the glass and steel industries.

The Engineering Data Input Report for this suboption is located in Section 6.5.

### 3.2.2 UO<sub>2</sub> (Ceramic) Option

High density UO<sub>2</sub> is uranium dioxide with an assumed particle density of about 9.8 g/cc (90 percent of its theoretical density [10.8 g/cc]) and bulk density of about 5.9 g/cc. Depending on the particle shape, size, and size distribution, the bulk density of UO<sub>2</sub> will generally be two to three times that of compacted U<sub>3</sub>O<sub>8</sub> powder. This higher density translates into substantially reduced space requirements for the storage and disposal alternatives. It also enables those radiation shielding applications in which depleted uranium oxide is substituted for the course aggregate material in conventional concrete.

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<sup>20</sup>Charles, L.D., et al. *Cost Study for the D&D of the GDPs, Depleted Uranium Management and Conversion* (Draft). K/D-5940-DF. Martin Marietta Energy Systems Central Engineering. September 1991.