



## Uranium Hexafluoride Deconversion and Disposal in the United States

There has been considerable discussion about the process by which uranium is mined from the ground and converted into fuel for the nuclear power industry. More importantly is what happens to the byproduct of the uranium enrichment process, how is it stored and ultimately disposed. The following points address these questions as well as the long-term prospects for the construction of a deconversion facility in the United States.

- Uranium mined from the earth is in the chemically stable oxide form.
- Uranium is converted from the oxide form to uranium hexafluoride in a conversion plant since this is the form needed for uranium to be enriched.
- Uranium hexafluoride contains mainly two different forms or isotopes of uranium (U), U-238 and U-235. The National Enrichment Facility (NEF) will use centrifuges to spin uranium hexafluoride (UF<sub>6</sub>) gas at high speeds to separate U-235 from the heavier U-238 isotopes. This process creates low enriched uranium (LEU) that is uranium containing about 3 to 5% of the U-235 isotope that is essential for fueling commercial nuclear plants.
- The byproduct of the enrichment process is depleted uranium hexafluoride, containing about 0.3 percent U-235. LES will store the uranium byproduct in U.S. Department of Transportation certified Uranium Byproduct Cylinders (UBCs) at the NEF site.
- This storage process will be regulated by the U.S. Nuclear Regulatory Commission (NRC), which will determine how many UBCs can be stored at the NEF site and the length of storage time. LES will also work with the New Mexico Environment Department to ensure compliance with the highest environmental standards.
- In order to dispose of the byproduct, it must be changed from uranium hexafluoride back to the more chemically stable uranium oxide form. This process is called "deconversion."
- There are no commercial deconversion facilities in the U.S. at this time.
- The deconversion process is a known technology and is in use in France.

In the Matter of LOUISIANA ENERGY SERVICE, LLP  
Docket No. 70-3103-M2 Official Exhibit No. 59  
OFFERED by: Applicant/Licensee INTERVENOR NEFS/PC  
NRC Staff Other  
IDENTIFIED on Witness/Panel A Makhloufi  
Action Taken: ADMITTED REJECTED WITHDRAWN  
Reporter/Clerk



- Since the U.S. government was, until 1998, the only entity in the U.S. that enriched uranium and therefore created the uranium hexafluoride byproduct, there was no government requirement or motivation to "deconvert" the byproduct.
- The government's byproduct has been stored for years on site at the enrichment facilities in Paducah, KY, Portsmouth, OH and Oak Ridge, TN.
- There are currently more than 700,000 metric tons (MTs) of byproduct owned by the U.S. Department of Energy (DOE) stored on site at these locations. LES will produce 7,800 metric tons per year at full production.
- The on-site storage of the byproduct at these locations has a very good safety record with no adverse impact to the workers, the population, or environment.
- Upon final privatization of the government enrichment capability in 1998 (i.e., the creation of USEC), the U.S. government also required that the DOE build and operate two deconversion facilities. These facilities have not yet been built.
- Uranium Disposition Services (UDS, LLC) a consortium of U.S. and French companies, has been awarded a contract to build facilities to deconvert and dispose of the stockpile of uranium byproduct; two deconversion facilities are budgeted – one at Paducah and one at Portsmouth. These deconversion facilities are scheduled to be built in the next three to four years.
- The 1996 statute creating USEC also requires that DOE dispose of the byproduct of enriched uranium produced by any private company such as LES, once it is declared to be waste.
- LES, however, is not depending on DOE to dispose of the byproduct from the LES facility since there are over 700,000 metric tons of government-produced byproducts to be deconverted first.
- LES believes that when approval to build and operate its uranium enrichment plant is obtained from the NRC a private company will be able to pursue financing for construction and operation of a deconversion facility.
- LES is open to discussions with such companies and would be prepared to enter into discussions to sign long-term disposal contracts. When it has received its license from the NRC.

- Discussions have recently been held with Cogema concerning a private deconversion facility. Cogema has experience with such a facility currently deconverting byproduct in France.
- Another company ConverDyn in the U.S. operates a facility to convert mined uranium oxide to uranium hexafluoride and is has the technical capabilities to build and operate a deconversion facility.
- Once the uranium hexafluoride byproduct has been "deconverted" to uranium oxide, it can be disposed of in existing facilities or in abandoned mines.
- There are three low level waste repositories in the country that could accept the byproduct: Envirocare in Utah, Hanford in Washington and Barnwell in South Carolina. Waste Control Specialists in Texas, plans to seek a license to take low-level waste.
- These facilities could bury the byproduct deep underground or contract with a company who owns an abandoned mine to bury the byproduct in its mine once the proper permits were obtained, for example, the Cotter mine in southern Colorado.

#### **Other deconversion and disposal options:**

- LES could also contract with the DOE for deconversion and final disposal of the byproduct. If the DOE deconversion facilities are completed before a private facility can be built, using a DOE option as a disposal path would help LES to meet its commitment to remove the byproduct from New Mexico.
- For many reasons, including the large volume of byproduct already in storage in the US, the DOE deconversion facilities are not LES's path of choice for byproduct deconversion. LES has continually supported the development of a commercial, private deconversion facility. In fact, the company will seek to develop long-term supply contracts with potential deconversion operators in order to assist in their financing and licensing efforts to build such a facility.
- Uranium byproduct could in theory, be shipped to Canada, Europe or to the Confederation of Independent States (CIS) of the former Soviet Union for re-enrichment or deconversion and disposal. However, this could only happen if a treaty was established between these countries and the U. S.



- Shipping the uranium byproduct to Cogema's facility in France for deconversion is another option. With this option, after deconversion the waste would be sent back to the U.S. for disposal. This option raises the cost of issues relating to transporting the byproduct to and from France.
- Uranium byproduct could, in theory, also be sent to Kazakhstan to be deconverted and for disposal. The U.S. has a treaty with Kazakhstan that would allow this to happen. The cost of transportation could weigh against this option.

**LES Commitment to Governor Bill Richardson:**

- LES has committed to the Governor of New Mexico (LES, 2003B) that:
  - There will be no long-term disposal or long-term storage (beyond the life of the plant) of UBCs in the State of New Mexico.
  - A disposal path outside the State of New Mexico will be utilized as soon as possible.
  - LES will aggressively pursue economically viable paths for UBCs as soon as they become available.
  - LES will work with qualified vendors pursuing construction of private deconversion facilities by entering in good faith discussions to provide such vendor long-term UBC contracts to assist them in their financing efforts.
  - LES will put in place as part of the NRC license a financial surety bonding mechanism that assures funding will be available in the event of any default by LES.