

Plutonium Management Background Paper¹
Number 1
Summary of Issues and Chronology of the Plutonium/MOX fuel
Lead Test Assembly Program in the
Department of Energy's Surplus Plutonium Management Program

I. Summary

According to information recently obtained through a Freedom of Information Act request by the Blue Ridge Environmental Defense League, the Department of Energy (DOE) is pursuing fabrication of four plutonium/MOX fuel "Lead Test Assemblies" that utilizes European plutonium fuel processing facilities and involves the transatlantic shipment of 115 kilograms (253 pounds) of purified, highly dispersible plutonium oxide powder.

This information has been previously reported only as an alternative by the Nuclear Industry trade press. The information obtained by BREDL indicates that the "EuroFab" approach was the only alternative considered after June 2000, and no evidence was found indicating serious consideration of another option.

The Lead Test Assembly program is an essential component of the overall "Fuel Qualification Plan" to obtain Nuclear Regulatory Commission (NRC) certification and approval of large-scale irradiation of plutonium/MOX fuel, and therefore a cornerstone of DOE's overall plutonium "disposition" efforts. (See LTA Fact Sheet). The program is filled with uncertainties and inherently flawed by political, technical, and regulatory complexities as well as excess transportation requirements.

The most recent information indicates the fuel qualification program involves:

- *the probable use of British military plutonium instead of U.S. surplus plutonium, although the source of the plutonium for the lead assembly program is uncertain and unidentified. A March 2001 foreign trip report by a DCS manager who identified the probable source as the British Ministry of Defense, stating that in the U.S. there was "lack of adequate material from the 34 metric tonnes declared excess."² A second motive identified by*

¹ Prepared by Don Moniak, Environmental Information Specialist and Consultant, PO Box 3487, Aiken SC 29802. June 11, 2002.

² Lawrence Losh. Framatome ANP. *Foreign Travel Trip Report*. Report Date March 4, 2001, for Travel to Bristol Abbey Wood, United Kingdom on 2/27/01 to 3/3/01. Obtained by BREDL through FOIA.

DCS was avoiding the “difficulties in commercial shipment of the material as indicated in the Canadian experience,” referring to DOE’S transportation fiasco with plutonium fuel rods from Los Alamos to Canada across the Great Lakes region in the middle of winter in December 1999.

- plutonium oxide/powder purification at Los Alamos National laboratory; where attempts to fabricate plutonium/MOX test fuel suffered repeated failures and equipment problems.³
- one or more transatlantic shipments of purified, deadly plutonium oxide powder from Los Alamos to Belgium for manufacturing plutonium/MOX fuel lead test assemblies (LTAs) involving a total of 115 kilograms of weapons-grade plutonium--enough to build more than 50 nuclear weapons;
- transatlantic shipment of four plutonium/MOX fuel assemblies from Belgium to McGuire Nuclear Power Plant near Charlotte, North Carolina for irradiation;
- shipment of plutonium fuel “scrap” produced during fabrication back to the U.S. to an undetermined or undisclosed location;
- shipment of irradiated MOX fuel assemblies to Oak Ridge National Laboratory for post irradiation exams.

The Lead Test Assembly program is pivotal to the overall success of DOE’s Pu/MOX fuel program (see LTA Fact Sheet), yet it has already been delayed one year and is likely to face further delays if DOE indecisiveness and inaction continue. According to Pu/MOX fuel contractor Duke Cogema Stone and Webster (DCS), the schedule for “delivery of the Lead Assemblies in early Calendar Year 2004” were “in jeopardy” due to inaction and indecision surrounding fuel fabrication.⁴ Specifically, these actions involve a supplemental analysis under NEPA to justify another Amended Record of Decision to its January 2002 SPDEIS, and government to government negotiations and agreements to authorize the project.⁵

The latest available project report from DCS is from February 2002 and was submitted to DOE on April 9, 2002. It states that a final proposal is due this month, meaning that LTA

³. For more information, see January 23, 2001 letter to the Canadian Nuclear Safety Commission (CNSC) at http://www.bredl.org/sapc/CNSC_letter012301.htm.

⁴. Duke Cogema Stone and Webster. January 2002 and February 2002 (DCS-DOE-000779) *MOX Fuel Project Reports*, Management Area 2, Fuel Qualification. Sections 2.0, 2.1, 2.8, 2.9. Obtained by BREDL through FOIA.

⁵. Ibid.

fabrication is unlikely to be completed prior to 2005. “Upcoming critical activities” were cited as:

- III. Upcoming Critical Activities:**
- A. Develop baseline plan for Eurofab option.
 - B. Complete development of a plan for DCS to acquire DUO₂ for the MFFF.
 - C. Develop subcontracts for lead assembly fabrication plants.
 - D. Meet with LANL and DOE to review plutonium oxide powder specification and packaging requirements.
 - E. Framatome ANP will host FBFC for a visit to the Lynchburg manufacturing facility.

III. Upcoming Critical Activities

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Figure 1: List of Critical Activities from DCS’s February 2002 MOX Monthly Project Report

This complicated, expensive, and risky approach to “qualifying”-- i.e., gaining approval from the Nuclear Regulatory Commission-- the use of nuclear fuel from weapons plutonium involves eventual use of plutonium fuel in Duke Power’s Catawba and McGuire nuclear power plants in the Charlotte, NC metropolitan area. The approach was recommended by DOE contractor Duke Cogema Stone and Webster not long after DOE’s January 2000 Record of Decision to fabricate lead test assemblies at Los Alamos National Laboratory.

The documents obtained by BREDL-- fourteen months after the original FOIA request-- indicate that DOE’s frequent changes to its plutonium management program involves continued violations of the National Environmental Policy Act’s (NEPA) provisions for timely public notification and participation in supplemental analyses. Instead of adhering to NEPA statutes and its own policy to follow “the spirit of NEPA,” DOE is pursuing a plan driven more by a more by a desire to avoid public scrutiny than economic or technical considerations.

DOE failed to analyze this new plan in its environmental impact statements and in fact rejected the use of European facilities for plutonium fuel fabrication in its January 1997 Record of Decision to pursue the “dual-track” plutonium disposition strategy.

Other important information contained in the documents obtained by BREDL, and discussed in Part 2 of the Chronology include:

- *There is uncertainty as to whether meeting the “spent fuel standard,” the basis for DOE’s entire plutonium management scheme, is sufficient to end international monitoring requirements for plutonium.*

- *Although Los Alamos was authorized to begin liquid acid processing (called ‘polishing’ by the plutonium industry) to prepare five (5) kilograms of plutonium for Lead Test Assembly operations in Europe, the lab had only completed two kilograms by the end of February 2002.*
- *Duke power is already pursuing exemptions and a license amendment request with the NRC, and a final Lead Assembly Project Plan was scheduled for completion by the end of March 2002;*
- *Duke Cogema Stone and Webster withheld important information in documents it submitted to the NRC in support of its efforts to license Pu/MOX fuel use in Duke Reactors;*
- *Evidence that DOE knowingly issued a false Record of Decision in January 2000 by stating that Los Alamos was its choice for LTA fabrication. Two weeks after this “decision” DCS officials signed the first revision of its complex Fuel Qualification Plan that stated Los Alamos was questionable and then waited seven months to submit the revised plan to the NRC.*

Overall, the developments cited here provide more evidence that DOE’s Plutonium Disposition Program is being managed for failure (for more information see <http://www.bredl.org/sapc>), that the Department cannot keep its word or live with its decisions, and the Pu/MOX fuel program is characterized by deception. The decision to cancel the Plutonium Immobilization Program left DOE with a single means--Pu fuel--for long-term surplus plutonium management, an option with complications, cost increases, and technical difficulties that demand the program be cancelled once and for all.

II. PLUTONIUM FUEL APPROVAL/QUALIFICATION, A TWO-PART CHRONOLOGY

PART 1: 1995 to January 2000 Promises and Lofty Rhetoric

1995: The National Academy of Sciences publishes its report titled *Management and Disposition of Excess Weapons Plutonium*. The report was sponsored by the U.S. Department of Energy (DOE), legitimized an approach to plutonium “disposition”⁶ called the “spent fuel standard,” described as:

⁶ The term plutonium “disposition” is a misnomer, since there is no feasible existing technology that can destroy plutonium in the next 100+ years, and the intent of the “disposition” program for surplus weapons plutonium is to make the plutonium less attractive for reuse and theft, and to reduce costs and complications associated with accounting, security, and other safeguards necessary for storage of highly concentrated separated plutonium.

“An appropriate standard for the final product of disposition options is that they transform the weapons pu into a physical form that is at least as inaccessible for weapons use as the much larger and growing stock of Pu that exists in spent [irradiated] fuel from commercial Nuclear Power Plants.”

In regard to fabrication of Pu/MOX fuel in Europe, the Academy described the option of substituting weapons-grade plutonium for the reactor-grade plutonium in commercial use in Europe and planned for Japan. While not recommending that approach, the Academy stated that the “option should be kept open.”

February 1996: Secretary of Energy Hazel O’Leary announces the declassification of the U.S. inventory of plutonium, including the locations of 38.5 metric tonnes of weapons-grade plutonium deemed “excess to national security needs.”

December 1996: After more than two years of preparation, DOE publishes the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement (Storage and Disposition PEIS), in which it analyzed the options for managing surplus weapons-grade plutonium as well as 14.3 metric tonnes of surplus fuel-grade, weapons-usable plutonium and 7.0 MT of weapon-grade plutonium likely to be declared surplus as a result of future arms reduction treaties.

January 14, 1997. DOE issues its Record of Decision (ROD) for the Storage and Disposition PEIS, in which it stated it would approach plutonium disposition “that would make surplus weapons-usable plutonium inaccessible and unattractive for weapons use.” DOE approach was termed the “dual-track,” since it allowed “for both the immobilization of some (and potentially all) of the surplus plutonium, and use of some of the surplus plutonium as MOX fuel in existing domestic, commercial reactors. The disposition of surplus plutonium would also involve disposal of both the immobilized plutonium and the MOX fuel (as spent nuclear fuel) in a potential geologic repository.”⁷

European fuel fabrication was analyzed, though not in depth, as an option, with DOE deciding that “the preferred alternative and the decisions in this ROD do not involve European MOX fuel fabrication.”

May 1997. DOE issues a Notice of Intent to conduct a Surplus Plutonium Disposition Environmental Impact Statement (SPDEIS) to build upon the January 1997 dual-track decision and determine whether or not to employ the plutonium/MOX fuel option and where to

⁷ U.S. DOE. Office of Fissile Materials Disposition. *Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement.*

locate a plutonium immobilization plant, a Pu/MOX fuel fabrication facility, a pit disassembly and conversion facility, and a location to conduct MOX lead test assembly operations.

December 1997: DOE initiates a procurement process to obtain Pu/MOX fuel fabrication and irradiation services.

February 1998: DOE issues a Draft Request for Proposals for the Pu/MOX fuel services.

May 1998: DOE issues a Request for Proposals for the Pu/MOX fuel services, and eventually receives three proposals from three fuel fabrication/engineering/nuclear utility consortiums.

August 1998. DOE issues a Draft SPDEIS proposing Savannah River Site for siting a Pu/MOX fuel fabrication facility and a plutonium immobilization plant.

December 1998: Secretary of Energy Bill Richardson selects SRS for the preferred location of the only remaining plutonium facilities, a plutonium pit disassembly and conversion plant, lacking a preferred alternative.

January 1999: After DOE disqualifies two of the three bidders for not meeting minimum bid specifications, a consortium called **Duke Engineering & Services, COGEMA Inc., and Stone & Webster (collectively known as DCS)** begins meeting with the **Nuclear Regulatory Commission** to discuss licensing activities.

March 1999. DOE awards the multi-phase contract to DCS for the design, licensing, construction, operation, and eventual deactivation of the MOX fuel fabrication facility, design and fabrication of lead test assemblies for fuel qualification and certification by the NRC, and irradiating the MOX fuel.

The Base Contract is worth \$133 million and involves design and licensing of a fuel fabrication facility, qualifying the fuel, designing and licensing a fuel assembly transportation container, and designing modifications and obtaining license amendments to irradiate plutonium fuel at nuclear power plants operated by Duke Energy (Catawba 1 and 2, and McGuire 1 and 2) and Virginia Power (North Anna 1 and 2). According to DOE, "full implementation of the base contract was contingent upon the successful completion of the NEPA process."

April 1999: DOE issues a Supplement to the SPD Draft EIS (DOE/EIS-0283-S) to analyze the potential environmental impacts of using MOX fuel in six specific reactors named in the DCS proposal, based on DCS's proposal. Attempts to persuade DOE to hold public comment hearings near Catawba, McGuire, and North Anna NPPs are rejected by the Department.

November 1999: DOE issues Final Surplus Plutonium Disposition Final Environmental Impact Statement.

January 4, 2000. DOE issues its Record of Decision for the Surplus Plutonium Disposition

Final Environmental Impact Statement, again selecting the “dual-track” approach.⁸ In regard to the Lead Assembly fabrication site, **DOE wrote:**

“Consistent with the Preferred Alternative in the SPD EIS, the Department has decided to use LAND for fabrication of MOX fuel rods for use in fabrication of lead assemblies. Based on consideration of the capabilities of the candidate sites and input from the team chosen for the MOX approach, LAND was selected because it already has facilities (i.e., Technical Area 55) that will not require major modifications in order to fabricate fuel rods, and takes advantage of existing infrastructure and staff experience. Additionally, the surplus plutonium dioxide needed to fabricate the MOX fuel rods for lead assemblies will already be on site.

At this time, however, no decision is being made as to which facility at LAND will be used for final assembly of the MOX fuel rods into lead assemblies. DOE is currently evaluating whether there may be the need for additional environmental analysis to support the final stages of lead assembly fabrication at LAND. Pending completion of that review, DOE is deferring a decision as to where on the LAND site this final lead assembly work will be done.”

PART 2: January 2000 to Present Deception , Indecision, and Delay

Events subsequent to DOE’s Record of Decision indicate that DOE knowingly announced a false decision regarding using Los Alamos for LTA fabrication.

January 18, 2000. *Two weeks after DOE’s Record of Decision is announced with fanfare, DCS completed Revision 1 of its MOX Fuel Qualification Plan, but DCS failed to submit the revised*

⁸. DOE statements in the SPDEIS Record of Decision include:

“Among the ‘action’ alternatives analyzed in the SPD EIS, the environmentally preferable action alternative is the 50-Metric-Ton Immobilization Alternative with the Immobilization and Pit Conversion facilities located at SRS.”

“At SRS, the health effects from 50 years of storage under the No Action Alternative would be lower than those associated with implementation of the Preferred Alternative.”

“Both the United States and Russia will still retain substantial stockpiles of nuclear weapons and weapons-usable fissile materials after disposition of the fissile materials currently considered excess is complete. These weapons and materials will continue to pose a security challenge regardless of what is done with excess plutonium. None of the disposition alternatives under consideration would make it impossible to recover the plutonium for use in nuclear weapons, or make it impossible to use other plutonium to rebuild a nuclear arsenal. Therefore, disposition will only reduce, not eliminate, the risk of reversal of current nuclear arms reductions.”

fuel qualification report to the licensing agency, the NRC, for seven months after its completion, at which time DCS managers wrote in a cover letter to NRC:

“The fuel qualification plan includes lead assembly fabrication at [Los Alamos]. However, as has been publicly noted by DOE, the decision has been made to fabricate the lead assemblies at LAND. Therefore, DCS is evaluating other alternatives, and the plan will change once an alternative is selected. It is expected that the selected alternative will preserve the fuel qualification schedule and will require only the fabrication portion of the [fuel qualification plan] to be changed.”⁹

January 31, 2000: Less than one month after the Record of Decision, DCS submits to DOE an Alternative Fuel Qualification Study, in which it proposes two alternatives not analyzed in the Surplus Plutonium Disposition EIS:

- *The EuroFab option involving fuel fabrication at one of three MOX fuel fabrication facilities in France and Belgium.*
- *The MFFF option of fabricating lead test assemblies at the Savannah River Site after the MFFF is built.*

Although the January 31 study was improperly withheld and not even identified in response to BREDL’s FOIA request, Modification #7 of the DOE-DCS contract identified the specifics of the EuroFab option:

- *WG plutonium is made available by the UK in a plutonium dioxide form, of which “at least part” came from a plutonium alloy form with greater than 1% gallium content;*
- *Shipment of packaged plutonium oxide from UK to Cherbourg, France to Valduc site in France;*
- *“Polishing” [plutonium purification in acidic solutions] at the plutonium oxide at Valduc followed by shipment to Cadarache;*
- *Fuel fabrication and assembly at Cadarache followed by shipment back to Cherbourg;*
- *Repackaging of hte fuel assembly at Cherbourg for sea transport and shipment to the U.S. Charleston Naval Weapons Station in South Carolina **using commercial transport.***
- *Removal of fuel from shipping package and placement into another transportation container;*
- *Loading of the fuel into DOE’s Safe Secure Transport truck and transported to McGuire NPP, Unit 2; and*
- *Unloading and irradiation of fuel at McGuire Unit 2.*

⁹. DCS Fuel Qualification Plan. DCS No. DCS-FQ-1991-001, Revisions 1 and 2.

March 2000: Virginia Power announces that it is withdrawing its reactors from the program in violation of the contract agreement. No amendment to the contract was issued as of August 2001 to either add new reactor capacity or remove Virginia Power from the contract.

July 3, 2000: A meeting is held between five DCS managers and seven COGEMA representatives at the Cadarache MOX fuel fabrication plant in France. An unscheduled agenda item involved discussion of possible fabrication of Lead Test Assemblies in Europe and initial planning for such an event. The first change to the plan involved probable use of Belgonucleaire's "P0" MOX fuel fabrication plant near Dessel, Belgium.

The foreign trip report--which DCS failed to send to DOE until three and a half months after the trip ended--stated, "the schedule for fabricating lead assemblies at Cadarache was roughly estimated at about two years, based on 1 ½ years for preparation, and about six months for actual fabrication."¹⁰

The trip report also identified one risk factor as follows:

"re-licensing of the Cadarache Facility to handle weapons-grade plutonium could be risky, in that the licensing authorities have indicated a desire to see the facility closed and could use the re-licensing as a basis to push the issue."

Belgonucleaire did not attend the meeting and there was no reported discussion as to whether Dessel would require relicensing to use WG Pu.

July 14, 2000. DCS finally submits the January 2000, Revision 2 of the Fuel Qualification Plan to the NRC, but fails to update the plan to reflect Virginia Power's withdrawal or to identify the latest status of the Alternative Fuel Plan to the NRC. An LTA fuel fabrication completion date of March 2003 is identified.

December 20, 2000: DCS submits the Environmental Report to the NRC as the first step towards a license application to construct a Pu/MOX (MFFF) fuel fabrication facility at SRS. No mention is made of the possibility of lead test assembly fabrication at SRS.

February 28, 2001: DCS submits the MFFF Construction Authorization request to the NRC in support of its license application. As with all other documents to date, there is no evidence that the LTA option at the proposed Pu/MOX fuel fabrication facility is anything but a straw candidate.

¹⁰ . March 4, 2001 DOE Foreign Trip Report from Lawrence Losh, Framatome ANP. Obtained through FOIA by BREDL.

February 27, 2001 to March 3, 2001. DCS fuel design and licensing manager Lawrence Losh met in Bristol Abbey Wood, UK with US DOE, the British Ministry of Defense OD, and French CEA and Cogema representatives “in support of evaluating the Eurofab option for lead assembly fabrication.” The meeting focused on identifying the source of weapons-grade plutonium and options for purifying (polishing) the plutonium.

The program that emerged was similar to that discussed in Amendment 7 with a few exceptions:

- *The UK remained the source of plutonium oxide, but Los Alamos was mentioned as a viable alternative;*
- *The location for French plutonium purification/polishing as well as fuel fabrication was now undecided;*

One reason identified in Losh’s trip report for the need to use British plutonium instead of U.S. surplus plutonium was that DOE cited a “lack of adequate material from the 34 metric tonnes declared excess, and the difficulties in commercial shipment of the material as indicated in the Canadian experience.”

Both British and French officials appeared unsatisfied with DOE’s answer, as one action item involved DOE “articulating in writing the reasons for the need for U.K. material and French polishing and send this material to the U.K. for review before sending formally.”

The UK plutonium facilities run by British Nuclear Fuels, Ltd (BNFL) were considered too large for the purification step and COGEMA’s MELOX facility, upon which DCS is basing much of its design for a US Pu/MOX fuel plant, suffered the same problem.

However, the uncertainties regarding site locations derived from French wariness over exposing their plutonium facilities to increased public scrutiny and regulatory oversight:

- *The La Hague plutonium processing facility is “too large” for processing material required for only four fuel assemblies, and “the current license does not cover WG material, and relicense would expose the facility to public intervention.”*
- *The ATALANTA facility at Marcoule, France was an yet unlicensed research facility and could not be used for plutonium “polishing;”*
- *French officials merely stated, without any reported reasons, that “the Valduc facility will not be used for polishing.”*

An alternate approach of using Los Alamos was discussed in which “non-safeguarded” plutonium would be purified/polished and then sent overseas to Belgium for fabrication.

No final decision was reached. Since DCS identified a two-year time frame for the EuroFab option, the March 2003 fuel fabrication completion date was no longer feasible.

April 16, 2001: One month after the UK meeting, DCS submits revision two of the MOX Fuel Qualification Plan to the Nuclear Regulatory Commission. *No mention is made of the latest plans and discussions involving EuroFab, and the March 2003 fabrication completion date remained intact. DCS either did not bother to update the schedule or knowingly submitted excessively optimistic, if not false information, to the NRC.*

April 15, 2001. The NRC issued its Notice for Request for Hearings *regarding the DCS license application, with the NRC Commissioners--either unaware of schedule delays or choosing simply to not care--setting an “aggressive schedule” for public hearings on the license application.*

October 12, 2001. DOE authorizes Los Alamos to begin polishing 5 kilograms of plutonium oxide for the lead test assembly program.

January and February 2002: DCS Monthly Status Reports indicate that DOE’s indecisiveness and lack of action on the EuroFab option places the entire schedule into jeopardy.

April 16, 2002: DOE announces an Amended Record of Decision to its Storage and Disposition PEIS of 1997, announcing that:

- *plutonium immobilization was canceled and all 34 MT of surplus WG Pu would be managed through the Pu/MOX fuel program, a decision actually reached in 2001;*
- *plutonium storage upgrades at Pantex and SRS were canceled, decisions actually made prior to 2000.*

DOE has yet to announce its amended decision regarding the fabrication of Lead Test Assemblies, in spite of having changed the decision either before or subsequent to the 1997 SPDEIS ROD. The fuel qualification program continues to accumulate cost-overruns and present unrealistic schedules.

- *References for this report on page 11*