VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
MICHAEL P. MURPHY
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COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

June 25, 1999

Ms. Laura S. H. Holgate, Director
Office of Fissile Materials Disposition
U. S. Department of Energy
P. O. Box 23786
Washington D. C. 20026-3786

RE: Supplement to the Draft Environmental Impact Statement for Surplus Plutonium Disposal proposed by the Department of Energy; DEQ-99-049F.

Dear Ms. Holgate:

The Commonwealth of Virginia has completed its review of the Supplement to the Draft Environmental Impact Statement concerning Surplus Plutonium Disposition. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to appropriate federal officials on behalf of the Commonwealth. The following agencies took part in this review:

Department of Environmental Quality
Department of Transportation
Department of Emergency Services
Department of Mines, Minerals and Energy
Marine Resources Commission
Virginia Port Authority.

In addition, the Department of Health, Thomas Jefferson Planning District Commission, and Louisa County were also invited to comment.

The Supplement to the Draft EIS evaluates the potential environmental impacts of using mixed oxide (MOX) fuel in six specific reactors at three sites: Catawba in York County, South Carolina; McGuire in Mecklenburg County, North Carolina; and North Anna in Louisa County, Virginia. The supplement describes the impacts of using a partial MOX core instead of a low-enriched uranium (LEU) core in existing commercial light reactors. Each of the three sites proposed has two operating reactors that would be used to irradiate MOX fuel assemblies. The supplement also discusses changes that have been made to the program since issuance of the Draft EIS in 1998. 1

An Agency of the Natural Resources Secretariat

MR016

MR016–1 **Alternatives**

DOE acknowledges the State has no objection to the proposed actions provided those actions are in strict accordance with all applicable Federal, State, and local regulations. It is DOE policy to construct and operate the proposed surplus plutonium disposition facilities in compliance with all applicable water quality, air quality, and waste management requirements and to protect human health and the environment.

Ms. Laura S. H. Holgate
Page 2

The Draft EIS identified potential environmental impacts of reasonable alternatives for siting, construction, and operation of three facilities for plutonium disposition. None of the alternatives analyzed were located in Virginia.

The Commonwealth of Virginia has no objection to the proposed project provided it is carried out in strict accordance with all applicable federal, state, and local regulations. As stated in our September 15, 1998 response to the DEIS, the Department of Emergency Services, Brian Iverson at (804) 674-2400, and the appropriate localities should be notified prior to the transportation of hazardous materials to or through Virginia.

Environmental Impacts and Mitigation

According to the supplement to the DEIS (page 48), there will be no new construction at the reactor sites and emissions of effluent from the reactors would not change significantly from using MOX fuel instead of LEU fuel. Accordingly, the use of MOX in existing reactors would not affect land use, cultural and archaeological resources, geology and soils, and natural resources. The following comments are related to potential operational impacts.

1. Water Quality. According to the supplement to the DEIS (page 47), the use of MOX fuel would not change water usage or discharge of nonradiological pollutants. Discharge of nonradiological wastewater at North Anna Power Station must be in accordance with the Virginia Pollutant Discharge Elimination System permit issued by the Department of Environmental Quality. If any modifications of the existing permit is required, Virginia Power should contact DEQ's Valley Regional Office at (540)-574-7803. 1

2. Air Quality. The supplement to the DEIS (page 31) indicated that emissions of air pollutants resulting from operation of the reactors is not expected to increase due to the use MOX fuel in the reactors. DEQ's Valley Regional Office should be notified of any changes in the current emissions, change in fuel used, manifestation of different pollutants, or installation of new equipment as a result of this project.

3. Solid Waste and Hazardous Substances. The supplement to the DEIS (page 31) states that wastes would continue to be handled in the same manner as they are today with no change required due to use of MOX fuel. In general, all solid wastes generated at the site should be reduced at the source, re-used, or recycled. Otherwise, solid waste, hazardous waste, and hazardous material must be managed in accordance with all applicable federal, state, and local environmental regulations.

Thank you for the opportunity to review the supplement to the Draft EIS for this undertaking. For clarification of these comments, contact Ellie Irons at (804) 698-4325.

MR016

Ms. Laura S. H. Holgate
Page 3

Comments submitted by reviewing agencies are attached.

Sincerely,

Michael P. Murphy, Director
Division of Environmental Enhancement

Enclosures

cc. Thomas Ballou, DEQ-OADA
Steve Frazier, OTAW
Tom Mizell, DEQ-VRO
Joseph Hassell, DEQ-OWP
Tony Watkinson, VMRC
Steven A. Walz, DMME
Robert R. Merhige, III, VPA
Kelly S. Coleman, VDOT
Brian Iverson, DES
Nancy O'Brien, Thomas Jefferson PDC
Jeffrey Lundsford, Louisa County.

MR016

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

DOCUMENT REVIEW CHECKLIST

TO: Ellie Irons

DATE: 6/23/99 **DEQ-OEIA PROJECT NUMBER:** 99-049F

___ STATE EIR ___ FEDERAL EA/FONSI _X_ FEDERAL EIS ___ GRANT/SCC

PROJECT TITLE: Surplus plutonium disposition - Department of Energy.

PROJECT DETAILS: Proposed siting, construction, and operation of three facilities for plutonium disposition (including one at the Virginia Power North Anna Nuclear Power Plant).

AIR PROGRAM COORDINATION DIVISION FINDINGS:

___ CONCURS WITH THE FONSI ___ CONCURS WITH THE CONFORMITY FINDING

_X_ SEE APPLICABLE REGULATORY REQUIREMENTS

THE PROJECT SITE IS LOCATED IN A:

___ OZONE/CARBON MONOXIDE NONATTAINMENT AREA

___ OZONE/CARBON MONOXIDE MAINTENANCE AREA

___ STATE VOLATILE ORGANIC COMPOUND & NITROGEN OXIDES EMISSION CONTR OL (VOC/NO_xEC) AREA

REGULATORY REQUIREMENTS MAY APPLY TO:

_X_ CONSTRUCTION ___ OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS FOR THE CONTROL AND ABATEMENT OF AIR POLLUTION THAT MAY APPLY:

1. ___ 9 VAC 5-40-5200 C and 9 VAC 5-40-5220 E - Stage I.
2. ___ 9 VAC 5-40-5200 C and 9 VAC 5-40-5220 F - Stage II Vapor Recovery.
3. ___ 9 VAC 5-40-5490 et seq. - Cut-back Asphalt Usage Restriction.
4. _X_ 9 VAC 5-40-5600 et seq. - Open Burning.

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5. _X_ 9 VAC 5-50-60 et seq. - Fugitive Dust Emissions.

6. ___ 9 VAC 5-50-130 et seq. - Odorous Emissions; applicable to the _____.

7. ___ 9 VAC 5-50-160 et seq. - Standards of Performance for Toxic Pollutants.

8. ___ 9 VAC 5-50-400 Subpart ___, Standards of Performance for New Stationary Sources, designates standards of performance for the _____.

9. ___ 9 VAC 5-80-10 et seq. of the regulations - Permits for Stationary Sources.

10. ___ 9 VAC 5-80-1700 et seq. of the regulations - Major or Modified Sources located in PSD areas. This rule may be applicable to the _____ _____.

11. ___ VAC 5-80-2000 et seq. of the regulations - New and Modified Sources located in nonattainment areas. This rule may be applicable to the _____ _____.

12. ___ 9 VAC 5-80-800 et seq. of the regulations - Operating Permits and Exemptions. This rule may be applicable to the _____.

OTHER REQUIREMENTS (R) AND/OR CONSIDERATIONS (C):

PLEASE CONTACT THE _____ OFFICE FOR ANY TECHNICAL AND/OR PERMIT ASSISTANCE.

Thomas R. Ballou
Technical Services Administrator

6-23-99
Date

MR016

If you cannot meet the deadline, please notify ELLIE IRONS at 804/698-4325 prior to the date given. Arrangements will be made to extend the date for your review if possible. An agency will not be considered to have reviewed a document if no comments are received (or contact is made) within the period specified.

REVIEW INSTRUCTIONS:

A. Please review the document carefully. If the proposal has been reviewed earlier (i.e. if the document is a federal Final EIS or a state supplement), please consider whether your earlier comments have been adequately addressed.

B. Prepare your agency's comments in a form which would be acceptable for responding directly to a project proponent agency.

C. Use your agency stationery or the space below for your comments. **IF YOU USE THE SPACE BELOW, THE FORM MUST BE SIGNED AND DATED.**

Please return your comments to:

MS. ELLIE IRONS
DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL IMPACT REVIEW
629 EAST MAIN STREET, SIXTH FLOOR
RICHMOND, VA 23219
FAX #804/698-4319

Ellie Irons
Ellie L. Irons
EIR Program Manager

COMMENTS

No activities described that fall under our agency's regulatory or management programs.

(signed) _____ (date) 6-21-99

(title) Deputy Chief, Habitat Management

(agency) Virginia Marine Resources Commission

PROJECT # 99-042F 8/98 MR016

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
MICHAEL P. MURPHY
PAGE 7 OF 11

If you cannot meet the deadline, 804/698-4325 prior to the date gi to extend the date for your revie not be considered to have reviewe received (or contact is made) wit

Post-it® Fax Note 7871	Date 6/16/99	# of pages ▶ 1
To Ellie Irons	From Tom Mizell	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

REVIEW INSTRUCTIONS:

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OFFICE OF ENVIRONMENTAL IMPACT REVIEW
629 EAST MAIN STREET, SIXTH FLOOR
RICHMOND, VA 23219
FAX #804/698-4319

Ellie Irons
Ellie L. Irons
EIR Program Manager

COMMENTS

No Comments

(signed) Charles T. Mizell Jr. (date) 6/16/99
(title) Water Resource Development Manager
(agency) Valley Regional Office DEQ

PROJECT # 99-049F 8/98 MR016

If you cannot meet the deadline, please notify ELLIE IRONS at 804/698-4325 prior to the date given. Arrangements will be made to extend the date for your review if possible. An agency will not be considered to have reviewed a document if no comments are received (or contact is made) within the period specified.

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DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL IMPACT REVIEW
629 EAST MAIN STREET, SIXTH FLOOR
RICHMOND, VA 23219
FAX #804/698-4319

17 1999

Ellie Irons
Ellie L. Irons
EIR Program Manager

COMMENTS:

No comments

(signed) Melissa Butterfield (date) 6-16-99
(title) Env. Program Analyst
(agency) DEQ-waste

PROJECT # 99-049F 8/98

MR016

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
MICHAEL P. MURPHY
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G. GENE DAYBNER
DIRECTOR

CHARLES N. WALZ, JR.
CHIEF DEPUTY DIRECTOR

BRENT B. SMARLOR
DEPUTY DIRECTOR

DIVISIONS
ENERGY
GAS AND OIL
MINED LAND RECLAMATION
MINING, NEWPORT
MINERAL RESOURCES
MINES
ADMINISTRATION

COMMONWEALTH of VIRGINIA
Department of Mines, Minerals and Energy

Ninth Street Office Building / 8th Floor
202 North Ninth Street
Richmond, Virginia 23219-3402
(804) 692-3200 FAX (804) 692-3237

Via Fax – 1 page total

MEMORANDUM

TO: Ellie Irons
Department of Enviroomental Quality

FROM: Stephen A. Walz

DATE: June 24, 1999

SUBJECT: Environmental Review – Project Number 99-049F Surplus Plutonium Disposition

The Department of Mines, Minerals and Energy has reviewed the Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement. The supplement states that there would be no impact on the geology or soils resulting from use of the MOX fuel, nor would the geology or soils be affected by any new construction activities related to MOX fuel use. The Department of Mines, Minerals and Energy has no comments on the EIS.

c: Gene Rader

MR016

If you cannot meet the deadline, please notify ELLIE IRONS at 804/698-4325 prior to the date given. Arrangements will be made to extend the date for your review if possible. An agency will not be considered to have reviewed a document if no comments are received (or contact is made) within the period specified.

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C. Use your agency stationery or the space below for your comments. IF YOU USE THE SPACE BELOW, THE FORM MUST BE SIGNED AND DATED.

Please return your comments to:

MS. ELLIE IRONS
DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL IMPACT REVIEW
629 EAST MAIN STREET, SIXTH FLOOR
RICHMOND, VA 23219
FAX #804/698-4319

Ellie Irons
Ellie L. Irons
EIR Program Manager

COMMENTS
According to this document, it appears that shipments of MOX fuel to the North Anna site would replace existing shipments of fresh LEU fuel to the site. Therefore, any transportation impacts of the proposed action should be minimal.

(signed) Kelly S Coleman (date) 6/10/99
(title) Environmental Program Analyst
(agency) Virginia Department of Transportation

PROJECT # 99-049F 8/98

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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
MICHAEL P. MURPHY
PAGE 11 OF 11

If you cannot meet the deadline, please notify ELLIE IRONS at 804/698-4325 prior to the date given. Arrangements will be made to extend the date for your review if possible. An agency will not be considered to have reviewed a document if no comments are received (or contact is made) within the period specified.

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OFFICE OF ENVIRONMENTAL IMPACT REVIEW
629 EAST MAIN STREET, SIXTH FLOOR
RICHMOND, VA 23219
FAX #804/698-4319

Ellie Irons
Ellie L. Irons
EIR Program Manager

COMMENTS

We have no comments.

(signed) Robert R. Murphy III (date) 6/9/99
(title) Deputy Executive Director
(agency) Virginia Port Authority

MR016

PROJECT # 99-049F

8/98

Please include in the Public Record

JUNE 23,1999

TO: USDOE, OFFICE OF FISSILE MATERIALS DISPOSITION, PO BOX 23786, Washington, DC 20026-3786

FROM: Tim Young and MB Condon, 380 Ilsa Way, Goldendale WA 98620
(509) 773-6991

RE: Supplement to the Draft Surplus Plutonium Disposition Environmental Impact Statement

We would like to express the following concerns to USDOE regarding the supplement to the Draft Surplus Plutonium Disposition EIS.

It is very disturbing that USDOE has gone forward with contracts with Duke Power and Virginia Power to utilize MOX fuel in commercial reactors before the Final Surplus Plutonium Disposition Environmental Impact Statement has been issued. It is even more disturbing that the only public meetings on this issue were held in Washington,DC, not in the communities where the MOX fuel will be shipped and burned. The people within the reactor communities and those along the shipping routes must be directly involved in USDOE's decisions that could increase the possibility of a nuclear accident and consequently increase the number of cancer deaths in their communities were such an accident to occur during the use of MOX fuels. 1

As residents of Washington State, who have been to many public meetings regarding Hanford, we would contend that USDOE's lack of outreach in this instance is par for the course. It only serves to reinforce the conception that USDOE acts unilaterally, when there may be public opposition to it's goals.

USDOE should extend the public comment period on this Supplemental EIS and hold public hearings in the reactor communities that will be affected by contracts with Duke Power and Virginia Power. These meetings should be publicized prominently in the affected communities and held at hours that are convenient for working people to attend.

Tim Young and MB Condon

Tim young
MB Condon

FR012

FR012–1 **General SPD EIS and NEPA Process**

DOE conducted a procurement process in accordance with DOE NEPA regulations 10 CFR 1021.216. The selected team, DCS, would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel in domestic, commercial reactors. However, these activities are subject to the completion of the NEPA process. As stipulated in DOE's phased contract with DCS, until and depending on the decisions regarding facility siting and approach to surplus plutonium disposition are made and announced in the SPD EIS ROD, no substantive design work or construction can be started by DCS on the MOX facility. Should DOE decide to pursue the No Action Alternative or the immobilization-only approach, the contract with DCS would end. The contract is phased so that only nonsite-specific base contract studies and plans can be completed before the ROD is issued, and options that would allow construction and other work would be exercised by DOE if, and only if, the decision is made to pursue the MOX approach.

DOE acknowledges the commentors' request for additional public hearings in areas affected by the use of MOX fuel and an extension of the public comment period, including the reactor and shipping route communities. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS* or to extend the public comment period. The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Further, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

DOE provided other means and time for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. At the invitation of South Carolina State Senator Phil Leventis, DOE also attended and participated in a public hearing held on June 24, 1999, in Columbia, South Carolina.

Although it did not extend the comment period, DOE did consider all comments received after the close of that period for the *Supplement*. All comments were given equal consideration and responded to as presented in Volume III, Chapter 4.

Statement of Brad Morse
Program Assistant
Alliance for Nuclear Accountability
June 15 Public Hearing on the Supplement to the Draft Surplus Disposition EIS
Morning Session

The Alliance for Nuclear Accountability is a network of organizations concerned with nuclear weapons, nuclear waste, materials disposition, and public health. ANA members are by and large community groups living in the shadows of the Department of Energy nuclear weapons complex.

ANA member organizations have a lifetime of experience with the legacy of fifty years of Cold War policy and production. It is with that experience that the 27 member organizations of the Alliance for Nuclear Accountability join with the over one hundred other organizations and individuals from more than a dozen countries in opposition to the use of weapons-grade plutonium as MOX fuel in commercial reactors. When that Pandora's Box of Plutonium is opened, we will be hard pressed to close it. 1

COMMENTS AND QUESTIONS ON THE SUPPLEMENT

I wanted to open with one question of some detail, and I hope I can have it answered today. On page 8 of Appendix P of the Supplement, table 6 indicates that the SPD Draft EIS estimated annual waste generation of .5 liters/year of liquid TRU waste, and .3 liters/year of liquid low level waste. The offeror estimated 500 liters/year of liquid TRU waste, and 300 liters/year of liquid low level waste. I don't want to be trivial right away, but is it the position of DOE that it was 1000% off in estimating annual waste generation. I ask this not as much out of concern of the total annual waste generated, but out of concern for where else an error of this magnitude may have occurred and its consequences. When that Pandora's Box of Plutonium is opened, we will be hard pressed to close it. 2

Question #1: What is the source of this error and has it been corrected?

The DOE and its predecessor agencies have a reputation for secrecy and a lack of meaningful public input. While the DOE has made strides in the right direction in recent years, the public process around the MOX proposal is shameful. Throughout the public process associated with the Draft Surplus Plutonium Disposition EIS, we in the NGO community were told time and again that the DOE couldn't possibly hold hearings in communities around nuclear reactors that were candidates for the MOX program, until the DOE knew which reactors were selected. Now we know the Catawba, McGwire, and North Anna reactors have been chose, and still the DOE declines to hold hearings in those communities. It is my most sincere hope that DOE reconsiders this decision, and does give communities which could endure decades of plutonium shipments in and out, and which assume the risk of a plutonium accident, the chance to voice their opinion. And how is it that we know which reactors will irradiate MOX fuel, without having yet completed the Environmental Impact Statement? The Department of Energy has done a discredit to itself and the public by its rush to judgement, and it has violated at least the spirit of NEPA. 3

Question #2: Doesn't the awarding of a MOX contract pre-determine the hybrid approach and the use of MOX?

DCR012

DCR012–1 **MOX Approach**

DOE acknowledges the commentor's opposition to the use of weapons-grade plutonium in MOX fuel and irradiating it in commercial reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

DCR012–2 **Waste Management**

Initial estimates provided in support of the MOX data report indicated that liquid TRU waste generation would be on the order of 0.5 l/yr (0.1 gal/yr) and liquid LLW generation would be approximately 0.3 l/yr (0.08 gal/yr). As part of the request for proposals for the MOX fuel fabrication and irradiation contract, DOE asked prospective offerors to review the projected resource requirements and waste estimates included in the SPD Draft EIS to determine if they considered them reasonable for the proposed MOX facility. DCS stated that overall the waste estimates were consistent with their experience, but they noted that the liquid radioactive waste estimates appeared low and probably should be on the order of m^3/yr instead of l/yr. Thus, the estimates were increased to 500 l/yr (132 gal/yr) and 300 l/yr (79 gal/yr), equivalent to 0.5 m^3/yr (0.6 yd^3/yr) and 0.3 m^3/yr (0.4 yd^3/yr).

Although the waste generation estimates were increased by a factor of 1000, they are still very small. For example, 300 l/yr (79 gal/yr) would fill approximately one and a half (208-l [55-gal]) drums. As described in Chapter 3 of Volume I, the F- and H-Area Effluent Treatment Facility at SRS can process 1.9 million m^3/yr (2.5 million yd^3/yr) which is equivalent to 1.9 billion l/yr (0.5 billion gal/yr) of liquid LLW. Therefore, 300 l/yr (79 gal/yr) of additional liquid LLW would be a very small portion of the waste that could be processed in the F- and H-Area Effluent Treatment Facility.

In other cases, DCS reported that their estimates were lower than those presented in the SPD Draft EIS. For example, DCS estimated that fewer workers would be needed to operate the MOX facility and thus the average worker dose would be much lower.

DCR012–3 General SPD EIS and NEPA Process

Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of open and public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. It hosts frequent workshops, and senior staff members make presentations to local and national civic and social organizations on request. For example, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in the public hearing that was held in Columbia, South Carolina, on June 24, 1999. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue. It is DOE policy to encourage public input into these matters of national and international importance.

DOE acknowledges the commentor's request that DOE hold public hearings in the communities near the potential reactor sites that would use the MOX fuel. During the 45-day public comment period on the *Supplement to the SPD Draft EIS*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement*. DOE provided other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Also, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in a public hearing held on June 24, 1999, in Columbia, South Carolina.

The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Further, parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

DOE conducted a procurement process in accordance with DOE NEPA regulations 10 CFR 1021.216. The selected team, DCS, would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel in domestic, commercial reactors. However, these activities are subject to the completion of the NEPA process. As stipulated in DOE's phased contract with DCS, until and depending on the decisions regarding facility siting and approach to surplus plutonium disposition are made and announced in the SPD EIS ROD, no substantive design work or construction can be started by DCS on the MOX facility. Should DOE decide to pursue the No Action Alternative or the immobilization-only approach, the contract with DCS would end. The contract is phased so that only nonsite-specific base contract studies and plans can be completed before the ROD is issued, and options that would allow construction and other work would be exercised by DOE if, and only if, the decision is made to pursue the MOX approach.

ALLIANCE FOR NUCLEAR ACCOUNTABILITY
BRAD MORSE
PAGE 4 OF 4

Question #3: Knowing the nuclear fuel cycle creates more reactor-grade plutonium, and looking at footnote #1 on page 3 "Weapons-grade, fuel-grade, and power-reactor-grade plutonium are all weapons usable."; how do you reconcile the goal of the MOX project of eliminating or reducing weapons-usable plutonium with the fact that MOX irradiation actually creates plutonium? 4

Question #4: At a public meeting at the Nuclear Regulatory Commission, I asked the consortium about the public's ability to gain access to environmental safety & health records from Europe, based on the notion that the US MOX program would heavily depend on the European experience with reactor-grade plutonium. I was told "we haven't asked them, and we don't need them" referring to the environmental records. Based on comments today, I assume that the consortium will indeed be looking at those records. Could I get a formal response to that question? 5

DCR012

DCR012–4 **MOX Approach**

The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this.

It is true that in the MOX approach only a fraction of the plutonium would actually be consumed in the reactor; but the remainder would be an integral part of massive spent fuel assemblies. The spent fuel assemblies would be so large and radioactive that any attempted theft of the material would require a dedicated team willing to suffer large doses of radiation, along with substantial equipment for accessing and removing the spent fuel from the storage facility and carrying it away.

Reactor-grade plutonium can be made into a nuclear weapon but it presents would be users with much greater difficulties than weapons-grade plutonium. The level of reactor-grade plutonium in MOX spent fuel would be higher than that present in LEU spent fuel but it would still be a very small percentage of the remaining fuel and be highly radioactive. In order for it to be used in a nuclear weapon, the fuel would have to be reprocessed. This is an operation that is very difficult to conceal.

DCR012–5 **MOX RFP**

DOE considered past environmental performance of COGEMA in awarding the contract for MOX fuel fabrication and irradiation services. The operating experience at MELOX is being factored into the MOX facility design and was used to update information in the SPD Final EIS as discussed in Appendix P. More information on COGEMA's environmental record can be found on their Web site at http://www.cogema.com or by contacting Ms. Christi A. Byerly. Her address is: 7401 Wisconsin Avenue; Bethesda, MD 20814. She may also be contacted by telephone at (301) 941-8367. Her fax number is (301) 652-5690, and her email address is cbyerly@cogema-inc.com.

ALLIANCE FOR NUCLEAR ACCOUNTABILITY * CAROLINA PEACE RESOURCE CENTER * NUCLEAR CONTROL INSTITUTE * PHYSICIANS FOR SOCIAL RESPONSIBILITY * SAFE ENERGY COMMUNICATION COUNCIL * SERIOUS TEXANS AGAINST NUCLEAR DUMPING * UNION OF CONCERNED SCIENTISTS * U.S. PUBLIC INTEREST RESEARCH GROUP

April 21, 1999

The Honorable Bill Richardson
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Secretary Richardson:

We are writing to express our strong objections to one important aspect of the Department of Energy's plans to release a supplement to the Draft Surplus Plutonium Disposition Environmental Impact Statement ("draft EIS"). [64 *Federal Register* 16720, April 6, 1999]

We agree that DOE is required under NEPA to prepare a supplement to the draft EIS in order to provide more information on "the potential environmental impacts of using mixed oxide (MOX) fuel in six specific commercial nuclear power reactors at three sites..." in Virginia, North Carolina, and South Carolina. We find it unacceptable, however, that DOE plans only one public hearing on these issues, to be held in Washington, DC.

When the draft EIS was released last summer, some of us objected to the lack of plans to hold hearings in the communities around reactors that would irradiate weapons-plutonium MOX. At that time, we were informed by representatives of the Office of Fissile Materials Disposition (MD) that local hearings in reactor communities could not be scheduled because the MOX procurement process was still underway, and reactor sites had not yet been selected. After DOE's contract award on March 22, 1999, this is clearly no longer the case. The consortium that won the contract has announced that it plans to irradiate MOX fuel in Virginia Power's North Anna reactors (located near Charlottesville, VA), and in Duke Power's McGuire and Catawba reactors (located near Charlotte, NC, and Rock Hill, SC). 1

The communities around these reactor sites have a great deal at stake in these decisions, and deserve an opportunity to voice their opinions on the MOX proposal. It is also important that DOE solicit input from stakeholders most directly impacted by the MOX plan, and make it easy for them to be heard by holding hearings in their

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MR013–1 General SPD EIS and NEPA Process

DOE acknowledges the commentors' request for additional public hearings in the communities near the potential reactor sites that would use the MOX fuel. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS*. In addition to the public hearing on the *Supplement* held in Washington, D.C., DOE provided other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Also, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in a public hearing held on June 24, 1999, in Columbia, South Carolina.

The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Further, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

communities. We therefore urge DOE to schedule promptly additional hearings near each of the reactor sites. 1

We thank you for your attention to this urgent matter.

Sincerely,

Paul Leventhal
Nuclear Control Institute

Linda Pentz
Safe Energy
Communication Council

Ethan Brown
Carolina Peace Resource Center

Susan Gordon
Alliance for Nuclear Accountability

David Lochbaum
Union of Concerned Scientists

Robert K. Musil, Ph.D
Physicians for Social Responsibility

Anna Aurilio
U.S. Public Interest Research Group

Don Moniak
Serious Texans Against
Nuclear Dumping

CC: Laura Holgate

MR013

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Nuclear Control Institute Comments on the Department of Energy's *Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement*

June 28, 1999

Comments on the Environmental Impact Analysis (Section 5 and Appendix P)

The Nuclear Control Institute (NCI) has long urged the Department of Energy (DOE) to conduct a thorough, accurate and honest assessment of the environmental, safety and health risks associated with irradiating mixed-oxide (MOX) fuel derived from warhead plutonium in existing light-water reactors.[1] NCI believes it is essential that such information be given considerable weight in the development of DOE's strategies both for disposition of U.S. excess plutonium and for cooperation with Russia on their own disposition program. Reactor safety issues have not been given the consideration that they warrant in the formulation of disposition policy, as evidenced by the selection of the MOX-immobilization "dual track" in 1996 based on the rudimentary environmental analysis and flawed calculations of the 1996 *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* (S&D PEIS).[2]

The calculations of severe accident consequences contained in the *Supplement to the Surplus Plutonium Disposition Environmental Impact Statement* appear to be somewhat improved compared with those presented in the S&D PEIS. However, the overall analysis remains grossly incomplete and inadequate. DOE's final analysis must be strengthened to improve its credibility both with the public and with the Nuclear Regulatory Commission (NRC), which in spite of its relatively late start in examining the safety issues associated with DOE's MOX plan now appears

1

[1] Edwin S. Lyman, "Comments on the Department of Energy's Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement: Public and Occupational Health and Safety Issues," Nuclear Control Institute, Washington, DC, June 7, 1996 (revised October 9, 1996).

[2] Edwin S. Lyman, "Public Health Consequences of Substituting Mixed-Oxide for Uranium Fuel in Light-Water Reactors," Executive Summary, Nuclear Control Institute, January 1999.

MR022

MR022–1 **MOX Approach**

DOE believes that this SPD EIS does evaluate the potential impacts of fabricating and irradiating MOX fuel, including those associated with postulated design basis and severe accidents at the reactors proposed to use the MOX fuel. In addition to these evaluations, Duke Power Company and Virginia Power Company, the reactor licensees for the plants proposed for irradiation of MOX fuel, would provide analyses and documentation to NRC in support of the required operating license amendments. NRC would not issue a license amendment without the licensee fully demonstrating that the requested change would not compromise safety at the plant.

DOE believes that analyses contained in the *Storage and Disposition PEIS* are sufficient for programmatic decisionmaking. Based on decision made in the *Storage and Disposition PEIS* ROD, to pursue the "dual track" or hybrid approach to plutonium disposition, use of MOX fuel is analyzed in this SPD EIS along with the No Action Alternative and immobilization-only alternatives.

NUCLEAR CONTROL INSTITUTE
EDWIN S. LYMAN

to be taking a more thoughtful approach than DOE.[3] If DOE continues to refuse to address seriously the full array of MOX safety issues, it will be inviting regulatory delays when license amendments to use MOX are sought by the Duke Cogema Stone and Webster (DCS) consortium in the future. 1

1) Beyond-Design-Basis Accident Analysis

The results of the beyond-design-basis accident analysis contained in the *Supplement* are substantially different from those provided by DOE in the S&D PEIS. This is apparent from the information provided in Table 4.28-9. Yet, there is no discussion in the text that explains the reasons for the different results of the two calculations. In addition, the table is misleading in not mentioning the fact that the S&D PEIS results were obtained for a full MOX core, while the *Supplement* calculations are based on a 40% MOX core.

The S&D PEIS calculations, which are cited in the Draft Surplus Plutonium Disposition EIS, indicate that for three out of four severe accident scenarios considered, the number of latent cancer fatalities (LCFs) that would result would be 3%-7% smaller for a full MOX core than for an LEU core. For the remaining accident scenario evaluated (late containment failure), the number of LCFs would be 8% higher for a MOX core.

The calculations in the *Supplement* give nearly diametrically opposite results. The three accident scenarios which were found originally to have less severe consequences for MOX cores than for LEU cores are now shown to have more severe consequences, with increases in LCFs of 1%-15% relative to LEU cores. In contrast, the one accident which was found in the S&D PEIS to have more severe consequences for MOX cores than for LEU cores, late containment failure, is now predicted to have less severe consequences for MOX cores at Catawba and McGuire, but more severe consequences for North Anna. 2

For North Anna, at first glance it appears that the result for late containment failure (a 9% increase in LCFs) is essentially unchanged from the S&D PEIS prediction of an 8% increase. However, taking into account the fact that the S&D PEIS results were obtained for a full MOX core, while the *Supplement* calculations are based on a 40% MOX core, it is clear that the new calculations indicate a MOX impact 2.5 times more severe than that implied by the S&D PEIS results.

The revised results provided in the *Supplement* are consistent with those estimated by NCI in a report released in January 1999 (attached), which found for a generic light-water reactor that the number of LCFs resulting from a severe accident with early containment failure or bypass would be approximately 28% greater for a 1/3-MOX core than for an LEU core as a result of

[3] U.S. Nuclear Regulatory Commission, "Mixed-Oxide Fuel in Commercial Light-Water Reactors," White Paper, 1999.

MR022–2 **Facility Accidents**

DOE agrees with the commentor that the accident consequences presented in Section 4.28 are closer to those postulated by the Nuclear Control Institute in February 1999. The results shown in this SPD EIS are related to the use of specific reactor information and a partial MOX core. It was always DOE's intention to update this section with reactor-specific information once the reactors that would use MOX fuel were identified as stated in the SPD Draft EIS. A footnote was added to the accident table referred to by the commentor to show that the *Storage and Disposition PEIS* evaluated the use of a full MOX core. The consequences of some of the accidents evaluated in this SPD EIS are greater than those presented in the PEIS. The analysis presented in Section 4.28 of this EIS used more precise data from the proposed reactors that have been selected to use MOX fuel.

This SPD EIS also analyzed several reactor accidents, including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. Both of these accidents have an extremely low probability of occurrence. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48 thousand per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

radiation exposures incurred within one week after the accident.[4] The chief difference between the NCI calculation and that of the *Supplement* is that the latter assumed that americium-241 (Am-241) would be removed from the plutonium via an aqueous separation process (so-called "plutonium polishing") prior to its fabrication into MOX fuel. However, at the time the NCI report was written, the baseline plan was to use only dry processing of plutonium feed, which would not remove the americium. NCI is revising its analysis to consider the effect of americium removal on its results. Preliminary results indicate that for a 40% MOX core with americium removal, the predicted number of excess LCFs is about 25% smaller than that originally estimated (for a 33% core without americium removal) or an increase of about 21% compared to an LEU core. Therefore, NCI's estimate and DOE's upper bound estimate are moving closer together. 2

However, many problems remain with DOE's analysis and presentation of data. These will have to be corrected and/or explained more fully in the final document. These include:

a) The results of calculations of population doses resulting from severe accidents are presented in the *Supplement* without sufficient detail to permit verification by independent analysts. The modeling of population dose in computer codes like MACCS 2 depends strongly on assumptions such as the time period of exposure considered, the cleanup standards, details of the evacuation and a whole host of other parameters. In general, the uncertainties associated with these calculations grow larger as longer time periods are considered. DOE must provide all the input parameters used in the calculations to facilitate independent public review.

Such information may shed light on some of the divergent results between sites, such as the reason why the MOX/LEU LCF ratios are smaller for Catawba and McGuire following a late containment failure accident, but larger for North Anna. These differences may be due to the use of results of the Independent Plant Evaluation (IPE), which have not been thoroughly reviewed by NRC. Because different utilities used different assumptions in developing their IPE submissions, the results may not be consistent for different plants. For instance, the frequencies of early containment failure at Catawba and McGuire given in the *Supplement* are smaller than that of North Anna, despite the fact that Catawba and McGuire have ice-condenser containments which are inherently more prone to failure in severe accident conditions. 3

Also, the reasons for the wide variation in MOX/LEU ratios depending on the particular type of severe accident must be discussed. NCI's analysis did not find such a large difference between early containment failure and containment bypass accidents.

b) There is an obvious error in the calculations in the *Supplement* which must be corrected in the final version. It is apparent from a comparison of population doses and LCFs in Tables 4.21-10 to 4.21-12 that a risk coefficient of 5×10^{-4} LCF/person-rem was used for all the calculations. This is inappropriate because it assumes a dose and dose-rate effectiveness factor (DDREF) of 2 is applicable for the entire affected population. However, this is clearly not the case, because 4

[4] Edwin S. Lyman, January 1999, *op cit.*

MR022–3 **Facility Accidents**

The accident calculations are voluminous, and therefore, included in the Administrative Record for this SPD EIS rather than in the EIS proper. The calculations contain all of the input parameters including the MACCS2 computer files. Principal input parameters, such as accident source terms and population distributions, are included in the EIS.

To determine the consequences and risks of severe accidents, the EIS analysis included data from plant probabilistic risk assessments. Each plant's probabilistic risk assessment is based on plant specific parameters, systems, operating procedures, etc. This often results in different assumptions and conclusions even for similar plants. These probabilistic risk assessments are the best plant specific severe accident data available, and were therefore used in the EIS analysis.

The EIS accident analysis was performed to determine the largest increase in risks when comparing the MOX-fueled reactor to the LEU-fueled reactor for each plant. Therefore, only certain severe accident scenarios, those which would result in the highest risk, were presented in the EIS. This results in a range of bounding severe accident risks providing sufficient information for a NEPA analysis. A complete risk analysis would require a consequence evaluation of every possible release and then summing these risks for an overall risk.

The severe accident scenarios chosen for analysis were selected in the following manner. Containment bypass and failure scenarios were evaluated since these events would result in the highest consequences. The containment bypass and failure release categories from each plant's probabilistic risk assessment were screened to determine which would result in the highest risk to the surrounding population. The probabilistic risk assessments sometimes contain several release categories for a release classification such as early containment failure. Summing the frequencies of all the release categories within the early release classification would lead to the total early release frequency. However, the purpose of this analysis was not to determine the total risk, but to show the largest possible increase in risk as a result of converting to a partial MOX core. Thus, the early release containment failure release category resulting in the highest risk to the surrounding population was presented in the EIS.

many exposures following a severe accident will involve high doses delivered in short periods of time at rates far exceeding the threshold below which a DDREF of 2 is believed to be applicable (i.e. below 10 millirem per minute, according to UNSCEAR). DOE must revise its calculations so that the number of LCFs expected among those experiencing higher doses and/or dose rates are properly estimated using a DDREF of 1. 4

c) The calculations employ the MACCS 2 code developed by Sandia National Laboratories. NCI discovered a major error in this code which has a large impact on calculations of the consequences of severe accidents. Sandia altered the code and provided a corrected version to NCI. DOE should also use the corrected version for its final calculations. 5

d) The MOX/LEU ratios for fission product core inventories are remarkably similar to those used in the S&D PEIS, when adjusted for the different MOX core fraction. This leads one to surmise that Oak Ridge National Laboratory did not recalculate all fission product ratios for input into the *Supplement*, but only those for the actinides, and used the AP-600 ratios for the fission products. NCI has pointed out that the S&D PEIS ratios are not appropriate for use in the *Supplement* because they were obtained from an analysis of the Westinghouse AP-600 LWR, a reactor that has not been built and will not be used for plutonium disposition, rather than from an analysis of the designs of the existing reactors that will use MOX. Moreover, some of the fission product ratios are of questionable validity, such as that for Cs-134. The ratio of the inventory of Cs-134 in a 40% MOX core to that in a full LEU core is given as 0.85 in Table K-2 of the *Supplement*. This corresponds to a full MOX to full LEU ratio of 0.63, which is close to the value of 0.65 originally used in the S&D PEIS. NCI has been unable to reproduce such a low MOX/LEU ratio for Cs-134 in repeated ORIGEN-S runs. The value obtained by NCI is 0.96. (Incidentally, the value for this ratio given in the 1975 NRC Generic Environmental Impact Statement on the use of Mixed-Oxide Fuel in Light-Water Reactors [GESMO] is also 0.96.) 6

2) MOX Fuel Performance and Severe Accident Issues

The *Supplement* is silent on the question of MOX fuel performance, and in particular makes no mention of serious unresolved issues associated with the potentially inferior behavior of MOX fuel in certain severe accidents such as reactivity insertion accidents (RIAs) and loss-of-coolant accidents (LOCAs).[5] These issues will surely be prominent in MOX licensing proceedings.

The *Supplement* assumes that all accident frequencies will remain unchanged by the substitution of MOX for LEU in existing LWRs, and references statements to this effect in the 1995 plutonium disposition study by the National Academy of Sciences (NAS). However, the NAS discussion was very general and did not examine in detail the following issues. These questions must be addressed in the *Supplement* so that the public can be informed about the numerous unresolved issues associated with MOX fuel performance in severe accidents. 7

[5] NRC White Paper, *op cit.*

MR022–4 **Facility Accidents**

The risk coefficient was corrected and used in the SPD Final EIS analysis.

MR022–5 **Facility Accidents**

The correction to the MACCS2 code was performed and employed in the SPD Final EIS analysis.

MR022–6 **Facility Accidents**

ORNL recalculated MOX/LEU ratios for all radioisotopes, including fission products, for the *Supplement to the SPD Draft EIS* based on operation of a typical Westinghouse pressurized water reactor. These ratios are not based on the Westinghouse AP–600. The MOX/LEU ratios are based on specific fuel enrichments and reactor cycle characteristics. Independent analyses, which do not use identical parameters, would result in different ratios.

MR022–7 **Facility Accidents**

Two significant light-water reactor transients analyzed in safety analyses are the loss-of-coolant accident (LOCA) and the reactivity insertion accident (RIA). Differences between LEU and MOX fuel could affect both of these accidents.

The reduced thermal conductivity in MOX fuel causes the fuel pellets to operate at somewhat higher temperatures than in LEU fuel of the same linear power rating. While the higher operating temperatures would not be a problem for normal operation, the fuel temperatures determine the amount of stored heat present at the beginning of a LOCA. However, the increased energy released per plutonium fission, compared with uranium fission, and early decrease in decay heat for MOX fuel will tend to offset the increased stored energy.

For RIAs, the higher fission gas release associated with plutonium hot spots may increase the severity of the pellet-cladding interaction, and the higher gas inventory may also cause greater entrainment and expulsion of fuel particles after cladding failure. Although, the higher creep rate of MOX fuel may reduce the severity of the pellet-cladding interaction that causes cladding failure at higher burnups.

MOX fuel produced via the MIMAS process, which will be the one used by the DCS consortium, is heterogeneous. It contains plutonium clusters (some of which have diameters of several hundred microns) which act as "hot spots," achieving much higher local burnups than occur in LEU fuel. For a fuel rod with an average burnup of 50 MWD/kg, the plutonium-rich clusters in MIMAS fuel achieve burnups of up to 200 MWD/kg.[6]

The locally high burnups in plutonium-rich clusters result in the formation of high-porosity regions which allow fission gas to escape from the interior of fuel pellets. In addition, MOX fuel has a thermal conductivity approximately 10% lower than LEU fuel, resulting in centerline temperatures about 50°C greater. These two effects cause greater fission gas releases to occur in MOX fuel than in LEU fuel at similar average burnups. Above about 35 MWD/kg, the fission gas release in MOX fuel rods rises to several times that of LEU fuel at the same burnup. Another troubling observation (from recent experiments at the Halden reactor in Norway) is that while fission gas release in LEU fuel ceases when the fuel temperature is lowered below the threshold of onset, the same is not true for MOX fuel.[7]

The increased fission gas release and higher temperature of MOX fuel rods can affect the severity of some accidents such as RIAs and LOCAs. The Rep-Na7 RIA test at the Cabri reactor in France, performed on a fuel rod that had been irradiated for four annual cycles and had a burnup of 55 MWD/kg, resulted in a "very severe failure" which caused the test channel to become almost completely blocked. This failure was unique because the fuel cladding did not have any important corrosion, unlike the LEU rods which failed in the same test series. As a result, according to those who conducted the experiment, "a MOX effect must be considered in this case."[8]

7

NCI acknowledges that the plan of DCS is initially to irradiate MOX fuel for only two 18-month cycles, whereas some LEU assemblies are now irradiated for three 18-month cycles. However, the *Supplement* should detail the exact fuel management scheme that will be used and specify the maximum MOX assembly and rod burnups that will occur under this scheme.

The maximum burnup to which DCS is initially seeking authorization to take MOX fuel, 50 MWD/kg, is above the maximum MOX rod burnup that is currently permitted in France (about 47 MWD/kg), and is in a region where the rods' resistance to RIAs is clearly in question. Moreover, DCS refuses to preclude eventually irradiating MOX fuel to the same maximum burnup to which it currently irradiating LEU (with maximum rod burnups well over 60

[6] "Reactivity Insertion Tests in Cabri with MOX Fuel," F. Schmitz, J. Papin and C. Gonnier, Institut de Protection et de Sûreté Nucléaire (IPSN), International Symposium on MOX Fuel Cycle Technologies for Medium and Long-Term Development, Vienna, Austria, 17-21 May 1999.

[7] W. Wiesenack, M. McGrath, "Performance of MOX Fuel — An Overview of the Experimental Programme of the OECD Halden Reactor Project and Review of Selected Results," International Symposium on MOX Fuel Cycle Technology, IAEA, Vienna, 17-21 May 1999.

[8] F. Schmitz *et al*, op cit.

The particular reactivity insertion accident scenario for a pressurized water reactor is a control rod ejection. The Cabri RIA test program was designed to challenge typical fuel rods under conditions that are more extreme than conditions that would be experienced during a real pressurized water reactor control rod ejection. Out of the nine Cabri tests (six with uranium fuel, three with MOX fuel), two uranium fuel rods and one MOX fuel rod experienced failures. The MOX failure occurred at an energy deposition rate that is greater than can realistically be reached by high burnup fuel, even after an extremely unlikely worst case control rod ejection.

These differences suggest that the behavior of MOX fuel during transients could be different than that of LEU fuel. These differences continue to be studied through several research programs. However, until definitive results are obtained, the best available data is the current reactor safety analyses. The offsite consequence analysis of these accidents was therefore based on LEU fuel behavior.

Both LOCA and RIAs were considered in preparing the *Supplement*. Because it was determined that RIAs would result in lower consequences and were of lower risk than the LOCAs, they were not presented in the *Supplement*.

Regarding whether the differences between LEU and MOX fuel affect the frequencies of accidents, an NRC White Paper (1999), *Mixed-Oxide Fuel Use in Commercial Light Water Reactors*, concluded that it appeared likely that the probability of severe accidents will not change and that consequence analyses, rather than full probabilistic risk assessments, may be sufficient to assess the changes due to the different inventory of radionuclides.

NRC believes that severe accident source terms would not be significantly different for MOX fuel than for LEU fuel. This conclusion was based on the assumption that a few percent additional plutonium in the core, with a reduction of only about 10°C (50°F) in melting temperature, will not have a significant effect on accident progression. Also, the processes that remove fission products will not be affected by the small change in composition of the core debris. Further, the source term itself is given in terms of fractions of initial inventory, so these fractions should not be changed significantly.

MWD/kg). It is acknowledged in France that the current generation of MIMAS fuel must be modified and improved before such high burnups can be achieved. DCS should specify in detail how it is going to take into account future fuel modifications in its fuel qualification program.

The issue of MOX fuel performance in LOCAs is one which NRC has highlighted as a concern. Increased fuel and cladding temperature due to the lower thermal conductivity and higher average linear power of MOX assemblies, as well as the possibility of fuel-clad gap reopening due to the increased fission gas release, could enhance the clad oxidation rate during a LOCA and increase the severity of the accident. DOE should address this concern and its proposed LOCA mitigation strategy in the *Supplement*. 7

There are also disturbing indications that the fission gas release dynamics of MOX fuel may lead to enhanced releases of volatile and semi-volatile radionuclides during the early stages of core degradation compared to LEU fuel.[9] This could have an effect on the consequences of some accidents, both design-basis and beyond design-basis.

3) Spent Fuel Management

The *Supplement* claims that the MOX program will not "impact spent fuel management" at the reactor sites, even though it predicts that additional spent fuel assemblies will be generated over the course of the campaign. However, the heat generation of spent MOX fuel will be greater than that of spent LEU fuel. NCI's calculations indicate that for two-cycle spent MOX fuel, the heat generation rate will be more than twice that of two-cycle LEU fuel soon after discharge and will remain at that level for many years. The *Supplement* should discuss how DCS can accommodate this incremental heat loading in their existing spent fuel storage facilities. 8

In summary, NCI believes that DOE cannot make credible or defensible decisions on a plutonium disposition strategy without a much more complete analysis of outstanding reactor safety issues associated with MOX use. Only then can the risks and benefits of various disposition strategies accurately be determined. In our view, the uncertainties and risks associated with reactor irradiation of MOX are significant enough to warrant a reevaluation of the "dual track" strategy. More serious consideration should be given to utilization of an all-immobilization approach to achieve the "spent fuel standard," so that the risks of MOX irradiation can be avoided. 1

Sincerely,

Edwin S. Lyman, PhD
Scientific Director

[9] Advisory Committee on Reactor Safeguards, "Use of Mixed Oxide Fuel in Commercial Nuclear Power Plants," letter report to the Nuclear Regulatory Commission, May 17, 1999.

NRC hypothesized that the gap release may marginally increase because of the elevated operating temperatures in MOX fuel compared to LEU fuel. The gap release is used in the analysis of design basis accidents and would not have a large effect on severe accident source terms. Once again, due to the lack of definitive information, for the offsite consequence analysis, the gap release was based on LEU fuel behavior. This possible difference is being evaluated by current research programs and any new information will be implemented in further safety analyses.

DCS proposes to continue the use of an 18-month fuel cycle. Specific fuel management schemes do vary during the life of a particular core life and setting a specific fuel management scheme would not be cost-effective. Maximum MOX fuel burnup levels will be approved by NRC only after thorough safety evaluations including information from current research programs.

MR022–8 **MOX Approach**

The DCS team reactor utility companies use a typical 18-month fuel cycle, replacing approximately 40 percent of the fuel assemblies in a reactor at each refueling. Some fuel assemblies are used for two cycles, some for three cycles. The utilities plan to maintain the current fuel management schemes and would use the MOX fuel assemblies for only two cycles.

Initially, when spent fuel is removed from the reactor, the MOX and LEU fuel would be about the same temperature and exhibit similar characteristics. After about a year out of the reactor, however, the temperature of MOX spent fuel would exceed that of LEU fuel of the same age. Therefore, storage of MOX spent fuel would increase the thermal loading in a spent fuel pool over that for only LEU fuel. However, thermal load limitations are based on the amount of cooling that the entire spent fuel pool can accommodate, not on individual fuel assemblies within the pool. Therefore, the additional heat load would be accounted for in the calculations for the reactor spent fuel management plans.

PUBLIC HEALTH CONSEQUENCES OF SUBSTITUTING MIXED-OXIDE FOR URANIUM FUEL IN LIGHT-WATER REACTORS

Edwin S. Lyman, PhD
Nuclear Control Institute
February 1999

Executive Summary

Background

In January 1997, the U.S. Department of Energy (DOE) decided to pursue a "dual track" policy for the disposition of approximately 50 metric tons (MT) of plutonium produced for weapons programs that have been declared excess to military needs. The two tracks of the "dual track" refer to two different approaches for converting separated plutonium into a dilute and highly radioactive form that is more difficult to return to weapons.

Under one approach, known as "can-in-canister" immobilization (CIC), plutonium will be incorporated into chemically stable ceramic discs. These discs will in turn be embedded in canisters of "vitrified" (glassified) high-level radioactive waste (VHLW) at the Defense Waste Processing Facility (DWPF) at the Savannah River Site in South Carolina. DOE is tentatively planning to use CIC for approximately 17 MT of excess plutonium in impure forms. The CIC facility will in all likelihood be sited at SRS adjacent to the DWPF.

Under the other approach, plutonium will be used to produce "mixed plutonium-uranium oxide" (MOX) fuel assemblies, which will be loaded and irradiated in a number of U.S. commercial nuclear reactors, displacing some or all of the low-enriched uranium oxide (LEU) fuel assemblies the reactors currently use. DOE is tentatively planning to utilize this option for approximately 33 MT of weapons-grade plutonium (WG-Pu). In 1998, DOE issued a Request for Proposals, seeking vendors interested in providing MOX fuel fabrication and irradiation services. Of the three proposals submitted, two have already been eliminated for failing to meet basic requirements. It is expected that DOE will sign a contract in February 1999 with the third party, a consortium including the French fuel fabricator Cogema and the U.S. utilities Duke Power and Virginia Power. It is also expected that Cogema will build and operate a MOX fuel fabrication plant at SRS, and that the fuel will be irradiated in Virginia Power's North Anna 1&2 plants and Duke Power's McGuire 1&2 plants in North Carolina and Catawba 1&2 plants in South Carolina.

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Both the immobilization and MOX tracks require large-scale handling and processing of plutonium, an extremely hazardous substance. Consequently, they will be expensive to carry out and will pose risks to human health and the environment. However, the costs and risks involved will be small compared to those experienced when the material was produced, and most arms-control advocates concur that the security benefits of plutonium disposition justify the risks.

Some analysts argue further that differences in cost and hazard associated with the two disposition approaches should not weigh heavily in policy decisions. However, this view is out of touch with both budgetary and political realities. Because Cold War-sized government coffers are not likely to be available to DOE for disarmament activities, the plutonium disposition program will be under pressure to minimize costs. Also, many environmental groups and citizens' groups near affected sites will likely oppose any disposition activities unless they clearly have low environmental and public health impacts. It is certainly sensible to reject an option with substantially greater economic and health risks, if it brings no additional benefits.

Cost and public health impact were major considerations in the process that DOE used to select MOX and immobilization from the large number of disposition options that were initially proposed. In deciding on the dual track policy, DOE argued that there are no decisive differences between the MOX and immobilization options with regard to any of its evaluation criteria, including public health impact. However, this report concludes that DOE's evaluation is inaccurate. We find that the public health risks associated with the MOX approach are significantly greater than those associated with CIC. This is due primarily to our findings that the consequences of severe accidents involving LWRs with MOX cores are likely to be greater than those involving LEU cores. | 9

Our finding also has international implications. For instance, the U.S. and Russia are also pursuing a plan to utilize Russian excess WG-Pu in VVER-1000 light-water reactors located in Russia and Ukraine, which meet less stringent safety standards than nuclear plants in the U.S. Also, several nations, such as France, Switzerland and Japan, either use or are planning to use plutonium obtained in so-called "civil" reprocessing programs as fuel for LWRs. The "reactor-grade" plutonium (RG-Pu) used in these programs has different isotopic characteristics than WG-Pu and a different impact on reactor safety, including a greater increase in potential consequences. | 10

In this report, the public health consequences of severe accidents at MOX-fueled pressurized water reactors (PWRs) are calculated and compared with the consequences of accidents at LEU-fueled PWRs. The acceptability of the increased risk associated with the change from LEU to MOX fuel in U.S. PWRs is then evaluated in the context of the "risk-informed" regulatory procedures now being implemented by the U.S. Nuclear Regulatory Commission (NRC).

Risks of MOX Use

The MOX approach consists of several stages, each of which can have a significant | 2

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MR022–9 **MOX Approach**

DOE acknowledges the commentor's concern regarding increased public health risks associated with the MOX approach. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

As discussed in Section 4.28.2.4, the risks during normal operations using a partial MOX core are almost identical to risks using a full LEU core. As described in Section 4.28.2.5, the risks during accidents may be higher or lower for a partial MOX core, depending on the accident scenario.

The remainder of this comment is addressed in response MR022–2.

MR022–10 **Nonproliferation**

DOE acknowledges the commentor's concerns regarding the disposition of surplus Russian plutonium as MOX fuel, although programmatic and policy issues such as U.S. policies toward plutonium disposition in Russia are beyond the scope of this SPD EIS. Similarly, plutonium reprocessing programs conducted in France, Switzerland, and Japan are beyond the scope of this SPD EIS.

environmental and public health impact. A plant for fabrication of the fuel must be built and operated, the fuel must be shipped to reactor sites, and the fuel must be irradiated in reactors. By comparison, the environmental impacts of CIC immobilization are associated primarily with the operation of the ceramic immobilization plant. Because this plant will be very similar to the MOX fabrication plant in design and size, it will have similar impacts. Therefore, any risks associated with MOX transportation and irradiation increase the cumulative risk of the MOX approach to a level greater than that of immobilization.

In order to quantify and compare the public health impacts of the two options, it is necessary to understand how the risks of nuclear power plant operation change when WG-MOX is substituted for LEU. Risk is defined as the product of the probability and the consequences of a particular event, summed over all events. Nuclear power plants pose risks both as a result of routine operation (high probability and relatively low consequence events) and through the possibility of accidents (low probability and high consequence events). This report focuses on accident risk.

Carrying out a complete and accurate comparison of the accident risks of MOX and LEU cores is a difficult undertaking, for a number of reasons. Nuclear power plant accident safety analyses, or probabilistic risk assessments (PRAs), are extremely complex. In general, the substitution of WG-MOX for LEU fuel will affect both the probability of occurrence and the consequence of each accident sequence which can occur during reactor operation, so that existing PRAs will have to be extensively modified. The difficulty of doing so is compounded by the relative lack of experience with the use of WG-MOX fuel, as well as insufficient data on many technical aspects of MOX use.

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Another complication results from the fact that almost every nuclear plant in the U.S. has unique features which are relevant to safety, so that the impacts of MOX use are highly reactor-specific. Also, the safety analysis will depend on details of the specific MOX irradiation plan, such as the amount of plutonium in the MOX fuel, the maximum burnup (amount of heat extracted) from each fuel assembly and the fraction of the core (from 33%-100%) that will be loaded with MOX fuel. These details have not been publicly released yet and may for the most part remain proprietary and unavailable to the public.

However, there are some safety-related problems with the use of MOX fuel which will apply to any LWR. For example, the total inventory of highly radiotoxic actinides, including plutonium-239 (Pu-239), americium-241 (Am-241) and curium-242 (Cm-242), is significantly greater in MOX cores than in LEU cores throughout the operating cycle. Our analysis shows that the public health consequences of some severe accidents will be greater for reactors fueled with MOX.

The exact quantities of plutonium and other actinides in MOX cores depend on parameters such as the concentration and isotopic content of the plutonium in the fresh fuel. For the case considered in this study we find that, compared to an LEU core, a full WG-MOX core will contain about three times the amount of Pu-239, seven times as much Am-241 and seven times

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as much Cm-242 at the end of an operating cycle (i.e. just before the reactor is shut down for reloading). For MOX fabricated with reactor-grade plutonium (RG-Pu), Am-241 and Cm-242 inventories are greater by additional factors of 4 and 3, respectively.

Since most of these radionuclides emit alpha particles, which are much more hazardous per decay than beta or gamma particles if inhaled or ingested, they will contribute significantly to public radiation exposures following severe reactor accidents, even if only a small fraction of the core inventory is released.

The initial draft of DOE's Storage and Disposition of Weapons-Usable Fissile Materials Draft Environmental Impact Statement (DPEIS) did not analyze the environmental impacts of accidents involving MOX-fueled LWRs. Instead, it only included an analysis of an LEU-fueled LWR. DOE justified this by claiming that

> "separate studies ... indicate that the use of MOX fuel in a ... LWR does not increase the risk and consequences of accidents. This results from the fact that the other radioisotopes that are released in an accident have more serious impacts on human health than the Pu used in the MOX fuel."[1]

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Another DOE study makes the stronger claim that the greater actinide inventories in a MOX core will not affect the consequences of an LWR accident because "plutonium and other insoluble fuel isotopes are not included in the releases to the environment."[2]

These statements are misleading, however. Certain severe accidents can result in the expulsion of significant quantities of actinides into the environment. Although such "beyond design-basis" accidents are expected to occur very infrequently, there are both historical precedents and regulatory requirements for considering them in safety analyses.

The best possible laboratory for loss-of-containment consequences, the Chernobyl accident, has demonstrated that significant and wide-ranging dispersal of actinides is possible. Recent reviews of the Chernobyl source term have concluded that approximately 3.5% of the core actinide inventory was released. Moreover, dispersal of these relatively heavy aerosols was not limited to the immediate vicinity of the plant; fuel fragments were discovered as far away as Greece and Germany, over one thousand kilometers away.[3]

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[1] U.S. Department of Energy, *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement*, DOE/EIS/0229-D, February 1996, Volume II, p. 4-690.

[2] Oak Ridge National Laboratory, *FMDP LWR PEIS Data Report*, Rev.3, ORNL/MD/LTR-42, December 1995, p. B-22.

[3] L. Devell *et al.* "The Chernobyl Reactor Accident Source Term: Development of a Consensus View," OECD/NEA, OECD/GD(96)12, November 1995.

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It has often been claimed that a Chernobyl-type accident cannot happen in the West because Western reactors have robust containment structures. However, while the presence of containment domes reduces the risk of such accidents, it does not eliminate it entirely. Many accident sequences for U.S. LWRs have been identified which can lead either to massive failure or bypass of the containment, thereby allowing significant releases of core particles. In fact, the U.S. Nuclear Regulatory Commission (NRC) has estimated that actinide releases as high as several percent of the core inventory are possible in such accidents.[4]

In comments on the DPEIS in 1996, the Nuclear Control Institute (NCI) challenged DOE's assumption that there was no difference between LEU and MOX with regard to reactor safety.[5] In particular, NCI cited the possibility of accidents resulting in a relatively large release of actinides.

DOE responded to NCI's comments in the final PEIS on storage and disposition of weapons-usable fissile materials (FPEIS) by presenting the results of a calculation that took into account the different radionuclide inventories of WG-MOX and LEU cores. The FPEIS claimed that the change in accident consequences (defined as the resulting number of latent cancer fatalities) associated with the substitution of WG-MOX for LEU ranged from +8% to -7%: in other words, the number of cancer fatalities caused by some accidents could actually *decrease* as a result of switching to MOX fuel.[6] 2

A complete review of the FPEIS calculation is not possible because few details are provided. However, an analysis of the information that is provided reveals several obvious inconsistencies. For instance, the FPEIS calculation used a value of 0.65 for the ratio of the quantity of cesium-134 (Cs-134) in the WG-MOX core to that in the LEU core. When this ratio was "arbitrarily set to 1.0" in the FPEIS analysis, however, the observed reduction in cancer fatalities associated with switching to MOX fuel changed to an increase. The FPEIS fails to mention a fact that appears in one of its own reference documents --- namely, that various studies have calculated Cs-134 MOX/LEU ratios ranging up to 1.08, and that the value used by the FPEIS was based on a Westinghouse "advanced" PWR and not on an existing reactor type.[7] Our study, which was based on existing PWRs, found a value of 0.96 for the Cs-134 MOX/LEU ratio at the end-of-cycle.

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[4] U.S. Nuclear Regulatory Commission, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," NUREG-1150, 1990.

[5] Edwin S. Lyman, "Comments on the Department of Energy's Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement: Public and Occupational Health and Safety Issues," Nuclear Control Institute, Washington, DC, June 7, 1996 (rev. Oct 9, 1996).

[6] U.S. Department of Energy, *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*, DOE/EIS-0229, December 1996, p. S-37.

[7] Oak Ridge National Laboratory (1995), *op cit.*

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Another factor that the FPEIS did not take into account is the sensitivity of the consequences of MOX accidents to the fraction of the actinides in the core that is assumed to be released. There are large uncertainties in predictions of the fraction of core actinides that can be released in severe accidents. The FPEIS assumed only very low values of the actinide release fractions.

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Because of the flaws in the FPEIS risk calculation, NCI undertook its own study to evaluate the consequences of loss-of-containment accidents at PWRs with MOX cores and compare them to those at PWRs with LEU cores. The specific example of a four-loop PWR with an ice-condenser containment was chosen for analysis. Four of the six plants included in the sole bid now being evaluated by DOE --- Duke Power's Catawba 1&2 and McGuire 1&2 --- are of this type.

First, radionuclide inventories were computed for LEU and WG-MOX cores, using the Oak Ridge National Laboratory (ORNL) SCALE 4.3 code to simulate changes in the fuel composition during irradiation. Full WG-MOX cores were considered as the bounding case. Fuel management schemes were based on those in a 1996 Westinghouse report on plutonium disposition in which full-MOX cycles were developed that resembled LEU cycles as closely as possible.

Second, the accident consequences (acute fatalities, early commitment of latent cancer fatalities, and other indicators of risk) for LEU and MOX cores were evaluated for several different accidents, using NRC methodology and the NRC consequence calculation software MACCS2,[8] and ICRP 72 dose coefficients. Generic parameters were used for population and atmospheric data. While the absolute values of consequence measures depend strongly on these parameters, the relative consequences of MOX and LEU accidents are much less sensitive to them.

Finally, the calculated increases in risk associated with substituting MOX for LEU were compared to the acceptance guidelines contained in the recently issued NRC Regulatory Guide (RG) 1.174,[9] "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." RG 1.174 describes a methodology for grading the intensity of NRC review of requested changes to the licensing basis (LB) of nuclear

[8] D.I. Chanin and M.L. Young, *Code Manual for MACCS2: Volume 1, User's Guide*, SAND97-0594, Sandia National Laboratories, March 1997. In the course of generating data for the present paper, the author discovered an error in the MACCS2 software which resulted in the overcounting of cancer fatalities among individuals receiving committed effective doses (CEDs) greater than 10 sievert (Sv) and a consequent overestimate of population-averaged cancer risk. While the error will not be fixed until release of the next version of MACCS, an "unofficial" corrected version of the code was provided to the author. Although the corrected version has not been officially validated, the results agree well with calculations carried out by the author by hand. All data in this report has been generated with the corrected, unofficial version of MACCS2.

[9] U.S. Nuclear Regulatory Commission, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, July 1998.

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power plants according to their risk significance. RG 1.174 therefore provides a framework for evaluating the regulatory significance of the increased risk associated with use of MOX fuel.

Although not directly applicable to the WG-Pu disposition program, the inventory of a typical reactor-grade (RG) MOX core was also calculated for comparison. Because RG-MOX cores have larger quantities of heavy actinides, the consequences of RG-MOX accidents are even more severe than those of WG-MOX, especially at the relatively high plutonium loadings necessary to achieve adequate utilization of the fuel.

Findings

1. The number of latent cancer fatalities (LCFs) committed within one week after a severe reactor accident will be significantly greater for both full and partial WG-MOX cores than for LEU cores. For most accidents considered, the number of prompt fatalities that result will also be greater.

(a) Compared to a PWR using LEU fuel, the number of latent cancer fatalities (LCFs) that will result from exposures immediately following a severe accident with early containment failure or bypass will be significantly greater for a PWR loaded with weapons-grade (WG) MOX fuel, for both full and 1/3-cores of WG-MOX. This is primarily due to the increased concentrations of plutonium and heavier actinides in MOX cores.

For a set of typical severe accidents that result in the release of about 1% of the inventory of plutonium and other actinides (compared with a 3.5% release for the Chernobyl accident), the number of "early" LCFs that result (those due to exposures occurring within one week after the accident), averaged over an operating cycle, was found to be 81%-96% greater for a full MOX core.

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For a 1/3-MOX core, the corresponding percent increase would be 29%-32%, a factor of three smaller than for a full core. However, because the increase in consequences is essentially linear with respect to the MOX core fraction, the overall excess *risk* (the product of probability and consequences) associated with the disposition program will be approximately the same for both full and partial MOX core loadings. Whether 33 MT of WG-Pu is processed in six plants with a 1/3-MOX core in 15 years, in six plants with a full MOX core in 5 years, or in two plants with a full MOX core in 15 years, the total average increase in risk to the U.S. public will be approximately the same in each case (although the risk to a particular individual may be different).

(b) These increases are considerably greater than the upper limit of the +8% to -7% range cited by the Department of Energy (DOE) in its environmental impact statements on surplus plutonium disposition for full-core MOX.

(c) The actual number of additional LCFs resulting from a MOX accident depends on details of

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the reactor site, such as population density and atmospheric conditions. For a generic site with a population density of 100 persons/square kilometer (which is very close to the actual density in the vicinity of the Catawba and McGuire plants) the number of additional LCFs within an area of 1000 miles radius, averaged over an operating cycle, was found to range from 1,440 to 6,165 for the set of accidents analyzed for a full-MOX core. For a 1/3-MOX core, the additional LCFs range from 495 to 2,385.

(d) The number of prompt fatalities resulting from acute radiation exposure is greater by around 40% for WG-MOX cores following early containment failure accidents. For containment bypass accidents, a 15% reduction was observed (from 33 to 28 cases) for a full-MOX core, and a 6% reduction for a 1/3-core. However, this reduction in prompt fatalities is tiny compared to the increase in LCFs observed.

2. The additional consequences of severe accidents involving MOX cores are sensitive to the fraction of actinides (i.e. plutonium, americium and curium) in the core that are released.

The increase in accident consequences associated with switching from LEU to MOX depends on the fraction of the actinide inventory that is released, which is a highly uncertain parameter. As the actinide release fraction is varied from 0.3% to 6%, the percent increase in LCFs resulting from an full-MOX core accident with early containment failure, averaged over an operating cycle, ranges from 39% to 131%, corresponding to an additional 1,730 to 18,185 LCFs for the generic reactor site. In the worst case, the number of *additional* cancers associated with a MOX accident is 60% as large as the *total* number of cases predicted to occur worldwide from the Chernobyl accident. For a 1/3-MOX core, the percent increases range from 14% to 44%, corresponding to an additional 610 to 6,135 LCFs.

3. The average latent cancer fatality accident risk to the population within ten miles of a nuclear plant is increased by approximately a factor of two when a full core of WG-MOX is substituted for LEU. This increase in risk is significant when compared to the risk limits in NRC's Safety Goal Policy Statement.[10] According to NRC's Regulatory Guide 1.174, a change in the licensing basis resulting in a doubling of risk would not be allowed for typical U.S. PWRs. The increase in risk associated with loading a 1/3-core of WG-MOX would also be unacceptably high.

When a full core of WG-MOX is substituted for LEU, the average increase in latent cancer fatality risk to the population near a reactor site nearly doubles. This is equivalent to the increase in risk that would occur if the probability of a severe accident with a large early release of radioactivity (the Large Early Release Frequency, or LERF) were doubled. For the PWR considered in this study, this would correspond to an increase in LERF of about seven in a million ($7x10^{-6}$) per year for a full MOX core, or more than two in a million ($2x10^{-6}$) per year

[10] U.S. Nuclear Regulatory Commission, "Safety Goals for the Operations of Nuclear Power Plants: Policy Statement," *Federal Register*, 51 FR 30028, August 4, 1986.

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for a 1/3-MOX core. In both cases, these exceed the threshold of one in a million ($1x10^{-6}$) per year established in NRC's Regulatory Guide 1.174 for allowable increases in LERF.

4. The use of WG-MOX in U.S. PWRs is not likely to lower the probability that a severe loss-of-containment accident may occur and may in fact increase it significantly.

Some reasons why this is the case are listed below.

(a) The ability of high-burnup MOX fuels in current use to withstand severe accident conditions is inferior to that of LEU fuel.

It has been observed that MOX fuel assemblies fabricated with current techniques are inferior to LEU fuel with regard to their integrity during abnormal events that cause rapid heating of the fuel, such as reactivity insertion accidents (RIAs) and loss-of-coolant accidents (LOCAs). Based on the results of a series of RIA tests at the Cabri test reactor in France, French regulators have concluded that "MOX fuel shows a higher failure potential than UO_2 at comparable burnup." In particular, a MOX fuel rod with a burnup of 55 gigawatt-days per metric ton (GWD/MT), which is typical of burnups achieved in U.S. PWRs today, experienced a violent rupture and dispersal of fuel particles, while two LEU rods of comparable and higher burnups were able to withstand similar conditions without rupture.[11] Based on this test, a French regulator recently concluded that this was a MOX-related phenomenon and that there is a "very high potential for rupture" of MOX fuel in RIA situations.[12]

(b) A MOX-fueled PWR may have a greater risk of experiencing pressurized thermal shock of the pressure vessel. 2

Due to a more rapid cooldown of the reactor vessel following a break in a main steam line, a MOX-fueled PWR may have a greater risk of experiencing pressurized thermal shock (PTS) than one fueled with LEU. PTS is a very severe event in which the reactor vessel becomes brittle at low temperature (below about 180°C or 350°F) and ruptures at high pressure, causing core debris to be expelled into the containment. Following such an event, it is nearly impossible to maintain cooling of the core and a meltdown becomes a virtual certainty. In addition, a sufficiently powerful rupture of the pressure vessel could damage the containment.

[11] DOE has recently claimed that the Cabri test is not relevant to the U.S. MOX program, arguing that (1) the burnup was higher than that which MOX rods will experience in U.S. reactors, and (2) the Cabri test rod was an obsolete fuel type with a high degree of heterogeneity. Both these statements are false. PWR fuel assemblies are authorized in the U.S. for burnups up to 62 GWD/t, and reactor operators expect that MOX and LEU fuel assemblies will be fully interchangeable. The Cabri rod was fabricated using the MIMAS process, which the French and Belgian industries have been using since 1984 and which is expected to be the process that a U.S. MOX fabrication plant will utilize. DOE is not encouraging the development of improved MOX fuel for the U.S. program because of the delays that would occur in its qualification.

[12] A. MacLachlan, "International Meeting Fails to Resolve Questions Surrounding Cabri Future," *NuclearFuel*, July 27, 1998, p. 6.

(c) Ice-condenser containments may be more vulnerable to early failure in a severe accident than large dry containments.

Four of the six PWRs that have been offered for MOX irradiation services in the sole remaining proposal being evaluated by DOE, Duke Power's Catawba 1&2 and McGuire 1&2, have ice-condenser containment structures. These containments are smaller in volume and have less structural strength than other types of PWR containments. In the event of a core melt, followed by failure of the reactor pressure vessel at high pressure, a phenomenon known as high-pressure melt ejection (HPME) can occur, resulting in a very rapid heating and pressurization of the containment atmosphere (direct containment heating, or DCH) which can cause containment failure. Ice-condenser containments "do not have the same inherent capacity to withstand the credible DCH loads from all scenarios as other Westinghouse plants," according to NRC.[13] The ability of ice-condensers to withstand hydrogen combustion events and steam explosions is also questionable.

Together, these facts raise the concern that if U.S. utilities plan to irradiate MOX fuel to a burnup comparable to that of LEU fuel, the risk of violent rupture and fuel dispersal that makes cooling of the core debris more difficult will be increased. Moreover, because such accidents can result in both dispersal of the core into the containment and early containment failure through the phenomenon of direct containment heating, they are also associated with release of solid core materials, such as actinides, into the environment. Therefore, both the consequences and the probability of this class of accidents may increase when MOX is substituted for LEU in PWRs. 2

5. A severe accident at a PWR with a reactor-grade MOX (RG-MOX) core would cause up to twice as many latent cancer fatalities (LCFs) as would an accident at a PWR with a WG-MOX core.

The number of LCFs resulting from a severe accident at a PWR fueled with a full core of RG-MOX, at the end of an operating cycle, was found to be 123%-486% greater than that resulting from an accident at a PWR fueled with LEU, depending on the actinide release fraction. This is more than twice as many cases as would result from an accident involving a WG-MOX core. This dramatic increase in risk should be taken into consideration by nations that are currently using or planning to introduce RG-MOX in their nuclear plants. Recently, some U.S. policy-makers who regret the U.S. decision not to pursue commercial spent fuel reprocessing and plutonium recycling have been seeking to take advantage of the current political difficulties of siting a geologic repository for spent fuel to revive the reprocessing option in the U.S. The results of this article provide an additional validation of the U.S. decision and another argument why reprocessing and recycle should be avoided.

[13] U.S. NRC, "Status of the Integration Plan for Closure of Severe Accident Issues and the Status of Severe Accident Research," SECY-98-131, June 1998.

Conclusions

1. Licensing of U.S. reactors to use MOX will have to take place primarily on a site-specific level. In addition, an NRC finding that MOX use poses "no significant hazards" under 10 CFR 50.92 clearly would not be justified.

A key question in the procedure for licensing reactors to use MOX fuel will be whether NRC will rule, under the procedures outlined in 10 CFR 50.92, that the introduction of MOX fuel into existing reactors involves a "significant hazards consideration," which would obligate the NRC to conduct public hearings prior to issuance of a license amendment. Prospective industry participants in the MOX program have indicated that they intend to have the MOX reload core methodology licensed on a generic basis, thereby removing most MOX-related issues from consideration on a plant-specific level. In this way, they hope to facilitate an NRC finding of "no significant hazards" in individual plant license amendment proceedings and thus prevent the possibility of site-specific hearings that could lead to substantial delays in introducing MOX fuel into reactors.

However, the results of this study indicate that site-specific considerations, such as the public health impacts associated with changes in the licensing bases of existing plants to use MOX fuel, will indeed be substantial, and therefore it should not be possible for NRC to justify issuing a finding of "no significant hazards" on the plant-specific level.

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2. Limitations on MOX fuel burnup to below 36 GWD/MT should be imposed unless high burnup safety issues are resolved.

Concerns with the performance of high-burnup MOX fuel in the event of an accident have led the French nuclear safety authority DSIN to restrict the burnup of MOX fuel to 36 GWD/t, whereas LEU fuel is permitted to reach 47 GWD/MT. The French national utility Electricité de France (EdF) has concluded that to achieve burnup parity with LEU, a new MOX fuel type will have to be developed. Such an effort could cause substantial additional delays to the MOX mission. The U.S. should follow France's lead and restrict MOX burnup pending resolution of these safety issues, even though this will be a costly inconvenience for U.S. nuclear plants.

3. Licensees who wish to use WG-MOX will have to demonstrate to NRC that the Large Early Release Frequencies (LERFs) of their plants are below one in a million ($1x10^{-6}$) per year. Even if they can meet this requirement, the request will be subject to an intensive NRC technical and management review, and the underlying probabilistic risk assessment (PRA) calculation will have to undergo peer review and satisfy quality control requirements.

We have shown that the introduction of a full core of MOX fuel into PWRs will result on average in a doubling of the risk to the public from a large early release of radioactivity. This increase in risk is equivalent to that which would occur if the Large Early Release Frequency (LERF) of the plant were doubled. According to NRC's RG 1.174, a change to the plant licensing basis resulting in a doubling of the LERF would only be considered for plants with a

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MR022–11 **DOE Policy**

DCS does not intend to request licensing of MOX fuel use on a generic basis. Duke Power and Virginia Power, the reactor licensees, would submit individual reactor license amendment requests to NRC for each of their reactors in which the MOX fuel would be irradiated. Plant-specific core load and safety analyses would be performed, and an NRC license amendment approved, prior to MOX fuel being introduced into any reactor. All issues considered by NRC to be important to safety and the environment would be evaluated during the license amendment process.

MOX fuel burnup is proposed at 45 GWD/t with peak pin burnup of 50 GWD/t. Actual MOX fuel burnup limits will be established in concert with the NRC following a thorough safety review. It should be noted that reactors in Belgium and Germany typically use MOX fuel to burnups between 45 and 50 GWD/t and that while current French burnup limits are lower than that, French burnup limits for LEU fuel are also lower than those for U.S. reactors.

There is a recognition that detailed analyses would need to be done to support the NRC license amendment process. This information would be prepared if the decision is made in the ROD to go forward with the MOX approach. The commentor's interpretation of NRC Regulatory Guide 1.174 is his opinion and may not be the interpretation adopted by NRC.

baseline LERF of one in a million ($1x10^{-6}$) or below. For a 1/3-MOX core, the corresponding threshold would be three in a million ($3x10^{-6}$).

The guidelines in RG 1.174 are not absolute. In particular, an applicant may argue that quantitative increases in risk are offset by "unquantified benefits" and that a less strict NRC response is warranted. Even so, plants wishing to use MOX will have to undergo intensive site-specific reviews by NRC, and may have to conduct full-scope (Level 3) probabilistic risk assessments (PRAs), which very few plants have done to date because of the time and expense involved. These will be necessary to document that the Large Early Release Frequencies of the plants are sufficiently low that the increased risk associated with a large early release from a MOX-fueled plant are "small and consistent with the intent of the Commission's Safety Goal Policy Statement." Moreover, PRA documentation will have to be done more carefully and in more detail in the future. Because of the great variability in the content and quality of PRAs that have been carried out to date, NRC is in the process of developing a quality control standard for PRAs submitted in support of risk-informed regulatory proceedings. 11

4. The U.S. plan to encourage Russia to use WG-MOX in Russian and Ukrainian VVER-1000 LWRs poses even greater risks than the plan for U.S. domestic use of WG-MOX.

Russian VVER-1000s do not meet Western safety standards in such critical areas as fire protection and instrumentation and control systems. Although the U.S. is encouraging Russia to commence a program for using WG-MOX in VVER-1000s, and has provided a portion of the initial financing, there will be no simultaneous effort to upgrade these plants so that they fully meet Western safety standards, which would cost on the order of $150 million per unit, according to recent estimates. In fact, Russia has to date been reluctant to accept Western assistance for plant safety upgrades. Given that the use of MOX will increase risk even in plants that do meet Western standards, encouraging Russia to use MOX in its less robust plants without ensuring maximum possible adherence to safety is nothing short of reckless. 10

5. Risks associated with irradiation of WG-MOX in both U.S. LWRs and Russian VVER-1000s could be averted if both nations implemented an all-immobilization policy for the entire stockpile of excess WG-Pu. The use of MOX is unnecessary and should be avoided.

The significant additional public health risks of MOX use in existing nuclear plants cannot be justified in terms of the security benefits of plutonium disposition, because a less risky alternative exists --- immobilization. The insistence of the Russian Ministry of Atomic Energy (MINATOM), along with U.S. and European nuclear interests, that immobilization is not an acceptable approach for either the U.S. or Russia, is one of the driving forces behind the heavy emphasis on MOX in both countries. However, the U.S. should not be compelled by a handful of bureaucrats and industry lobbyists to adopt an outdated, shortsighted and technically flawed approach that will unnecessarily endanger the health of its citizens. Rather than proceeding with the MOX plan, the U.S. should recognize and highlight the environmental, economic and security advantages of immobilization and explore creative ways of enhancing its acceptability both at home and in Russia. 9

12

MR022

NEI

NUCLEAR ENERGY INSTITUTE

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June 28, 1999

Ms. Laura S. H. Holgate
Director, Office of Fissile Materials Disposition
U.S. Department of Energy
Supplement to the SPD EIS
P.O. Box 23786
Washington, DC 20026-3786

Dear Ms. Holgate:

The Nuclear Energy Institute (NEI) has reviewed the Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement. We did not identify any significant comments to submit.

NEI would like to take this opportunity to endorse the Department of Energy's (DOE's) hybrid approach to plutonium disposition, with the majority of the surplus plutonium dedicated for use in existing reactors as mixed oxide fuel. NEI notes that the environmental impacts of the preferred plutonium disposition alternative (hybrid approach) are relatively minor, and the nonproliferation benefits of the program make the preferred alternative far superior to the "no action" alternative. In addition, NEI commends DOE for its thorough efforts to provide for public input as a part of the Surplus Plutonium Disposition Environmental Impact Statement process. 1

Sincerely,

Felix M. Killar, Jr.

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MR019

MR019–1 **Alternatives**

DOE acknowledges the commentor's support for the hybrid approach and appreciates the recognition of its public outreach efforts.

NUCLEAR INFORMATION & RESOURCE SERVICE
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PAGE 1 of 11

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Comments on the Supplement to Surplus Plutonium Disposition Draft Environmental Impact Statement

Prepared by Mary Olson, Nix MOX Campaign Coordinator

We share the overall goal of this program: to render weapons plutonium unusable in weapons. We oppose the proposal to make plutonium fuel for nuclear power reactors in the United States, Russia, Canada or anywhere else for that matter. 1

This is an experimental program with extremely high stakes which are not justified under any circumstances. The assertion that the Russians are dictating the US program is simply not credible. The US would wage a reversal of our policies against plutonium in commerce, risk a major reactor accident here and in Russia for the minor benefit of isotopic alteration of plutonium in Russia since they propose nothing more than a delay in the reprocessing of the MOX fuel and moving ahead towards a plutonium cycle, at US tax payers expense. The fact that plutonium fuels increase the real hazard of US reactors is not justified by this marginal gain a the geo-political level.

Comments on the Process

We appreciate that the Department is finally providing site specific information about irradiation of MOX, and for this opportunity to comment. However, the Department has made a mockery of public participation in a decision making process, and the inclusion of those most impacted in the process. The fact that there is already a consortia under contract which includes the use of these reactors (Duke Power's McGuire and Catawba and Virginia Power's North Anna reactors) precludes the very consideration of whether to use them or not. Further, the fact that DOE has not seen fit to do any public education or solicitation of direct in-put from these host communities betrays any claim that DOE has conducted a fair process as described under the National Environmental Policy Act. 2

We (again) formally request that DOE hold hearings on this Supplement and draft EIS in the vicinity of Duke Power's McGuire and Catawba and Virginia Power's North Anna reactors. While the people of Columbia, SC appreciated the opportunity provided by 3

FR003

FR003–1 **MOX Approach**

DOE acknowledges the commentor's opposition to the MOX approach. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again. DOE will announce its decisions regarding the approach to surplus plutonium disposition in the SPD EIS ROD.

While it is true MOX fuel has not been produced commercially in the United States, it has been produced in Western Europe. MOX fuel fabrication is not a new technology. This experience would be used to benefit disposition of the U.S. surplus plutonium.

The *Joint Statement of Principles* signed by Presidents Clinton and Yeltsin in September 1998 provide general guidance for achieving the objectives of a future bilateral agreement to disposition surplus plutonium in the United States and Russia. Sensitive negotiations between the two countries have indicated that the Russian government accepts the technology of immobilization for low-concentration, plutonium-bearing materials, but that the MOX approach would be considered for higher-purity feed materials. DOE will continue to discourage Russia from reprocessing its spent nuclear fuel and starting a plutonium cycle but this issue is beyond the scope of this SPD EIS.

FR003–2 **General SPD EIS and NEPA Process**

DOE conducted a procurement process in accordance with DOE NEPA regulations 10 CFR 1021.216. The selected team, DCS, would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel in domestic, commercial reactors. However, these activities are subject to the completion of the NEPA process. As

stipulated in DOE's phased contract with DCS, until and depending on the decisions regarding facility siting and approach to surplus plutonium disposition are made and announced in the SPD EIS ROD, no substantive design work or construction can be started by DCS on the MOX facility. Should DOE decide to pursue the No Action Alternative or the immobilization-only approach, the contract with DCS would end. The contract is phased so that only nonsite-specific base contract studies and plans can be completed before the ROD is issued, and options that would allow construction and other work would be exercised by DOE if, and only if, the decision is made to pursue the MOX approach.

Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD.

Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. It hosts frequent workshops, and senior staff members make presentations to local and national civic and social organizations on request. For example, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in the public hearing that was held in Columbia, South Carolina, on June 24, 1999. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue. It is DOE policy to encourage public input into these matters of national and international importance.

Senator Leventis, the June 24 event in Columbia cannot be construed as a substitute for hearings in the reactor communities. We also request an extension of the comment period. It is not appropriate to hold a single hearing and then close the comment period within a week. 3

Information Missing From the Supplement

In order to compare the 100% immobilization route to plutonium disposition with the hybrid approach that include making and using MOX plutonium fuel there are a number of direct comparisons which must be made. Most of these are in the department of contamination and waste.

Nowhere in the supplement or the draft EIS is there a compilation with radioisotopic profiles of the operating wastes and discharges. To get the full picture, reference must be given for each of the chosen reactors using LEU uranium fuel, projections using MOX fuel and the totals (including Pu processing and fuel fabrication) compared to the immobilization route.

Of particular interest is the air and water discharges and so-called "low-level" waste generated. It is not sufficient for the Department to simply say that the current regulation swill be met. The question remains whether the waste and discharges would bear more plutonium and total actinides and whether there would be more fission products and what the profile of tritium generation would be. Since we do recognize current regulations to be protective we are still interested in the net impact of shifting part of the fuel used in these reactors in such a way as to increase the plutonium in the system. 4

While it is possible to assert, as the Department does, that regulations would be met, this does not guarantee that in fact, the regulations will be met. Nor does this assertion justify the practice of putting unique, untested plutonium fuel in existing, aging reactors. The International Committee on Radiological Protection (ICRP) explicitly states in publishing their guidelines that society must justify a practice which leads to radiation exposure, and the standard is then applied, not he other way where the assumption is that any practice that meets a standard is therefore justified. The ICRP guidelines are the basis on which national regulators establish existing national radiological standards,

Current waste standards allow the generator to simply prepackage and dilute to meet regulations. Further, the basis for regulation of discharges looks only at each year's discharge, with no reference to the loading of the environment with persistent radionuclides.

It is also not appropriate to look at only one year of discharge for each reactor. It would be more appropriate to average the discharge to air and to water, each over 5 years, since there is considerable variation between years in air and water discharge. These figures would then be compared to projections of discharges to air and water using MOX fuel ,

FR003

FR003–3 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's request for additional public hearings in the communities near the proposed reactor sites. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement*. In addition to the public hearing on the *Supplement* held in Washington, D.C., DOE provided other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Further, as discussed in response FR003–2, DOE attended and participated in a public hearing in Columbia, South Carolina at the invitation of Senator Phil Leventis. Moreover, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process should the MOX approach be pursued per the SPD EIS ROD.

FR003–4 **Waste Management**

The commentor states that the radioisotopic inventories of emissions from the reactors need to be assessed using MOX fuel against using LEU fuel. For normal operating conditions, the emissions are the same. The only emission stream that might result from using MOX fuel that would result in a different radioisotopic mix than LEU fuel occurs in the event that there is a MOX fuel failure, in which there is a emission pathway from the core. Given the history and integrity of fuel, a fail failure may never occur during the limited fuel campaign to disposition surplus plutonium. Notwithstanding, if there were a MOX fuel failure, the effect on the radioisotopic inventory in emissions would be almost indistinguishable because: (1) the radionuclide inventories in MOX and LEU fuel are similar (as shown in Table K–27) and (2) the contribution of fuel failures to the total emissions from the reactor is small (other contributions to the site's effluents dominate).

Electricité de France reactors in France have seen little or no changes in radionuclide releases in effluents from the use of MOX fuel. All of the proposed reactors would continue to operate within stringent NRC 10 CFR 20 and 10 CFR 50 radionuclide release and dose requirements. Doses for hybrid alternatives and immobilization-only alternatives are given for each of the

candidate sites in Appendix J and for each applicable alternative in Chapter 4 of Volume I.

While it is accepted that there are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle, these differences are small enough that essentially no dose differential can be observed by members of the public during normal reactor operations. The only time significant quantities of fission products could be released to the environment would be in the event of a large-scale fuel leak. In regard to normal operations, FRAGEMA's (a subsidiary of COGEMA; one of the companies chosen to operate the proposed MOX facility) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA alone has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods for commercial reactor use. There have been no failures and leaks have occurred in only 3 assemblies (a total of 4 rods). All leaks occurred as a result of debris in the reactor coolant system and occurred in 1997 or earlier. The French requirements for debris removal were changed in 1997 to alleviate these concerns. Since that time, there have been no leaks in MOX fuel rods.

In the event of a leaker, fission products are released into the primary containment and are ultimately either passed through a series of resins (for liquid releases) or through a HEPA filtration system (for releases to the atmosphere) that would capture approximately 99.99 percent of the radionuclides. In either case, the impact on dose would be expected to be small.

The use of MOX fuel would not be expected to result in any additional radioactive discharges to the air or water, or the production of additional LLW because the reactors would continue to operate on the same schedule as if they were using only LEU fuel. Any additional ionizing radiation would be limited to the containment and not reach the public. It is important to recognize that the quantities of "key" radionuclides (i.e., those radionuclides that typically account for the vast majority of public dose from normal reactor operations) are projected to remain about the same or in some cases decrease when a partial MOX core is used. These radionuclides include: iodine 131, cobalt 60, cesium 137, and tritium. By the end of core life, the presence of

these radionuclides is expected to increase by 3 percent, decrease by 28 percent, decrease by 9 percent, and decrease by 5 percent, respectively, as presented in Table K–27 when a partial MOX core is used.

As described in Section 3.7, the waste generation rates are 5-year average waste generation rates. Since waste generation rates and isotopic composition are not expected to change appreciably, offsite municipal and commercial waste treatment and disposal facilities, and nuclear laundries should not be adversely affected. Likewise, activities of state regulators and the LLW disposal compacts should not be adversely affected.

The reactors for MOX fuel irradiation would not be operated by DOE. The reactors would continue to be operated by the utilities and regulated by NRC. Eventual D&D of the reactors, to include any recycling of metals, would be performed by the utilities in accordance with NRC regulations in force at that time. However, it is premature to assume that scrap metal at the reactors would be recycled as part of D&D. MOX fuel use is unlikely to impact reactor D&D since as described above, radionuclide inventories and contamination are unlikely to change significantly.

based on real data from the so-called experience of the consortia members, radionuclide by radionuclide.

The same would be repeated for so-called low-level waste.

The reason that this must be done is so that decision makers at all levels of the impacted communities can really weigh the MOX option against the no-MOX option where uranium fuels continue to be used. Municipal drinking water is at stake. Ground and surface water is at stake, state resources for dealing with so-called low level waste sites are also at question.

This analysis must be carried fully to all the extensions of reactor operations: nuclear laundries – on –site and off, nuclear decontamination and waste treatment facilities, incinerators of so-called low-level waste, brokers of this waste (off-site storage) and all transportation steps between these points. What is the radioisotopic profile compared to uranium and what are the doses that would be expected. 4

Finally, because of the Department's cavalier practice of releasing radioactively contaminated metals from decommissioning to the market place as if they were not radioactive, it is also necessary to compare the contamination of metals and other materials from LEU operations and MOX operations. We oppose the release of this material, but do not think that an analysis of the relative impact of MOX and LEU will be complete without it.

Inappropriate Risk Assessment

It is not credible to tie the current health effects analysis to the calculated risk associated with a single year of the operation of any of the 6 chosen reactors. If residents in the area of these reactors only lived there one year, there could be an argument made for this. For the most part they live there longer. Regulations should assume that someone is going to spend their life in this location. That is still a strong cultural tradition in the United States. When the risk factors given are multiplied by 70 year life span one arrives at the familiar, and still unacceptable 3.5 cancer fatalities in 1000 life time exposures given an annual dose on 100 millirems . This is nothing to brag about. 5

We appreciate that the Department has significantly altered their analysis of the impacts of MOX plutonium fuel on the health effects resulting from a major reactor accident.. However, the claim that the likelihood of such an accident occurring is only 1 chance in 4.2 million per year is not credible. The Chernobyl accident happened. It is an ongoing example of the type of core breach that plutonium fuel would complicate. Chernobyl happened in less than 3000 worldwide reactor years. It was the third, perhaps more, reactor accident, but the first core dump. To calculate probability on a model when we have direct data is folly. One can argue that the reactors are different and that containment is a factor. However, containment fails at US reactors regularly, we are simply lucky that this has not (yet) happened coupled with a major reactor problem. OF 6

FR003

FR003–5 **Human Health Risk**

The assertion of 3.5 cancer fatalities over 70 years for a population of 1,000 people is accurate when assuming that each of these persons incurs the maximum permissible public dose level (per 10 CFR 20) of 100 mrem/yr. However, it should be noted that this 100 mrem/yr dose is a limiting dose as established in the U.S. Code of Federal Regulations and that the three candidate reactor sites (Catawba, McGuire, and North Anna) do not come close to this dose value for even a hypothetical MEI. As shown in Section 4.28, the MEI at these sites would be expected to receive an annual dose of less than 1 mrem. Hence, over a 70-year timeframe, this actually equates to 0.035 fatal cancers in a population of 1,000 persons. It should also be noted that the probability of just one individual receiving this "hypothetical maximum exposure" of 1 mrem/yr is small; therefore, an annual exposure of 1 mrem to 1,000 persons is highly unlikely. A typical member of the public would receive an annual dose from natural background radiation which is roughly 300 times higher than the hypothetical 1 mrem dose received from MOX reactor operations.

FR003–6 **Facility Accidents**

The frequency of occurrence estimates were obtained from each plant's probabilistic risk assessment in response to NRC's request for individual plant examinations to assess each plant's vulnerability to severe accidents.

It should be noted that D.C. Cook has been shut down due to issues unrelated to its ice condenser. NRC has not considered it necessary to restrict operation of any of the other reactors in the United States that use ice condenser containments.

real concern is the choice to use 4 Duke ice condenser model reactors,. where like DC Cook, the containment can be unusable. | 6

Chances of an Accident Greater

The physics of plutonium fission are not the same using weapons plutonium as either MOX fuel from reprocessing or the consistent claim from industry that this is no different from the fissioning of the plutonium which reactors make towards the end of their fuel cycle.

A higher percentage of prompt neutrons a positive coefficient of heat reactivity and the tendency to accelerate the aging of reactors, as well as the possible degradation of fuel cladding by any possible residual gallium leads us to assert that a reactor accident is more likely to occur using MOX plutonium fuel. | 7

The Department acknowledges that the consequences of a core-dump type accident will be worse than if LEU furl was used.. In making a comparison, one must assume the probability off the event occurring is 1. This means that there is an absolute increase in hazard, even if the probability is low.

Need For Site Specific High-Level Waste Analysis

Supplement needs to include a very detailed comparison of LU and plutonium MOX fuel and the type of issues that are currently being seen with dry cask storage challenges. These include metallurgical reactions between fuel and coolant and the gases as well as coatings on the inside of the casks. There are also thermal load issues with being able to unload these casks. | 8

There needs to be a detailed analysis of potential impacts on a repository at Yucca Mountain. What about comparative doses during transport? | 9 | 10

Thermal load issues are of paramount concern for fuel pools and the reactor core in the case of extended loss of off-site power to the reactor . Turkey Point, Davis Besse and a Scottish reactor are all examples of the short fuse that LEU fuel has,. What is the impact of 40% MOX on these parameters? These are all site specific concerns. | 11

If use of MOX is going to cause these 2 utilities to have more waste to handle, and need a fuel pool that is relatively open, then what about the impact on having to load more dry casks sooner, What about this in the context of current Department negotiations over high-level nuclear waste obligations? Who pays if the utility must go to dry casks sooner than otherwise? | 12

No increased exposure to workers is not credible. | 13

No plutonium contamination expected from plutonium activities at SRS is not credible. | 14

FR003

FR003–7 **Facility Accidents**

Differences between MOX fuel and uranium fuel are well characterized and can be accommodated through fuel and core design. Initial evaluations indicate that partial MOX fuel cores have a more negative fuel Doppler coefficient at hot zero power and hot full power, relative to LEU fuel cores for all times during the full cycle. These evaluations also indicate that partial MOX cores have a more negative moderator coefficient at hot zero power and hot full power, relative to LEU fuel cores for all times during the full cycle. These more negative temperature coefficients would act to shut the reactor down more rapidly during a heatup transient.

All of the factors discussed by the commentor were evaluated by the proposed reactor licensees to ensure that the reactors can continue to operate safely using MOX fuel and will continue to be evaluated. Before any MOX fuel is used in the United States, NRC would have to perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications.

For MOX fuel, as compared to LEU fuel, there is an increase in accident risk for certain accident scenarios, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. Both of these accidents have an extremely low probability of occurrence. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48,000 per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

FR003–8 **MOX Approach**

Initially, when spent fuel is removed from the reactor, the MOX and LEU fuel would be about the same temperature and exhibit similar characteristics. After about a year out of the reactor, however, the temperature of MOX spent fuel would exceed that of LEU fuel of the same age. By the time the

decay heat from MOX spent fuel assemblies becomes significantly greater than that from LEU fuel, the total decay heat load in the spent fuel pool would have dropped to such a point that it is no longer limiting from a heat removal standpoint. Consequently, there would be minimal adverse impact on the cooling needed for irradiated fuel assembly storage due to substitution of MOX for LEU fuel assemblies. During the base contract period, the utilities would confirm the decay heat removal characteristics of the MOX fuel assemblies and would confirm what, if any, modifications may be needed to the spent fuel pool and dry storage cask cooling systems. If necessary, the MOX spent fuel could be preferentially retained in the spent fuel pools and only LEU spent fuel moved to dry cask storage. This would eliminate any concerns about storing MOX fuel in dry casks.

FR003–9 **Repositories**

This SPD EIS assumes, for the purposes of analysis, that Yucca Mountain, Nevada, would be the final disposal site for all immobilized plutonium and MOX spent fuel. As directed by the U.S. Congress through the NWPA, as amended, Yucca Mountain is the only candidate site currently being characterized as a potential geologic repository for HLW and spent fuel. DOE has prepared a separate EIS, *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999), which analyzes the environmental impacts from construction, operation and monitoring, related transportation, and eventual closure of a potential geologic repository. The potential MOX spent fuel and/or immobilized plutonium are included in the inventory analyzed in that draft EIS should the decision be made to proceed with the hybrid or immobilization-only approaches.

FR003–10 **Transportation**

As described in Appendix L.5.4, all shipments (including MOX spent fuel shipments) were conservatively assumed to have a dose rate equal to the regulatory limit of 10 mrem/hr at 2 m (6.6 ft). The dose rate near a vehicle carrying spent nuclear fuel could be lower depending on factors such as the degree of fuel burn-up, the amount of post-irradiation cool-down time allowed

before fuel shipment, and the amount of spent fuel being shipped. Because the dose rate can vary due to factors other than the fuel type, it is likely that shipments of MOX spent fuel and LEU spent fuel would have similar dose rates. Therefore, the impacts from shipping MOX and LEU spent fuel are expected to be similar under normal conditions. Accidents involving the shipment of spent fuel (which would reasonably represent the potential accident impacts from MOX spent fuel) are being considered in the *Yucca Mountain EIS* as described in response FR003–9.

FR003–11 **MOX RFP**

As discussed in response FR003–8, when spent fuel is initially removed from the reactor, the MOX and LEU fuel would be about the same temperature and exhibit similar characteristics. After about a year out of the reactor, however, the temperature of MOX spent fuel would exceed that of LEU fuel of the same age. Therefore, storage of MOX spent fuel would increase the thermal loading in a spent fuel pool over that for only LEU fuel. However, thermal load limitations are based on the amount of cooling that the entire spent fuel pool can accommodate, not on individual fuel assemblies within the pool. Therefore, the additional heat load would be accounted for in the calculations for the reactor spent fuel management plans.

The commentor has expressed a concern that MOX fuel in the reactor core might affect core cooling in the event of an extended loss of offsite power event. Each of the proposed nuclear units has two independent sources of offsite power capable of supplying power to the Engineered Safety Features, and two emergency onsite diesel generators as standby power sources should offsite power not be available. Each of the plant's extended shutdown capabilities has been evaluated, including during loss of offsite power and station blackout scenarios. As part of the safety analyses supporting the license amendment request to use MOX fuel, each licensee would reevaluate these scenarios to account for MOX fuel in the core, to ensure that the reactors can be safely shutdown and maintained in that mode for an extended period. Rigorous safety analyses and operational parameter assessments would be conducted, and a license amendment approved by NRC, prior to the use of MOX fuel in any reactor. Differences in neutron flux, decay heat, temperature of the fuel assemblies and other parameters that could affect

reactor operation and core cooling, both during normal operation and postulated transients and emergencies would be considered in these analyses, and factored into operating and emergency procedures, as necessary. Changes in the amount of moderator, neutron poisons and other reactor control mechanisms and emergency systems would be made as necessary to ensure continued safe operation of the proposed reactors.

Two examples of loss of offsite power in the United States were noted by the commentor. On August 24, 1992, winds from Hurricane Andrew caused extensive damage to southern Florida, including offsite power supplies to the Turkey Point Nuclear Generating Station. Offsite power to Turkey Point was unavailable for 6 days. During that time period, the emergency diesel generators operated and provided power for essential systems, including spent fuel pool cooling.

On June 24, 1998, a tornado struck the Davis-Besse Nuclear Power Plant and caused damage to the electrical switchyard. As a result, offsite power to Davis-Besse was lost for approximately 24 hours. The emergency diesel generators operated and provided power for essential systems, including spent fuel pool cooling. The ambient room temperature for one of the diesel generators slightly exceeded the design limit, but the generator continued to run and supply its load.

In both cases severe external phenomena caused a loss of offsite power for an extended period of time, but plant systems responded as designed to provide decay heat removal. It should be noted that all U.S. nuclear power plants, including the mission reactors, are required to demonstrate to NRC that they can withstand a station blackout (loss of all AC power, including onsite emergency power) for at least 4 hours. Therefore, there is substantial margin in the ability to provide adequate cooling for spent fuel. The impact of incorporating a limited number of MOX spent fuel assemblies on the ability to provide for spent fuel pool cooling is expected to be negligible and to be reviewed by NRC, as appropriate, as part of the reactor-license amendment process.

FR003–12 **Waste Management**

As described in Section 4.28, the amount of additional spent nuclear fuel generated is estimated to range from approximately 2 to 16 percent of the total amount of spent fuel that would be generated by the proposed reactors during the time period MOX fuel would be used. The amount of additional spent fuel is not expected to change spent fuel management practices at the reactor sites. Spent fuel from the reactors would be moved to the spent fuel pool and later, if needed, to onsite dry storage. Ultimately, the spent fuel would be moved to a potential geologic repository prepared in accordance with the NWPA. As is current practice, the utilities would pay for any spent fuel storage needed at the reactor sites.

As described in response FR003–9, DOE is preparing a separate EIS on a potential geologic repository for HLW and spent fuel.

FR003–13 **Health Human Risk**

Under normal operating conditions, it is not expected that the waste streams and handling characteristics would change significantly from those associated with LEU fuel. Electricité de France reactors in France have seen little or no increased impacts on workers from the use of MOX fuel; accordingly, little or no increases in worker exposure would be expected.

FR003–14 **Human Health Risk**

There are minute releases of plutonium to the environment expected from the proposed surplus plutonium disposition facilities at SRS. These releases are presented in Appendix J and factored into the analysis presented in Chapter 4 of Volume I.

PSR

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Physicians for Social Responsibility Comments On the Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement
(DOE/EIS - 0283-DS, April 1999)

June 28, 1999

Physicians for Social Responsibility (PSR) is a national organization of approximately 15,000 members. We are the United States affiliate of the International Physicians for the Prevention of Nuclear War (IPPNW), winners of the 1985 Nobel Peace Prize. PSR was founded in the 1960's when we worked to end atmospheric nuclear testing by documenting the presence of Strontium 90 in children's teeth. PSR is committed to achieving the complete, verifiable elimination of nuclear weapons, and addressing the legacy of the Cold War. In that context, we urge the safe, secure disposition of plutonium. We oppose policies and efforts that would encourage the United States or other countries to use or proliferate this most lethal bomb material. 1

We support the stated goal of the Department of Energy's plutonium disposition program: "*[To] Reduce the threat of nuclear weapons proliferation worldwide.*" We believe however, that the planned use of MOX in commercial reactors does not achieve this goal. Instead, we find that the MOX program fuels a worldwide plutonium economy, incurs unnecessary environment, safety, and health impacts and risks, wastes taxpayer money, and is not supported in the United States or worldwide. We are also concerned that DOE has not held public hearings in communities around the chosen reactor sites where citizens will be most directly impacted by this MOX program. 2

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FR017–1 **Alternatives**

DOE acknowledges the commentor's concern that the MOX approach does not meet the surplus plutonium disposition program's goal. Use of MOX fuel in domestic, commercial reactors is proposed to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. DOE is not advocating a plutonium economy. The use of U.S. surplus plutonium in existing domestic, commercial reactors does not involve reprocessing (reprocessing is a chemical separation of uranium, transuranic elements [including plutonium], and fission products from spent reactor fuel and the reuse of the plutonium and uranium to produce new fresh fuel) and therefore does not support building a plutonium economy.

FR017–2 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's request for extending the comment period and planning for additional public hearings in the three communities where the proposed reactors would use MOX fuel. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS*. In addition to the public hearing on the *Supplement* held in Washington, D.C., DOE provided other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Although it did not extend the comment period, DOE did consider all comments received after the close of that period. All comments were given equal consideration and responded to.

The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the

PHYSICIANS FOR SOCIAL RESPONSIBILTY
KATHRYN A. CRANDALL
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MOX : Fueling a Plutonium Economy

We recognize the difficulty in negotiating with Russia on plutonium disposition issues. It is quite clear that Russia values plutonium as a fuel resource, intends to continue reprocessing activities, and would like to expand Russian use of breeder reactors. It seems however, that with our policy of pursuing a MOX program in parity with Russia, we have failed to exercise strong leadership. Real leadership on this issue would send a clear message to Russia and other countries that we are truly committed to our non-proliferation policies against reprocessing and could steer Russia and other countries away from reprocessing. Instead our policy has been a very confusing message, essentially saying to Russia and the world *"follow us, we're right behind you."*

While the DOE pays lip service to the United States policy on reprocessing (see box at right), in fact this current MOX program undermines that policy and supports a worldwide plutonium fuel economy.

"The United States does not encourage the civil use of plutonium and, accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes." (President Clinton 1993)

Examples of how MOX supports a worldwide plutonium economy:

- **"Aqueous Polishing" required for the U.S. weapons-grade plutonium to be used as MOX fuel is a reprocessing activity.** When we asked where there was experience with Aqueous Polishing, the answer from Cogema representatives was that Aqueous Polishing is part of the current reprocessing activities at La Hague. Thus, it seems that DOE's assertion that *"the MOX approach does not involve reprocessing,"* is incorrect. (DOE Fact Sheet, *Surplus Plutonium Disposition and the U.S. Policy of Reprocessing*, June 14, 1999).
- **The United States supports a Japanese effort to assist Russia in burning MOX at the BN-600, a breeder reactor.** Not only does this encourage the use of breeder reactors in Russia, it furthers Japan's understanding and use of similar fast reactors. DOE Under Secretary Moniz has reported that the United States is very supportive of this effort. (Under Secretary Moniz, spoke at the *Nuclear Weapons Exchange/ Monitor Publications' Sixth International Policy Forum on the Disposition of Plutonium and HEU* on June 7, 1999. Russian policymakers and Japanese contractors also made presentations.)
- Support of the BN-600 use is troubling especially given that Russia does not believe that enough MOX can be burned in the currently available VVER light water reactors to reach plutonium disposition goals. **Instead, Russia would like to build and operate the BN-800 -another new breeder reactor. Will the United States support that effort in order to enable Russian parity with the U.S. MOX program?**
- **Russia is committed to a "closed fuel cycle," and intends to reprocess MOX spent fuel at some point.**
- **Cogema, chosen as the MOX fabricator in the DCS consortium carrying out the U.S. MOX program, is well known throughout the world for its reprocessing operations, as well as related reactor-grade MOX use.**

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proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. As pointed out by the commentor, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

It is DOE policy to encourage public input into these matters of national and international importance. DOE has followed the spirit of NEPA and has not neglected its responsibilities to the public. Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. It hosts frequent workshops, and senior staff members make presentations to local and national civic and social organizations on request. For example, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in a public hearing held on June 24, 1999, in Columbia, South Carolina.

FR017–3 **Nonproliferation**

As discussed in response FR017–1, DOE is not proposing to reprocess spent nuclear fuel or support a plutonium fuel economy. DOE acknowledges the commentor's concerns regarding the disposition of surplus Russian plutonium as MOX fuel. The *Joint Statement of Principles* signed by Presidents Clinton and Yeltsin in September 1998 provide general guidance for achieving the objectives of a future bilateral agreement to disposition surplus plutonium in the United States and Russia. Sensitive negotiations between the two countries have indicated that the Russian government accepts the technology of immobilization for low-concentration, plutonium-bearing materials, but that the MOX approach would be considered for higher-purity feed materials. The goal of surplus plutonium disposition program is to reduce the threat of nuclear weapons worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this. This activity permanently

removes nuclear materials from the military arena, and does not compromise the traditional separation between military and commercial uses of nuclear materials.

On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity removal from the plutonium dioxide. Appendix N was deleted from the SPD Final EIS, and the impacts discussed therein were added to the impacts sections presented for the MOX facility in Chapter 4 of Volume I. Section 2.18.3 was also revised to include the impacts associated with plutonium polishing. Plutonium polishing is not a reprocessing activity (it is performed on plutonium dioxide made from pits, not on spent reactor fuel) but rather a process that is used to remove impurities, in particular gallium, in order to meet the required plutonium dioxide feed specifications for MOX fuel.

The United States and the other G–8 nations (Group of Eight industrialized nations: Canada, France, Germany, Great Britain, Italy, Japan, Russia, and United States) are supporting plutonium disposition efforts, both financially and by providing technical assistance, in Russia because these countries consider it vitally important to ensure that weapons-usable nuclear material does not fall into the hands of terrorists or rogue states. Russia considers the plutonium a valuable resource that can be used for energy production. DOE will continue to discourage Russia from reprocessing its spent nuclear fuel and starting a plutonium cycle, but this issue and the issue of Japan assisting Russia in building a reprocessing facility are beyond the scope of the SPD EIS.

Should the decision be made to proceed with the hybrid approach, COGEMA, part of the team that would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel, would lend its expertise within the limits of the contract, which does not have any provisions for reprocessing.

(Examples of MOX fueling a plutonium economy continued)

- **While DOE's stated intention is to shut down the MOX facility at the completion of the plutonium disposition mission, it would seem to be quite difficult to simply close down this large operation and infrastructure.** Thus, it is possible, if not probable, that the U.S. will continue to utilize the MOX process, eroding the once-through, no-reprocessing policy. 4

- **Use of MOX fuel in commercial reactors will forever blur to obliteration the line that the United States has maintained between military nuclear weapons processes and peaceful commercial nuclear power.** 3

Taken together these examples reveal the extent to which MOX and reprocessing are intrinsically related and serve to support the worldwide plutonium fuel economy, thereby undermining the non-proliferation goal of the plutonium disposition program.

MOX: A Public Safety & Health Risk

Plutonium is fairly characterized as one of the most lethal substances on earth. Any disposition method will pose inherent safety and health dangers to workers and the public. The DOE should make every effort to minimize those dangers.

> *"Plutonium . . . poses an extraordinarily dangerous threat to health as an emitter of alpha particles. Experiments in animals have demonstrated that plutonium is readily absorbed when inhaled as fine particles. Absorbed plutonium lingers in the body for decades. Major sites of retention include the lung, lymph nodes, liver, and bone, with relative distribution of the plutonium depending on its chemical form and entry route. Exposed animals develop high rates of cancer, primarily of the lung and bone, even when the dose of plutonium is small. Cell culture experiments suggest that such carcinogenesis may reflect a unique ability of alpha particles to cause inherited chromosomal defects from a minute amount of exposure."* Plutonium: Deadly Gold of the Nuclear Age, International Physicians for the Prevention of Nuclear War and The Institute for Energy and Environmental Research. 1992

Relative to the immobilization options, the MOX option presents additional risks and impacts. For example: 5

- **MOX requires more, transportation and multiple reactor locations.** Thus, more people and a broader environment are exposed to radiation and potential accidents in the fuel fabrication, transport, handling, and reactor use of plutonium.

- **Operation of MOX-fueled reactors risks greater harm than current uranium-fueled reactor operations.** The Nuclear Control Institute's recent study estimates that in the event of a severe loss of containment accident, releases from a reactor burning MOX fuel could cause from hundreds to thousands of additional cancer deaths among people exposed to the radioactive fallout. This is because MOX-fueled reactors contain greater quantities of radioisotopes including plutonium, americium, and curium than do reactors using uranium fuel. (*Public Health Consequences of Substituting Mixed-Oxide for Uranium Fuel in Light-Water Reactors*, Edwin S. Lyman, PhD, **Nuclear Control Institute**, January 21, 1999.) 6

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FR017–4 **DOE Policy**

Consistent with the U.S. policy of discouraging the civilian use of plutonium, a MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. DOE will evaluate options for D&D or reuse of the proposed facilities at the end of the surplus plutonium disposition program. However, none of the current plans include using the facility to continue to manufacture MOX fuel.

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard as discussed in response FR017–1. Although cost will be a factor in the decisionmaking process, this SPD EIS contains environmental impact data and does not address the costs associated with the various alternatives. A separate cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), which analyzes the site-specific cost estimates for each alternative, was made available around the same time as the SPD Draft EIS. This report and the *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013, November 1999), which covers recent life-cycle cost analyses associated with the preferred alternative, are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

FR017–5 **MOX Approach**

The health and safety of workers and the public is a priority of the surplus plutonium disposition program, regardless of which approach is chosen. Operation of the proposed surplus plutonium disposition facilities would comply with applicable Federal, State, and local laws and regulations governing radiological and hazardous chemical limits. Within these limits, the level of exposure would be kept as low as is reasonably achievable. Chapter 5 summarizes the environmental statutes, regulations, and permits that cover emissions, waste, and ALARA standards.

DOE has considered the inherent risks, including terrorist concerns, associated with transporting plutonium materials. While DOE prefers to minimize the transportation of plutonium that is still desirable for weapons use, plutonium is routinely and safely transported in the United States. As described in Appendix L.3.3, transportation of nuclear materials would be performed in accordance with all applicable DOT and NRC transportation requirements. Interstate highways would be used, and population centers avoided, to the extent possible.

All shipments of surplus plutonium that have not been converted to a proliferation-resistant form would be made by DOE's SST/SGT system, as described in Appendix L.3.2. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material. While it is true the MOX approach requires more transportation with regard to shipping the MOX fuel from the fabrication facility to the reactors, and then eventually shipping the MOX spent fuel to the potential geologic repository, each shipment would follow strict procedures using licensed equipment and in compliance with applicable requirements. A quantification of the risks associated with the various transportation scenarios is presented in Chapter 4 of Volume I by alternative and summarized in Section 2.18.

FR017–6 **Facility Accidents**

Section 4.28.2.5 provides a discussion of the analysis of several reactor accidents including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. Both of these accidents have an extremely low probability of occurrence. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48,000 per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

(MOX: A Public Safety & Health Risk continued)

- **While much is made of the operational experience with MOX reactors in Europe, these reactors abroad are using reactor-grade MOX fuel with much more plutonium-239.** U.S. weapons-grade plutonium fuel is different and unique, and even requires the additional Aqueous Polishing step. 7

- **The operational experience in Europe is irrelevant without adequate information about the health, safety and environment records of those operations.** The record of Cogema's operations should be disclosed to the public. We were pleased to note at the June 15 Public Meeting that at least some of this information will be posted on the web. The full environment, safety and health record of Cogema's reprocessing activities, along with its MOX experience, should be made available to the public. 8

MOX: An Expensive Option

- **Subsidies to Russia.** Achieving Russian plutonium disposition is a goal that we support. Thus we do not object to funding for this effort, and indeed have communicated our support to Congress in the past. We wonder however, why the U.S. cannot be more persuasive in directing the Russian programs. Instead, the U.S. approach is to fund and pursue MOX which seems to lead inevitably to reprocessing and breeder reactor use in Russia. Lawmakers including Jesse Helms (R-NC), Chair of the Senate Foreign Relations Committee, have raised serious concerns about the MOX program in Russia. Any program that does not have the clear support of Congress risks losing needed financial support. PSR cannot support funding for a plutonium disposition program with Russia that so heedlessly pursues MOX in the face of crucial non-proliferation concerns. 3

- **Subsidies to U.S. Utilities.** *"There will be small savings to the utility company's customers for the use of partial MOX fuel reloads."* (DOE Fact Sheet *"The Economics of the Plutonium Disposition Contractual Arrangement,"* June 14, 1999). The same fact sheet lists the costs covered by the DOE (which is funded by taxpayers), including the licensing expenses of the Nuclear Regulatory Commission and all modifications to the MOX mission reactors. While funding assistance to Russia may be needed even with other plutonium disposition options, taxpayer subsidies to the utilities and their customers is a unique cost of the U.S. MOX program. It is impossible to tell how "small" this subsidy is without full disclosure of the cost figures. The full costs of the entire MOX program should be disclosed to the public. We were pleased to note that access to at least a redacted form of the DOE- DCS MOX contract was made available at the June 15 Public Meeting, and hope that further cost information will be disclosed throughout the process. 4

- **Exclusive focus on the MOX option may endanger Congressional funding and support for plutonium disposition. Sufficient funding for the immobilization option is critically important.** In the political, competitive budget atmosphere of the U.S. Congress, it is important that steady plutonium disposition progress is made in order to maintain solid funding support for the program. Even proponents of MOX realize that MOX is not an option for all of the surplus plutonium. Some plutonium wastes will have to be immobilized. Moreover, especially because MOX is a new process in the U.S., delays and glitches are to be expected, and complete failure is a possibility. We are concerned that if money is poured into MOX , there may not be sufficient funding in later years to pursue immobilization or other options. 9

FR017–7 **MOX Approach**

Reactor fuel in Europe is fabricated to similar enrichment levels (about 5 percent plutonium 239) to the levels being proposed for the U.S. reactors that would be used to irradiate MOX fuel.

Fabricating MOX fuel from surplus weapons-usable plutonium should have less impact than fabricating MOX fuel from spent nuclear fuel. At the La Hague Plant in France, COGEMA is reprocessing spent nuclear fuel to recover the plutonium. Because spent fuel is highly radioactive, it presents a series of unique hazards that need to be carefully dealt with. The La Hague Plant includes a series of processes to remove highly radioactive fission and activation products from the spent fuel. The MOX process being evaluated in this SPD EIS does not involve reprocessing. The proposed U.S. MOX facility would handle plutonium that is unirradiated. Therefore, the radiation exposures and emissions normally associated with reprocessing spent nuclear fuel would not be present in the proposed MOX facility.

The remainder of this comment regarding plutonium polishing is addressed in response FR017–3.

FR017–8 **MOX RFP**

European reactors of various designs use MOX fuel. European nuclear regulatory authorities in France, Germany, Belgium, the Netherlands, and Switzerland have reviewed MOX fuel use in reactors of varying designs. Recent reports prepared by the French Government have concluded that the radioactive releases from the La Hague Plant are not the cause of an excess childhood leukemia in the area of the plant between 1978 and 1996. As discussed in response FR017–7, the La Hague Plant is a spent fuel reprocessing plant. The use of U.S. surplus plutonium in existing domestic, commercial reactors does not involve reprocessing so a plant like La Hague would not be needed for the MOX approach.

In this regard, questions on environment, safety and health records of COGEMA can be directed to Ms. Christi A. Byerly. Her address is: 7401 Wisconsin Avenue; Bethesda, MD 20814. She may also be contacted by telephone at (301) 941-8367. Her fax number is (301) 652-5690, and

MOX: Unsupported by Citizens Worldwide

As we push for nuclear disarmament progress, PSR believes that it is especially important that plutonium disposition efforts be supported by citizens worldwide. If people feel that plutonium disposition methods are dangerous and waste money, they may be less willing to support nuclear disarmament efforts in the first place. There is much opposition to MOX in Russia, the United States and other countries. The ***"Statement of Non-Governmental Organizations on Plutonium Disposition"*** submitted at the June 15 Public Meeting, was signed by over 160 citizen's groups worldwide. This is the latest evidence that there is opposition to MOX throughout the world. 9

Public hearings should be held in the reactor communities.

DOE officials have stated that they would *"consider public hearings"* in the reactor communities. (Office of Fissile Materials Disposition (MD) Director Laura Holgate stated this at the *Nuclear Weapons Exchange/ Monitor Publications' Sixth International Policy Forum on the Disposition of Plutonium and HEU* on June 8, 1999, and MD Reactor Group Director Dave Nulton echoed this at the Public Meeting on June 15.) We strongly urge DOE to extend the comment period and ***plan*** hearings in the three communities where reactors will use MOX fuel.

PSR does recognize that the DOE has held a number of hearings throughout this Environmental Impact Statement process, and many of our members have participated in these hearings. We strongly believe, however, that DOE has an obligation to hold hearings in the communities where reactors have been identified. Hearings have not been held in these communities. The citizens in these areas feel that failure to hold hearings in their communities is a gratuitous slap in the face. DOE is asking them to carry the largest burden of risk and impact for its disposition program, but does not even have the courtesy to go hear directly the concerns and questions people have. 2

While it is true that the Nuclear Regulatory Commission will license the reactors, and public hearings will likely be held by the NRC, this does not discharge DOE's responsibility. It is DOE's plutonium disposition mission, DOE has the contract with DCS, and it is DOE that is paying for the NRC licensing processes. Therefore, it is DOE's responsibility to hold hearings in the most affected communities at this time. We look forward to knowing when and where those hearings are planned.

Thank you very much for considering our written comments, and we do appreciate the efforts of the DOE Office of Fissile Materials Disposition at the June 15, 1999 Washington DC Public Meeting.

Comments prepared for Physicians for Social Responsibility by
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her email address is cbyerly@cogema-inc.com. You can also visit their Web site linked from the MD Web site at http://www.doe-md.com or directly at http://www.cogema.com.

FR017–9 **DOE Policy**

DOE acknowledges the commentor's observation that there is worldwide opposition to the MOX approach given the statement signed by over 160 citizen's groups. As discussed in response FR017–3, the disposition actions proposed are reasonable alternatives developed and analyzed to address the goals of the surplus plutonium disposition program. One of the advantages of pursuing the hybrid approach, which involves both immobilization and MOX fuel, is flexibility in meeting program goals and agreements reached with Russia should one of the approaches run into schedule delays. Decisions on the surplus plutonium disposition program will be based on environmental analyses, technical and cost reports, national policy and nonproliferation considerations, and public input. Should the decision be to proceed with the hybrid approach, construction and operation of the pit disassembly, immobilization, and MOX facilities would effectively occur simultaneously so there would be no threat of running out of funds to pursue immobilization. As shown in Appendix E, the immobilization would begin operating a year before the MOX facility was to begin cold startup operations.

ASHEVILLE
CITIZEN-TIMES

Tuesday, March 23, 1999

GUEST COLUMN

A global plutonium economy flourishes at our doorstep

By Lewis Patrie
and Olga Pitsenova

We are writing to express our dismay about the proposed use of plutonium fuel both in the United States and Russia. Many U.S. citizens don't realize that environmental activists have been operating in Russia at their peril since before the break up of U.S.S.R. Recently, we took part in a lively discussion among six courageous Russian activists and many local community members who discussed nuclear issues on the UNCA campus.

Last December Secretary of Energy Bill Richardson identified the Savannah River Site in South Carolina as the preferred location to receive 50 tons of surplus plutonium from nuclear warheads from various locations around the country where most of it would be converted into plutonium fuel for use as fuel in nuclear power plants. Any day now the U.S. Department of Energy expects to contract with a consortium which includes French fabricator, Cogema, Virginia Power and Duke Power; the latter would accept MOX for use in its McGuire and Catawba reactors near Charlotte.

Lewis Patrie

Olga Pitsenova

Concurrently, the United States is promoting the use of plutonium fuel in Russian nuclear reactors. It would be U.S. money offered to conduct an initial experiment in the use of weapons grade plutonium fuel at the Balakovskaya Nuclear Power Station along the bank of the Volga River near Balakovo. The United States is promoting use of this fuel in many other Russian locations. Russian activists want U.S. citizens to know that plutonium plants in both countries are connected and that this movement signals the beginning of a global plutonium economy.

Our concern about plutonium fuel include the billions of dollars for fabricating this fuel, transporting it to nuclear plants, offering it at no cost to power companies, future inestimable subsidies to the industry and the costs of promoting Russian fuel use. We dread even more that the characteristics of this fuel make it less stable than current fuel for reactor use, increasing the risk of a sever reactor accident and increasing the anticipated effects on human health should one occur. Such an event could ultimately result in many cancer deaths within 1000 miles of the accident.

Using pure plutonium fuel, the Nuclear Control Institute, a U.S. watchdog organization, estimates about double the cancer deaths from the radiation exposure within the first week of such an accident compared with nuclear fuel currently being used.

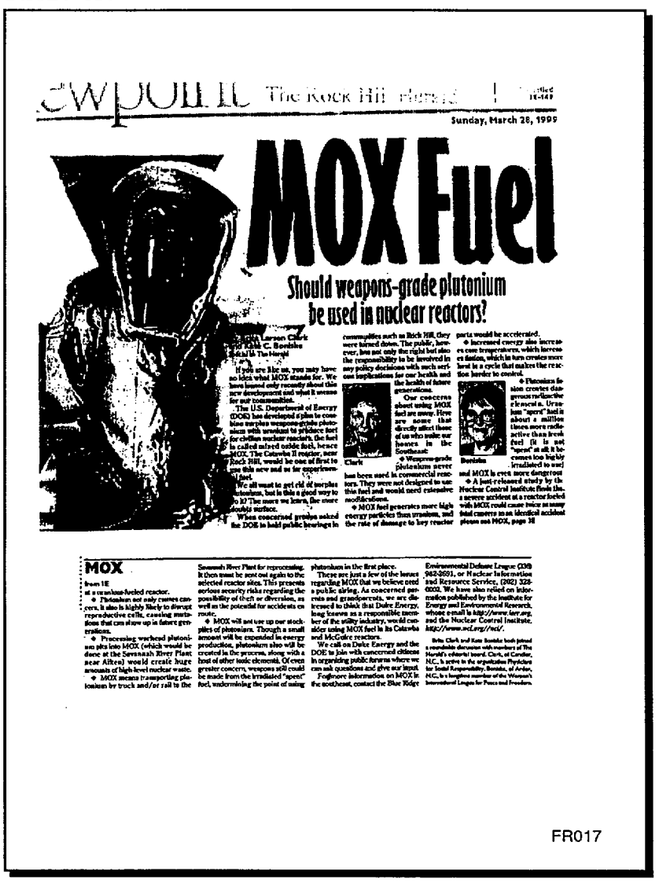
Although, DOE minimizes the risk of a disaster, reminiscent of Chernobyl, there are sufficient data to suggest that use of plutonium increases that risk.

Plutonium fuel substantially increases the waste management problem. Problems of security and nuclear proliferation are also increased with the use of plutonium fuel. Environmental problems from plutonium will linger for more than 200,000 years. For the sake of our world and that of our children, we should tell our governments that plutonium should never be used as fuel.

Olga Pitsenova is Program Director of the Center for Assistance to Environmental Initiatives in the Saratov region of Russia. The main goals of the organization are to encourage cooperation among environmental groups in the Saratov region and to encourage initiatives to protect and restore the environment.

Lewis Patrie is President of Western North Carolina of Physicians for Social Responsibility.

FR017



The Rock Hill Herald

Sunday, March 28, 1999

MOX Fuel

Should weapons-grade plutonium be used in nuclear reactors?

Clark

Bostian

MOX

from 1E

at a nuclear-fueled reactor.

❖ Plutonium not only causes cancers. It also is highly likely to disrupt reproductive cells, causing mutations that can show up in future generations.

❖ Processing weathered plutonium pits into MOX (which would be done at the Savannah River Plant near Aiken) would create huge amounts of high-level nuclear waste.

❖ MOX means transporting plutonium by truck and/or rail to the Savannah River Plant for reprocessing. It then must be sent out again to the selected reactor sites. This presents serious security risks regarding the possibility of theft or diversion, as well as the potential for accidents en route.

❖ MOX will not use up our stockpiles of plutonium. Though a small amount will be expended in energy production, plutonium also will be created in the process, along with a host of other toxic elements. Of even greater concern, weapons still could be made from the irradiated "spent" fuel, underminding the point of using plutonium in the first place.

There are just a few of the issues regarding MOX that we believe need a public airing. As concerned parents and grandparents, we are distressed to think that Duke Energy, long known as a responsible member of the utility industry, would consider using MOX fuel in its Catawba and McGuire reactors.

We call on Duke Energy and the DOE to join with concerned citizens in organizing public forums where we can ask questions and give our input.

For more information on MOX in the southeast, contact the Blue Ridge Environmental Defense League (208 982-2691, or Nuclear Information and Resource Service, (202) 328-0002. We have also relied on information published by the Institute for Energy and Environmental Research, whose e-mail is http://www.ieer.org, and the Nuclear Control Institute, http://www.nci.org//nci/.

Brita Clark and Kate Bostian both joined a roundtable discussion with members of The Herald's editorial board. Clark, of Catawba, N.C., is active in the organization Physicians for Social Responsibility. Bostian, of Ardrey, N.C., is a longtime member of the Women's International League for Peace and Freedom.

MORE on MOX, page 3E

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The Herald

Sunday, March 28, 1999

MOX Fuel

Should weapons-grade plutonium be used in nuclear reactors?

There's a better alternative

1

DCR003

DCR003–1 Alternatives

DOE acknowledges receipt of the commentaries that question the MOX approach.

The Herald
Sunday, March 28, 1999

MOX

from 1E

at a uranium-fueled reactor.

- Plutonium not only causes cancers, it also is highly likely to disrupt reproductive cells, causing mutations that can show up in future generations.
- Processing weapons-grade plutonium pits into MOX (which would be done at the Savannah River Plant near Aiken) would create huge amounts of high-level nuclear waste.
- MOX means transporting plutonium by truck and/or rail to the Savannah River Plant for reprocessing. It then must be sent out again to the selected reactor sites. This presents serious security risks regarding the possibility of theft or diversion, as well as the potential for accidents en route.
- MOX will not use up our stockpiles of plutonium. Though a small amount will be expended in energy production, plutonium also will be created in the process, along with a host of other toxic elements. Of even greater concern, weapons still could be made from the irradiated "spent" fuel, undermining the point of using plutonium in the first place.

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We call on Duke Energy and the DOE to join with concerned citizens in organizing public forums where we can ask questions and give our input.

For more information on MOX in the southeast, contact the Blue Ridge Environmental Defense League (704) 982-2691, or Nuclear Information and Resource Service, (202) 328-0002. We have also relied on information published by the Institute for Energy and Environmental Research, whose e-mail is http://www.ieer.org, and the Nuclear Control Institute, http://www.nci.org//nci/.

Greg Clark and Gene Bowles both served a roundtable discussion with members of The Herald's editorial board. Clark, of Candler, N.C., is active in the organization Protestors for Social Responsibility. Bowles, of Arden, N.C., is a longtime member of the Women's International League for Peace and Freedom.

Dr. Arjun Makhijani is president of the Institute for Energy and Environmental Research in Takoma Park, Md. Dr. Ed Lyman is scientific director of the Nuclear Control Institute in Washington, D.C. Both participated in a roundtable discussion with The Herald's editorial board regarding the use of MOX fuel.

Nuclear

from 1E

for people living downwind of the Catawba and McGuire reactors are the potential consequences of an accident in a reactor using MOX fuel. MOX-fueled reactors contain greater quantities of hazardous radioisotopes, including plutonium, americium and curium, than do plants using uranium fuel. A recent Nuclear Control Institute study estimates that in the event of a severe loss-of-containment accident, the higher releases of these isotopes from a plant using MOX could cause from hundreds to thousands of additional cancer deaths among people exposed to the radioactive fallout.

The DOE has tried to allay these concerns by pointing to countries such as France that use MOX fuel in some of their reactors. But the MOX experience abroad is not based on weapons-grade plutonium, which contains significantly more plutonium-239 and hence requires more stringent reactor control arrangements. The DOE also has failed to inform the public about the 1997 test in France in which a MOX fuel rod violently ruptured under simulated accident conditions while a uranium fuel rod with similar characteristics did not.

Finally, the MOX approach would mean that U.S. taxpayer dollars would be used to subsidize the creation of an infrastructure for commercial plutonium fuel use in this country and in Russia. Black-market dangers in Russia will only increase and proliferation problems will be aggravated by such a reversal of long-standing U.S. policy.

The poor plutonium policy is being accompanied by bad process. The DOE has not held hearings in the communities that host the reactors that would likely use the MOX fuel, nor even in Washington, D.C. Further, U.S. subsidiaries of two corporations, Cogema, owned by the French government, and British Nuclear Fuels, owned by the British government, would be intimately involved at SRS. The former is the likely contractor for the MOX plant; the latter is set to become part owner of Westinghouse, the SRS site contractor.

The DOE has not required these companies to make public their full operating safety, health and environmental records in their home countries. Yet they claim that extensive plutonium experience in their home countries especially qualifies them to do sensitive nuclear work in the United States.

Both Cogema and BNFL have polluted the environment in their home countries. Their plutonium separation operations are the subject of protest not only by environmentalists but also by other governments of the European Union, which have asked them to greatly reduce discharges of radioactivity, which are contaminating seafood.

Before letting a contract for MOX to Cogema or allowing BNFL to have a central role in operating SRS, the DOE should hold hearings in the Southeast and in Washington, D.C. on all relevant issues, including the home country records of Cogema and BNFL. All corporations that want public money, whether they are Cogema or Duke, should make all safety, health and environmental records public. (Much of Duke's record is already public via its disclosures to state and federal regulators.)

In the meantime, the region's public and policy-makers should withhold their support of the MOX program, which would introduce unnecessary environmental and proliferation risks and complicate the job of plutonium disposition.

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DCR003

Opinion

The Herald
Sunday, March 28, 1999

2E

Jayne Speizer
Publisher

Terry C. Plumb, Editor
Richard R. Rassmann, Managing Editor
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The editorial opinion of The Herald is reached by consensus of a board consisting of Jayne Speizer, Terry Plumb, James Warrell, Rich Rassmann and Deborah Barrow, day news editor.

Our view

Let's take a closer look at MOX fuel proposal

In summary

- Opponents of plan raise disconcerting questions.

Last week, the U.S. Department of Energy gave the go-ahead to an international consortium led by Duke Energy to develop a plan for the use of weapons-grade plutonium in nuclear reactors. We worry that this plan is hurtling forward with virtually no attempt to educate the public about the potential hazards or to seek public reaction to the plan.

The use of what may be the most dangerous substance on the globe would occur at the Catawba Nuclear Station near Lake Wylie. It would be transported here overland from the Savannah River Site in Aiken County.

We have been reassured by Duke Energy officials and by others in the industry that the process is safe. They say it has been implemented successfully in Europe. And they point to an excellent safety record at Catawba and other nuclear plants in the consortium.

Proponents also maintain that providing a commercial use for plutonium will encourage other nations, notably Russia, with stockpiles of the material to use it in reactors. And, they say, unless plutonium is degraded in reactors, there is no way to keep it out of evil hands over its 100,000-year lifespan.

But others in the scientific community dispute both the safety claims and the efficacy of "burning" plutonium in nuclear plants to reduce stockpiles. These critics are not simply radical "anti-nuke" activists; they are doctors and scientists with the right credentials.

For example, Dr. Arjun Makhijani, who wrote a commentary that appears on the cover of today's Viewpoint section, is president of the Institute for Energy and Environmental Research. His Ph.D thesis was on controlled nuclear fusion, and he has served on an Environmental Protection Agency subcommittee on national radiation cleanup standards.

What both sides do agree on is the pressing need to render the nation's stockpile of plutonium to its least harmful state and keep it out of the hands of terrorists who could use it to build nuclear weapons. Where they disagree is over the best way to accomplish that.

The plan approved by the DOE last week calls for the plutonium to be turned into fuel that could be used in reactors. Mixed oxide fuel, commonly referred to as MOX, is made by mixing uranium oxide and plutonium oxide and placing the material in fuel "rods" for commercial use.

Rods would be shipped from the Savannah River Site by trucks or rail. Security details would be required to ensure the shipments weren't hijacked.

Industry officials say using MOX to generate electricity in nuclear plants would consume a significant portion of the plutonium and degrade the remainder, making it harder to use as a nuclear weapon. Eventually, they claim, this method would reduce the U.S. stockpile of surplus plutonium and help generate energy in the process.

Critics, however, claim, the conversion of plutonium to MOX fuel would produce hundreds of gallons of liquid radioactive waste. Furthermore, only a small portion of the plutonium is "burned" away in reactors and the fission process that occurs in the reactor actually creates more plutonium. And

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finally, used MOX fuel is much more radioactive and difficult to handle than normal uranium waste.

Opponents of the MOX program say the nation's weapons-grade plutonium should be encased in molten glass and stored in a secure area. Immobilization, they say, would be a quicker, less expensive and more efficient way to make this substance inaccessible.

Before buying industry claims that use of MOX fuel is both safe and economical, the public should demand answers to the concerns posed by opponents of this program. They claim that:

◆ An accident at a reactor using MOX fuel would pose a far greater danger of contamination and resulting cancer deaths of residents living near the plant.

◆ Transporting plutonium would be more difficult and dangerous than transporting uranium.

◆ Customers would enjoy no savings on fuel bills as a result of the use of MOX fuel.

◆ Workers at nuclear plants would be at higher risk.

◆ Commercial use of weapons-grade plutonium would encourage Russia and other nations to produce more plutonium.

◆ The bulk processing of plutonium would make it more difficult to account for the whereabouts of this dangerous material.

◆ An accident in which plutonium "went critical" would be more difficult to contain than one involving uranium fuel.

◆ The cost of refitting plants to accept MOX fuel would reduce or completely negate any savings in fuel costs.

These are just a few of the issues raised by opponents of the MOX fuel plan. Perhaps the Department of Energy and the nuclear power industry have answers for all of them.

To date, however, those answers have not been forthcoming. Nor has the industry offered to conduct forums to educate the public about its intention to use plutonium fuel.

Too much is at stake, especially for a community located so close to a nuclear power plant. The assurance that the Catawba Nuclear Station has a sterling safety record and that its engineers are convinced of the safety of this program is not enough.

The public needs to know more before it can endorse this controversial program.

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SAFE ENERGY COMMUNICATION COUNCIL
LINDA GUNTER
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Statement of
Linda Gunter, Communications Director
Safe Energy Communication Council

Date: June 22, 1999
To: United States Department of Energy,
Office of Fissile Materials Disposition.

Overall, commercial nuclear power is already uneconomical, environmentally damaging and dangerous. Its future looks bleak. All new reactors ordered in the United States since 1974 have subsequently been canceled. No new reactors have been ordered since the accident at Three Mile Island 20 years ago. In fact, more than 100 reactors planned or under construction, have been canceled. In poll after poll, U.S. voters are clear: Americans want taxpayers' money spent on renewable energy options, not nuclear power, which already produces vast quantities of radioactive waste without a safe, permanent storage solution. This year, the Washington International Energy Group (WEIG), an industry think tank, released its **1999 Electric Industry Outlook** which found that 80 percent of utility CEOs and managers surveyed said no new nuclear power plants will be ordered in North America. In January, 1999, Steven Fleischman, Utilities Analyst for Merrill Lynch, predicted that no more nuclear reactors would be constructed in the U.S. Therefore, nuclear power has failed on Main Street, Wall Street and in the executive suites. 1

Using weapons plutonium – whose only purpose was supposed to be, and has hitherto been for bombs – in commercial reactors is even more uneconomical and even more dangerous. Furthermore, it is unnecessary. There is a safer, cheaper, faster alternative – immobilization – puts this dangerous material away forever. The U.S. Department of Energy (DOE) has agreed to immobilize up to 17 tons of surplus weapons plutonium, although we suspect the only reason is because it is unsuitable for Mixed Oxide fuel (MOX). However, the Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement acknowledges that all of the surplus weapons plutonium could be immobilized. 2

So why pursue MOX at all? Why run such needless security, environmental and health risks to support a program that will prop up a 3

MR011

MR011–1 **Other**

DOE acknowledges the commentor's view that commercial nuclear power has a bleak future in the United States.

MR011–2 **Alternatives**

DOE acknowledges the commentor's opposition to the use of weapons-grade plutonium in MOX fuel and irradiating it in commercial reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

DOE does not agree that the MOX approach is inherently more dangerous than the immobilization approach. DOE and NAS have conducted studies to compare risks, including the nuclear material security and proliferation risks of alternatives analyzed in this SPD EIS. These studies include the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Materials Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997), *Proliferation Vulnerability Red Team Report* (SAND97-8203, October 1996), *Management and Disposition of Excess Weapons Plutonium* (NAS, 1994), and *Management and Disposition of Excess Weapons Plutonium, Reactor-Related Options* (NAS, 1995). As discussed in Section 4.28.2.5, studies by NAS have led it to the following conclusion: "no important overall adverse impact of MOX use on the accident probabilities of the LWRs involved will occur; if there are adequate reactivity and thermal margins in the fuel, as licensing review should ensure, the main remaining determinants of accident probabilities will involve factors not related to fuel composition and hence unaffected by the use of MOX rather than LEU fuel."

The environmental, safety and health consequences of the MOX approach at the proposed reactors are addressed in Section 4.28. In addition, NRC would evaluate license applications and monitor the operations of both the MOX facility and domestic, commercial reactors selected to use MOX fuel, to ensure adequate margins of safety.

As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach would be more expensive than the immobilization-only approach. However, as discussed, pursuing the hybrid approach provides the United States important insurance against potential disadvantages of implementing either approach by itself.

Operation of the proposed surplus plutonium disposition facilities is expected to take approximately the same amount of time for either the immobilization-only approach or the hybrid approach. The difference in timing for the hybrid approach is associated with the amount of time that MOX fuel would be irradiated in domestic, commercial reactors.

MR011–3 **Nonproliferation**

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. If the effective value of the MOX fuel exceeds the cost of the LEU fuel that it displaced, then the contract provides that money would be paid back to the U.S. Government by DCS based on a formula included in the DCS contract. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program.

SAFE ENERGY COMMUNICATION COUNCIL
LINDA GUNTER
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Statement from Linda Gunter, SECC
June 22, 1999
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mature industry rapidly going the way of the dinosaurs? The DOE's response so far has been that we should address these concerns to the Nuclear Regulatory Commission (NRC). SECC asked questions specifically about security issues at a recent NRC public meeting. We were referred to a second NRC meeting the following week where, we were assured, security would be at the top of the agenda. But at that subsequent meeting we were told in no uncertain terms right at the start that we would not be allowed to ask questions, nor would we be permitted to make statements. Furthermore, not only was security not at the top of the agenda, it wasn't on the agenda at all. So much for the myth of an open, thorough public hearing process at the NRC. 4

Again we ask, why pursue the MOX option? Let us not be fooled by the Duke-Cogema-Stone & Webster (DCS) Consortium's assertions that it is for the good of the country and the noble cause of non-proliferation. Using MOX will end non-proliferation as we know it and increase the risk of nuclear-weapon proliferation by countries and, more seriously, by terrorist organizations. In reality, DCS is endorsing the MOX program for the usual reason – money. Its utilities, Duke Power and Virginia Power, will be paid to use MOX, which is the only way it is financially feasible for them. And who will have to shoulder the burden of this handout? We, the people. The American taxpayer. 3 5

We urge the DOE to abandon this needless waste of government time and public money on the MOX program. The Department should instead focus on immobilization and safe storage while allowing the nuclear power industry to continue in the direction in which it is already appropriately proceeding, toward an orderly phaseout. 2

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MR011

In order to address security against terrorist-related incidents, all intersite shipments of plutonium for the surplus plutonium disposition program would be made using DOE's SST/SGT system. This involves having couriers that are armed Federal officers, an armored tractor to protect the crew from attack, and specially designed escort vehicles containing advanced communications equipment and additional couriers. Further, DOE does not anticipate the need for any additional security measures at reactor sites, other than for the additional security applied for the receipt of fresh fuel. Commercial reactors currently have armed security forces, primarily to protect against perimeter intrusion. There would be increased security for the receipt and storage of fresh MOX fuel, as compared with that for fresh LEU fuel, for additional vigilance inside the perimeter. However, the increased security surveillance would be a small increment to the plant's existing security plan. After irradiation, the MOX fuel would be removed from the reactor and managed with the rest of the spent fuel from the reactor, eventually being disposed of at a geologic repository built in accordance with the NWPA.

MR011–4 General SPD EIS and NEPA Process

NRC's public outreach policies are beyond the scope of this SPD EIS, however, since the inception of the U.S. fissile materials disposition program, DOE has supported a vigorous public participation policy. All interested parties would likely have the opportunity to submit comments during the NRC reactor license amendment process should the MOX approach be selected.

MR011–5 MOX Approach

The MOX approach is not intended to affect the viability of nuclear power generation at any particular reactor. DCS would not have to continue to use MOX fuel if it determined that it was uneconomical to operate the reactor. Furthermore, DCS would only be reimbursed for costs solely and exclusively related to the MOX fuel irradiation. This would ensure that the taxpayers were not underwriting otherwise uneconomical electricity-generating assets.
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WOMEN'S ACTION FOR NEW DIRECTIONS
ANN OBER
PAGE 1 OF 7

Good Morning
My name is Ann with WAND -- Women's Action for New Directions, a national organization educating women to act politically. We also represent women state
legislators in all 50 states through our project Women Legislators Lobby (WiLL).

WAND was founded in 1980 as Women's Action for Nuclear Disarmament and has
worked toward nuclear arms reductions for nearly 20 years. We are encouraged
that at long last some nuclear weapons are being dismantled -- we hope there are many more to come. We also support the goals of the Clinton Administration
and the Department of Energy to dispose of the plutonium from these weapons in
such a way that they may never again be used in a weapon of mass destruction. 1

We are deeply concerned, however, with the DOE's approach to plutonium disposition and strongly disagree that converting some plutonium into fuel for
commercial power plants is the proper way to proceed. We feel the full balance
of the 50 tons of declared surplus plutonium should be immobilized and isolated
from the environment for safety, environmental, and proliferation reasons.

Fabricating MOX fuel and using it in commercial reactors in South Carolina, North Carolina and Virginia will require unnecessary and excess transportation
of plutonium, primiarly across the southeastern United States. WAND has active grassroots members and state legislators in these primary states. 2

While we hear repeated assurances that the plutonium will be transported "safely," it is important to remember that ANY shipment of plutonium involves
risk, and the MOX option maximizes that risk.

DCR009

DCR009–1 **Alternatives**

DOE acknowledges the commentor's opposition to converting some of the surplus plutonium into MOX fuel and irradiating it in commercial reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

The safety, health, and environmental consequences of the MOX approach at the proposed reactors are addressed in Section 4.28. In addition, NRC would evaluate license applications and monitor the operations of both the MOX facility and domestic, commercial reactors selected to use MOX fuel, to ensure adequate margins of safety.

DOE and NAS have conducted studies to compare risks, including the nuclear material security and proliferation risks of alternatives analyzed in this SPD EIS. These studies include the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Materials Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997), *Proliferation Vulnerability Red Team Report* (SAND97-8203, October 1996), *Management and Disposition of Excess Weapons Plutonium* (NAS, 1994), and *Management and Disposition of Excess Weapons Plutonium, Reactor-Related Options* (NAS, 1995).

DCR009–2 **Transportation**

DOE has considered the inherent risks, including terrorist concerns, associated with transporting plutonium materials. While DOE prefers to minimize the transportation of plutonium that is still desirable for weapons use, plutonium is routinely and safely transported in the United States. As described in Appendix L.3.3, transportation of nuclear materials would be

performed in accordance with all applicable DOT and NRC transportation requirements. Interstate highways would be used, and population centers avoided, to the extent possible.

All shipments of surplus plutonium that have not been converted to a proliferation-resistant form would be made by DOE's SST/SGT system, as described in Appendix L.3.2. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material.

The MOX option also maximzes cost, waste generation, and potential worker
exposure to plutonium as it involves far more processing than the immobilization option. It will require the construction of a MOX Fabrication
Factility at the Savannah River Site, which is already highly contaminated and
has will take many decades to clean up, if it can, in fact, ever be cleaned up. 3

We are particularly concerned about the impact of the use of MOX in commercial
reactors on the surrounding communities. The people living near these reactors,
who will not have the benefit of speaking directly on this matter as DOE has refused to hold hearings in their communities, will bear the brunt of any accident involving MOX fuel. Yet they have not been adequately informed of the
risk they are being asked to take on. 4

WAND represents women legislators and grassroots activists living within 50 miles of these
reactors. [[[Kim: reactor locations are: McGuire reactor, 10 miles north of Charlotte, NC; the Catawba reactor, about 6 mi. south of Charlotte; and the North Anna reactor in Mineral, VA, kind of between Richmond and Fredericksberg. Can you find members in these areas?]]]

They are concerned, as we are, that:

* a severe accident at one of these reactor sites using MOX fuel, would result in far greater consequences with many more deaths and injuries than if such an accident
occurred with conventional uranium fuel. 5

* using MOX fuel in the reactor will cause embrittlement and premature
aging of the reactor, compromising safety

*since MOX fuel is made from WEAPONS plutonium (and not commercial

DCR009

DCR009–3 **MOX Approach**

As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach would be more expensive than the immobilization-only approach. However, pursuing the hybrid approach provides the United States important insurance against potential disadvantages of implementing either approach by itself as discussed in response DCR009–1.

Cleanup at SRS is a priority, will remain a priority, and can coexist with other DOE initiatives. The surplus plutonium disposition program would be conducted in a way which ensures that cleanup remains a priority at SRS and that the production of any additional waste is processed and disposed of in a timely and environmentally acceptable manner.

As described in Chapter 4 of Volume I and summarized in Section 2.18, potential impacts of any of the proposed activities during routine operations at any of the candidate sites would likely be minor. To avoid contamination that has occurred in the past at some DOE sites, DOE would design, build, and operate the proposed surplus plutonium disposition facilities in compliance with today's environmental, safety, and health requirements. Furthermore, any accidental releases would be promptly addressed following established policies and procedures by trained personnel.

DCR009–4 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's concern that the people living near the proposed reactors that would use MOX fuel are not getting to speak directly on this matter in a public hearing held in their community. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS*. DOE provided other means for the public to express their concerns and provide comments. Also, at the invitation of South Carolina State Senator Phil Leventis, DOE attended and participated in a public hearing held on June 24, 1999, in Columbia, South Carolina.

The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Further, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

For those interested parties who could not attend the hearing on the *Supplement* held in Washington, D.C., on June 15, 1999, DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Equal consideration was given to all comments, regardless of how or where they were received.

DCR009–5 **Facility Accidents**

While it is understood that there are differences from the use of MOX fuel versus LEU fuel, these differences are not expected to change the frequency of severe accidents in MOX-fueled reactors. Because differences between MOX fuel and uranium fuel are well characterized, they can be accommodated through fuel and core design. Before any MOX fuel is used in the United States, NRC would have to perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications.

Reactor vessel embrittlement is a condition in which the fast neutron fluence from the reactor core reduces the toughness (fracture resistance) of the reactor vessel metal. Analyses performed for DOE indicated that the core average fast flux in a partial MOX fuel core is comparable to (within 3 percent of) the core average fast flux for a uranium fuel core. All of the mission reactors have a comprehensive program of reactor vessel analysis and surveillance in place to ensure that NRC reactor vessel safety limits are not exceeded.

plutonium) it is therefore an experimental fuel --and neither DOE, Duke Energy,
Virginia Power, Cogema, nor any other DOE subcontractor have a full understanding of how this fuel will behave in a reactor. The fact is, it has never before been used on a commercial scale and tests done at the labroatory
scale indicate we have much, much more to learn about this volitile fuel. 5

* MOX fuel made from weapons plutlonium will make the reactor harder to
control safely. We know "it can be done," but we also know the margin of safety is narrowed with the use of MOX fuel.

* the nuclear industry will receive huge, as-yet undisclosed subsidies and incentive fees for its participation in this program. 6

*storage of MOX fuel at reactor sites will be a security problem, as plutonium in MOX fuel can be extracted fairly easily and used in a weapon, making it very attractive to steal. Reactor sites are not set up to handle this kind of security situation. 7

* We are also concerned about plutonium fuel transportation and the impact on our communities and our children of heavily armored vehicles carrying
plutonium fuel moving through our town's streets and highways.

At the very least, communities that must face these risks should have the opportunity to speak for themselves and ask questions to you directly about this risky program. We are dismayed that you have robbed them of that chance. 4

We also feel the MOX program is costly and dangerous, puts people at risk unnecessarily, and undermines the efforts of WAND and so many others to reduce
the threat of nuclear weapons in the world. Your plan would provide the funds
and infrastructure for a plutonium economy, which only worsens environmental
and nuclear proliferation problems. It is particularly troubling that you are 8

DCR009

Section 4.28.2.5 provides a discussion of the analysis of several reactor accidents including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. Both of these accidents have an extremely low probability of occurrence. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48,000 per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

The fabrication of MOX fuel and its use in commercial reactors has been accomplished in Western Europe. This experience would be used for disposition of the U.S. surplus plutonium. Electricité de France reactors in France have seen little or no impact from the use of MOX fuel on radionuclide releases in effluents. No change would be expected from normal operations, given that MOX fuel performs as well as LEU fuel and the fission products are retained within the fuel cladding. FRAGEMA's (a subsidiary of COGEMA and FRAMATOME) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods for commercial reactor use. There have been no failures and leaks have occurred in only 3 assemblies (a total of 4 rods). All leaks occurred as a result of debris in the reactor coolant system and occurred in 1997 or earlier. French requirements for debris removal were changed in 1997 to alleviate these concerns. Since that time, there have been no leaks in MOX fuel rods. Further, as discussed in response DCR009–1, NRC would evaluate license applications and monitor the operations of the commercial reactors to ensure adequate margins of safety.

DCR009–6 **MOX Approach**

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this

WOMEN'S ACTION FOR NEW DIRECTIONS
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pursusing this option when a cheaper, safer, more environmentally sound option
exists that does not encourage plutonium use and production in the US, Russia
and beyond. We implore [encourage? you to discard the MOX option and immobilize
all surplus plutonium as quickly and safely as possible. 8

Thank you for considering our comments.

DCR009

proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. If the effective value of the MOX fuel exceeds the cost of the LEU fuel that it displaced, then the contract provides that money would be paid back to the U.S. Government by DCS based on a formula included in the DCS contract. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program.

DCR009–7 **Nonproliferation**

DOE does not anticipate the need for any additional security measures at reactor sites, other than for the additional security applied for the receipt and storage of fresh fuel. Commercial reactors currently have armed security forces, primarily to protect against perimeter intrusion. There would be increased security for the receipt and storage of fresh MOX fuel, as compared with that for fresh LEU fuel, for additional vigilance inside the perimeter. However, the increased security surveillance would be a small increment to the plant's existing security plan. After irradiation, the MOX fuel would be removed from the reactor and managed with the rest of the spent fuel from the reactor, eventually being disposed of at a geologic repository built in accordance with the NWPA.

In order to address security against terrorist-related incidents, all intersite shipments of plutonium for the surplus plutonium disposition program would be made using DOE's SST/SGT system. This involves having couriers that are armed Federal officers, an armored tractor to protect the crew from attack, and specially designed escort vehicles containing advanced communications equipment and additional couriers.

The dates and times that specific transportation routes would be used for special nuclear materials are classified information; however, the number of

shipments that would be required, by location, has been included in Appendix L. Additional details are provided in *Fissile Materials Disposition Program SST/SGT Transportation Estimation* (SAND98-8244, June 1998), which is available on the MD Web site at http://www.doe-md.com.

DCR009–8 **DOE Policy**

DOE is not advocating a plutonium economy. Rather, as discussed in response DCR009–6, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The use of U.S. surplus plutonium in existing domestic, commercial reactors does not involve reprocessing (reprocessing is a chemical separation of uranium, transuranic elements [including plutonium], and fission products from spent reactor fuel and the reuse of the plutonium and uranium to produce new fresh fuel) and therefore does not support building a plutonium economy.

The remainder of this comment is addressed in response DCR009–1.

CATHOLIC WORKER HOUSE
OF HOSPITALITY

Casa Maria

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US Dept. of Energy
Office of Fissile Materials Disposition
PO Box 23786
Washington DC 20026-3786

6-8-99

Dear Friends,

There is no real reason for dealing with deadly plutonium. There are alternative sources of energy that can be used for our energy. One of the problems is that corporations cannot make money on these alternative sources of energy. This, of course, is the reason why we do not adopt these sources. 1

The problem with radioactive waste, the product of plutonium, is that we still do not have a safe and adequate way of storing the waste. We are not leaving much of a future for our children and their children with this constant use of plutonium as a source of energy. 2

Unless we take the time, effort and cost of using alternative forms of energy other than plutonium there will be a slow and painful death for most Americans. You have the choice. You either give in to the corporations and continue to use plutonium or help to save lives with alternative sources of energy. 1

Thank you for your attention.

Sincerely,
Don Timmerman

MR004

MR004–1 **Purpose and Need**

The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this. Use of MOX fuel is not proposed as an alternative energy source nor in order to subsidize the commercial nuclear power industry.

The issue of spending the time and resources to develop alternative forms of energy is beyond the scope of this SPD EIS.

MR004–2 **Repositories**

This SPD EIS assumes, for the purposes of analysis, that Yucca Mountain, Nevada, would be the final disposal site for all immobilized plutonium and MOX spent fuel. As directed by the U.S. Congress through the NWPA, as amended, Yucca Mountain is the only candidate site currently being characterized as a potential geologic repository for HLW and spent fuel. DOE has prepared a separate EIS, *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999), which analyzes the environmental impacts from construction, operation and monitoring, related transportation, and eventual closure of a potential geologic repository. The immobilized plutonium and MOX spent fuel are included in the inventory analyzed in that draft EIS should the decision be made to proceed with the hybrid or immobilization-only approaches.

The public doesn't need the plutonium in the reactors in Mecklenberg County. We have enough pollution. I would like to see my grandchildren grow up without cancer from the plutonium in the air. 1

The U.S. Department of Energy (DOE) presumes in this environmental impact statement (EIS) that anything meeting the regulatory requirements is justified. Yet the International Commission on Radiological Protection, in the formation of its recommendations on allowable exposures, states that one must come up with a justification for a practice first, then find out if it meets the regulations. This means that a standard or regulation cannot be used as the justification, yet that is all the public is given. The public cannot be expected to compare what happens in different reactors using different fuels and what are the outcomes. 2

I find it very interesting that the litany of concerns I have raised in previous meetings is almost quoted in the sections on process materials, but without supporting data and analysis. There is, moreover, no mention of nuclear laundries in terms of a comparison for fission products. Are those products increased in a laundry that is serving a plutonium fuel reactor or not? Questions such as these are basic; they relate to information the public has a right to know but has not received. That tritium is elevated is something that I have heard, but I can't go anywhere in this document and find that. 3

WASHDC–1 **Reactors**

Section 4.28 was revised to discuss the potential environmental impacts of operating Catawba, McGuire, and North Anna, the reactors that would use the MOX fuel. There would be no expected releases of plutonium from the proposed reactors occurring from normal operating conditions. Annual doses to an MEI at each of the plants are estimated to be small—i.e., McGuire, 0.31 mrem; Catawba, 0.73 mrem; and North Anna, 0.37 mrem. All of these doses fall within stringent NRC 10 CFR 20 and 10 CFR 50 regulatory requirements and are much lower than radiation annually received from natural background sources.

WASHDC–2 **Human Health Risk**

In Volume I the need for the proposed actions are summarized in Chapter 1. Within this chapter the "justification behind the proposed actions" is discussed in detail. Subsequently, in Chapter 4, analytical results are presented which are then compared against radiation protection standards. In essence, this approach is parallel with ICRP recommendations.

Section 4.28 presents an analyses of the impacts expected if MOX fuel were used in the proposed reactors. In the case of accidents, there are direct comparisons of the impacts of a partial MOX fueled reactor versus a traditional LEU core. Also doses from normal operations of the proposed reactors are compared to the current doses as presented in the affected environment section in Chapter 3 of Volume I.

WASHDC–3 **Human Health Risk**

Under normal operating conditions, it is not expected that there would be any change in nuclear laundries due to the use of MOX fuel at the proposed reactors. The laundries could be affected in either of two cases. If there were a fresh fuel assembly received at the reactor sites that had a cladding defect and contamination on the outside of a rod, the anti-contamination clothing would have a higher alpha-contamination with MOX fuel than it would with LEU fuel. However, since the cladding is sealed and inspected as a pressure boundary at the MOX facility prior to shipment and the fuel is transported in specifically designed packages, the likelihood that a rod would be ruptured

I am concerned as to the clear and present danger of this material. I am concerned about my grandchildren. We can spend a lot of time arguing about this. As I see it, however, we have to do something with this material other than store it. We need to put this material in a form that makes it unavailable for weapons use. The United States is not talking about reprocessing the spent fuel; it is talking about doing something with the separated plutonium. I have not heard any positive editorials read today, although some people have expressed agreement with use of the North Anna plant. 4

This process is reprehensible. It is clear that the main driver of the dual-track approach is access by nuclear corporations to taxpayer dollars. The decision had been made well before it was announced. This makes people mad—not only people in the communities of the reactors but also those giving their taxpayer dollars. Taxpayers do not want to have to give money to the largest debiting corporations in the world; they see the main issue as not that this program is better or that it accomplishes its goals, but that nuclear corporations need money. 5

when received at the reactor sites is remote. The other case that could result in a different radioisotopic inventory is if a MOX fuel rod failed in service and a different radioisotopic inventory were communicated to the reactor purification system and then this was somehow communicated to a worker's protective clothing. Both Virginia Power Company and Duke Power Company use onsite laundries for re-usable anticontamination protective clothing. The laundry water is filtered and then released in accordance with effluent release regulations and site permits. Alpha contamination, indicating the presence of actinides, is very low and far below regulatory limits. The same condition is expected to hold true for partial MOX fuel cores.

As shown in Table K–27, by the end of core life, the presence of tritium is expected to decrease by 5 percent when a partial MOX core is used.

WASHDC–4 **Purpose and Need**

DOE acknowledges the commentor's concern regarding the clear and present danger of surplus plutonium. The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this. Section 4.28 was revised to discuss the potential environmental impacts of operating Catawba, McGuire, and North Anna, the reactors that would use the MOX fuel.

WASHDC–5 **MOX Approach**

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. If the effective

It is clear DOE can't meet its obligations, in particular the obligation to hold full and open public hearings. The local community will not have the information it needs if you don't talk to them. 6

I have a question about storage of plutonium at the Savannah River Site (SRS). I have heard that DOE is deferring construction of the Actinide Processing and Storage Facility (APSF) facility at SRS. I understand that plutonium would be stored in the K-Reactor building. If this program turned out to involve longer-term storage and the mixed oxide (MOX) fuel program did not go forward, could the goal of long-term storage be accomplished by the K-Reactor building alone—that is, without a dedicated facility? 7

value of the MOX fuel exceeds the cost of the LEU fuel that it displaced, then the contract provides that money would be paid back to the U.S. Government by DCS based on a formula included in the DCS contract.

DOE has identified as its preferred alternative the hybrid approach for the disposition of U.S. surplus plutonium, it is not a decision. Decisions on the surplus plutonium disposition program will be made in the SPD EIS ROD based on environmental analyses, technical and cost reports, national policy and nonproliferation considerations, and public input.

WASHDC–6 **General SPD EIS and NEPA Process**

Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue. It is DOE policy to encourage public input into these matters of national and international importance.

WASHDC–7 **Alternatives**

In August 1998, DOE amended the *Storage and Disposition PEIS* ROD to allow for the receipt and storage of non-pit, surplus weapons-usable plutonium at SRS, in advance of the completion of APSF. If DOE selects SRS

Have the problems with Defense Waste Packaging Facility processing material caused the Office of Fissile Materials Disposition to rethink the immobilization technique? | 8

as the immobilization site in the SPD EIS ROD, current plans are to ship material from RFETS to SRS and store it in shipping containers in Building 105–K (K Reactor) beginning in about 2000; material from Hanford would be shipped to SRS and stored in APSF. Before storage, the material would first be stabilized and packaged for long-term storage in accordance with DOE Standard-3013-96, *Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long-Term Storage.*

Building 105–K is currently undergoing modifications to provide for the safe, secure storage of the RFETS surplus plutonium per decisions made in the amended *Storage and Disposition PEIS* ROD. These modifications include upgrades to safeguards and security features, installation of criticality monitoring devices, and removal of unused process equipment. DOE would also expand APSF, as planned in the *Storage and Disposition PEIS* ROD, to accommodate the storage of Hanford surplus plutonium pending disposition. Should DOE decide to build and operate APSF at SRS, a portion of the RFETS material could be transferred from Building 105–K to APSF in order to provide for operational flexibility. If APSF is not built, the development of additional storage space in Building 105–K or in other DOE facilities could be necessary in order to provide for storage of the balance of surplus plutonium materials; such an action would only be done after an appropriate NEPA review was completed.

WASHDC–8 **Alternatives**

DOE is presently considering a replacement process for the in-tank precipitation (ITP) process at SRS. The ITP process was intended to separate soluble high-activity radionuclides (i.e., cesium, strontium, uranium, and plutonium) from liquid HLW before vitrifying the high-activity fraction of the waste in DWPF. The ITP process as presently configured cannot achieve production goals and safety requirements for processing HLW. Three alternative processes are being evaluated by DOE: ion exchange, small tank precipitation, and direct grout. DOE's preferred immobilization technology (can-in-canister) and immobilization site (SRS) are dependent upon DWPF providing vitrified HLW with sufficient radioactivity. DOE is confident that the technical solution will be available at SRS by using radioactive cesium from the ion exchange or small tank precipitation process. A supplemental EIS (DOE/EIS-0082-S2) on the operation of DWPF and associated ITP alternatives is being prepared.

Will any expected failures of the fuel rod process be considered in the licensing process?	9
Is there any known analysis of the radionuclide profile of low-level waste (LLW) generated during operations with plutonium fuel at the proposed reactors?	10

WASHDC–9 **MOX RFP**

FRAGEMA's (a subsidiary of COGEMA and FRAMATOME) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods for commercial reactor use. There have been no failures and leaks have occurred in only 3 assemblies (a total of 4 rods). All leaks occurred as a result of debris in the reactor coolant system and occurred in 1997 or earlier. French requirements for debris removal were changed in 1997 to alleviate these concerns. Since that time, there have been no leaks in MOX fuel rods.

WASHDC–10 **Waste Management**

No, there are not any current analyses of the radionuclide profile of LLW generated during operations with MOX fuel at the proposed reactors. There are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle. However, the only time significant quantities of fission products could be released to the environment or end up in LLW would be in the event of a large-scale fuel leak. In regard to normal operations, FRAGEMA's (a subsidiary of COGEMA; one of the companies chosen to operate the proposed MOX facility) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA alone has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods for commercial reactor use. As previously discussed, there have been no failures and leaks have occurred in only 3 assemblies (a total of 4 rods). FRAGEMA has also produced 43,826 LEU assemblies over the years and has experienced leaks in only 471 assemblies.

The use of MOX fuel would not be expected to result in any additional LLW from refuelings because the reactors would continue to operate on the same schedule as if they were using only LEU fuel. Before any LLW would be shipped from the reactors to a disposal site, analyses would be performed to ensure that the concentrations of radioisotopes fall within regulatory limits. All of the proposed reactors will continue to operate within stringent NRC (10 CFR 20) radionuclide release and dose requirements.

Because radioisotopic profiles are linked to fuel rod failure, any additional information on such failure in other countries would be helpful. 11

In regard to high-level nuclear waste repositories, what differences are known to exist between low-enriched uranium (LEU) fuel and MOX fuel at the point where they become what we call high-level nuclear waste? It seems to me that there is not enough information on such waste and its effects on the program? 12

On page K–3 of the EIS, the curium 244 fraction is given as 0.94, when it should be over 2. Also, the chart shows no delayed neutron precursors, in particular those of the bromine series; they should be added. The chart also does not show all of the reactor poisons, specifically samarium, nor all fission product gases. The buildup of these gases could lead to a bursting of the fuel rods. The tritium fraction should also be included, as should any other fraction of gases produced in quantity. 13

WASHDC–11 **Facility Accidents**

This comment is addressed in response WASHDC–10.

WASHDC–12 **Repositories**

This SPD EIS assumes, for the purposes of analysis, that Yucca Mountain, Nevada, would be the final disposal site for all immobilized plutonium and MOX spent fuel. As directed by the U.S. Congress through the NWPA, as amended, Yucca Mountain is the only candidate site currently being characterized as a potential geologic repository for HLW and spent fuel. DOE has prepared a separate EIS, *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999), which analyzes the environmental impacts from construction, operation and monitoring, related transportation, and eventual closure of a potential geologic repository. As described on page 2–2 of the *Yucca Mountain Draft EIS*, immobilized plutonium and MOX spent fuel generated by the surplus plutonium disposition program are included in the inventory analyzed in that draft EIS should the decision be made to proceed with the hybrid or immobilization-only approaches. Section A.2.4.5.1 of the *Yucca Mountain Draft EIS* describes the expected material characteristics of MOX spent fuel from the surplus plutonium disposition program including: mass and volume, amount and nature of radioactivity chemical composition, thermal output, and physical parameters. Section A.2.1.5 describes similar characteristics for commercial LEU spent fuel.

WASHDC–13 **Facility Accidents**

The curium 244 inventories shown in Appendix K were extracted from the output for the ORNL Isotope Generation and Depletion Code (ORIGEN) cases. Because the rate of curium 244 production is strongly dependent on burnup, it has a higher inventory level in LEU assemblies that are left in the reactor for three cycles than MOX assemblies that are left in the reactor for a maximum of two cycles. As a result, at the end of a cycle the ratio of curium 244 in a 40 percent MOX core would be about 6 percent lower than the ratio of curium 244 in an LEU core because more of the LEU core would be made up of assemblies that have been used for three cycles (33 percent of the core versus 20 percent of the core for the proposed MOX core).

It is true that burnups of 40 GWD/t or more result in higher fission gas production than LEU fuel at the same burnup. However, this does not automatically result in higher doses from reactors operating with MOX fuel. MOX fuel assemblies are engineered to accommodate this additional gas. In the event of a leaker, the gas is released into the reactor coolant and scrubbed through a series of filters that capture nearly all of the radionuclides so that any impact on dose would be expected to be small. Appropriate MOX fuel burnup limits would be established in concert with NRC following a thorough safety review. It should be noted that reactors in Belgium and Germany typically use MOX fuel to burnups between 45 and 50 GWD/t and that while current French burnup limits are lower than that, French burnup limits for LEU fuel are also lower than those for U.S. reactors.

This SPD EIS analyzes offsite consequences and risks in terms of LCFs and/or prompt fatalities. Previous studies have determined that certain radioisotopes are primary contributors to offsite consequences due to their effects on humans and the environment. These radioisotopes are included in Table K–27. Radioisotopes bromine 87 through bromine 91 and iodine 137 through iodine 141 are not included in Table K–27 because they are not significant contributors to offsite consequences. Bromine 87 through bromine 91 and iodine 137 through iodine 141 are delayed neutron precursors with half-lives of less than 1 minute. They were included along with the hundreds of other isotopes in the ORIGEN analysis done to support this EIS.

Xenon 135, the most important reactor poison, with a thermal absorption cross-section 60 times greater than samarium 149 is included in Table K–27. Samarium 149, a stable (nonradioactive) isotope, is not included because it is not a significant contributor to offsite consequences.

Tritium is a significant contributor to offsite consequences. The MOX/LEU ratio for tritium was calculated to be 0.95. Since this value is lower for the MOX core than an LEU core, the current analysis is conservative with respect to tritium.

I have a real objection to similar statements presented on pages 33 and K–2. The statement on page 33 reads as follows: "Although it has been suggested that the frequency of these accidents would be higher with mixed oxide fuel, no empirical data is available to support this." I have been trying to give you this information, the use of MOX fuel would involve a lower delayed neutron fraction; faster neutrons due to the higher thermal neutron absorption cross-section of plutonium, meaning a higher average neutron speed and thus both a reduction in control rod worth (a safety impact) and a shorter reactor period; different temperatures coefficients of reactivity; and more gas production, thus higher releases. 14

In Section 4.28.2.1 (page 31) of the EIS, it is stated that the estimated air pollutants resulting from operation of the proposed reactors would not be expected to increase due to the use of MOX fuel. It is my understanding that the gas production of MOX fuel is much higher—not just tritium, but also xenon and krypton—so I would assume that statement to be incorrect. I would like for you to respond to that. 15

WASHDC–14 **Facility Accidents**

The commentor states that MOX fuel will have a lower delayed neutron fraction, harder neutron spectrum, lower control rod worth, a shorter reactor period, different reactivity coefficients, and higher gas generation rate. These are all factual statements. These parameters require that the nuclear core designers accommodate these differences using verified and validated codes that incorporate these affects. Such nuclear codes have been used successfully in Europe and would be adopted and utilized by fuel designers in the United States. Before any MOX fuel is used in the United States, NRC would have to perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications pursuant to 10 CFR 50.

WASHDC–15 **Air Quality and Noise**

Section 4.28.2.1 discusses nonradiological air impacts of the proposed irradiation of MOX fuel. Radiological impacts are discussed in Section 4.28.2.4 which indicates that the radiation dose to the general public from normal operations would not be expected to change with the use of MOX fuel in the selected reactors.

For normal operating conditions, the emissions are the same. The only emission stream that might result from using MOX fuel that would result in a different radioisotopic mix than LEU fuel occurs in the event that there is a MOX fuel failure, in which there is an emission pathway from the core. Given the history and integrity of fuel, a failure may never occur during the limited fuel campaign to get rid of surplus plutonium. Notwithstanding, if there were a MOX fuel failure, the effect on the radioisotopic inventory in emissions would be practically indistinguishable because: (1) the inventories in MOX and LEU fuel are similar (as shown in Table K–27), and (2) the contribution of fuel failures to the total emissions from the reactor is small (other contributions to the site's effluents dominate).

In the last public meeting in Amarillo, I asked what exactly the temperature fuel coefficient of reactivity response curve is. I received no response, so I submitted a card again. 16

Plutonium has a lower melting point, which will reduce safety; the higher decay heat of spent nuclear fuel would seem to increase the likelihood of a waste accident; and concerns as to the criticality of MOX fuel in storage would appear to justify greater concern as to the risks of spent MOX fuel in storage. 17

WASHDC–16 **Facility Accidents**

DOE is unsure what the commentor means by "temperature fuel coefficient of reactivity." DOE suspects that the commentor is interested in either the Doppler coefficient or the moderator temperature coefficient. For core designs similar to the ones DOE expects at the mission reactors, DOE has some illustrative data to provide. Moderator temperature coefficients are more negative for MOX cores than LEU cores. The beginning of life value for an "equilibrium MOX core" is approximately -12 pcm/F, which is more than twice as negative as the LEU number, which is about approximately -5 pcm/F. The temperature coefficient becomes more negative as a function of burnup and approximately linearly changes as a function of burnup until a burnup of approximately 20 GWD/t with a value of approximately -35 pcm/F. At this burnup, the coefficients for MOX and LEU merge and are approximately the same. (ANRCP-199-1, *Disposition in Weapons-Grade Plutonium in Westinghouse Reactors*, March 1998.) In the original question related to Doppler coefficient, DOE has an illustrative estimator of the parameter from *The Plutonium Disposition Study, Implementation of Weapons-Grade MOX Fuel in Pressurized Water Reactors* (Westinghouse Electric Corporation, August 30, 1996). At 100 percent power, the coefficient for an "equilibrium" MOX core is approximately -8.5 pcm/ percent-power which is slightly more negative than an LEU core at approximately -7.7 pcm/percent-power. These numbers are extracted from design studies performed under contract or grant from DOE for representative Westinghouse cores and may not be precise indicators for the actual mission reactors or mission fuel cycles. These more negative temperature coefficients would act to shut the reactor down more rapidly during a heatup transient.

WASHDC–17 **Facility Accidents**

The plutonium in MOX fuel would be present as plutonium dioxide in ceramic-like fuel pellets, not elemental plutonium. Plutonium dioxide has a significantly higher melting point than pure plutonium metal. In any case the melting point of MOX fuel would be within the specifications for that type of reactor fuel.

Initially, when spent fuel is removed from the reactor, the MOX and LEU fuel would be about the same temperature and exhibit similar characteristics.

I was glad to see that the *Supplement* does not suggest, as original data suggested, that health effects go down—that is, that plutonium is good for local communities. However, I don't see any reflection of the information received at the Canadian meeting a month ago. At that meeting, the head of the regulating body acknowledged that alpha radiation may in fact have a quality factor of 2,000, not 20, which is what the U.S. Nuclear Regulatory Commission (NRC) provides for us. Credible work shows that the presence of plutonium in a reactor would double the impacts of a reactor accident. There are, however, no voices from the communities to let you know how they feel. 18

After about a year out of the reactor, however, the temperature of MOX spent fuel would exceed that of LEU fuel of the same age. Therefore, storage of MOX spent fuel would increase the thermal loading in a spent fuel pool over that for only LEU fuel. However, thermal load limitations are based on the amount of cooling that the entire spent fuel pool can accommodate, not on individual fuel assemblies within the pool. Therefore, the additional heat load would be accounted for in the calculations for the reactor spent fuel management plans.

Although the amount of fissile material would be higher in MOX spent fuel rods than in LEU spent fuel rods, rod spacing and boron content in the spent fuel pools would be adjusted as necessary to maintain criticality safety.

WASHDC–18 **Facility Accidents**

The latest published version of 10 CFR 20.1004 (January 1, 1999) states that the quality factor for alpha particles is 20. This regulatory criteria (10 CFR 20) is established by NRC, and is therefore the official benchmark from which U.S. nuclear utilities are continually governed in the realm of radiation protection.

This SPD EIS analyzed several reactor accidents, including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. Both of these accidents have an extremely low probability of occurrence. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48 thousand per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as

When the dual track was announced, I asked if anyone had looked into the impacts of reactor irradiation of plutonium fuel on the LLW from reactor operations, and the resulting impacts on the destination of that LLW, the low-level radioactive waste dump. An example would be the impact on Ward Valley of a waste stream from Palo Verde. Ward Valley has not been designated as an LLW site but could well be within the time allotted. A major concern as to Ward Valley is how much plutonium would be going into the site and whether it would jeopardize the Colorado River. Government officials and the citizens of South Carolina are concerned that Barnwell is leaking. 19

There is a need for analysis of DOE's new—and currently contested—standard on the release of contaminated metals to consumer products. What about effects of the release of metals from facilities using MOX rather than LEU fuel on consumer products developed from recycled metals? The public doesn't have the information it needs on this matter. 20

to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. DOE provided various means for the public to express their concerns and provide comments: public hearing, mail, a toll-free telephone and fax line, and the MD Web site. Further, the communities near the proposed reactors and all other interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

WASHDC–19 **Waste Management**

As described in Section 4.28.2.2, the volume of LLW generated at the reactor sites is not expected to increase as a result of the reactors using MOX fuel. There are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle. However, as discussed in response WASHDC–10, the only time significant quantities of fission products could be released to the environment or end up in LLW would be in the event of a large-scale fuel leak. The amount of radioactivity that can be received at commercial LLW disposal sites is determined through the NRC licensing process for the particular site (e.g., Barnwell). This licensing process considers potential impacts on the environment near the disposal unit. Reactor wastes are only accepted if they meet the waste acceptance criteria of the disposal site. The LLW generated at the proposed reactors that would use MOX fuel is expected to meet the waste acceptance criteria.

WASHDC–20 **Waste Management**

The reactors proposed for MOX fuel irradiation would not be operated by DOE. The reactors would continue to be operated by the utilities and regulated by NRC. Eventual D&D of the reactors, which may include recycling of metals, would be performed by the utilities in accordance with NRC regulations in force at that time. However, it is premature to assume that scrap metal at the reactors would be recycled as part of D&D.

I would like to see a table comparing the wastes associated with the use of MOX versus LEU fuel and another comparing the MOX and immobilization approaches to surplus plutonium disposition. This table would make matters clearer for the public. The public would see that the MOX approach involves more steps and thus more opportunities for something to go wrong, more expense, and more waste streams. The taxpayer dollar spent on these processes goes to someone, and it represents a kind of nuclear welfare. I think that the energy producers are going to start noticing that in a deregulated market some people are getting a handout. 21

The environmental analysis does not state the positive health and safety impacts of substituting MOX fuel for the LEU fuel. Once MOX fuel is used, you will see that the impacts of using LEU are worse. This will not clean up our entire area, but it will make an improvement. I wish everyone would look at both side of the issue and make a mature decision. 22

Is DOE planning to conduct a public meeting next week in Russia? Have public meetings ever taken place in Russia? 23

WASHDC–21 **Alternatives**

This SPD EIS does not evaluate MOX, by itself, versus immobilization. Rather, this EIS evaluates hybrid alternatives (i.e., both immobilization and MOX) and immobilization-only alternatives. All of the surplus plutonium would not be made into MOX fuel because of the complexity, timing, and cost that would be involved in purifying the material to make it suitable for fabrication. A simple comparison of these approaches at the same site can be observed by comparing Alternative 2 to Alternative 11A in Table 2–4. This EIS does, however, look at the differences in operating the reactors with LEU and MOX fuel. Section 4.28 indicates that there is very little difference in the potential impacts of reactor operation, including waste generation, using MOX fuel in place of up to 40 percent of the LEU assemblies as proposed.

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors.

WASHDC–22 **MOX Approach**

Section 4.28.3 was added to this SPD EIS to show an estimate of the environmental impacts that would be avoided if MOX fuel was substituted for LEU fuel at the proposed reactors.

WASHDC–23 **General SPD EIS and NEPA Process**

DOE has no plans to hold a public hearing in Russia and has not held any public hearings there on this subject.

Why has DOE not held any meetings at any of the reactor communities? | 24

The citizens of the United States do not have access to the radionuclide profile analysis from France. Under the National Environmental Policy Act (NEPA) process what can be done to enable public review of that information? What other information is being discussed that the public does not have access to? | 25

WASHDC–24 **General SPD EIS and NEPA Process**

After careful consideration of its public involvement opportunities, including availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on *the Supplement to the SPD Draft EIS*. DOE felt there were sufficient other means provided for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. For those interested parties who could not attend the hearing on the *Supplement* in Washington, D.C., on June 15, 1999, DOE provided the various other means discussed above for the public to express their concerns and provide comments. Further, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

WASHDC–25 **General SPD EIS and NEPA Process**

In accordance with CEQ implementing regulations (40 CFR 1506.6(f)), DOE has provided copies of reports and documents used in the preparation of this SPD EIS in DOE reading rooms and made them available on their Web site at http://www.doe–md.com. The radionuclide profile analysis referred to by the commentor was not used in this EIS but may be available from COGEMA. Information on COGEMA's environmental record can be found on their Web site at http://www.cogema.com or by contacting Ms. Christi A. Byerly. Her address is: 7401 Wisconsin Avenue; Bethesda, MD 20814. She may also be contacted by telephone at (301) 941-8367. Her fax number is (301) 652-5690, and her email address is cbyerly@cogema-inc.com.

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I am confused as to where DOE is in the NEPA process. Has the public been given the information needed to assess the dual-track approach. Is it DOE's opinion that the public will be able to compare and comment on the impacts of the immobilization-only and dual-track approaches? 26

The affected communities have been ignored by DOE, NRC, and Duke. We are tired of being ignored. All you want to do to us is dump on us and use us. The public does not know about these issues and is being deceived. 27

WASHDC–26 **General SPD EIS and NEPA Process**

DOE is committed to providing the public with comprehensive environmental reviews of its proposed actions in accordance with NEPA and believes it provided numerous opportunities and means for public comment on the program. The SPD Draft EIS analyzed each environmental resource area in a consistent manner across all the alternatives to allow for a fair comparison among the alternatives and among the candidate sites for surplus plutonium disposition facilities. The comment period for the SPD Draft EIS was extended from 45 days to 60 days. During that time, DOE convened five public hearings to obtain oral and written comments from the public. These hearings were open to all individuals and organizations, and their format was intended to encourage public discussion and interaction.

As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. Responses to those comments are provided in Volume III, Chapter 4.

WASHDC–27 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's concern that they are being ignored, taken advantage of, and not kept informed. Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North

In regard to the public hearing process, DOE has made a good attempt, but not having meetings since the reactors were chosen and not having those meetings in the affected communities are like a slap in the face. DOE has an obligation to hold meetings in the reactor communities and to educate the public as to what is going to be used in the reactors. 28

I am opposed to use of plutonium in Duke reactors. 29

Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. For those interested parties who could not attend the hearing on the *Supplement*, DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Further, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

To stay informed and involved on the progress of the surplus plutonium disposition program, request to be included on the mailing list by visiting the MD Web site at http://www.doe-md.com, or writing to the following address: Office of Fissile Materials Disposition, United States Department of Energy, P.O. Box 23786, Washington, DC 20026-3786. Another source of information is the public reading rooms located at each of the DOE sites.

WASHDC–28 **General SPD EIS and NEPA Process**

Although DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS*, since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy, including informing and educating the public. DOE has presented information about the disposition of fissile materials to the public in various forms: public hearing presentations, fact sheets, exhibits, technical reports, visual aids, and a video. Information has been distributed by such mechanisms as mail, email, fax, Web sites, telephone, and press interviews.

WASHDC–29 **Reactors**

DOE acknowledges the commentor's opposition to using MOX fuel in Duke reactors. The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this. Section 4.28 was revised to discuss the potential environmental impacts of operating the Duke reactors (Catawba and McGuire) with MOX fuel.

The representative of COGEMA stated that information is sent to those who ask. What is the address? | 30

In view of the fact that you have no plans for holding meetings in the Southeast, my organization, the Nuclear Information and Research Service, will submit three videotapes of its hearings. We gave individual members of the public an opportunity to get information and make comments. There is a zero relationship between the tapes and public meetings. | 31

Who is the contractor chosen to complete the MOX fuel process? COGEMA has a vested interest in reprocessing technologies worldwide. | 32

WASHDC–30 **MOX RFP**

Information on COGEMA's environmental record can be found on their Web site at http://www.cogema.com or by contacting Ms. Christi A. Byerly. Her address is: 7401 Wisconsin Avenue; Bethesda, MD 20814. She may also be contacted by telephone at (301) 941-8367. Her fax number is (301) 652-5690, and her email address is cbyerly@cogema-inc.com.

WASHDC–31 **General SPD EIS and NEPA Process**

Videotapes of hearings hosted by the Nuclear Information and Research Service were not received by DOE.

For those interested parties who could not attend the public hearing on the *Supplement to the SPD Draft EIS,* DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Equal consideration was given to all comments, regardless of how or where they were received. Further, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process should the MOX approach be pursued per the SPD EIS ROD.

WASHDC–32 **MOX RFP**

The contractor selected by DOE for MOX fuel fabrication and irradiation services, is DCS. They would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel in domestic, commercial reactors. However, these activities are subject to the completion of the NEPA process. Should the decision be made to proceed with the hybrid approach, COGEMA would lend its expertise within the limits of the contract, which does not have any provisions for reprocessing.

U.S. policy dating back to the Ford Administration has prohibited the commercial, chemical reprocessing and separation of plutonium from spent nuclear fuel. The use of U.S. surplus plutonium in existing domestic, commercial reactors does not involve reprocessing (reprocessing is a chemical separation of uranium, transuranic elements [including plutonium], and fission products from spent reactor fuel and the reuse of the plutonium and uranium to produce new fresh fuel). The proposed use of MOX fuel is consistent with the U.S. nonproliferation policy and would ensure that plutonium which was

It is appalling that the consortium is relying on the operating experience of European reactors, which use different fuel, and that the safety records of the consortium have not been made available. | 33

I understand it has been requested that some of the Federal budget money earmarked for APSF be moved to the SRS canyons project. Will this diversion of money affect the APSF project in the long term? | 34

What types of activities or technologies can the United States provide to Russia before the U.S.–Russian agreement is in place in September? | 35

produced for nuclear weapons and subsequently declared excess to national security needs is never again used for nuclear weapons.

WASHDC–33 **MOX Approach**

Information gleaned from experience of European reactors is one of many factors taken into consideration in developing the strategy for using the MOX fuel in domestic, commercial reactors. The environmental, safety and health consequences of the MOX approach in the proposed reactors are addressed in Section 4.28. In addition, NRC would evaluate license applications and monitor the operations of both the MOX facility and reactors selected to use MOX fuel, to ensure adequate margins of safety. As discussed in the revised Section 4.28, the most recent performance assessments of the reactors selected to irradiate MOX fuel, completed in the first three months of 1999, were deemed acceptable by NRC. (In 1999, NRC began to perform plant performance reviews instead of the systematic assessments of licensee performance. At that time, NRC changed its rating system from adjectives of acceptable, good or superior, to one of acceptable or unacceptable.)

WASHDC–34 **Other**

The funding of APSF is beyond the scope of this SPD EIS. Since it is uncertain whether APSF will be built, this SPD Final EIS does not take any credit for the presence of APSF and has revised any discussion of APSF to include the phrase "if built" to inform the reader of this uncertainty. This change is discussed in more detail in Chapter 1 of Volume I.

WASHDC–35 **Nonproliferation**

The United States and Russia have been engaged in extensive ongoing cooperative research, small-scale tests, and demonstrations of plutonium disposition technologies under the auspices of the *Agreement on Scientific and Technical Cooperation in the Management of Plutonium.* Technical subjects addressed in these collaborative efforts include conversion of plutonium metal to an oxide form, use of weapons-grade plutonium in MOX fuel in various types of nuclear power reactors, and immobilization of plutonium into forms suitable for geologic disposal.

To date has any technology been transferred from the United States to Russia? There is a May 4, 1999, application on file with NRC, but it does not really say what would be transferred to Russia. Will this technology or information go forward before the agreement is finalized? 36

Is DOE sure that equipment can be exported before the U.S.–Russian agreement is in place? 37

MOX fuel does not meet the goals outlined by the Office of Fissile Materials Disposition. The Russians are really trying to pursue the reprocessing of plutonium, which is contrary to U.S. policy. Our leadership is always confused, and it seems that it may be getting manipulated. The clearest expression of our policy seems to be, "Follow us; we are right behind you." The relationship of our policy and our goals is confusing to Russia. Therefore, I question whether our policy is meeting the goals that the two countries share. 38

WASHDC–36 **Nonproliferation**

Technology that has been transferred to date includes a code package for performing safety analyses on fast reactors, critical experiment data to validate computer safety codes, and data on irradiation of MOX fuel in commercial U.S. reactors. The May 4, 1999, NRC license application is intended to cover equipment for manufacturing fuel. The precise equipment list will be developed once Russia has selected the fuel fabrication methods it intends to use for this mission. Equipment and technology may be transferred to support work covered by the *Agreement on Scientific and Technical Cooperation in the Management of Plutonium* signed in July 1998. All transfers of equipment and technology completed to date were covered by individual licenses submitted on a case-by-case with the appropriate government organization.

WASHDC–37 **Nonproliferation**

Yes, equipment may be transferred to support work covered by the *Agreement on Scientific and Technical Cooperation in the Management of Plutonium* signed in July 1998.

WASHDC–38 **Nonproliferation**

The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this.

The *Joint Statement of Principles* signed by Presidents Clinton and Yeltsin in September 1998 provide general guidance for achieving the objectives of a future bilateral agreement to disposition surplus plutonium in the United States and Russia. Sensitive negotiations between the two countries have indicated that the Russian government accepts the technology of immobilization for low-concentration, plutonium-bearing materials, but that the MOX approach would be considered for higher-purity feed materials.

Why run the security risk of MOX fuel fabrication and use? We have tried to discuss security with NRC with no avail. The United States has so many nuclear weapons that it is easy for people to get their hands on weapons-grade plutonium. The availability of plutonium, however, is not a good excuse for its use in MOX fuel. In fact, the use of MOX fuel will end nonproliferation as we know it. 39

Commercial nuclear power is already highly uneconomical, environmentally damaging, and dangerous. No new reactors have been built since Three Mile Island. Americans want renewable energy, not nuclear power, which produces radioactive waste for which there are no accommodations. Plutonium was made for bombs; using it in commercial reactors is dangerous. 40

WASHDC–39 **Nonproliferation**

DOE acknowledges the commentor's concern for security of MOX fuel. The proposed DOE surplus plutonium disposition facilities are all at locations where plutonium would have the levels of protection and control required by applicable DOE safeguards and security directives and requirements. Safeguards and security programs would be integrated programs of physical protection, information security, nuclear material control and accountability, and personnel assurance. Physical barriers; heavily armed guards; access control systems; detection and alarm systems; procedures, including the two-person rule (which requires at least two people to be present when working with special nuclear materials in the facility); and personnel security measures, including security clearance investigations and access authorization levels, would be used to ensure that special nuclear materials stored and processed are adequately protected. Closed-circuit television, intrusion detection, motion detection, and other automated materials monitoring methods would be employed. Furthermore, the physical protection, safeguards, and security for the MOX facility and domestic, commercial reactors would be in compliance with NRC regulations. International inspections of the proposed facilities would be conducted strictly by procedure so as not to compromise security.

WASHDC–40 **DOE Policy**

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry or provide a new energy source. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. The proposed use of MOX fuel is consistent with the U.S. nonproliferation policy and would ensure that plutonium which was produced for nuclear weapons and subsequently

There seems to be an implication in the viewgraphs that there are two options: one, immobilization of all 50 t (55 tons); the other, a combination of immobilization and the irradiation of MOX fuel. Are these in fact the options, and when will there be a decision as to going one way or the other? 41

What is aqueous polishing, and how is it incorporated into the surplus plutonium disposition process? Is there experience in other places with aqueous polishing. 42

Is part of the reprocessing process at La Hague? 43

declared excess to national security needs is never again used for nuclear weapons.

The use of renewable energy sources is beyond the scope of this SPD EIS.

WASHDC–41 **Alternatives**

Section 2.3.1 explains the development of the 15 reasonable alternatives that were analyzed in this SPD EIS. Four of the alternatives (11A, 11B, 12A and 12B) provide the option to immobilize all the surplus plutonium while the other eleven provide facility siting options of the hybrid approach of using both immobilization and MOX fuel fabrication. DOE has identified as its preferred alternative a hybrid approach to disposition up to 50 t (55 tons) of surplus plutonium. Under this approach, approximately 33 t (36 tons) of clean plutonium would be used to fabricate MOX fuel, which would be irradiated in domestic, commercial reactors. The remaining 17 t (19 tons) of low-purity plutonium would be immobilized because it is not suitable for fabrication into MOX fuel due to the complexity, timing, and cost that would be involved in purifying those plutonium materials. Decisions on the surplus plutonium disposition program will be based on environmental analyses, technical and cost reports, national policy and nonproliferation considerations, and public input. DOE will announce its decisions regarding facility siting and approach to surplus plutonium disposition in the SPD EIS ROD no sooner than 30 days after publishing the SPD Final EIS.

WASHDC–42 **Plutonium Polishing**

Aqueous polishing as proposed for surplus plutonium disposition is a process that removes gallium and other impurities that can affect the use of the plutonium as reactor fuel from the plutonium dioxide feed for the MOX facility. The process, described in Section 2.4.3.2, would dissolve plutonium dioxide in nitric acid, subject the solution to solvent extraction, then convert the solution back to an oxide powder through precipitation. Similar processes have been used at many DOE facilities including Hanford, LANL, and SRS.

WASHDC–43 **MOX RFP**

La Hague is a reprocessing facility. However, U.S. policy dating back to the Ford Administration has prohibited the commercial, chemical reprocessing

Immobilization is safer, faster, and cheaper. You have agreed to immobilize 17 tons of surplus plutonium, but probably only because it is not suitable for MOX fuel. All of the material could be immobilized, so why not immobilize all of it? Why resort to MOX fuel at all? 44

We find the MOX plan unacceptable, for it poses unreasonable risks to public health and the environment, undermines U.S. nonproliferation goals, and lacks a sound economic strategy. 45

and separation of plutonium from spent nuclear fuel. The U.S. surplus plutonium would be fabricated into MOX fuel at a secure DOE site that is owned by the U.S. Government and would be irradiated in the selected domestic, commercial reactors. This does not involve reprocessing (reprocessing is a chemical separation of uranium, transuranic elements [including plutonium], and fission products from spent reactor fuel and the reuse of the plutonium and uranium to produce new fresh fuel).

WASHDC–44 **Alternatives**

DOE has identified as its preferred alternative the hybrid approach which includes both immobilization and MOX fuel. As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach would be more expensive than the immobilization-only approach. However, pursuing the hybrid approach provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

WASHDC–45 **MOX Approach**

DOE acknowledges the commentor's opposition to the MOX approach to surplus plutonium disposition. DOE has identified as its preferred alternative the hybrid approach.

This SPD EIS identifies and analyzes the potential human health and environmental impacts from the construction and normal operation of the MOX facility, and irradiation of MOX fuel in the Catawba, McGuire, and North Anna reactors. The proposed use of MOX fuel is consistent with the U.S. nonproliferation policy and would ensure that plutonium which was produced for nuclear weapons and subsequently declared excess to national security needs is never again used for nuclear weapons.

The utilities are in this for money, and that money will be furnished by taxpayers. We need to forgo this endeavor and allow for the phaseout and shutdown of nuclear energy operations. Immobilization should be our focus. | 46

Is the annual 10 million dollar cap stipulated in the Request for Proposals no longer applicable? | 47

A separate cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), which analyzes the site-specific cost estimates for each alternative, was made available around the same time as the SPD Draft EIS. This report and the *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013, November 1999), which covers recent life-cycle cost analyses associated with the preferred alternative, are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

WASHDC–46 **MOX Approach**

Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. If the effective value of the MOX fuel exceeds the cost of the LEU fuel that it displaced, then the contract provides that money would be paid back to the U.S. Government by DCS based on a formula included in the DCS contract. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program.

WASHDC–47 **MOX RFP**

The $10,000,000 cap is no longer applicable. During negotiations it was clear that fluctuations in the price of LEU that the MOX fuel would replace, a variable that the contractor has no control of, has a significant impact on the economics. In order to ensure an equitable sharing of risk, a revised approach to the maximum Government liability was included in the final negotiated contract. The revised approach includes a consideration of market price of LEU as well as other variable factors affecting the fabrication of MOX fuel

Will there be disclosure to the taxpayers of how much utilities will be compensated, over and above their costs, for participation in this program? | 48

Who is liable for environmental damage during the transportation and irradiation of MOX fuel? | 49

Is the plutonium still Government material after it is converted to MOX fuel? | 50

I am concerned about the dimensional stability of MOX fuel. If the fuel shrinks slightly, there is a loss of heat transfer between the fuel and the cladding, which can lead to fuel melting. If there is expansion, resulting pressure on the cladding can cause a rupture. It is my understanding that COGEMA has more experience with these processes. What is the consortium's track record? | 51

such as throughput and escalation. The final methodology to determine the maximum cost to the Government for any given year is to be submitted by the contractor for DOE approval prior to commencement of fabricating MOX fuel.

WASHDC–48 **MOX RFP**

The utilities would be compensated for all costs in excess of the cost associated with the use of LEU which are directly attributable to MOX fuel. These costs include, for example, increased NRC oversight costs; modification costs required for the proposed reactors to use MOX fuel; and increased costs for additional LEU enrichment. In addition, the utilities would receive the MOX fuel at a discounted price when compared to the price of the LEU fuel that the MOX fuel replaces. The exact amount of the discount is set in the contract. It is between 10 and 50 percent.

WASHDC–49 **DOE Policy**

The reactor licensee is responsible for the MOX fuel once it is received at the reactor site. The transportation of special nuclear materials, including fresh MOX fuel is the responsibility of DOE's Transportation Safeguards Division. The transportation of the MOX spent fuel to the potential geologic repository for disposal would also be the responsibility of DOE.

WASHDC–50 **DOE Policy**

DOE would own the MOX facility and MOX fuel until the fuel was received at the reactor site. At that point, the fuel would become the responsibility of the reactor licensee.

WASHDC–51 **MOX RFP**

FRAGEMA's (a subsidiary of COGEMA and FRAMATOME) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods for commercial reactor use. There have been no failures (including fuel melts or ruptures) and leaks have occurred in only 3 assemblies (a total of 4 rods). All leaks occurred as a result of debris in the reactor coolant system and occurred in 1997 or earlier. The French requirements for

I am curious about your position on differences between MOX spent fuel and the low-level radioactive waste that is generated in the normal operation of the reactor, and about your estimation of the amounts of plutonium that would be released under recycle or clearance level rulemaking in which NRC is currently involved. I am defining "recycle" in terms of materials that can be converted into consumer products. 52

In performance of the health evaluations, what is the biological effectiveness rating used for alpha emitters? 53

According to the *Supplement*, the MOX fuel assemblies would only be irradiated for two cycles, whereas uranium is now irradiated for three 18-month cycles. What is the basis for making that change to operating procedures? Will accommodations for that change have any impact on existing fuel management? What is the highest rod burnup on discharge of the second-cycle fuel assemblies? What is the highest burnup for the second cycle that we can expect? Do you have any plans for transition to three cycles for MOX fuel in the course of the program? 54

debris removal were changed in 1997 to alleviate these concerns. Since that time, there have been no leaks in MOX fuel rods.

WASHDC–52 **Waste Management**

There are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle. However, the only way significant quantities of fission products could end up in LLW would be in the event of a large–scale fuel leak. As discussed in the previous response, there have been no failures and very few leaks in FRAGEMA's experience. The use of MOX fuel would not be expected to result in any additional LLW from refuelings because the reactors would continue to operate on the same schedule as if they were using only LEU fuel. Eventual D&D of the reactors, which may include recycling of metals, would be performed by the utilities in accordance with NRC regulations in force at that time. However, it is premature to assume that scrap metal at the reactors would be recycled as part of D&D and end up in consumer products.

WASHDC–53 **Human Health Risk**

The latest published version of 10 CFR 20.1004 (January 1, 1999) states that the quality factor for alpha particles is 20, and this factor was used in the analysis performed for this SPD EIS. This regulatory criteria (10 CFR 20) is established by NRC, and is therefore the official benchmark from which U.S. nuclear utilities are continually governed in the realm of radiation protection.

WASHDC–54 **MOX Approach**

The fuel management plan that would be used with the MOX assemblies does not reflect a change in operating procedures, other than the fact that some of the assemblies would be MOX rather than LEU. The DCS team utility companies currently use a typical 18-month fuel cycle, replacing approximately 40 percent of the fuel assemblies in a reactor at each refueling. Some assemblies are used for two cycles, some for three cycles. The utilities plan to maintain the current fuel management schemes and would use the MOX fuel assemblies for only two cycles. There are currently no plans to transition to three cycles for the MOX assemblies.

The EIS indicates that 0.25 mg of plutonium will be released annually into water and air at the fabrication facility. This seems like a very large amount. How much would be released into the air or water annually near the reactor communities? Will those numbers be written out somewhere? I want to know the numbers. My definition of significant might not be the same as yours. 55

I recently wrote a report criticizing the analysis of design basis accidents for reactors using MOX fuel. My criticism focused on the treatment of the emissions of plutonium and other alpha-emitting actinides in beyond-design-basis accidents at reactors, and the impacts of those emissions in terms of additional latent cancer fatalities. It is noteworthy that the *Supplement* reflects recalculations that are much closer to my figures. There are, however, some outstanding questions relative to those calculations. For example, it is not clear for how long into the future the dose is calculated. What are the assumptions? Will there be evacuation or cleanup? It is impossible for someone to make an independent check without knowing all of the parameters and assumptions. I hope that these will be provided in the SPD Final EIS. The document is still inadequate with regard to the discussion of potential differences in the consequences of accidents and the risks of severe accidents associated with the use of MOX fuel. There is still no discussion of very germane, unresolved fuel performance issues associated with the current generation of MOX fuel that have been noted in Europe; increased fission gas generation, increased fuel temperature, and the Cabri reactor test go unmentioned in the document. There is also no concrete discussion of the severe accident risks of the reactors that have been chosen. In particular, four of the six reactors have special ice condenser containments that are not representative of the fleet of U.S. pressurized water reactors, and NRC has outstanding concerns about their performance. 56

MOX fuel burnup is proposed at a maximum burnup of 45 GWD/t with peak pin burnup at 50 GWD/t. Actual MOX fuel burnup limits would be established in concert with the NRC following a thorough safety review. It should be noted that reactors in Belgium and Germany typically use MOX fuel to burnups between 45 and 50 GWD/t and that while current French burnup limits are lower than that, French burnup limits for LEU fuel are also lower than those for U.S. reactors.

WASHDC–55 **Human Health Risk**

From a scientific standpoint, an annual release of 0.25 mg of plutonium is a very small quantity. There would be no expected releases of plutonium isotopes from the proposed reactors occurring from normal operating conditions. Doses to an MEI at each of the plants are also expected to be small—i.e., McGuire, 0.31 mrem; Catawba, 0.73 mrem; and North Anna, 0.37 mrem. All of these doses fall within stringent NRC 10 CFR 20 and 10 CFR 50 regulatory requirements.

WASHDC–56 **Facility Accidents**

The accident results in Section 4.28 have been revised to incorporate computer code corrections. The accident calculation is included in the Administrative Record for this SPD EIS. The calculation contains all of the input parameters including the MACCS2 computer files.

The particular "control rod ejection" scenario is a bounding postulated accident. None has ever occurred at a nuclear power plant. The Cabri RIA test program was designed to challenge typical fuel rods under conditions that are more extreme than conditions that would be experienced during a real pressurized water reactor control rod ejection. Out of the nine Cabri tests (six with uranium fuel, three with MOX fuel), two uranium fuel rods and one MOX fuel rod experienced failures. The MOX failure occurred at an energy deposition rate that is greater than can realistically be reached by high burnup fuel, even after an extremely unlikely worst case control rod ejection. These data, both for LEU and MOX fuel, will be used in ongoing fuel design studies.

While it is understood that there are differences from the use of MOX fuel versus LEU fuel, these differences are not expected to decrease the safety of

I have heard nothing about what will be done with the additional waste from this process. | 57

the reactors. All of the factors discussed by the commentor were evaluated by the proposed reactor licensees to ensure that the reactors, including those with ice condensers, can continue to operate safely using MOX fuel and will continue to be evaluated. Before any MOX fuel is used in the United States, NRC would have to perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications.

WASHDC–57 **Waste Management**

As described in Section 4.28.2.2, the volume of waste generated is not expected to increase as a result of the reactors using MOX fuel. The wastes would continue to be handled in the same manner as they are today with no change required due to the use of MOX fuel at the reactors.

As described in Sections 2.18.3 and 4.28.2.8, additional spent fuel would be produced by using MOX fuel instead of LEU fuel in domestic, commercial reactors. Spent fuel management at the proposed reactor sites is not expected to change dramatically due to the substitution of MOX assemblies for some of the LEU assemblies. Likewise, the additional spent fuel would be a very small fraction of the total that would be managed at the potential geologic repository.

This SPD EIS assumes, for the purposes of analysis, that Yucca Mountain, Nevada, would be the final disposal site for all immobilized plutonium and MOX spent fuel. As directed by the U.S. Congress through the NWPA, as amended, Yucca Mountain is the only candidate site currently being characterized as a potential geologic repository for HLW and spent fuel. DOE has prepared a separate EIS, *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999), which analyzes the environmental impacts from construction, operation and monitoring, related transportation, and eventual closure of a potential geologic repository.

My principal concerns go to the well-known toxicity of plutonium. The only solution to the management of the radioactive waste generated by the production and use of plutonium in the weapons program would be isolation for the full hazardous life of the materials. It appears that the hazardous life is now far longer than we had previously understood. Recent research findings with respect to alpha emitters and alpha-related damage at the cellular and subcellular level indicate far greater risks of cancer and other health impacts than are currently considered in the setting of radiation protection standards. (Those standards are currently based on either the lifetime risk of fatal cancer or gross genetic defects in the first couple of generations.) We have been learning more in recent years about the impacts of low-dose irradiation, particularly as it may be received repeatedly over a period of time. The most recent studies show that DNA may be affected by exposures in the cytoplasm rather than the nucleus of a cell. There may also be a delayed mutational effect at the cellular level. This means that we may have underestimated the impacts of alpha emitters. At the Second International Symposium on Ionizing Radiation (held in Canada), a statement was made that rather than the range of biological effectiveness that was previously used, 2- to 20-fold, it may be necessary for us to consider a quality factor of 2,000 or more with respect to alpha emitters. Moreover, all of the international regulators attending that conference concurred that it is necessary to set protective standards for each distinctive component of the environment for its own sake. NRC was not represented at the conference. 58

Where are the transport corridors and what communities would be affected? Where are the results of that analysis? 59

WASHDC–58 **Human Health Risk**

DOE acknowledges the commentor's concern of the toxicity of plutonium and its effects on human health. The latest published version of 10 CFR 20.1004 (January 1, 1999) states that the quality factor for alpha particles is 20, not 2000. This regulatory criteria (10 CFR 20) is published in coordination with NRC, and is the official benchmark from which U.S. nuclear utilities are continually governed in the realm of radiation protection.

WASHDC–59 **Transportation**

The transportation of special nuclear materials is the subject of detailed planning with DOE's Transportation Safeguards Division. The dates and times that specific transportation routes would be used for special nuclear materials are classified information; however, the number of shipments that would be required, by location, has been included in Appendix L. The results of transportation analyses are presented in the transportation sections in Chapter 4 of Volume I. Additional details are provided in *Fissile Materials Disposition Program SST/SGT Transportation Estimation* (SAND98-8244, June 1998), which is available on the MD Web site at http://www.doe-md.com.

I am glad DOE will be using safe, secure transport. However, the communities the vehicles are to pass through will not know about the materials being transported. Can you tell me where it says in the law or regulations that these individuals do not have a right to this information? 60

Transportation has not been given enough emphasis. 61

There has not been adequate inclusion of the areas through which this material would be transported. Any terrorist who wants to find out where the material is can simply track the shipments. 62

WASHDC–60 **Transportation**

The dates and times that specific transportation routes would be used for special nuclear materials are classified information; however, the number of shipments that would be required, by location, has been included in Appendix L. DOE Safeguard and Security Orders govern the handling and transport of fissile materials and can be found on the DOE Web site at http://www.explorer.doe.gov.

WASHDC–61 **Transportation**

DOE acknowledges the commentor's concern that the transportation issue has not been given enough emphasis. The transportation requirements for the surplus plutonium disposition program are evaluated in this SPD EIS. Potential environmental impacts of transportation are presented in the transportation sections in Chapter 4 of Volume I and in more detail in Appendix L. The transportation of special nuclear materials is the subject of detailed planning with DOE's Transportation Safeguards Division. The dates and times that specific transportation routes would be used for special nuclear materials are classified information; however, the number of shipments that would be required, by location, has been included in Appendix L. Additional details are also provided in *Fissile Materials Disposition Program SST/SGT Transportation Estimation* (SAND98-8244, June 1998), which is available on the MD Web site at http://www.doe-md.com.

WASHDC–62 **Transportation**

DOE has considered the inherent risks, including terrorist concerns, associated with transporting plutonium materials. While DOE prefers to minimize the transportation of plutonium that is still desirable for weapons use, plutonium is routinely and safely transported in the United States every day. As described in Appendix L.3.3, transportation of nuclear materials would be performed in accordance with all applicable DOT and NRC transportation requirements. Interstate highways would be used, and population centers avoided, to the extent possible. All shipments of surplus plutonium that have not been converted to a proliferation-resistant form would be made by DOE's SST/SGT system, as described in Appendix L.3.2.

Response WASHDC–59 provides additional information related to transportation concerns.

All of the communities on the transportation route are affected communities. I would like to call your attention to a DOE-commissioned study by Dr. Jenkin Smith at the University of New Mexico. This study very thoroughly documents public concerns with the transport of any type of nuclear materials. The public is discerning as to whether it wants to take a risk, and as to the causes and goals of the risk. Nevertheless, there are those in the community who have more to say before a decision is made—some of them in support of immobilization at SRS. I believe, furthermore, that there are those out there in the general public who can distinguish one goal from another. They are aware, for example, that the transportation of plutonium would be more complicated—i.e., involve more steps—for the MOX fuel option than for immobilization. Because all persons in the transportation areas would be affected, all should be included in this information exchange on the issue of transportation. 63

The people of Southeast know little of this program and have no access to the relevant information. How many DOE persons are available to come down to the reactor communities and attend meetings like this one? 64

WASHDC–63 **Transportation**

Transportation would be required for both the immobilization and MOX approaches to surplus plutonium disposition. Transportation of special nuclear materials, including fresh MOX fuel, would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material.

DOE acknowledges the commentor's concern that all persons along the transportation routes be included in the information exchange. Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. It hosts frequent workshops, and senior staff members make presentations to local and national civic and social organizations on request. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue. It is DOE policy to encourage public input into these matters of national and international importance.

WASHDC–64 **General SPD EIS and NEPA Process**

Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. For those interested parties who could not attend the meeting on the *Supplement*, DOE

I am glad to hear that additional meetings are going to be considered. We have been told of the 80 meetings that you as an office have held. We would like to get a list of those meetings showing when and where they were held, how they were announced, and what topics were discussed. Laura Holgate did not stay to hear the earlier comments or questions, and she is not here this afternoon. How serious can this be taken if the Director does not stay?

65

provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. After careful consideration of its public involvement opportunities, including the availability of information and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement*. DOE felt there were sufficient other means provided for the public to express their concerns and provide comments as discussed above. Further, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy, including informing and educating the public. DOE has presented information about the disposition of fissile materials to the public in various forms: public hearing presentations, fact sheets, exhibits, technical reports, visual aids, and a video. Information has been distributed by such mechanisms as mail, email, fax, Web sites, telephone, and press interviews. To learn more about the surplus plutonium disposition program or request to be included on the mailing list, visit the MD Web site at http://www.doe-md.com, or write to the following address: Office of Fissile Materials Disposition, United States Department of Energy, P.O. Box 23786, Washington, DC 20026-3786. Information on the program is also available in the public reading rooms located at each of the DOE sites.

WASHDC–65 **General SPD EIS and NEPA Process**

Although DOE decided not to hold additional meetings on the *Supplement to the SPD Draft EIS,* other means have been provided for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Further, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process should the MOX approach be pursued per the SPD EIS ROD.

Laura Holgate regrets she was not able to attend the entire hearing but she was required to meet with the State Department in preparation for her trip to Russia. Dave Nulton, the program manager since the inception of MD in 1994, is well versed in the surplus plutonium disposition program and has acted on

the behalf of Ms. Holgate on many occasions. DOE is entrusted with implementing the U.S. nonproliferation policy and takes that responsibility very seriously.

The following is the list of meetings and hearings detailing the dates and location, by topic, of previous public meetings and hearings held by DOE that addressed the fissile materials disposition program. These meetings and hearings were advertised to the public through newspaper advertisements, special mailings, or public service announcements. Scoping meetings and hearings on draft NEPA documents included two complete sessions for each date given (usually one in the afternoon and one in the evening; and in Washington, D.C., one in the morning and one in the afternoon).

DOE PUBLIC MEETINGS AND HEARINGS RELATING TO THE STORAGE AND DISPOSITION OF WEAPONS-USABLE FISSILE MATERIALS PROGRAM

Pre-Scoping Meetings for *Storage and Disposition of Weapons-Usable Fissile Materials PEIS*

Date	Location
4/21/94	Washington, DC[1]
5/4/94	Arlington, VA[1]
5/5/94	Arlington, VA[1]
8/5/94	Washington, DC (Public Interest Groups)
9/30/94	Washington, DC (Industry Groups)

[1] DOE provided travel and living expenses for representatives from various organizations to attend this meeting (nongovernmental organizations; tribal representatives; Citizens Advisory Board members, etc.).

Scoping Meetings for *Storage and Disposition of Weapons-Usable Fissile Materials PEIS*

Date	Location
8/17/94	North Augusta, SC
8/24/94	Chicago, IL
8/24/94	Denver, CO
8/31/94	Richland, WA
9/7/94	Amarillo, TX
9/14/94	Boston, MA
9/14/94	Las Vegas, NV
9/21/94	Idaho Falls, ID
9/28/94	Oak Ridge, TN
9/28/94	Livermore, CA
10/5/94	Los Alamos, NM
10/12/94	Washington, DC

Remove HEU from Scope of *Storage and Disposition of Weapons-Usable Fissile Materials PEIS*

Date	Location
11/10/94	Oak Ridge, TN

Review Hearings for *Disposition of Surplus Highly Enriched Uranium Draft EIS*

Date	Location
11/14/95	Knoxville, TN
11/16/95	Augusta, GA

Plutonium Disposition Option Meeting

Date	Location
12/13/94	Washington, DC

Review Hearings for *Storage and Disposition of Weapons-Usable Fissile Materials Draft PEIS*

Date	Location
3/26/96	Denver, CO
3/28/96	Las Vegas, NV
3/29/96	Las Vegas, NV
4/2/96	Oak Ridge, TN
4/11/96	Richland, WA
4/15/96	Idaho Falls, ID
4/18/96	Washington, DC
4/22/96	Amarillo, TX
4/23/96	Amarillo, TX
4/30/96	North Augusta, SC

Date	Location
7/23/96	Austin, TX
7/25/96	Palo Alto, CA
7/29/96	Chicago, IL
7/31/96	Boston, MA
8/1/96	Washington, DC

Proposed Nonproliferation Assessment Outline
Review of *Draft Nonproliferation Assessment*

Date	Location
10/28/96	Oakland, CA
10/28/96	Las Vegas, NV
10/28/96	Idaho Falls, ID
10/30/96	Richland, WA
10/30/96	Portland, OR
11/1/96	Washington, DC
11/4/96	Amarillo, TX
11/6/96	North Augusta, SC
11/6/96	Oak Ridge, TN
11/8/96	Denver, CO

Scoping Meetings for *Surplus Plutonium Disposition EIS*

Date	Location
6/10/97	Idaho Falls, ID
6/12/97	Amarillo, TX
6/19/97	North Augusta, SC
7/1/97	Richland, WA

MOX Procurement Meetings

Date	Location
8/28/97	Chicago, IL
12/11/97	Chicago, IL
5/20/98	Atlanta, GA
5/21/98	Atlanta, GA

Immobilization Conference

Date	Location
5/12/98	Washington, DC

Review Hearings for *Surplus Plutonium Disposition Draft EIS*

Date	Location
8/4/98	Richland, WA
8/11/98	Amarillo, TX
8/13/98	North Augusta, SC
8/18/98	Portland, OR
8/20/98	Idaho Falls, ID

Review Hearing for *Supplement to the Surplus Plutonium Disposition Draft EIS*

Date	Location
6/15/99	Washington, DC

National Dialogue Meetings

Date	Location
7/23–24/96	Chicago, IL
11/18–19/96	Washington, DC
9/6/97	Knoxville, TN
9/9–10/97	Boise, ID
10/20/97	Portland, OR
10/21/97	Richland, WA
10/22/97	Spokane, WA
10/23/97	Seattle, WA
6/22–23/98	San Diego, CA
6/25–26/98	Chicago, IL

DOE Citizens Advisory Boards[2]

Date	Location
2/24/98	Amarillo, TX
6/27/98	Aiken, SC

FISSLE MATERIALS DISPOSITION PROGRAM PARTICIPATION IN PUBLIC MEETINGS SPONSORED BY OTHER ORGANIZATIONS

National Tribal Plutonium Forum

Date	Location
4/30/96	Seattle, WA

Public Meeting Sponsored by South Carolina State Senator Leventis

Date	Location
6/24/99	Columbia, SC

Military Production Network/Alliance for Nuclear Accountability

Date	Location
5/96	Washington, DC (DC Days)
5/94	Washington, DC (DC Days)
1/22/98	Washington, DC
5/98	Washington, DC (DC Days)

[2] MD briefed DOE Citizens Advisory Board meetings upon request. More briefings were provided than those listed.

Is the Brockett report available, and how would I get a copy of it? This report goes back a couple of decades. | 66

I have a concern about COGEMA. In the United States we can ask for information under the Freedom of Information Act and typically get answers from the appropriate agency—NRC, for example. With COGEMA, however, we don't have this opportunity. COGEMA has extensive experience with MOX fuel in its country. Will we have full access to its information on MOX fuel use? How would I go about getting this? | 67

What kind of access do we have to COGEMA's experimental database on the use of MOX fuel? | 68

What was the reason for announcing the Chicago Operations Office address. What information will we receive from that office? I don't think it will be the contract itself. How will we know the quantitative outcome of the new negotiations, which will include replacement of the only compensation rate that the public is aware of? | 69

Will speakers be able to review their comments before they are submitted for publication in the SPD Final EIS? | 70

Speakers Bureau Presentations Given by DOE Personnel

Date	Location
3/25/99	Oklahoma City (Conference of Southern County Associations)
7/19/99	Kansas City (Conference of Southern Legislators)

WASHDC–66 **General SPD EIS and NEPA Process**

DOE was unable to identify the requested report.

WASHDC–67 **MOX RFP**

Information on COGEMA's environmental record can be found on their Web site at http://www.cogema.com or by contacting Ms. Christi A. Byerly. Her address is: 7401 Wisconsin Avenue; Bethesda, MD 20814. She may also be contacted by telephone at (301) 941-8367. Her fax number is (301) 652-5690, and her email address is cbyerly@cogema-inc.com.

WASHDC–68 **MOX RFP**

See response WASHDC–67 for contact information at COGEMA.

WASHDC–69 **General SPD EIS and NEPA Process**

Copies of the redacted contract for MOX fuel fabrication and irradiation services is available from the Chicago Operations Office and were handed out at the June 15, 1999 hearing. Additional copies can be requested by contacting Mr. Robert Selby at (603) 252-2067 or by email, Robert.Selby@ch.doe.gov. This will provide all information on the contractual arrangement between DCS and DOE.

WASHDC–70 **General SPD EIS and NEPA Process**

Notetakers captured the main points of issues or concerns raised by the commentors; therefore, the comments presented here are not a verbatim transcript of the hearing. In the interest of finalizing this SPD EIS it would not be practical to have each speaker review their comments prior to publishing

The Blue Ridge Environmental Defense League opposes the use of plutonium fuel in commercial reactors for the reasons stated in the written comment by Lou Zeller, and for other reasons as well. The planned use of MOX fuel establishes a dangerous precedent in the nuclear industry by needlessly exposing people to the risks of plutonium. DOE will be engaging in a crapshoot if it moves forward with the MOX fuel plan. 71

The public must bear in mind that NRC is proposing to eliminate or curtail adjudicative license proceedings, the only opportunity we have as citizens for access to the judicial system. 72

I resent having to drive—in my case from North Carolina—to a meeting with persons outside the affected area. When the Chicago Operations Office handled a meeting in the Southeast, it was a real formal meeting with a real transcript. Those who held the meeting were patient people who did not pretend that they were in charge; it was a public meeting, and we were in charge. The move to an interactive meeting, even though it may seem to be more polite, diminishes the public's role. In this format the public is not listened to. There must be a more open process and better access to information. Several people are working today and cannot come to the meeting. My democratic rights are threatened due to fact that all relevant information—i.e., proprietary and other corporate information—has not been provided. 73

the Comment Response Document. DOE and the notetakers have made every effort to ensure the essence of each participant's comment(s) has been presented in a clear, concise, and accurate manner. Written comments were accepted at the hearing and have been submitted via fax, mail, or Web site. Equal consideration was given to all comments, regardless of how or where they were received.

WASHDC–71 **MOX Approach**

DOE acknowledges the commentor's opposition to the use of MOX fuel in commercial reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

This SPD EIS identifies and analyzes the potential human health and environmental impacts from the construction and normal operation of the MOX facility. Section 4.28 was revised to discuss the potential environmental impacts of operating Catawba, McGuire, and North Anna, the reactors that would use the MOX fuel.

WASHDC–72 **DOE Policy**

NRC requirements for adjudicative license proceedings are beyond the scope of this SPD EIS.

WASHDC–73 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's concern that the hearing format does not allow the public to be listened to and that the process should be more open, with easier access to information. Since the inception of the fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum

required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue. It is DOE policy to encourage public input into these matters of national and international importance.

Based on the feedback from participants in previous public hearings, DOE used an interactive hearing format. This format facilitates open discussions and better understanding of the proposed actions associated with surplus plutonium disposition. It also provides an opportunity for the participants to meet one another, exchange information, and share concerns. Notetakers captured the main points of issues or concerns raised; these comments, along with the written comments submitted and the phone messages recorded during the public comment periods, were analyzed and responded to. Equal consideration was given to all comments, regardless of how or where they were received.

DOE has also placed copies of data reports and documents used in the preparation of this SPD EIS in DOE reading rooms. DOE is not permitted to disseminate proprietary or classified information, although as much information as possible (e.g., redacted copies of the contract with DCS) has been made available to the public. To learn more about the surplus plutonium

I have a videotape of testimony by people from the reactor community, but have been denied permission to play this tape at the meeting today. I was told there was no opportunity. These people are not being heard. In my view, sane-looking people are making an insane proposal. The Southeast will not be victimized any further by the Federal Government. 74

The proposed reactors have been operated very safely. In fact, nuclear reactors are inherently an environmentally safe source of energy. The only truth told by the antinuclear advocates today is that nuclear power is expensive. That is due to construction costs. Nuclear power does have a role to play. I can't understand why persons have these concerns when the citizens of Lake Anna do not seem to have a problem. 75

Public meetings should be held in the Southeast, and the comment period should be extended to accommodate those meetings. 76

disposition program; DCS, the team selected to fabricate the MOX fuel and irradiate it; request to be included on the mailing list; or to contact the program office, visit the MD Web site at http://www.doe-md.com. Written requests for information on the program can be addressed to: Office of Fissile Materials Disposition, United States Department of Energy, P.O. Box 23786, Washington, DC 20026-3786.

WASHDC–74 **General SPD EIS and NEPA Process**

In the interest of stimulating discussions and providing opportunities for the participants to speak, it was not possible to show the proceedings of other public hearings contained on the videotape. The comments from the videotape and their responses are addressed in the responses identified as DCR005A and DCR005B presented in the State of North Carolina in Volume III, Chapter 4.

WASHDC–75 **MOX Approach**

DOE acknowledges the commentor's belief that nuclear power reactors are a source of safe energy and have a role to play in the disposition of surplus plutonium. Based on the analyses of the potential environmental impacts presented in the revised Section 4.28, DOE believes using MOX fuel in domestic, commercial reactors is an effective way to accomplish the goal of the program. The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Because the reactors selected to use MOX fuel already exist, the expense to build new reactors is avoided.

WASHDC–76 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's request for additional public hearings in the Southeast and extension of the comment period. After careful consideration of its public involvement opportunities, including information availability and mechanisms to submit comments, DOE decided not to hold additional hearings on the *Supplement to the SPD Draft EIS*. However, interested parties will likely have the opportunity to submit additional comments during the NRC reactor license amendment process should the MOX approach be selected. In addition to the public hearing on the

What is the role of Nuclear Fuel Services in Irwin, Tennessee, on the contractor team? | 77

On page 1 of the *Supplement*, it is stated that no construction would begin until the Record of Decision for the *Surplus Plutonium Disposition Environmental Impact Statement* was issued. When you look at the Federal budget request, however, you can see that in 1999 there were appropriations for construction in the amount of 48 million, and 28 million of that was for a MOX fuel fabrication facility. This looks like design, not construction. Will this be changed in the next budget request? It is getting a little confusing. | 78

There are problems in fabricating test fuel at the Los Alamos National Laboratory (LANL). A report indicates that to date 14 batches of MOX fuel test pellets have failed to meet technical specifications or have experienced other problems. I would encourage DOE to address this in the SPD Final EIS. I was thinking that it would be helpful to know if this could affect the time line in a general or specific way. | 79

Supplement held in Washington, D.C., DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Although it did not extend the comment period, DOE did consider all comments received after the close of that period. All comments were given equal consideration and responded to.

WASHDC–77 **MOX RFP**

Nuclear Fuel Services will lend support in the area of safeguards and security based on its experience as a NRC fuel fabrication plant licensee.

WASHDC–78 **DOE Policy**

The money included in the fiscal year 1999 budget request was for the MOX facility design. The terminology used in preparing the budget has been set by the U.S. Congress and Office of Management and Budget. DOE does not have the ability to change this terminology.

WASHDC–79 **MOX Approach**

Fuel fabrication R&D at LANL was sponsored in order to fabricate test fuel for irradiation in the Advanced Test Reactor at INEEL. Fuel for the first irradiation test was fabricated successfully. The second irradiation test was canceled based on technical input from DCS, the team that was selected to fabricate MOX fuel and irradiate it. Fuel R&D continues at LANL because further development is useful to DOE in the event that a lead assembly fabrication facility is needed and for other programmatic purposes, especially related to characterizing the feed powder from the pit conversion facility.

The difficulties encountered with fabrication of MOX test fuel at LANL are due neither to the lack of MOX fuel fabrication capability at LANL nor to generic technical difficulties associated with weapons-grade plutonium. These difficulties are primarily due to switching the uranium oxide used in the MOX test fuel. LANL had successfully fabricated MOX test fuel for the first irradiation test using an uranium oxide commercially supplied by CAMECO. To begin fabrication of the MOX test fuel for the second irradiation test, an uranium oxide from the ammonium uranyl carbonate process was used.

There are some issues I am uneasy about. We (the United States) have a 50-year history of attempting to separate the military and commercial uses of nuclear power, but this MOX approach far more effectively combines the two than anything in the past. It also does not incorporate any means of disposal. The State of Pennsylvania has had a little experience with an experimental reactor that features a partial plutonium core. Over the period during and immediately after its operation, a level of leukemia six times higher than expected was seen in the nearby community. However, these findings were dismissed as insignificant. The people in the environs of the facility are concerned both about the materials remaining in the area and about the impact of releases prior to facility shutdown. 80

Although LANL is involved in this process, along with Pantex, the citizens in the area have been fighting the Waste Isolation Pilot Project (WIPP). WIPP is now open, probably illegally, but that is how you people do business. We don't want any more waste shipped throughout the country, and we particularly don't want to see more waste coming to WIPP or LANL, making it more of a "bomb plant." DOE has made promises of a cleanup but has only been creating more waste. There is no reason to make this MOX fuel. No one wants nuclear power anymore; the nuclear power plants now operating are old and are not being replaced. There is no reason for the Government to get involved in providing fuel to a dead industry that is going to kill us all. 81

WASHDC–80 **DOE Policy**

Consistent with the U.S. policy of discouraging the civilian use of plutonium, a MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. For reactor irradiation, the NRC license would authorize only the participating reactors to use MOX fuel fabricated from surplus plutonium, and the irradiation would be a once-through cycle with no reprocessing. After irradiation, the MOX fuel would be removed from the reactor and managed with the rest of the spent fuel from the reactor, eventually being disposed of at a potential geologic repository built in accordance with the NWPA.

Under normal operating conditions, it is not expected that the makeup of the discharges will change significantly from those associated with non-MOX (LEU) fuel. Electricité de France reactors in France have seen little or no impact from the use of MOX fuel on radionuclide releases in effluents. The use of MOX fuel in U.S. reactors is analyzed in Section 4.28. No LCFs would be expected from normal operations.

Furthermore, annual doses to an MEI at each of the plants are estimated to be small—i.e., McGuire, 0.31 mrem; Catawba, 0.73 mrem; and North Anna, 0.37 mrem. All of these doses fall within stringent NRC 10 CFR 20 and 10 CFR 50 regulatory requirements and are much lower than radiation annually received from natural background sources.

WASHDC–81 **MOX Approach**

The goal of the surplus plutonium disposition program is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Converting the surplus plutonium into MOX fuel and using it in domestic, commercial reactors is an effective way to accomplish this. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program.

This is the first time DOE has gone through NRC in regulating DOE facilities. DOE is paying for the licensing processes. Are you also paying for licensing of the tritium process?	82

The operation of WIPP has been subject to NEPA review, EPA certification, and legal challenge. NEPA documentation for the operation of WIPP was completed in 1997 with the publication of the *WIPP Disposal Phase Final Supplemental EIS* (DOE/EIS-0026-S-2, September 1997) and ROD. The operation of WIPP received EPA certification in May 1998. Despite continued legal challenges, Judge John Garrett's March 22, 1999, ruling paved the way for WIPP to receive its' first waste shipment on March 26, 1999.

Transportation would be required for both the immobilization and MOX approaches to surplus plutonium disposition. Transportation of special nuclear materials, including fresh MOX fuel, would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material. The transportation requirements for the surplus plutonium disposition program are also evaluated in this SPD EIS.

Response WASHDC–80 provides additional information on doses at each of the proposed reactors.

WASHDC–82 **NRC Licensing**

The use of TVA commercial reactors to produce tritium for DOE is addressed in the *Final EIS for the Production of Tritium in a Commercial Light Water Reactor* (DOE/EIS-0288, March 1999). DOE anticipates reaching an agreement concerning license amendment costs associated with this proposal.

STATEMENT OF NON-GOVERNMENTAL ORGANIZATIONS ON PLUTONIUM DISPOSITION

June 15, 1999
FINAL VERSION

The nuclear arms race has left the United States and Russia with large plutonium stockpiles. Both countries have had terrible experience with plutonium processing and its attendant wastes. Contamination of areas such as Hanford, Savannah River, and Rocky Flats in the United States, and Chelyabinsk, Tomsk, and Krasnoyarsk in Russia demonstrates the hazards of plutonium processing, and the poor environmental and safety culture of the US Department of Energy (DOE) and the Russian Ministry of Atomic Energy (Minatom).

With the end of the Cold War, we have the opportunity to redirect resources from nuclear weapons programs into cleaning up the legacy of nuclear weapons development, and to other needed programs. Under the pressure of people of both countries, the governments of the US and Russia have between them declared 100 metric tons of plutonium (roughly one-third of the total) to be "surplus" to military needs. We recognize the need for this plutonium to be stored as safely as possible, and to be converted into non-weapons-usable forms.

However, we are deeply disturbed by the primary method by which this conversion is planned. We are convinced that using surplus weapons plutonium in fuel for nuclear reactors (known as mixed-oxide or MOX fuel) is not an acceptable solution. A better method of disposition would be to immobilize the plutonium -- that is, to mix it with ceramic or glass and to provide a radioactive barrier to further prevent theft and diversion. 1

We are very concerned about the safety risks of using MOX fuel in existing reactors, almost none of which are designed to run on plutonium fuel. According to a study released by the Nuclear Control Institute in January, the use of a one-third core of warhead plutonium fuel in U.S. nuclear reactors could result in up to a 37% increase in cancer risk to the public in the event of a severe accident. Concerns are even greater in Russia. Many of the Russian reactors slated for MOX use are old and will reach the end of their 30-year licensed lifetimes before the disposition program is complete. Furthermore, Russian regulatory agencies do not have sufficient resources or political standing to adequately ensure safety at a MOX fabrication facility and at reactors. 2

Furthermore, we are dismayed that the people of both countries have been cut out of the process as decisions about plutonium disposition are made. The US has not ensured that Russian programs funded with American money follow environmental and public participation requirements. Joint US-Russian documents are largely unavailable to the Russian public, and the Russian translation of a 1996 joint study was marked "for official use only." Within the US itself, the DOE has made a mockery of the public participation process by issuing a contract for production and irradiation of MOX fuel before issuing a final Environmental Impact Statement and Record of Decision on the subject. It has also failed to include the input of communities living near reactors that are proposed for MOX fuel irradiation. Much of the European reprocessing and MOX performance record, cited by 3

DCR008

DCR008–1 **MOX Approach**

DOE acknowledges the commentors' concern regarding the use of weapons-grade plutonium in MOX fuel and irradiating it in commercial reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program. Furthermore, although no U.S. commercial reactors are licensed to use plutonium-based fuel, several are designed to use MOX fuel, and others can easily and safely accommodate a partial MOX core.

The environmental, safety and health consequences of the MOX approach at the proposed reactors are addressed in Section 4.28. This section analyzes several reactor accidents, including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. Both of these accidents have an extremely low probability of occurrence. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48 thousand per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

NRC would evaluate license applications and monitor the operations of both the MOX facility and domestic, commercial reactors selected to use MOX fuel, to ensure adequate margins of safety.

DCR008–2 Nonproliferation

DOE acknowledges the commentor's concerns regarding the safe disposition of surplus Russian plutonium as MOX fuel, although programmatic and policy issues such as U.S. policies toward plutonium disposition in Russia are beyond the scope of this SPD EIS. The scope of this SPD EIS is focused on analysis of alternatives on whether and how much U.S. surplus plutonium should be used as MOX fuel, which technology should be used for immobilization, where to construct the proposed surplus plutonium disposition facilities that are needed, and where to perform lead assembly fabrication and testing.

DCR008–3 General SPD EIS and NEPA Process

The public outreach programs available to the people of Russia concerned with plutonium disposition are beyond the scope of this SPD EIS. Since the inception of the U.S. fissile materials disposition program, DOE has supported a vigorous public participation policy. It has conducted public hearings in excess of the minimum required by NEPA regulations to engender a high level of public dialogue on the program. The office has also provided the public with substantial information in the form of fact sheets, reports, exhibits, visual aids, and videos related to fissile materials disposition issues. It hosts frequent workshops, and senior staff members make presentations to local and national civic and social organizations on request. Additionally, various means of communication—mail, a toll-free telephone and fax line, and a Web site (http://www.doe-md.com)—have been provided to facilitate the public dialogue.

Efforts were made to contact persons living near the selected reactor sites and inform them of the proposed use of MOX fuel. The *Supplement to the SPD Draft EIS* was mailed to those stakeholders who requested it as well as to those specified in the DOE *Communications Plan* (i.e., Congressional representatives, State and local officials and agencies, and public interest

groups around the United States) and the utilities' contact lists. The utilities, Duke Power Company and Virginia Power Company, would operate the proposed reactors (located in North Carolina, South Carolina, and Virginia) should the MOX approach be pursued per the SPD EIS ROD. For those interested parties who could not attend the public hearing on the *Supplement* held in Washington, D.C., DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Further, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process.

DOE conducted a procurement process in accordance with DOE NEPA regulations 10 CFR 1021.216. The selected team, DCS, would design, request a license, construct, operate, and deactivate the MOX facility as well as irradiate the MOX fuel in domestic, commercial reactors. However, these activities are subject to the completion of the NEPA process. As stipulated in DOE's phased contract with DCS, until and depending on the decisions regarding facility siting and approach to surplus plutonium disposition are made and announced in the SPD EIS ROD, no substantive design work or construction can be started by DCS on the MOX facility. Should DOE decide to pursue the No Action Alternative or the immobilization-only approach, the contract with DCS would end. The contract is phased so that only nonsite-specific base contract studies and plans can be completed before the ROD is issued, and options that would allow construction and other work would be exercised by DOE if, and only if, the decision is made to pursue the MOX approach. DOE is not permitted to disseminate proprietary or secret information, although as much information as possible (e.g., redacted copies of the contract with DCS) has been made available to the public. To learn more about the surplus plutonium disposition program or DCS, the team selected to fabricate the MOX fuel and irradiate it; request to be included on the mailing list; or to contact the program office, visit the MD Web site at http://www.doe-md.com. Written requests for information on the program can be addressed to: Office of Fissile Materials Disposition, United States Department of Energy, P.O. Box 23786, Washington, DC 20026-3786.

STATEMENT OF NON-GOVERNMENTAL ORGANIZATIONS ON PLUTONIUM DISPOSITION
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DOE as proof that MOX is a sound technology, is secret, further hindering public participation. | 3

We hear a number of contradictory things from the US and Russian governments about the rationale behind a MOX program. DOE representatives say that the United States must support MOX programs in both countries because Russia insists upon it. Meanwhile, Minatom has said that it would prefer not to undertake a large-scale MOX program at the current time, and will do so only with heavy funding from abroad. | 4

Minatom officials claim that plutonium is a valuable energy resource. Yet by their own estimates, plutonium-based nuclear energy will be more expensive than uranium-based nuclear energy for at least several decades. US officials say that MOX is not being pursued for its energy value but rather that it has been chosen to facilitate quick disposition of plutonium in Russia. However, immobilization is likely to be a much faster and cheaper method of plutonium disposition than MOX. | 5

Finally, we are told that the MOX program is a non-proliferation measure. But under pressure from nuclear establishments in both countries, the goal of stabilization and immobilization of plutonium has been undermined by a program which threatens to push both countries into a plutonium economy. Money makes policy. The larger the investment into plutonium facilities under the auspices of a disposition program, the more likely it is that these facilities will continue to be used for other purposes once the disposition program is completed. Furthermore, it is apparent that international plutonium companies such as Cogema (France) and British Nuclear Fuels, Ltd. are seeking to serve their own financial interests by pushing MOX.

Fresh MOX fuel in commerce presents a proliferation threat as the plutonium in it can be removed and used for weapons purposes. A 1997 DOE non-proliferation assessment of plutonium disposition found "that fresh MOX fuel remains a material in the most sensitive safeguards category, because plutonium suitable for use in weapons could be separated from it relatively quickly and easily." | 4

It is clear to us that rather than solving the problem of placing plutonium into safe and secure forms, a MOX program is likely to promote further plutonium processing and use, something that is undesirable on environmental, safety, economic, and non-proliferation grounds.

Therefore, we call on the US and Russian governments to stop MOX disposition programs in both countries. Instead, emphasis should be placed on safe storage and development of immobilization programs.

Plutonium disposition programs must include significant and meaningful public input, including access to all information, including costs and operating records of the various actors involved in a disposition program. The public in the communities most directly affected should have ample opportunity for meaningful input into the decision-making process. All US funding of Russian programs should be contingent on compliance with the appropriate environmental and public process laws. | 3

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DCR008–4 **Nonproliferation**

The *Joint Statement of Principles* signed by Presidents Clinton and Yeltsin in September 1998 provide general guidance for achieving the objectives of a future bilateral agreement to disposition surplus plutonium in the United States and Russia. Sensitive negotiations between the two countries have indicated that the Russian government accepts the technology of immobilization for low-concentration, plutonium-bearing materials, but that the MOX approach would be considered for higher-purity feed materials.

Understanding the economic dilemma in Russia, the U.S. Congress has appropriated funding for a series of small-scale tests and demonstrations of plutonium disposition technologies jointly conducted by the United States and Russia. In fiscal year 1999 (starting October 1998), Congress further appropriated funding to assist Russia in design and construction of a plutonium conversion facility and a MOX fuel fabrication facility. This funding would not be expended until the presidents of both countries signed a new agreement. Although the amount appropriated by Congress is not sufficient to fund the entire Russian surplus plutonium disposition program, the United States is working with Russia and other nations to resolve this issue.

DOE agrees that plutonium oxide and fresh MOX fuel are proliferation concerns and would only ship these materials in SST/SGTs as discussed in Appendix L. To avoid proliferation concerns at the proposed plutonium disposition facilities, they would be built to meet DOE and/or NRC's highest security standards, guarded by heavily armed security forces, and surrounded by state-of-the-art security equipment. However, DOE does not agree that MOX presents a larger proliferation concern than immobilized plutonium. A nonproliferation assessment was completed by DOE on the various alternatives for disposing of surplus plutonium. This assessment, *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives* (DOE/NN–0007, January 1997), concluded that "Each of the options for disposition of excess weapons plutonium that meets the Spent Fuel Standard would, if implemented appropriately, offer major nonproliferation and arms reduction benefits. . ."

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June 15, 1999

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Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors. Consistent with the U.S. policy of discouraging the civilian use of plutonium, a MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. For reactor irradiation, the NRC license would authorize only the participating reactors to use MOX fuel fabricated from surplus plutonium, and the irradiation would be a once-through cycle with no reprocessing.

DCR008–5 **Alternatives**

DOE has identified as its preferred alternative the hybrid approach as discussed in response DCR008–1. As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach would be more expensive than the immobilization-only approach.

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June 15, 1999

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Appendix A
Transcript of Public Meeting on Mixed-Oxide Fuel

A.1 TRANSCRIPT OF PUBLIC MEETING ON MIXED-OXIDE FUEL HELD IN COLUMBIA, SOUTH CAROLINA ON JUNE 24, 1999

PUBLIC MEETING ON
MIXED-OXIDE FUEL

CONDENSED

DATE: Thursday, June 24th, 1999

TIME: 6:38 p.m.

LOCATION: Gressette Building
Columbia, SC

REPORTED BY: LISA D. JETER
Court Reporter

COMPUSCRIPTS, INC.
A Full-Service Court-Reporting Agency
Post Office Box 7172
Columbia, SC 29202

MEMBERS ON PANEL:

SENATOR PHIL P. LEVENTIS
SENATOR JOHN COURSON
MR. ETHAN BROWN
MS. ABBY WOODWARD
MR. DAVID NULTON
MR. BERT STEVENSON
MR. CHARLIE ANDERSON
DR. ARJUN MAKHIJANI
MS. MARY OLSON
MR. ROBERT C. SELBY
MR. DENIS HUGELMAN
MR. R.H. IHDE
MR. STEVE NESBIT

SENATOR LEVENTIS: Good evening. I'm Phil Leventis, and I have convened this meeting to meet several purposes.

I want to expand the record and create a record, an additional record, on the MOX proposal that the Department of Energy has initiated for the Savannah River Site.

I want to offer the Department of Energy and contractors an opportunity to make statements they may want to make. And they have also agreed to answer questions, which is the primary purpose for all of our being here.

Then as time permits, I would like to permit you to ask questions, as well. But from the number of people who have indicated they are interested in asking questions, I hope we can accommodate as many as possible. I don't know how many that will be.

We have a variety of folks with us this evening, and I appreciate everyone's being here.

Let me, before I recognize anyone, tell you that we're going to conduct a relatively informal meeting. However, if you would like to speak, be recognized, please come

to the podium, and state your name clearly for the recorder.

Our recorder this evening is Ms. Lisa Jeter, and she will be recording the proceedings, and we also have a tape recording of the proceedings.

The scenario I would like to follow is, I would like to recognize first those folks who are here from the Department of Energy, from Cogema, from Westinghouse, and also from Duke, and several others who are here whom I would like to acknowledge. Then I'm going to turn the meeting over to Mr. Nulton for some comments from DOE.

Because of the technical nature of the issues that I would like to deal with, I would like for the folks who are speaking to be able to complete their presentations before we start asking any questions.

I have a series of questions that I would like to ask before we open it up to the public, so if you have questions, please write them down.

I've already recognized Ms. Jeter, who is our recorder. I'd like to recognize

several members of the legislature that are here. I've mentioned myself; Senator John Courson, from Columbia; Representative Bill Clyburn. He's sitting in the back with some folks from his district, which is near the facility.

I'd also like to recognize Ms. Abigail Woodward, who has joined us this evening. She is representing Representative Nan Orrock, who is a member from Georgia, representing the downtown Atlanta area. Due to a traffic jam, I guess she wasn't able to be here.

MS. WOODWARD: Actually, she's in Washington right now.

SENATOR LEVENTIS: That's just a little joke because of the quality of life in South Carolina versus the quality of life in Georgia. We appreciate your being here and your interest.

I'd like to recognize those that I understand are here from DOE, and Dave, if there are others, please point them out.

First, Mr. Bert Stevenson; Dave Nulton, who I talked about; Mr. Bob Sel

also from Duke is Mr. Steve Nesbit; and from Duke, Cogema, Stone and Webster, Mr. Bob Ihde. And also joining us from Europe -- and I hope I pronounce your name correctly -- Mr. Dennis Hugelman with Melox.

We also have from the Institute for Energy and Environmental Research, Dr. Arjun Makhijani, who has joined us, in addition to some other folks from that organization.

Is there anyone else here whom I should have recognized that I didn't? Ethan is with us also. We appreciate your being here.

Anyone else? Oh, I'm sorry. Mary Olson with Nuclear Information and Resource Council from Washington.

Anyone else? Mr. Hank Stallworth is with the Governor's office now dealing with environmental issues and is just here to listen.

Okay. All of those preliminaries have been taken care of. Let me turn the meeting over to Dave Nulton to make what comments you'd like and to recognize those people from DOE.

MR. NULTON: Thank you, Senator.

I'll be brief, so that we can get into the main part of the meeting and try to address the issues that you have raised.

We came prepared tonight with representatives of the Duke, Cogema, Stone and Webster team, that has been selected by the government for the mixed-oxide fuel fabrication and irradiation services program.

SENATOR COURSON: Excuse me. It may be helpful on the microphone if --

SENATOR LEVENTIS: He's got his own.

SENATOR COURSON: I'm sorry about that.

SENATOR LEVENTIS: I'm sorry.

MR. NULTON: I'll get closer to the microphone.

We've tried to bring with us representatives of the MOX fuel team that can respond to questions that were raised by Senator Leventis in a June 8th letter that he sent to the Department of Energy.

Very briefly, the Department in January of 1997 chose a hybrid approach for the disposition of surplus weapons plutonium that would come out of weapons here in the United States.

That hybrid approach has two technical approaches: One is to immobilize a portion of the surplus plutonium in a ceramic form, and then embed that ceramic form into high-level waste containers that are being produced at the Savannah River Site. And the second approach is to use some of the plutonium in mixed-oxide fuel to be burned in commercial reactors.

We conducted a procurement last year and awarded the contract in the spring of this year to the Duke, Cogema, Stone and Webster team, which we will refer to tonight as DCS.

They will design and construct and operate a facility to fabricate mixed-oxide fuel. And then on their team are utilities, Virginia Power and Duke Power, that will provide reactors that will burn that mixed-oxide fuel, and we'll say more about those reactors later.

We have ongoing a negotiation with Russia. This is the result of a number of discussions and agreements that were reached between Vice-President Gore and Prime Minister

Kiriyenko, and also between Presidents Clinton and Yeltsin in a number of meetings that occurred over the past two to three years.

In September of 1998, there was a summit meeting at which Presidents Clinton and Yeltsin charged their officials in their countries to develop a bilateral agreement between Russia and the United States to dispose of surplus plutonium from weapons.

That negotiation is ongoing, and our goal is to have a bilateral agreement in place at the end of this year -- actually, at the end of this fiscal year.

So by the end of September, our goal is to have a bilateral agreement in place that will address a number of things: The amount of material to be dispositioned in each country, the means by which it will be dispositioned.

That agreement will also address a number of transparency arrangements, that is to show how each country will assure that the other country is indeed getting rid of their material in a way that they have identified in this agreement, so that is ongoing.

We are also in the process of

completing an Environmental Impact Statement and analysis that is the second of two that we've done on this subject.

The first was a programmatic Environmental Impact Statement that was completed in December of 1996. And this -- the more recent document that we are preparing now identifies or evaluates specific sites where these disposition activities will be conducted, the amount of material that would go to either immobilization or mixed-oxide fuel, and then, of course, the impacts of the various technologies to be used for that purpose.

At this point in time, the Department has identified Savannah River as the preferred site for the construction of three facilities: One for immobilization of a portion of the surplus weapons plutonium; one for converting the weapons pits into an oxide material that can be used to feed these other facilities that will be used for disposition; and the third would be a facility to fabricate mixed-oxide fuel, which would then go to the reactors that I mentioned earlier for disposition.

There were a number of questions raised about the contract that the Department has entered into with the Duke Cogema team with regard to cost and fuel offsets and things of that nature. We're prepared to respond to those questions tonight.

Also, there were a number of questions raised about Cogema and their record in Europe at the La Hague plant and the Melox plant. I believe we can answer most of those questions tonight. We also have representatives from Duke Power to answer questions on reactors.

I think, with those brief comments, we should move forward.

SENATOR LEVENTIS: Thank you very much. What I'd like to do is go through a series of questions that I have put together, and I have provided those for folks for DOE, from DCS.

I did not talk with anyone from Duke. But if you would like to, Mr. Nesbit, we've got some questions we'd like to ask, as well. I know you did not necessarily come prepared, but if you would like, we'd like to

ask you some questions.

So I'll go through a series of these questions and then also may have some additional information that we'd like to bring up.

I discussed the issues with the gentlemen from DOE and the other places before we started, and since the purpose of the meeting is to create a record, if they have anything they would like to bring up or add that they feel would help our understanding or help in creating a record, then I invited them to do that. So let me start with the series of questions.

First of all, how long would the immobilization of all 50 tons take if that were the effort?

MR. NULTON: We are developing the capability to immobilize or convert to MOX fuel all 50 tons either -- you know, using a combination of both or immobilizing all, in a period of 10 to 15 years, and that's also the time frame -- 10 years, I believe, is the time frame being addressed in the bilateral agreement with Russia.

SENATOR LEVENTIS: And that's from the point of startup?

MR. NULTON: The point of startup, that's correct.

SENATOR LEVENTIS: That really addresses the second question. You're saying that either immobilizing all of it or using the combination should take 10 to 15 years from the startup?

MR. NULTON: That's correct.

SENATOR LEVENTIS: How long do you think it will take, from your best information, for Russia to complete the use of their 50 tons of plutonium in their reactors?

MR. NULTON: The time frame being addressed in the agreement is 10 years.

SENATOR LEVENTIS: And that's from the time they start up?

MR. NULTON: Yes. Correct.

SENATOR LEVENTIS: Do you have any ideas at this time when they're projected to start up?

MR. NULTON: Well, the schedule that we're working on right now, as we get the facilities up and operating, is in the 2006

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time frame.
SENATOR LEVENTIS: And that is about the schedule that you all have projected. Are there any changes in that projection for our startup?
MR. NULTON: Not at this point. That is our schedule right now.
SENATOR LEVENTIS: Is it true that the Department is beginning to design these facilities that you've described even before testing is complete on these projects?
MR. NULTON: There is preliminary design work going on right now. In the case of mixed-oxide fuel, there is no development work to be done.
The MOX fuel process that is being proposed for use and that will be used is essentially the same as the one that's being used in France. It's a process that's been used for a number of years successfully. The fuel has been used successfully in French reactors, so there is no development work to be done there.
SENATOR LEVENTIS: Excuse me. Is that weapons-grade fuel that's reprocessed?

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MR. NULTON: It is not weapons-grade fuel, but we're prepared to talk about the differences in those two, if you'd like to do that.
SENATOR LEVENTIS: Well, go ahead and finish. I'm sorry I interrupted you.
MR. NULTON: Okay. In the case of immobilization -- well, let me go to pit conversion. The pit conversion process involves taking a weapons pit, separating it into two hemispherical pieces, and then converting that hemisphere into an oxide form, plutonium oxide.
We currently have a demonstration line, a full-scale demonstration line, operating at the Los Alamos National Laboratory, so that is proceeding.
There's really two purposes of that facility: One is to demonstrate the process, most of the pieces of which have been demonstrated in the past, but what we've done is integrated it into a single line, and that work is ongoing.
The second purpose of that is to process several of the different types of pits

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that were produced during the Cold War to show that we can handle these different kinds of pits, so that activity is ongoing.
In the case of immobilization, we're in the final stages of demonstrating the technical process that's going to be used for immobilization.
SENATOR LEVENTIS: Is it absolutely necessary to go through the conversion of the weapons pits to go to immobilization?
MR. NULTON: Yes. They have to be converted to a feed form that can be used for that immobilization process.
SENATOR LEVENTIS: I know that the plan is to use that conversion of the weapons pits for both immobilization and for preparation to fabricate the MOX.
Is that the only process that could be used for immobilization, for preparation for immobilization, or are there other processes available?
MR. NULTON: We have to convert it to a feed form. Now, we probably don't necessarily need to do it with a pit conversion facility. There are chemical processes that

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can be used, but they also would require new facilities. So we would propose to use the pit conversion facilities if we were allowed to do that.
SENATOR LEVENTIS: Are they similar in cost when you're talking about the other alternatives for immobilization, beginning the immobilization process?
MR. NULTON: We, in our analysis, concluded that the quickest and least expensive way to build is with the pit conversion facility, yes.
Considering the other activities that are planned for the facilities that are already in existence at Savannah River, the commitments made to shut those facilities down in a certain time frame, the fact that we would have to make modifications to those facilities, we felt that pit conversion facility was -- designing was the way to go, yes.
SENATOR LEVENTIS: Isn't it true that with several programs, including the ITP, that unfortunately has just failed, that the Department has authorized design, even construction, before testing was complete?

MR. NULTON: Charlie, can you answer that?

MR. ANDERSON: Just a little bit on the intank precipitation, ITP, that you talked about. There actually was testing that was conducted for ITP. It was conducted in a lab and in a demonstration prototype scale form.

The difficulty with ITP has been taking that technology and putting it into a production mode inside a high-level waste tank. Of course, that was the cost savings feature for the intank precipitation process also.

One of the alternatives being considered for that process is a smaller version in a smaller tank, so that you can control the process. The process was approved in laboratory process.

So there was testing there. And in a lot of these projects, particularly first of a kind, it's in the conversion of that testing at a lab scale, and then a prototype scale, onto a full production scale.

In some cases, as in DWPF, some portions of that system were tested at full scale. Dave just mentioned the pit disassembly

is being worked -- that process at a full scale. And there are some processes that can be better done at a full scale than others.

I don't know if you had any other examples, but --

SENATOR LEVENTIS: I guess what I'm getting at is, those particular programs, no one thought that they would fail to succeed, but unfortunately they did. I'm just wondering how the department is trying to take that into account in terms of the mixed-oxide fuels, which, to my knowledge, the mixed-oxide fuels using weapons-grade plutonium have not on any scale been done before.

MR. NULTON: The question is use the of weapons-grade plutonium to do that.

MR. HUGELMAN: In France we don't use the military plutonium for MOX fuel. We use only civilian plutonium coming from reprocessing of used civilian fuel coming from the nuclear power plant, VDF from France, the other customers of Cogema, means utilities coming from Japan, Germany, Switzerland, Belgium.

And in fact, the process which is

used to produce MOX consists of mixing some borders -- (inaudible) uranium border and plutonium border, under processes exactly the same.

It's different from the release of plutonium, civilian plutonium or military plutonium. Oxide -- you mix it with uranium -- (inaudible). It's exactly the same process. But we don't use military plutonium in France.

SENATOR LEVENTIS: Right. And we expect some differences, I suppose.

The question is: Have we already started designing this plant before we've demonstrated on a scale of about 5 tons per year that we can extract the pits?

I take it you're saying, David, that out in Los Alamos they are doing a production rate of about 5 tons a year. And my concern and my question is: Have we started designing full-scale plants yet, and where are we in the testing of the fabrication of MOX fuel using weapons-grade plutonium?

MR. NULTON: Let me be clear on the demonstration at Los Alamos. This is a full-scale line, but there will be multiple

lines required in the actual pit conversion facility. So it is not processing 5 tons a year at this point in time. It's just demonstrating with different types of pits that we can take pits apart and convert them into an oxide powder. So we have a larger through put facility that will ultimately be used at Savannah River for processing those pits.

Also, in the case of the MOX plant, the through put will be 3-1/2 tons a year as opposed to 5, because we're proposing to use immobilization for the balance of that 5-ton-per-year capacity.

I think what Mr. Hugelman was saying here is that, from the fabrication point of view, the process is the same using the weapons plutonium or the recycled plutonium for the fabrication of the MOX fuel. Chemically it's the same, as I understand.

SENATOR LEVENTIS: What about with the demonstration at Los Alamos and also with the fabrication, are the rates of waste generation consistent with what the '96 Environmental Impact Statement said and all th estimates that we have available to us?

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MR. NULTON: We have prepared and released a couple months ago a supplement to the draft EIS.

The way this process worked was, we prepared a draft Environmental Impact Statement and then in our procurement of a contractor for the MOX program, we asked for environmental data to be submitted as part of their proposals so that we could take actual data from actual facilities and processes that were being proposed for use.

We took that environmental data and updated our analysis. We issued -- an environmental critique was prepared, and we issued a synopsis of that critique for public review. Then we also took that information and prepared a supplement to draft EIS, updated it using the most recent data from the procurement.

In there we updated our waste streams, and for the most part, the environmental impacts and waste streams were not significantly different. There were some -- in the case of true waste and low-level waste, the numbers went up from -- in the case

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of true waste, from .5 liters to 500 liters. In the case of low-level waste, from .3 liters to 300 liters.

SENATOR LEVENTIS: For --

MR. NULTON: This is waste produced per year. That's transuranic waste produced per year, and low-level waste produced per year.

SENATOR LEVENTIS: Five hundred liters?

MR. NULTON: Liters, yes. This is a relatively small amount, low-level waste as well. I think Savannah River has a low-level waste processing capacity of 1.9 billion gallons per year. So 300 liters is 75 or 80 gallons per year. So it's a relatively small amount compared to what these sites normally produce.

Those numbers were different for two reasons mainly. First of all, we now had an actual process that we could use to identify what those waste stream volumes were.

Secondly, we added a polishing process on the front of the MOX plant, which added to the waste produced in the MOX plant.

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So those numbers were different.

Others numbers changed, as well. Some went down. Some went up slightly, but for the most part, the numbers were not significantly different.

SENATOR LEVENTIS: Now, is this taking into account -- or tell me now, have you all decided to go with more of a wet process than the originally proposed dry process for production?

MR. NULTON: No, one of the chemical constituents in weapons plutonium is a metal called gallium. It was introduced into plutonium at a volume percent of 1 percent. It helps with the fabricability of the weapons pits. It can be a problem for the cladding of the fuel and reactors.

So in the procurement, we gave the proposers an option to remove that gallium using a dry process, the pit disassembly, conversion facility, or using a wet process on the front end of the MOX facility.

This is not a full-scale chemical processing capability. It's a small chemical plant that will just remove that gallium

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material.

In the case of the Duke Cogema team, they chose the wet processing step on the front end, so that is what we're using now as our reference case.

SENATOR LEVENTIS: And that is what changed the amount of waste?

MR. NULTON: That does increase the amount of waste that we have out of the MOX facility, yes.

SENATOR LEVENTIS: Are those changes going to affect the startup date?

MR. NULTON: No, they're not. In fact, my guess is they actually make the schedule much more achievable because the removal of gallium using a dry process, using what we were calling the TIGR -- I can't remember what TIGR stands for now -- Thermal Induced Gallium Removal. TIGR is what we call it, Thermal Induced Gallium Removal.

This would have been a process used in the pit conversion facility. It was very developmental. Although we had done some preliminary work on it, we were not getting the gallium levels down as low as we would have

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liked. By using the wet chemistry approach, we get them down to extremely low levels which are acceptable to the utilities, so I think in terms of development in time, the dry process would have taken much longer to develop. The chemical process is well understood.

In terms of cost, the TIGR process would have cost on the order of $50 million to develop, and although we still need to get some more preliminary design done to get a good cost estimate, it will be on the order of, perhaps, $50 million, as well, so I think it's a wash with the cost.

SENATOR LEVENTIS: Pardon the pun.

MR. NULTON: Yes. Sorry.

SENATOR LEVENTIS: When do you expect testing to be complete for the pit conversions and the immobilizations?

MR. NULTON: Do you know? 2002 for the pit conversion.

SENATOR LEVENTIS: And the design is taking place now, though, of the production facility?

MR. NULTON: In the case of pit conversion, it has not gotten started, but

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probably started within a month.

MR. SELBY: That's right.

SENATOR LEVENTIS: Let me proceed.

Are there any penalties that DOE or the government have to pay to contractors if parts of this program are not ready when -- with the schedule that has been proposed or contracted for, I should say?

MR. SELBY: You're right. We need to explain that there is -- at least in the MOX fuel fabrication facility, part of the plutonium disposition -- a base contract that is laid out for preliminary design and final design of the MOX fuel fabrication facility and also at the reactor sites.

That program would go through about 2003 before we're ready to move to a new option, which is the option for construction, and we will not move into the option for construction until such time that the Secretary makes a decision that the processes that will support it -- the Russian program that will support the MOX disposition is in place -- so we do have what I would call the offramp, if there are major problems there at the end of

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the design effort in the MOX disposition contract. We do not have to proceed to option one.

SENATOR LEVENTIS: I don't want to take you all too far afield from technical matters, but is it fair to say that the impetus for this program is diplomatic and deals with our relationships with Russia more than it does with a technical decision that this was the avenue that we should take?

MR. NULTON: I think the impetus for this program is primarily the concern over the Russian plutonium materials, getting them initially into safe, environmentally sound storage, but then getting them into some disposition path, so they cannot be reused with weapons or be converted to another nation where they can be used as weapons.

SENATOR LEVENTIS: We've got a series of questions we'll ask you on that on the second page, but let me get back to the questions before us.

As part of this process, is the Department of Energy or the government going to pay the uranium industry for any declines in

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sales of fuel prices that they may experience as a result of the replacement of uranium fuel with the MOX fuel?

MR. SELBY: It's such an insignificant amount. Considering the total amount of nuclear reactors that are used in the uranium field, there should be no impact for the six reactors using 40-percent MOX fuel, because they are also using uranium fuel at the same time.

SENATOR LEVENTIS: So you don't believe that there will be an impact?

MR. SELBY: No, I don't.

SENATOR LEVENTIS: Let me ask a few questions. Mr. Hugelman, I'll ask these questions of DOE first and then give you an opportunity to talk at a later point about these things so if you have some points you'd like to make, we'll get to that.

From the perspective of DOE, do you believe that Cogema's record of compliance with the laws in its home country is relevant for its potential compliance to the United States law?

MR. NULTON: Yes, and we reviewed

those as part of the process.
SENATOR LEVENTIS: Have you made those public? Do we have available to us the records that you looked at about Cogema's compliance?
MR. STEVENSON: Yes sir, you do, in the form of an environmental synopsis, which takes the environmental information that was provided to us by DCS, which we independently assessed and verified and presented to the decision maker, Mr. Howard Canter, who's the person who was the source selection official. And that synopsis said to him that we had reviewed the environmental -- or the potential environmental -- impact of this contract, and we recommended in that synopsis that he approve the contract.
SENATOR LEVENTIS: Now, in making those recommendations, did you review information about Cogema's record of compliance in the European facility?
MR. SELBY: During the proposal period we -- first of all, we were unable to release anything to the public because we were in a procurement process.

The procurement looked at the NRC regulations -- the recognition. The procurement recognized the Cogema plant, the Melox plant, would be transferred to the United States, and would be required to follow all of our internal NEPA requirements, our EPA requirements, and the NRC requirements.
We also requested the environmental information as a result of discharges, of whatever the discharges were to the environment from the Melox plant. Those were evaluated as part of the RFP process and were used in preparing the environmental synopsis.
SENATOR LEVENTIS: Is that information anywhere available to the public now?
MR. SELBY: That information is going to be made available, as I understand it.
MR. STEVENSON: Excuse me. The environmental synopsis has been published. It is on our electronic or worldwide web site and also is available upon request by mail.
SENATOR LEVENTIS: Now, if it were requested by mail, is it the synopsis or is it the full information?

MR. STEVENSON: The synopsis, as it turns out, because we only had -- let me explain one thing about the difference between computing and synopsis.
MR. NULTON: I'd like to say something. I think the quick answer here, the bottom line, is this information is available, and I think when we hear Cogema speak later in the meeting, they will. In fact, in the answers to the questions that were sent to you, Senator, we gave you some of this information, and we have more this evening.
There are web sites, reports, a number of things that have been prepared by the French government that speak to the releases from both the La Hague and the Melox plant and to what extent they meet the standards and release limits in France, so I think we have some of that. I think, in the public domain, and we have more that we will speak to this evening.
SENATOR LEVENTIS: Do they meet the release limits in France?
MR. NULTON: Yes, they do.
SENATOR LEVENTIS: Do they meet the

international treaty limits set in the 1980s?
MR. NULTON: Yes.
MR. HUGELMAN: Speaking around the releases of Cogema, we can speak around the two plants, La Hague and Melox, exactly the same rules in France. To be allowed to run such a plant, we have to have an authorization for releases. The authorization for releases is given by the two ministries in France. The F ministry and the intergovernmental ministry.
For example, for La Hague reprocessing plant, we have two authorizations. One is along the liquid discharge, and the other is along the air discharge. This is for reauthorization.
When we have such an authorization, we have to have a public inquiry. We have to have documents given to people who can read it, keep the information, ask the questions.
We have to give such a procurement to the open community because we are in Europe under the European rules, something which is named Article 47. The European community has to give them advice around the authorization, discharge authorization, and around the impact

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of these releases.
Upon this information is disclosed for this procedure in France and Europe. After that when we have authorization, each month we give all of the information along what was released first to the authorities and second to the public. And we give these each month around each site. I have one for one site of Cogema. We disclose -- with all the information, all the readings in the atmosphere, in water, if we are -- on all the analyses we do on all the results of the analyses.
For example, for oxides, we would take around 20,000 samples per year. We do around 80 analyses of the samples. We give the information on paper. We send it. We print several thousand of this document. We send it to people, to the elected people, to all the communities around the plant, but we don't put that very often on the web because we have since 20 years in France a national system, Minitel. On Minitel, it's very used in France. In fact, we put information on Minitel.
On the web it's becoming more and

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more popular. I think now month after month, we are getting more and more information on the web sites of Cogema. But the Minitel system is public. Everybody in France has a Minitel at home and can ask them questions.
On the other side, there is another thing which is very important that we have what we name CLI. This is an information commission. On the inside the information commission, there are some elected people, generally the president is a mayor or he's a deputy, a member of parliament.
Inside the commission there are some trade union representatives. There are some anti-trade association representatives. There are some elected people. And once every three months, there is a meeting, and we go to give all of the information to the local information commission to these people.
Each year, to finish with this topic, we disclose an informal report, and we give all of this information. These documents are public, that we give to people.
So in fact, all of the information around what we release is disclosed to the

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public around all of the sites of Cogema, La Hague and around Melox. This is the same rule.
SENATOR LEVENTIS: Thank you. Has your company at either one of those plants been cited for violations of the discharges?
MR. HUGELMAN: Never, sir. We can't do that. If we did that, the French authorities would stop the plant. We can't do that.
SENATOR LEVENTIS: How about the 1980 discharge permit that you received? Have you received an update since then, or are you still operating under that permit?
MR. HUGELMAN: No. The permit we had was -- for the La Hague plant was in '84. That was for the La Hague site. I will look. The one for Melox was in '94, because Melox is a much more recent plant, in fact. And for La Hague, the last year, meaning in '98 of all the graduated amounts because we have authorization for the graduated amounts.
For example, for emissions last year on the air, it was 3.3 percent of the authorization. For the -- 0.06 percent. I

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have all the information here. I have a slide. Perhaps we can show it if you want.
SENATOR LEVENTIS: We just need to make it available so folks can get it if they'd like.
MR. HUGELMAN: It was the same year after year. For Melox it's around 0.5 percent of the authorization.
SENATOR LEVENTIS: Did the company not have a proposal for a plant in Germany? Did you all bid on a plant to construct a plant in Germany to do reprocessing?
MR. HUGELMAN: Construct a plant in Germany? I think the German project a long time ago -- it was German people, a German company. It wasn't Cogema.
SENATOR LEVENTIS: Was Cogema going to be a part of a consortium there as you are here, or do you recall?
MR. HUGELMAN: I don't know because I have to say who I am. I am the Director of the Melox plant in France -- produce the MOX fuel for EDF in the next future for the Japanese utilities. I was before the Deputy Director of La Hague processing plant. I'm

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here today to answer your question around Melox.

SENATOR LEVENTIS: So you're not aware how much of Cogema is owned by the French government? Do they have an ownership?

MR. HUGELMANN: Yes. A part of the French government is a little more than 80-percent. The name of the party is Total, which is another company.

SENATOR LEVENTIS: Thank you.

Let me shift the focus to the folks from DOE and talk about the agreement that you talked about earlier that was made between President Clinton and Vice-President Gore and Russian officials. Let's talk about that for a while, if you don't mind.

Is there any agreement with Russia that obligates the United States to use the MOX process?

MR. NULTON: The only agreement that will determine how much material gets dispositioned and how much will be by MOX or other means is this bilateral agreement that I spoke of earlier that will be concluded in September.

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At this point, it is going to result in MOX being used in Russia and MOX being used for a portion of material in this country.

The Russians, when we first talked with them, their preference was to store their plutonium and to save it for a number of decades and use it in advanced breeder reactors.

As a result of this Clinton/Yeltsin summit that I mentioned in September of '98, the agreement was made that they wouldn't do that, they'd get rid of it sooner using some more expedient means, and that's what focused the attention on the use on commercial reactors and MOX.

So the bilateral agreement, as we call it, that will be concluded in the fall. We'll have the final agreements on how much material and what means will be used to get rid of it, and it will involve MOX.

SENATOR LEVENTIS: So do you think that that agreement will obligate the United States to use the MOX process?

MR. NULTON: It will. I mean, it will say how much we are going to get rid of

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and how much will go to MOX versus immobilization.

SENATOR LEVENTIS: I know you weren't there, but I think you keep up with it. Has Russia stated that they will not pursue a disposition program if we do not pursue MOX?

MR. NULTON: They've certainly made those statements to us as we've talked with them over the years, yes.

SENATOR LEVENTIS: Is Russia planning to use the MOX process in their light-water reactors? Is that something that we're trying to compel them to do through the agreement, or where did that come from?

MR. NULTON: As I said earlier, it came from the fact that their real preference was to save the plutonium, to stockpile it, and to use it in breeder reactors in perhaps one to two decades, and then use those breeder reactors to make even more plutonium.

It was the Clinton/Yeltsin agreement in September of '98 that drove us towards a nearer term conclusion using the commercial reactors and MOX in these commercial reactors.

SENATOR LEVENTIS: So is it our idea

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that they should use it in their light-water reactors or is that something they --

MR. NULTON: I think it's their idea and it's our idea collectively.

SENATOR LEVENTIS: Are we going to pay for their use of MOX fuel in their light-water reactors?

MR. NULTON: The Russians do not have the money to implement this program, and they have said that they would need financial support from the G7 countries, of which we are one: Ourselves, Canada, Germany, France, Britain, Italy, Japan. We will not pay for it all, but we will pay for a portion of it.

SENATOR LEVENTIS: And that's that same agreement that's being worked out, the bilateral?

MR. NULTON: Yes. That bilateral agreement will have some -- and again, I'm not negotiating the agreements. I don't know the specific terms. There will be provisions in there or statements by the Russians that they will need financial support from the other countries.

SENATOR LEVENTIS: I know it's not

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finished, but to date, is it true that they are allowed to reextract left-over plutonium from MOX spent fuel after the passage of some time?

MR. NULTON: After the passage of some time, yes. There are provisions in the agreement, being negotiated in the agreement, that the Russians will not be allowed to reprocess any spent fuel that was made with weapons plutonium until all of that weapons plutonium has gone through the disposition process.

SENATOR LEVENTIS: At the present projection, that would be sometime after 2015?

MR. NULTON: It would be after 2015. It would be at least 10 years after whenever they began to disposition this material, which would start in 2006.

SENATOR LEVENTIS: Will the delay in reprocessing the MOX spent fuel negatively affect Russia's current reprocessing program?

MR. NULTON: I don't know that they have a current reprocessing program at this time. They don't have the money to get a reprocessing program going at this point.

SENATOR LEVENTIS: Do they have to

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do substantial changes in their light-water reactors to use MOX fuel?

MR. NULTON: At the rate that they will be using the MOX, they do not need to make substantial changes to their reactors.

If they want to increase the amount of material that goes into those reactors, they would need substantial changes, as I understand it.

SENATOR LEVENTIS: Have there been any discussions of liabilities for any accidents that happen while the MOX program is in use over there?

MR. NULTON: That's part of what's being negotiated in this contract, how liabilities will be handled.

SENATOR LEVENTIS: Do you know the current status of that?

MR. NULTON: I don't know the status at this point.

There is language that's been proposed on both sides. I just don't know what the status is at this point. It's probably being negotiated literally as we speak.

SENATOR LEVENTIS: You mentioned

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earlier something about an escalator out of the process if it was required. Do you think that -- do we have the ability or are we committed to stop the MOX program if there are difficulties, for example, if the Russians don't enter into the bilateral agreement?

MR. NULTON: Absolutely. If the Russians don't enter into the bilateral agreement, then we will not proceed into construction and disposition of our own material. The idea is that we will move forward roughly in step with the Russians. We both get rid of our material or neither of us do.

SENATOR LEVENTIS: Has DOE agreed, or in this agreement is there anything that will allow Russia to make MOX fuel for its breeder reactors as part of the disposition program?

MR. NULTON: There is, as part of the agreement to convert the BN600 reactor, which is a reactor built by the Russians for the purpose of breeding. But before it would be used, it would be converted into a burner -- it is a liquid metal reactor, but it would be

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used to help increase the amount of material that the Russians could disposition. But it would be used as a non-breeder reactor for that purpose.

SENATOR LEVENTIS: So the agreement, as you understand it to date, doesn't allow them to --

MR. NULTON: It does not allow them to breed in that reactor. That's correct.

SENATOR LEVENTIS: So as you look at my sheet, question number 14 is obvious, that we're not allowing them to, according to the agreement, as it's stated now, create any additional quantities of plutonium.

MR. NULTON: That's right. The Russians have also proposed an additional liquid metal reactor, and we will not agree to do that. Since this one already exists, and it can be used as a burner, we are negotiating whether the -- the use of that reactor burning plutonium.

SENATOR LEVENTIS: We talked a little bit about -- or we talked a lot about the state of our program and its development and the design of our facilities.

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Where are the Russians? Are we exporting our technology to them? Where are they in their process of trying to set up fabrication facilities, extraction facilities, et cetera?

MR. NULTON: We have been working with the Russians in technical studies and developments and demonstrations for about three, three and a half years, actually working with them on immobilization as well as other technologies.

We are also working with the Russians to do a demonstration for pit conversion, probably with a different process than we're using, but we are working with them to get a pit conversion demonstration up and running. That will later be expanded so they can handle more pits, larger additional lines to handle their pit conversion.

There is also some discussion going on between ourselves and the French and the Russians regarding design of a facility for MOX fuel fabrication.

SENATOR LEVENTIS: Before we leave that subject, I need to ask Mr. Selby, because

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I passed it up and didn't ask him that. We talked about the ITP, the problems that happened there for whatever reason. I'm certainly not technically capable of understanding it, except that it seemed that large-scale intank precipitation didn't work because of controlling heat or whatever, and we've talked about multiple lines as opposed to one line that runs a large capacity -- several lines that run in a capacity to produce.

Are there any problems that are inherent in several lines in a nearby area versus one line as we have now out in New Mexico?

MR. NULTON: The only thing that -- and these kinds of considerations are taken into account when you design the plant, would be practicality concerns. You don't want to get too much material --

SENATOR LEVENTIS: Too close?

MR. NULTON: -- too close. That is part of the design process is to make sure that you have adequate space and lines and so forth.

SENATOR LEVENTIS: Before I leave that, is there anything else you all would like

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to say about the proposed negotiations that would help us consider these issues?

MR. NULTON: I can't think of anything I would want to add.

SENATOR LEVENTIS: Well, at any point you want to add something, please let me know.

MR. NULTON: Okay.

SENATOR LEVENTIS: Let me shift the focus now to storage because it has a lot of implications for South Carolina, and there's a lot of interest in those things.

Did DOE fail to fulfill a commitment it had made to the Defense Nuclear Facilities Safety Board to build a special storage facility called the APSF facility for plutonium at the Savannah River Site? You may know what I'm talking about.

MR. ANDERSON: Yes, actually, the commitment was to stabilize and put into long-term storage plutonium materials from Savannah River Site, and also would be Rocky Flats, and Hanford at some point.

And a part of that commitment then would -- was the construction and operation of

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the APSF, Actinide Packaging (sic) and Storage Facility, which would have stabilized both the plutonium materials at Savannah River, and we were also looking at the stabilization of materials from other sites at Savannah River, even though the baseline plan was to stabilize those materials at Rocky Flats before shipping to Savannah River or stabilizing at Hanford.

We went into an evaluation process in the December time frame, largely due to the three new missions, and taking a look at this facility, and what we were planning to do with it, to make sure we were going to be designing and constructing an appropriate facility.

SENATOR LEVENTIS: Has anything come from Rocky Flats to Savannah River Site?

MR. ANDERSON: None of the material that was planned for that stabilization process. There are some materials from Rocky Flats that are going through the canyons now, as we speak, are being stabilized in the canyons at Savannah River.

SENATOR LEVENTIS: Are they in the same chemical form in containers that they arrived at at Savannah River Site?

MR. ANDERSON: I just got your question. You had a series of questions there. I'm going to try to answer a couple of those.

SENATOR LEVENTIS: Please.

MR. ANDERSON: The materials that are going to be stored at Savannah River will be received in accordance with a storage standard, which is for long-term storage. And that would be the same standard that is used for the materials that we would stabilize. It would require stabilization material in those containers. And it also sets up requirements for the containers themselves, which are double containers, double type containers.

Materials that are not received in that condition will be processed and stabilized either right now at this point, through the Canyons, or we won't be receiving them in another process if we don't have another disposition path for stabilizing that material.

SENATOR LEVENTIS: The ones that are received in satisfactory condition, how long can they be stored there at Savannah River Site before they have to be removed from the containers and processed or immobilized?

MR. ANDERSON: The ones that are in satisfactory condition --

SENATOR LEVENTIS: When they arrive.

MR. ANDERSON: -- when you say that would meet the standard, the standard is referred to as a 3013 standard, and that's a 50-year standard. Materials that are stabilized according to a 3013 standard and packaged according to that standard are good for at least 50 years.

SENATOR LEVENTIS: I wish I were. I don't feel like I'll make it another 50.

Anything else you'd like to comment on that because I'd like to turn my attention to Mr. Nesbit, if you don't mind.

MR. ANDERSON: The only other comment on the APSF material storage was, the receipt of those materials at Savannah River Site was dependent on the record of decision for the disposition path. So Savannah River was not receiving materials that it did not have a disposition path for.

SENATOR LEVENTIS: And the ones that you received that you judged not to be appropriately stored -- and I know that happens on occasion -- what do you do with those? What's the process there?

MR. ANDERSON: Currently they are run through the canyon processing facilities, which is a chemical processing facility for those materials.

SENATOR LEVENTIS: Let me turn my attention to Mr. Nesbit with Duke Power. We appreciate your coming. I've got a series of questions I'd like to ask you. Do you have those?

MR. NESBIT: I have a sheet here I got a couple of minutes ago with questions there.

SENATOR LEVENTIS: It's got Duke in the middle?

MR. NESBIT: That's the one.

SENATOR LEVENTIS: Okay, how much confidence do you have in the Department of Energy's overall performance in meeting their contract obligations? And of course, we're talking about some specific matters in terms of waste fuels and the like?

(Laughter.)

MR. NESBIT: Well, whenever we enter into a contract with any other person or organization, we always expect them to live up to their contractual obligations, just as we intend to.

SENATOR LEVENTIS: But has that been the record, especially in terms of waste matters to this point in time?

MR. NESBIT: Problems sometimes arise in these types of relationships.

SENATOR LEVENTIS: Are you all -- you all being Duke Power -- presently involved in a legal action against the department in terms of the waste?

MR. NESBIT: Yes, we are.

SENATOR LEVENTIS: Have you all looked into technical failures that the Department has experienced in recent years, such as the ITP, the Pit 9 project in Idaho, and the vitrification pilot plant in Ohio? Do those things concern you?

MR. NESBIT: We're aware that the Department of Energy has a daunting task in front of it throughout the weapons complex. As they've strived to deal with the problems that they face, there's been successes and failures.

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We're also aware of some successes they've had, but with respect to this program, I want to emphasize that our confidence is in the ability of the Duke, Cogema, Stone and Webster consortium, primarily with the knowledge and technology of Cogema to design, build, and operate a successful mixed-oxide fuel fabrication facility. We know they can do it because it's been done.

SENATOR LEVENTIS: If the material is not ready in 2006, will you have incurred costs that you won't be able to recover until you actually use the fuel?

MR. NESBIT: We can adjust our fuel procurement and planning process to have flexibility so that up to approximately a year prior to actually putting the fuel into the reactor, we won't incur costs.

SENATOR LEVENTIS: Has your company been in contact with the Public Service Commission here in South Carolina about the financial implications of the proposed contract with DOE?

MR. NESBIT: I don't know. That's not my department. I personally have been in

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touch with the people in our company who handle that liaison responsibility, but I don't know for a fact whether they have or have not had discussions with the Public Service Commission.

SENATOR LEVENTIS: Would you please let us know when you can the status on that particular issue because that's what most directly affects the folks of South Carolina in terms of any costs or savings they may expect?

MR. NESBIT: Certainly, I'd be glad to.

SENATOR LEVENTIS: What would be the impact if the Department is unable to pay the expected fees involved on Duke?

MR. NESBIT: Well, I'm not sure that -- I guess the question is more like if the Department is not capable of delivering the fuel because we anticipate paying the consortium for the fuel.

We will have a contract. We have a contract and will have a contract with the Duke, Cogema, Stone and Webster consortium. We don't have a contract directly with the Department of Energy in this program, and we don't anticipate having one, so the impact will

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be, if we don't get the fuel, we don't pay for it.

SENATOR LEVENTIS: If you're familiar with this part of the contract, please tell me. If you're not, then I'd like for you to see if you can determine it for us.

Do you feel that your company is contractually bound to pay fuel offset credits to the government?

MR. NESBIT: I think, as I understand the question, we are. The fuel offset credit is what you refer to as the value of the displaced uranium fuel that would have been used had we not loaded mixed-oxide fuel in the reactor, and we will pay for the mixed-oxide fuel, so that is essentially the value of the fuel to us, which --

SENATOR LEVENTIS: The value of uranium has varied substantially in the last several months, years. What if the value of uranium is such that the mixed-oxide fuels are an expensive proposition, vis-a-vis uranium, at that point in time? How will ratepayers of South Carolina be affected by that?

MR. SELBY: Senator, maybe I could

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help you with that.

SENATOR LEVENTIS: Sure.

MR. SELBY: In the formula you may have seen in the contract, the ratepayers of South Carolina are not at a risk with that.

The fuel offset is the offset of the 40-percent MOX fuel that is being used by Duke and Virginia Power in their reactors.

There is a savings if you -- and I do have a chart on it to show the rest of the audience -- F factor is between .5 and .9. That F factor allows for the ratepayers not to have to pay full value for the LEU offset. In other words, they get the MOX fuel at a slightly decreased price over the current LEU fuel at that particular moment in time.

SENATOR LEVENTIS: Since the LEU fuel has decreased in cost recently -- and of course, we don't know what it will do in the future -- but since that's happened, does that make the program more expensive for the Department of Energy now?

MR. SELBY: As LEU fuel prices decrease, and if they do, the offset, yes, will be more expensive for the Department.

However, in any program -- this is a program to dispose of materials -- you're going to have a price. The taxpayers, not the ratepayers, are the people who do pay for both the fabrication of the weapons, and now we unfortunately will be paying for the disposition of the weapons.

There is a, as I said before, only a slight offset that we'd give the ratepayer -- would not allow the ratepayers to pay any higher utility bills if they were using MOX versus LEU.

SENATOR LEVENTIS: This is a little more technical question, but please follow me if you can.

In the material that you've sent, the fuel fabrication facility was, I believe, listed at a cost of 250 million. Was that after you had subtracted the 930 million projected fuel displacement credits from the 1.18 billion?

MR. SELBY: I'm not sure where that number came from. I think our design-only CDR estimates the cost of the MOX fuel fabrication facility, I believe, at around 450, 480.

The fuel offset is still the fuel offset credit. I mean, we're going to be offsetting LEU fuel with MOX fuel. It's going to be a number based on whatever the price uranium is at the particular time.

That full offset will not be, though, available to offset the cost of operation, complete cost of operation of MOX fuel, because part of that offset will go to the -- to assure that the utility ratepayers will pay no more than the price of LEU fuel.

SENATOR LEVENTIS: Than they otherwise would have paid on other costs to the utilities, besides the cost for fuel, any other changes in the facility, administrative costs, et cetera?

MR. SELBY: The changes in the facility are addressed in what we call -- there's a clause H11 in the contract. In that clause, we address that if there's a cost to the utility that is caused specifically by the use of MOX fuel, whether it's a change in equipment, because of the use of MOX fuel, or whether it's increased regulatory oversight or inspection, the Department will pick up those

additional costs.

Now, remember the first two -- the first two phases, the base contract and option 1 are cost reimbursable contracts.

Option 2A, which is the hot startup, is also a cost reimbursable contract, and then never go into the operation of the facility in option 2B.

SENATOR LEVENTIS: What is the likelihood that the NRC may not be as excited about MOX fuel as everyone else? I mean, is there any likelihood that NRC would change the cost structure to Duke in a way that we haven't projected with their requirements? How much are you planning for NRC requirements to cost, which are reimbursable, I take it?

MR. NESBIT: Well, we certainly anticipate -- the licensing costs are reimbursable under the contract. We certainly anticipate the Nuclear Regulatory Commission will be a vigilant oversight organization as they've always been with our reactors. I don't anticipate anything other than that.

With the public interest that's involved with this program, they will be

careful, and I'm sure they'll discharge their responsibilities appropriately.

We certainly anticipate that we'll need some minor modifications at our plants in order to demonstrate that we can safely operate with mixed-oxide fuel, both to our own satisfaction and to the satisfaction of the Nuclear Regulatory Commission.

SENATOR LEVENTIS: Have you all already made that application?

MR. NESBIT: No, we're going -- our current plans are to submit the application for a batch scale utilization of mixed-oxide fuel at the end of 2003. So there's quite a bit of time between now and then.

We're going to use that time to do the detailed plant-specific studies in order to quantify the impacts of using MOX fuel, and identify any required modifications, and to design those modifications.

SENATOR LEVENTIS: We've been going for quite awhile. What I'd like to do is to give Ms. Jeter a rest and to recognize those folks, such as Senator Courson, who have been very patient, Representative Clyburn, to see if

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they have any questions. Then I'd like to take about five minutes to give her a chance to catch up, and then reconvene, and we should be ready to discuss some things from the audience.

There are also issues dealing with the cost factors in the Environmental Impact Statement, and I'd love to give you all a copy so we'll all be reading off the same sheet. I don't want you to have to guess where we are, and try to lead us through some of those steps.

Senator Courson?

SENATOR COURSON: I have just one basic question involving the DOE, I guess.

You mentioned the three and a half years we've had bilateral negotiations between the United States and Russia. Does that include -- are we having similar negotiations with other provinces -- former provinces of the Soviet Union, like Ukraine, Belorussia, and others that possess nuclear capabilities, or is this just isolated to bilateral between the U.S. and Russia?

MR. NULTON: It's just between the U.S. and Russia at this point.

SENATOR COURSON: Follow-up would

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be: Do you anticipate any negotiations between the United States and other former Soviet Union provinces that have nuclear capability and nuclear weapon systems?

MR. NULTON: My understanding is the weapons all came back to Russia. That's why we are negotiating.

SENATOR COURSON: All the weapons are back in Russia?

MR. NULTON: That's our understanding.

SENATOR COURSON: All the weapon systems, nuclear weapon systems formed in the Soviet Union are back now in Russia?

MR. NULTON: That's my understanding. There may be some materials still in these other countries, but I believe the weapon systems are back in Russia. There are no negotiations at this point in time with any other provinces.

SENATOR LEVENTIS: Thank you, Senator Courson.

Representative Clyburn, did you have any questions you'd like to ask?

REPRESENTATIVE CLYBURN: I do not

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have any questions. I just wanted to observe.

SENATOR LEVENTIS: Well, we certainly appreciate your presence and everyone's patience. We appreciate your sitting through this, and we'll get to some of your questions after the break.

It is now, by the clock on the wall, five minutes to eight. I'd like for us to get back together at five minutes after eight.

(A recess transpired.)

SENATOR LEVENTIS: Thank you, I appreciate your patience. We didn't start on time, but that's my fault.

I'd like to pursue a line of questioning now regarding some financials. I wanted to recognize Ethan Brown to go over some of the financial information that was in the EIS, and I think the draft EIS.

Then I'd like to recognize Dr. Makhijani for a couple of questions. We will reassemble our thoughts, and then we'll proceed from there.

And of course, I've invited the gentlemen from DOE or Duke or Cogema to make any comments that they'd like to make if they

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feel it would help the process.

MR. BROWN: Thank you, Senator Leventis, for having me here.

I just want to try to clarify my understanding of some issues as they were addressed tonight and as they have been addressed in public documents that DOE has presented.

I hope you guys have a copy of -- this is the EIS technical summary supporting document. I think they're passing those out right now.

This gives a value of 930 million for the fuel displacement credit. And my question is -- I guess two parts to it -- the first is: What level of certainty would be required to include that as the 930 million dollar offset credit given the price of uranium fluctuating?

And the second: Why is there no mention in the EIS of this fraction F that will allow the reactors to withhold up to 465 million dollars from the government, thereby increasing the total cost of the MOX program by that amount?

MR. SELBY: Okay. The first point is, the contract has just been recently, as you know, negotiated. March 22nd is when we completed the negotiation.

There will be a revised cost report that comes out with the final EIS that will reflect the negotiated agreements.

MR. BROWN: If I were to take the .5, then I would be correct in adding to the 250-million-dollar net lifecycle cost, 465 million dollars?

MR. SELBY: As I said before, the .5 to .9 are the ranges. I can't tell you the exact number.

MR. BROWN: Just go with half?

MR. SELBY: Yeah.

MR. BROWN: So I would add that amount to the cost of the fuel fabrication?

MR. SELBY: The .5 would be -- exactly, the credit would be increased.

MR. BROWN: Okay. My second question relates to the decision in the EIS literature to exclude the payments of annual fees, even though those in the contract are presented in the very same equation that the

fuel displacement credit is discussed, and it reminded me a little bit of folks who run into problems on Wall Street, where they go ahead and present to the SEC their accounts receivable as certain but discount away their accounts payable. I'm wondering what the decision was to include a potential credit to the government but exclude a potential cost when they're both contained in the exact same payment equation. What was the reasoning behind making the difference between the two?

MR. SELBY: I guess I'm not sure exactly your question. Would you repeat it?

MR. BROWN: Sure.

SENATOR LEVENTIS: Do you have the equation in front of you?

MR. NESBIT: Bob, I think he's talking about the 1996 cost report.

MR. BROWN: I'm trying to reconcile that with the contract.

MR. NESBIT: The 1999 contract.

MR. BROWN: Right, the payment formula has included it in this annual fee. I'm wondering why that was excluded from these cost estimates.

MR. SELBY: Again, I'm sure those cost estimates were prepared prior to the contract being negotiated.

Let me tell you about -- so there's no misconception -- this cost containment formula starts, as you're probably aware, at option 2B, when we start getting the full operation of the MOX fuel fabrication facility.

The fabrication costs would include whatever the operating costs are. These are the operational costs, with the LEU as being revenue, being the offset minus the percentage of the formula, either the .5 to .9 that I talked to you about, so that was what we negotiated. I can't speak to the cost.

MR. BROWN: Okay, but I guess just what I want to make clear is, in the final EIS, then this annual fee and its value would be included in the total cost.

MR. SELBY: The annual fee actually hasn't been negotiated yet.

MR. BROWN: But it will be included at --

MR. SELBY: Some number for that annual fee is what you're asking?

MR. BROWN: Would it be fair to say that the estimated, what, 300 million that the Department has put out in two separate documents is an accurate estimate of how much that annual fee will be over the lifecycle?

MR. SELBY: What our estimate has been, at least in terms of what we did for the negotiations was, that we estimated that the cost of operating the MOX fuel fabrication facility would be somewhere between 55 and 60 million dollars a year.

MR. BROWN: I think I'm speaking about the fee as opposed to the cost. I know in the contract they draw a distinction between the two, and they estimate in two documents, one, this '96 technical summary, and two, the one coming out of Oakridge, I think, in April of '97, that says the value of the potential annual fee will be 300 million dollars, and that's included nowhere in the official cost estimates. I'd just like to know whether that's going to be anywhere.

MR. SELBY: I don't recognize that number.

MR. BROWN: Okay.

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MR. SELBY: What we plan, the cap on fee, as far as the Department is concerned, is 10 percent. At 50 to 55 million dollars a year, we're talking maybe 5 million dollars, maximum 5.5 million dollars.

DR. MAKHIJANI: I think there's a miscommunication going on. If I might try to clarify. I think Ethan is asking about the fee to the utilities, this annual fee in the cost formula regarding fuel reimbursement.

MR. SELBY: Oh, the production --

DR. MAKHIJANI: The annual fee to the utilities you would pay them for the MOX irradiation services, how much is that, and the fact that it's not in the EIS. I think you're misunderstanding.

MR. SELBY: I'm sorry. Yes, pardon me. I am off base on that.

What we've done is, we've done a sample calculation. I chose the mid-point of F equals 0.7. You can choose 0.5 to figure out what it is that we're talking about.

On an annual basis, the reload of 40-percent MOX core will offset -- a total reload will cost about 42 million. About

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40 percent of that then would be the LEU -- the MOX fuel. And if you use the -- I use, again, the .7 for my calculation, I come out with about 5 million dollars a plant, out of the 42 million that would be spent on a core as a reduction in cost for the utility.

Now, if you take that on the total cost of nuclear operation, which includes O&M costs and other costs like depreciation and taxes, et cetera, the actual savings in nuclear generation, I calculated, is about 18 percent, that five 104 -- 5.04 million or about 2.1 in overall savings to a utility for using MOX fuel. Again, I used it based on a 42-million-dollar reload.

The numbers I used to calculate the O&M cost were about 14 percent for O&M, 15 percent for other costs, 6 percent for nuclear fuel.

And if I want to put in the transmission costs, which are, again, 65-percent of the total cost for the consumer to receive electricity, in terms of seven mills per kilowatt, seven cents per kilowatt hour, I come up with reduction on the overall plan of

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only about .8 percent. If you take the total value of what it takes to produce electricity and transmit it to the --

MR. BROWN: I appreciate your thoroughness, but I think -- I had a much more simple question, and that is: The Department knew in 1996 that this annual fee may be required, and the annual fee they estimated at 300 million dollars to pay out to the reactors to participate in this program.

MR. SELBY: Uh-huh.

MR. BROWN: I want to know why they didn't include that in the official cost estimate, and why they decided to include the 930-million-dollar fuel offset credit.

MR. NULTON: I think, first of all, we need to -- the cost estimate we did back in the past was based on our best guess at how this fuel was going to work at that time.

Now we have actual numbers and contracts in place. I think we ought to focus on what the current arrangement is because this is more accurate.

Can you say, Bob, what the maximum fee to the utility would be a year, based on --

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MR. SELBY: Well, this is, again, a 5-million-dollar offset based on a 42-million-dollar core replacement. That five million, though, then has to be compared to what is the total overall -- I mean, if we're concerned about utilities having a windfall, I mean, you've got to really compare that 40 --

MR. NULTON: Is the number anywhere near 3 hundred million?

MR. SELBY: The number at -- let's see. It could be about -- if you take it over the life of the 13 years.

MR. BROWN: So can I just then recalculate the cost -- or in this EIS to update it to the level of knowledge and understanding we have now? If I take .5, which is just saying we'll split the factor in the middle, right, then I get --

MR. SELBY: No. The factor runs between .5 and .9.

MR. BROWN: Okay. Fine.

MR. SELBY: You're taking the worst case, and that's okay.

MR. BROWN: Well, I didn't know the value of that.

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MR. SELBY: No, no, no.
MR. BROWN: I'm just saying 495. I'm going to add that to the 250, right? Then I'm going to go ahead and add the 300 million. So that's a much more expensive program than initially estimated. That's like four times the cost of the immobilization program.
MR. NESBIT: You're including an incentive fee of 300 million, plus a fuel discount. That's double counting.
MR. SELBY: You can't do that because the fuel discount is their incentive.
MR. BROWN: Okay. That's not how it's laid out in this. So the total incentive payment or annual fee to the participating reactors would be something like 300?
MR. SELBY: No. On an annual basis, on an annual basis --
MR. BROWN: Over the course --
MR. SELBY: -- per core load, it's about 5 million dollars.
MR. BROWN: Okay.
MR. SELBY: Per core load.
MR. NULTON: Which is every 18 months.

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MR. SELBY: But on average, it's going to be three to four --
MR. BROWN: So it would be fair to say then it's going to be approximately double the cost of what was in the EIS estimate, if you take that --
MR. SELBY: I'm not -- I've got to look at the EIS. I'm not --
SENATOR LEVENTIS: I think what would be reasonable to do would be to ask you to take a look at that and provide for us, if you would, when you can, what you think lifecycle cost would be, vis-a-vis, this '96 --
MR. SELBY: Absolutely. It's going to be revised in issue with the EIS. It is --
SENATOR LEVENTIS: When -- do you have any guesses?
MR. NULTON: Yes, September.
SENATOR LEVENTIS: No, not when the EIS is --
MR. NULTON: I think what Mr. Selby was saying was, it isn't 300 million -- you said it's possible it could be 300 million, but that would be over the life of the program --
MR. BROWN: That was my

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understanding.
MR. NULTON: -- for the whole 10 to 15 years, not per year.
SENATOR LEVENTIS: Right.
MR. BROWN: And that's what I just wanted added --
MR. NULTON: Big difference.
MR. BROWN: So we're in agreement. That's fine. So it's going to be roughly double over the lifecycle of the program is my understanding, based on what you said.
MR. SELBY: I --
MR. BROWN: For the actual reactor component you have 290 million; and I'm saying, given the fact you'll be paying out over the lifecycle 300 million in fees that weren't included in this estimate, given that consideration, it's going to be roughly double.
MR. SELBY: I don't think I would agree. I think that if we -- let's walk through the formula. We know that we're going to spend 50 million dollars to 60 million dollars a year for the MOX fuel fabrication facility. That includes the fee for the consortium, 60 million a year.

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We know we have an LEU offset. We produced 58 -- as you know, the plant runs at -- I think it's about 58,000 -- let's get the numbers here, 58 metric tons per year.
With that, you can do the calculations using either F of somewhere between .5 and .9. You can choose .5, since that's the worst case. You know the LEU offset value. It's 40 percent of the total core load, which is approximately 42 million dollars.
So you know what the utility would get. You know what the MOX fuel fabrication facility costs are. You can use the 10 percent -- less than 10 percent for the annual fee MOX fuel, which adds up to a 60-million-dollar MOX fuel fabrication cost.
So what we're looking at for a maximum liability to the government -- let's say the uranium prices are at -- again, I used an F factor. I'll give you an example of .5. We'll end up paying on an annual basis about 34 million dollars over a 15-year life.
MR. BROWN: Can I ask one other question?
SENATOR LEVENTIS: Please.

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MR. BROWN: I just wanted to clarify a discussion that we had about the cost of the plutonium polishing addition.

It was suggested there was going to be no increase in schedule and no increase in cost. I think it was said it was going to be a wash.

I'm just having trouble reconciling that with a number of statements in the different DOE documents that listed anywhere from costing an additional 50 million to costing up to 250 million.

What am I not seeing in the documents that you're seeing?

SENATOR LEVENTIS: What documents are you taking about, Ethan?

MR. BROWN: The technical summary report for surplus weapons usable plutonium, October '96; then the 1997 study that Oakridge did.

I mean, does that pretty much directly suggest there's going to be an additional cost and a schedule increase?

MR. SELBY: I think, first of all, we don't believe that there will be a schedule

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increase. I think we looked at that when we were analyzing the schedule that was proposed by Duke, Cogema, Stone and Webster for the project.

What does happen is, we reduce the length of the time of the fuel qualification program, as Dave Nulton stated, by removing the gallium and other potential impurities in the weapons-grade material.

So I think it -- although we haven't had a design done as yet of the polishing facility -- there's no indication that the design will require a longer schedule in terms of construction, nor that the cost will be significantly increased from the estimate.

MR. BROWN: I just want to read then for the record this DOE document says, The sunk cost of the -- the dry processing would be, approximately 50 million, and then an additional 50 million for establishing the wet polishing line, and a two-year increase in schedule. It says, Articles in trade press suggested the cost be as much as 250 million or higher. And that's Dr. Reed and Dr. Miller, April '97, Oakridge.

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MR. NULTON: I don't know where the article -- the number of the trade press came from. I don't think it was one of our numbers.

MR. BROWN: That's fine. Just go with 100 million.

MR. NULTON: My point earlier, my comment was, when you look at the dry gallium removal process, it involved a substantial amount of R&D work and time to do that. It involved a substantial amount of fuel testing in the ATR reactor. We no longer have to do that, so there's a lot of cost savings there.

We also would have had to produce a larger number of lead test assemblies, which we now don't have to do.

So when you look at the savings and lead test assemblies, which each one of them has a fairly significant cost, the fact we don't have to do the R&D, and we don't have to do the test and ATR, there's an enormous cost savings there.

That's going to be offset by the fact that we do have to design and build this AVS acqueous polishing, so I'm saying they offset each other somewhat.

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MR. BROWN: Can you just explain, though, how the sunk costs becomes a wash?

MR. NULTON: The sunk costs are there. We can't go back and cover those. We hadn't sunk very much that would have been a -- we never did any work on TIGR. We never got that up and started. So we didn't spend any money on that. We didn't design the NPDCF, because we didn't design the facility yet. So I'm saying those costs were never expended.

MR. BROWN: So there was no 50 million --

MR. NULTON: No.

SENATOR LEVENTIS: Dr. Makhijani, do you want to proceed?

DR. MAKHIJANI: I had some questions about the Russian or clarification about some parts of the Russian program.

Mr. Nulton, you said that you're not aware of a Russian reprocessing program. So far as I'm aware, there's a reprocessing plant, a military plant, operating approximately as of the 26th.

MR. NULTON: I'm not aware of a civilian reactor --

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DR. MAKHIJANI: There is a military plant, Thomas 7, and there is a civilian plant, RT1 at Mayak in Southern Europe. And that is the reprocessing plant, in fact, where not only Russian fuel is reprocessed, but a fair amount of foreign fuel has been reprocessed. All of the foreign contracts are in some jeopardy because of cost consideration, but they're still negotiating with the Bulgarians, for instance, for taking their spent fuel, new process in RT1.

RT1 has long been their commercial reprocessing plant. Isn't that right?

MR. NULTON: I don't know. I was not aware of it.

DR. MAKHIJANI: Well, I'm a little bit surprised because one of the greatest security concerns that has been widely expressed by us and by many people in the official capacity has been the 30-odd tons of commercial plutonium that has already been separated from Russian commercial plants and foreign commercial plants -- but I think it's primarily from Russian plants -- that are stored there in separated form, plutonium

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dioxide form, in 12,000-some bins in Mayak.

I believe the Department has had some security concerns around this and that there is an operating reprocessing program.

One of the reasons this whole agreement is a source of concern to many of us is that the Department has gone back from the original idea that in Russia and the United States it will be a once-through program, and not allow reprocessing.

But now, as I understand it, the Russians have a reprocessing program. They've got a backlog of spent fuel to reprocess. So does it make any difference that MOX fuel would be reprocessed 10 years from now as opposed to now or ten years from 2005? Will it stop their reprocessing program in some way or upset it?

MR. NULTON: I think they clearly, at some point in the future, would like to reprocess this material, and the agreement that is being negotiated is that they won't initiate that until the disposition activity is completed.

I think the thought there is that the weapons-grade material will at least be

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degraded to a reactor-grade form at that point.

DR. MAKHIJANI: Well, degraded reactor fuel can be made into weapons. It's my understanding -- I don't know if it quite confirms with your understanding -- that the main threat from Russian plutonium is not that the Russians are going to use their plutonium again in weapons. The main threat is that it will wind up in black markets and be sold to third countries or terrorist groups and so on.

Isn't that the main problem about Russian plutonium?

MR. NULTON: That is a concern about Russian plutonium.

DR. MAKHIJANI: It's not that both the U.S. and Russia have plenty of surplus plutonium, so they wouldn't use degraded plutonium in their weapons, but degraded plutonium can be used to make weapons.

So my problem is that the -- my concern that we're having, and I'm wondering why the Department doesn't share it is, the Russian reprocessing program will be going on as it is now, and is not affected in any significant way, so far as nonproliferation

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issues are concerned, by delaying the reprocessing of MOX fuel. It just simply seems like some kind of paper satisfaction for the American side at having given away a very big negotiating point to allow the Russians to reprocess their MOX fuel. It doesn't accomplish a disposition purpose, right?

MR. NULTON: It delays it. There is some net destruction of plutonium by using it in reactors. And it does degrade it to reactor-grade form, which is much less desirable for weapons, so there is that gain.

SENATOR LEVENTIS: And some of the concerns that I think we ought to acknowledge that -- some of the concerns you've shared, while they're very valid, are not DOE policy issues because they're being negotiated and dealt with at a different level than that.

I understand completely what you're saying, but these gentlemen may not have a hand on that particular throttle. I think that if you can reflect on it, it would help us, but I know there's some that you can't reflect on.

DR. MAKHIJANI: I have some questions about the regulatory system in Russia

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and how their relicensing or licensing activities would work.

What's the condition of their Nuclear Regulatory Commission in terms of their authority over their power plants, their authority to require changes, their budgetary situation?

MR. NULTON: Well, I'm not sure, and I don't think we have the right people here to answer that. I can say that GAN, which is their Nuclear Regulatory Agency, will regulate the facilities that use this MOX fuel.

Our NRC works with their GAN to try to help in their regulatory process, but I don't know the details. We can answer those questions. We just don't have the right people here this evening to do that.

MR. STEVENSON: The funding of GAN, in order to perform their regulatory functions, is also part of the subject of negotiations, because we have to make sure that what is negotiated is a complete program, and therefore the regulation of the Russian reactors to disposition of weapons-grade plutonium is part of that negotiation.

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DR. MAKHIJANI: Thank you very much for that clarification because we had heard their regulatory commission, which is GAN, is sometimes not able to pay their electricity bills, much less regulate anybody, so it has been a concern, so thank you very much for clarifying that.

Their reactors, as I understand, are not -- were their reactors designed for use of MOX fuel? Are you assuming that they would use 40-percent MOX fuel also?

MR. NULTON: No, they're not going to use 40 percent. They will use much less than that.

Again, I don't know that we have the right people here to get into the details of their reactor designs, but we do have our laboratory experts working with theirs to determine how much they can burn safely, what modifications would be required for those reactors and so forth.

SENATOR LEVENTIS: How many reactors do you believe will be involved in their MOX process?

MR. NULTON: Seven.

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SENATOR LEVENTIS: Seven?

MR. NULTON: Yes.

SENATOR LEVENTIS: They're going to expend all of their fuel using -- I mean, they're going to MOX all of their fuel instead of stabilizing any of it?

MR. NULTON: They're going to MOX almost all of their weapons-grade material. That's correct. They have some chemical solutions and waste materials that they will probably immobilize. That's part of what we're negotiating in this contract, or in this bilateral agreement.

SENATOR LEVENTIS: Then it must not be simple math because we have six plants that are going to use MOX fuel for 10 to 12 years and do away with 30-some-plus tons, and they have seven that are going to use it for a similar period of time and do away with a lot more.

MR. NULTON: Except we need some additional capacity in Russia because they're going to put less plutonium into their reactors.

SENATOR LEVENTIS: Right.

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MR. NULTON: So we need to identify additional reactor capacity.

SENATOR LEVENTIS: Which hasn't been done yet.

MR. NULTON: Right. That would have to come from European reactors or Ukraine reactors, or we also have a program that we're working with the Canadians, where they might possibly burn some of the Russian plutonium. So that would provide the additional reactor capacity if the Russians don't.

DR. MAKHIJANI: Finally, I really have been very, very concerned about the liability questions. It is my understanding that Russia did not consider the use of MOX in light-water reactors as part of their program until the disposition question came up, and it was brought up by the American side. Is that right?

MR. NULTON: I don't know. I don't believe their reactors were designed specifically for MOX. I'm not sure that means that they can't burn some amount of MOX in those reactors.

DR. MAKHIJANI: No, no, it's my

understanding that they never considered it because they didn't consider it a desirable thing to do with plutonium, as to use it in light-water reactors.

MR. NULTON: I think that initially they did not want to burn it in their reactors. I don't think that we talked them into it. I think this was part of the joint negotiations that we had with them.

What they wanted to do, as I mentioned, was store it and build more breeder reactors. What they wanted was aid from the G7 countries to build a series of breeder reactors. We said we would not do that so that led us logically to the use of their existing reactors.

I don't think it was a matter of talking them into it. It's just we worked out the joint agreement.

SENATOR LEVENTIS: At the bilateral negotiations and discussions, are there high level DOE officials and GAN officials as well as the vice-president and the president? Who's doing the negotiations?

MR. NULTON: The negotiations are

being done by the State Department and the Department of Energy.

We have a team of negotiators made up of individuals from the State Department and Laura Holgate, who is the Director of the Office of Materials Disposition, member of that, Deputy Negotiator on the U.S. side, and on the Russian side we're negotiating with them now.

DR. MAKHIJANI: Thank you very much.

SENATOR LEVENTIS: Gentlemen, thank you. You've been very patient, and I'm going to recognize some folks from the audience now and hope that we have time to recognize as many as possible. I'd ask you to identify yourself for Ms. Jeter, and please come forward. Make sure that red light in that little machine is on there.

Certainly, if you'd like to make a statement, that's fine. I'd like for you to ask questions. In consideration of the other folks who have been so patient, please try to be prompt.

Actually, I was going to recognize Ms. Thomas first.

SPEAKER: I'm sorry.

SENATOR LEVENTIS: It's not McDonald's. I'm sorry.

SPEAKER: Is there a list?

SENATOR LEVENTIS: Ruth Thomas with Environmentalists, Inc., would like to make a statement and ask some questions.

MS. THOMAS: I had some --

SENATOR LEVENTIS: Is the red light on, Ms. Thomas?

MS. THOMAS: Yes, but my voice is not doing too well.

SENATOR LEVENTIS: You might have to lean down a little bit so we can all hear you.

MS. THOMAS: I'm getting smaller. I've been getting smaller anyway as I get older.

We agree with the Department of Energy that plutonium must be kept from terrorists. However, the draft Environmental Impact Statement does not adequately explain how the proposed options could accomplish this.

And Mr. Makhijani, he got in ahead of me the questions about how -- if you go ahead and irradiate mixed-oxide fuel at

commercial reactors, this is only a temporary approach, and a ban on reprocessing could easily be changed, not just in Russia. It could be changed in this country.

We've addressed that, but I did want to bring it up to you because it's one of our concerns. And incidentally, Environmentalist, Incorporated has been involved in these issues for 27 years, and we have raised questions and tried to bring about awareness and to get answers to our questions.

The draft EIS appears to address the security and health problems associated with plutonium, but it's very difficult to find answers to questions due to the -- there's not much footnoting, and the connections are not made between specific references and places in the text where there are statements and conclusions.

And you have to go from one part to the other, and back and forth, and look at charts. I'm hoping this will be corrected in the final.

Some of the options suggested appear to be in conflict with what is known about

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plutonium. So much moving around -- I was going to try to take all those moving around because it not only seems to be moving materials from Texas to South Carolina, and then from there to nuclear reactors, but they have to get special materials from other places, and I thought it would be good to have a visual to see all of those routes intersecting and how many different areas of the country would be affected and exposed to the problems with transportation and accidents.

There's not enough justification for the proposal for mixed-oxide fuel in terms of factual data. Only a limited amount of information is included about the past history of operations which are related to other facilities which involve plutonium, particularly reprocessing plants.

There's nothing about nuclear fuel services, New York State, Cogema, British reprocessing, and all the hearings lately that went on about the bio-nuclear fuel reprocessing plant in which our organization was involved over a period of five to seven years.

These documents have information

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that need to be included in references, and I've seen none of this.

Then there's the defense waste processing facility. What is the status of that, and is that available for identifying both high-level and plutonium?

As I understand it, the problem with the Savannah River defense waste processing facility is the intank precipitation process.

The releases of benzene, for example, in the development of the salt cakes, which leaves not only a fraction, as I understand it, of the sludge available for the defense waste processing. There's inadequate information regarding reprocessing and how a change in nuclear policy would affect security issues.

Is it possible to recover plutonium once the plutonium goes through the vitrification process?

I haven't given you time to answer these questions.

Options which might offer a better chance for accomplishing the goal of protecting against the theft of plutonium by terrorists or

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used by other countries are not included in the draft EIS. I feel that it does not come up to the standard of the National Environmental Policy Act.

And I've got 100 other questions, but I know I want to give other people a chance. Thank you.

SENATOR LEVENTIS: Thank you, Ms. Thomas. Let me just say that you've raised a number of questions, and we appreciate that. We do want to try to get everyone in, especially if the questions have been asked before, please take those answers.

As far as specific issues in the document that are difficult to follow, I think that you need to raise some specifics to these gentlemen so that they can hopefully address those.

Some of the other questions I'd certainly defer to DOE, but I think it's important to recognize -- and I forget which one of the gentlemen said it -- the direct question about how the program was initiated for MOX, that it definitely was initiated by the administration at the State Department as

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opposed to DOE although, I know there must have been consulting on the issue, but I'll defer to DOE to answer questions about the defense waste processing, security, et cetera, vitrification and reclamation.

MR. NULTON: I'll just try to hit some of the high points if I can.

The EIS does not address reprocessing because we don't propose to do any reprocessing of fuel.

The purpose of the program is to have a once-through fuel cycle, so this plutonium, once it is used in MOX fuel, would go to a geological repository and would not be reprocessed.

At this point, the United States has a policy not to reprocess fuel from commercial reactors.

With regard to the defense waste processing facility at Savannah River, the immobilization approach that we've described in the EIS does propose to use a high-level waste immobilization facility, either at Hanford or at Savannah River.

At this point in the EIS we have

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identified Savannah River as the preferred site for immobilization because the DWPF is already built and is already operating, and it's less expensive and more timely to use it for immobilization.

The process that we've proposed is to take the plutonium and to immobilize it into a ceramic form, about the size of a hockey puck. Then we stack these hockey pucks in this stainless steel can, and those cans are imbedded in the high-level waste canisters that are produced in the DWPF.

We cannot mix the plutonium directly in with the immobilized waste without having to make either a new facility or substantial changes to the DWPF.

And also, there were questions on the chemistry of the glass, whether or not we could come up with a suitable chemistry if we were to mix plutonium in with the rest of the waste materials.

So the less expensive and more scheduled effective way of doing this is to immobilize it separately, and then imbed it in the high-level waste.

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Can you recover plutonium from immobilized waste? Yes, you can. You can dissolve the glass. You can move the plutonium back out of the immobilized form. That's one of the concerns the Russians have raised in our negotiations with the use of immobilization.

Nonetheless, we do plan to use immobilization as one of the two approaches.

I would mention here because I may not have made it clear before, the purpose of the hybrid approach of having both MOX and immobilization was to make sure that we had at least one -- I mean, we think both will work. We intend on a track to implement both. The idea of having at least two was, if you had problems with one, you would have at least one successful technology.

As you've mentioned, Ms. Thomas, we've had problems with the intank precipitation at Savannah River. I think we'll get those resolved but it's concerns of that type that drove us from the beginning to have at least two technologies available to us so that if one ran into problems, we would at least have one remaining that would work.

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SENATOR LEVENTIS: Didn't you also tell me earlier about reclamation after immobilization that it was economically more expensive to do than just to process plutonium to weapons-grade quality to begin with?

MR. NULTON: I'm not sure if I understand the question. Certainly we don't intend that we'd ever take it back out of the immobilized --

SENATOR LEVENTIS: No, we don't, but if we needed that quality plutonium, wouldn't it be easier just to process?

MR. NULTON: Oh, produce new plutonium?

SENATOR LEVENTIS: Right.

MR. NULTON: I don't know, but I suspect it would be less expensive to dissolve the ceramic pucks.

SENATOR LEVENTIS: I misunderstood that.

MR. NULTON: I think you could dissolve it fairly quickly, but I don't know.

Charlie, you may want to comment on that.

MR. ANDERSON: I'm not sure.

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MR. NULTON: You need a reactor to make new weapons-grade plutonium. We don't have one right now that can do that.

SENATOR LEVENTIS: Thank you.

I'm going to call on Mary Olson. After Ms. Olson, Jim Kearse, so if you would be ready.

MS. OLSON: I'm just going to be brief tonight, but tracking this process and looking at the numbers in the supplemental EIS on reactor impacts -- this would be a question for the Department of Energy -- the supplemental EIS shows that in the rather rare event that we've had Chernobles, we've had it happen -- of a reactor accident that were to expel core materials, as in fuel, to the environment, that using plutonium fuel in reactors does increase the number of latent cancers that would be expected from that event, which clearly there would be cancers from uranium being dumped in a similar way, but there would be an increase in the number associated with using plutonium fuel.

An independent study done by Dr. Ed Lyman has also estimated this number and showi

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a significant increase of risk.
Working for an organization that tracks the status of the operating reactors in the United States, we're well aware of the influence of both aging on reactors, and the impact of intense heat and radiation, degrading the metals that the reactors are made of, and also the impacts of the deregulated utility environment, in terms of the needs for corporations to cut their costs and become competitive.
And those things combined with the difference between the fission physics of plutonium and the difference compared to uranium lead us to feel that there is an increased risk in the possibility of accidents, incidents, releases above what operating uranium in reactors currently demonstrates, so increased chance of an accident or incident coupled with increased consequences of such an accident or incident, we are in a need for process here. I would like a clear statement from the Department of what the justification is for exposing the reactor communities to this increased hazard.

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MR. NULTON: Okay, I may ask Duke to jump in here, if you feel you have to.
I think, first of all, the events that Mr. Lyman addressed in his study were beyond design basis events. Let me see if I can put this in layman's terms. These are not normal operating kinds of events. They are very, very low probability events, one-in-10-million, one-in-100-million kind of events.
There are two or three of those events which would result in a release of plutonium.
In most events that occur in a reactor, you release fission gasses, but you don't release the actual plutonium or uranium metal that's in the fuel.
However, there are these very, very low probability events that would release plutonium, and as Ms. Olson points out, there's already plutonium in normal reactor fuel that is built into that fuel as it is irradiated in the reactor.
If those very rare events occur, there are some increases in latent cancer

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fatalities, and our own numbers show that, and they're, I think, fairly consistent with Mr. Lyman's.
As someone pointed out in one of our earlier meetings, the fuel that we use in reactors today has very, very few failures. There's almost no failures, so these are extremely low probability events.
As far as the degrading materials, the reactor components, the reactor vessel, and so forth, the utilities, as I understand it -- and you may want to jump in here -- will use a fuel cycle or a fuel -- they will put the MOX fuel in the core in a way that it does not degrade their reactor vessel or materials.
I assume they're going to put the fresh fuel in the center of the core, and as it burns down, they'll move it into the outer regions, but it will be managed at the fuel location. The location of the MOX fuel will be managed in a way that will have minimal impact on the materials and systems in that reactor.
As far as deregulation pressures, you know, I can't speak for the utilities, but I will say that part of our procurement process

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was to look for reactors that were financially healthy, that had good operating records with the NRC, and we believe that the Duke reactors and the Virginia Power reactors fit that bill, that they are well run and some of the best reactors that operate in this country today with a very good safety record.
So we feel that this is a safe program, and again, it will be regulated by the Nuclear Regulatory Commission, as will the fuel fabrication plant. We could have regulated that within the Department, but we felt that we wanted to use the Nuclear Regulatory Commission. They're an independent agency. They regulate other fuel fabrication facilities, so we believe that this is a very safe endeavor.
SENATOR LEVENTIS: Thank you. After Mr. Kearse, Dr. Mary Kelly.
MR. KEARSE: I'm Jim Kearse, Barnwell County Council.
How many of these people on this panel to the right are from South Carolina? I'm just curious.
SENATOR LEVENTIS: Mr. Brown is from

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Charleston. Ms. Pierce is our research director.

MR. KEARSE: The reason being is, the committee from South Carolina, Barnwell, Aiken, Senator Brad Hutto, Representative McCade -- we went and talked with DOE, Dave, and begged them to bring this process to South Carolina.

What I'm hearing here tonight is some people that doesn't understand what we're going to get from this.

When I was riding up here, I saw a beer can roll across the road, and I thought about the bad things that come out of it. One was death, and the other is split families. Innocent people die, but then there's some good things that come out of them beer cans. You end up with maybe a lawn chair to sit on the beach with after it's recycled.

When you look at plutonium going into MOX fuel, we'll end up with electricity in South Carolina, New York, Washington, wherever. We'll have something coming back to us that we've already paid for. We used it as a weapon of war, and now we're going to use it for peace

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times.

All I'm wondering is when we're going to get started. Dave, do you have an answer for that one?

MR. NULTON: Yes, as we touched on very briefly earlier, we are now in the process of initiating design of the fuel fabrication facility. Construction will start in the 2002/2003 time frame and will begin fabricating fuel around the 2006 time frame.

MR. KEARSE: Thank you.

SENATOR LEVENTIS: Dr. Kelly?

After Dr. Kelly, Mr. Lewis Zeller.

DR. KELLY: My name is Mary Kelly, and I have been following these nuclear issues -- I hate to tell you this -- but since before the bombs dropped in Japan.

As a chemist, I have been kind of tuned in, and a lot of what goes on I find deeply troubling.

I am aware of the fact that the nuclear reactors that we now have a finite time frame during which they can operate.

I've seen places where it says -- that had to do with the ability to borrow the

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money to build those reactors. However, the other factor involved is the aging of these reactors so that they are no longer safe.

At a recent meeting, I believe it's the one -- there was a recent meeting in Augusta with a subcommittee of the National Science Foundation, and I was able to ask some questions over there.

I was told on this question of -- the reactors are reaching the end of their lives and are slighted to be decommissioned, that they had picked reactors that have as much life in them as they need, and now people are talking about 10 to 12 years over which this MOX fuel is to be burned, but the figure that I was told over that meeting was six years. That's one of the things that I find troubling.

The other one is the question of criticality. We don't often hear anybody talking about criticality, but it is an important issue. We talked about it tonight in terms of the lines from the -- I believe from the tanks.

However, we are assembling a tremendous amount of nuclear material at the

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Savannah River Site, and something that kind of lit a light bulb in my head was an article I read in the Wall Street Journal some months ago talking about North Korea.

North Korea, according to the Wall Street Journal, is almost in a situation where they can blackmail the rest of the world because who is going to go in and bomb nuclear facilities? No one in their right mind.

However, we live in a world filled with terrorists and countries that might get the capacity to deliver a missile. What is going to happen if one gets dropped on the Savannah River Site? You know, that is something that does occur to me, so I think there are a great many troubling questions about this whole thing, and we do need some candid evaluations and the belief that we can really trust what we are being told. Thank you.

SENATOR LEVENTIS: Mr. Nulton, I think one of the issues that Dr. Kelly has raised might be invited by saying, are any of the proposed plants that are going to burn the plutonium, the MOX fuel, scheduled to reach

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their service life end before 2020?
MR. NESBIT: Do you want me to take that, Dave?
MR. NULTON: Go ahead.
MR. NESBIT: We've got six mission reactors proposed for plutonium disposition. Of those, two have licenses which expire before 2020 or in 2020. That's North Anna Unit One in 2018 and North Anna Unit Two in 2020. The McGuire and Catawba Units licenses expire between 2021 and 2025.
We have an irradiation plan for accomplishing the plutonium disposition mission that would accomplish it in the six mission reactors without relying on any extension of that license lifetime beyond the original 40 years.
We've also done evaluations to address aging, specifically on the reactor vessels, which is one of the primary concerns.
As Dave alluded to earlier, when responding to Ms. Olson's question, due to the field management schemes that we use, there's relatively no or close to no impact on the aging of the reactor vessel due to using

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mixed-oxide fuel, and we'll be able to demonstrate a large safety margin in that area, so we're not relying on license extension to accomplish the program. However, I will add that at Duke Power we are in the process of applying for and obtaining a license extension for our Oconee reactor in South Carolina. We're very optimistic about getting that license and using that reactor for up to 60 years.
SENATOR LEVENTIS: The security concerns at Savannah River Site, without breaching any security, do they include airborne as well as surface threats?
MR. ANDERSON: (Nodding head.)
MS. CARROLL: Can you put a nod on the record?
SENATOR LEVENTIS: I used to fly over that place in a plane carrying bombs all the time. It was one of ours.
All right. Next is Mr. Louis Zeller. After Mr. Zeller, Ernie Chaput.
MR. ZELLER: Thank you, Senator Leventis. My name is Lou Zeller. I'm on the staff of the Blue Ridge Environmental

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Defense League since 1986.
The Blue Ridge Environmental Defense League opposes the use of plutonium fuel in commercial power reactors. The plant's use of mixed-oxide or MOX fuel is unsafe, uneconomical, and unnecessary.
MOX fuel use in reactors operated by Duke Energy and Virginia Power would set a dangerous precedent in the nuclear industry by needlessly exposing many people to the risk of additional radiation exposure from a plutonium fuel power plant accident.
The program is experimental, in that no reactor has ever been operated with fuel derived from weapons-grade plutonium.
I'd read an excerpt from a letter written on May the 17th of 1999 from the advisory committee on reactor safeguards to the chairman of the Nuclear Regulatory Commission.
It states that, quote, The U.S. Department of Energy is proposing to dispose of some fraction of the nation's excess weapons-grade plutonium by converting this plutonium into MOX for use in commercial nuclear power plants. There is, however,

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rather limited operational or regulatory experience with the use of MOX in the U.S. Even the experience in other countries is not extensive.
Safety margins will be reduced because reactors designed for uranium fuel will be using plutonium fuel. These are my words. Without modifications of the plant, containment vessel, inspection schedules, and maintenance procedures, the increased danger of a reactor will be hidden by an outwardly normal appearance. It's like a land mine which could go off when least expected.
I want to dwell on just two points here tonight: One is the transportation of plutonium fuel and also issues of reactor safety.
The transportation hazards in emergency response to a rail or a highway accident must be well prepared and rapid. Delays in response to accidents which involve the release of radioactive materials would expose unknown numbers of people to negative health effects.
In 1996, a Department of Energy

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Transport and Safeguards Division, Safety-Co transport trailer carrying nuclear weapons slid off a road and rolled over in rural Nebraska.

Four hours elapsed before DOE headquarters were notified, and it was 20 hours before a radiological assistance program team determined there was no release.

A similar delay in response to a MOX fuel accident could make effective emergency response dangerous and cleanup impossible.

The following comment by the Georgia Environmental Protection Division cites, Vehicular tests of materials deposited on roadways, it takes issue with the DOE's approach to emergency response to accidental plutonium fuel releases.

It says, quote, "After a passage of about 100 cars, only a small fraction of the original contamination remained on the road surface. Unless emergency officials promptly closed the accident scene to vehicle traffic, an unlikely situation, emergency responders may face an incident scene that is, unknown to them, extremely hazardous due to respirable plutonium. Post-emergency actions may also be

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complicated due to the enhanced spread of contamination by vehicular traffic."

These are the words of the Georgia Environmental Protection Division from their comments to the Department of Energy.

SENATOR LEVENTIS: I appreciate your concerns, and we'd be happy to put anything in the record.

What, I think, would be of more significance this evening would be to pose questions that these gentlemen can respond to because their expertise is available to us, so if we could sort of go in that direction, it would help.

MR. ZELLER: Yes, sir. I understand. In fact, I was just about to get to some questions, which might be to the liking of the representative from Duke Energy and from Cogema with regard to reactor safety.

French test results suggest that plutonium fuel is more unstable than uranium fuel.

In 1997, a MOX fuel rod violently ruptured when subjected to test conditions designed to simulate an accident. The uranium

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fuel rod in that same test did not rupture.

Again, the letter from the advisory committee to the chairman of the NRC stated that, We're aware of experimental studies that show there to be enhanced release of fission gasses to the fuel cladding gap during reactor operations with MOX relative to conventional fuels.

We're also aware of anecdotal accounts from the results of Laquores test in France dealing with the release of volatile radionuclides, such as cesium, from MOX under severe accident conditions.

The results of these tests revealed that during the early stages of core degradation, releases of volatile radionuclides from MOX are more extensive than from conventional fuels at similar levels of burnup.

Does anybody care to address those test results?

MR. NESBIT: We're aware of the Capri tests in France. One of the team participants, Electricity to France, is a sponsor of those tests. They happen to be the world's largest user of mixed-oxide fuel. I

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believe they have 17 reactors in France now loaded with mixed-oxide fuel and using it.

I make that point to emphasize that this is not an experimental program. It's a mature, proven technology. It's been done safely for years and years.

The performance of mixed-oxide fuel in nuclear reactor cores over decades, primarily in Europe, but also in the United States and Japan, has been comparable to that of uranium fuel.

Concerning the Capri tests specifically, the tests involved nine reactivity insertion accident simulations in a sodium cooled reactor core. The intent of the test was to fail some specimens in order to determine when the specimens would fail.

Six of the tests were uranium fuel. Three were MOX fuel. One of the uranium fuel tests experienced failure, so did one of the mixed-oxide fuel tests.

Our evaluations indicate that the energy deposition rates at which the mixed-oxide fuel failed were significantly in excess of any that could be seen in one of our

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cores operating from mixed-oxide fuel in the extremely unlikely event that this accident took place in the first place.

All in all, I want to reiterate and point out that the performance of mixed-oxide fuel has years and years of experience behind it in Europe, and it has been exemplary.

If we thought otherwise, Duke Energy would not be involved in the program. We have a tremendous financial investment in these plants. Our workers work there. We live in the plant communities. We'd be crazy to do something that we didn't think was safe.

By the time we'd get to the point of actually irradiating mixed-oxide fuel in our reactors, we will have thoroughly evaluated the entire spectrum of potential accidents that could occur, we will have submitted these evaluations for Nuclear Regulatory Commission review and approval, and they have to give us their specific regulatory approval before we can go forward with the program.

MR. ZELLER: I hope that's some of the concerns of the advisory committee on reactor safeguards regarding the limited

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experience of MOX fuel, that you would help provide some information to them, because apparently, they feel that this experience is rather limited.

With regard to reactor safety, once again, at the Catawba plant and the McGuire plant, safety hazards in such plants are a combination of human and technical error. Both types of error are noted in the Nuclear Regulatory Commission's most recent plant performance review of the McGuire, Catawba, and the North Anna reactors.

The NRC's plant performance review, which was completed on March the 25th of 1999 says that, Unit One experienced forced outage of approximately three weeks in duration due to blocked flow channels in portions of the ice condenser, which is part of the containment structure.

Problems in maintenance programs and processes included examples of surveillance deficiencies for ventilation systems and ice condensers.

And the third one is, the engineering performance decline was a result of

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deficiencies in auxillary filling ventilation system testing, overheating a vent in the upper surge tank, and degraded conditions in the Unit One ice condenser.

While the issues were ultimately resolved properly, each had its roots in poor engineering performance. These are the words of the Nuclear Regulatory Commission in their review.

The NRC has a mandate to protect public health and safety. The findings from the Cook plant, which uses also ice condensers, indicate that both of its units may not have protected the public had there been an accident.

SENATOR LEVENTIS: Mr. Zeller?

MR. ZELLER: Yes.

SENATOR LEVENTIS: I have to ask you to get to a question. These things that you're pointing out certainly are a matter of record and are important, and we'd be more than happy to hear them. But we really have no access to any kind of resolution of those. If you have a question that you could ask, it really would be helpful.

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MR. ZELLER: Sure, the Catawba and McGuire both utilize the ice condensers, which I mentioned, which absorb energy to allow smaller physical containment structures to contain accidental releases from its reactors.

The ice condensers must work in a reactor emergency, similar to an air bag in an automobile. You don't get a second chance.

The Donald Cook plant, like I mentioned, uses similar technology and has been shut down since 1997 because of ice condenser problems. This is a fundamental problem with the containment in the case of an accident within -- in the reactor.

Is it wise to proceed at Catawba or McGuire with the MOX fuel before the ice condenser problems are solved?

MR. NESBIT: The NRC has no regulatory issues with the design or operation of our ice condensers at McGuire and Catawba. That's why our plants are up and running. And yes, we think it is wise to proceed with the mixed-oxide fuel program at McGuire and Catawba.

MR. ZELLER: Well, then, in closing,

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I guess I should add one more point from the advisory committee on reactor safeguards.

She said that public attention has been drawn to the higher actinide inventories available for release for MOX banned from conventional fuels. She states, "Significant releases of actinides during reactor accidents would dominant the accident consequences. Models of actinide release now available to the NRC staff indicate very small releases of actinides from conventional fuels under severe accident conditions." In other words, MOX fuel is more dangerous and will cause more harm to the general public in the case of an accident.

Senator Leventis, I appreciate the opportunity to talk to you today. A total of 3.7 million people live within 50 miles of the McGuire and the Catawba nuclear power stations, and another one and a half-million live within 50 miles of the North Anna reactor, yet the Department of Energy did not see fit to have public hearings in those communities -- but to hold a long hearing in Washington DC on a weekday during working hours. Our written request to the Secretary of Energy for

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additional hearings met with rejection.

The unprecedented veil of secrecy which envelops this civilian project threatens to undermine free debate on important issues of public policy.

Senator Leventis, on behalf of the Blue Ridge Environmental Defense League, I want to express our gratitude to you for holding this public meeting in Columbia, and I appreciate the inquiry to the DOE's plutonium fuel program, which you have initiated. Thank you for the opportunity to address these people today.

SENATOR LEVENTIS: Thank you, Mr. Zeller.

Could you address the notion of public hearings? I know that's been an issue. You all were kind enough to come at my request, but could you go over that just a little bit?

MR. NULTON: We will consider these requests as we get them, but we have set up at this point that there will be a public process related to the license modification that will be required for each of these reactors to burn MOX fuel. That will be conducted by the

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Nuclear Regulatory Commission. And we believe that will provide the public with the opportunity that they need.

SENATOR LEVENTIS: Thank you, Mr. Zeller.

MR. ZELLER: I have additional remarks in writing. I will hand them to the reporter or --

SENATOR LEVENTIS: I think if you will hand them to Ms. Pierce, that will be fine. Thank you.

After Mr. Chaput is Rita Kilpatrick. Mr. Chaput? I hope I pronounce that correctly.

MR. CHAPUT: Thank you, Senator. With a name like Chaput, we answer to almost anything. Thank you, very much.

SENATOR LEVENTIS: Before you begin, I'm looking at about 20 people who would like to speak, and I would like to hear them, and we will stay, but in deference, please see if we can focus on questions that this panel can answer.

MR. CHAPUT: Yes. I do have a statement I'd like to submit. I will skip the statement and just go right to the questions.

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SENATOR LEVENTIS: Thank you.

MR. CHAPUT: I'm with the Economic Development Partnership in Aiken, South Carolina. We've made extensive studies of the activities being conducted and proposed were being conducted at Savannah River Site to make sure it meets the community's expectations with regard to the types of programs that can be conducted safely at that site.

We had an important role in winning the Cold War. We want to have an important role in sort of the next step as the Cold War winds down, as the National Academy says disposing of excess plutonium constitutes a -- you know, that those materials constitute a clear and present danger to national and international security.

We want to have a role, and we think we have the right capability to assist in that important national goal.

If the overall objective is to make 100 metric tons -- 50 in our countries, 50 in Russia -- of weapons-grade plutonium less attractive or ideally unusable for weapons, nuclear weapons, then that can equate to, as I

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understand the literature, as many as 20,000 nuclear weapons, 20,000 nuclear weapons.

What is the best form for that plutonium to be in? You know, is the form of that material better off as weapons-grade plutonium or reactor-grade plutonium?

I think, as this panel said, you can make a weapon out of reactor-grade plutonium, but which is the better form, whether you're a national state making weapons or a terrorist group who wants to make one weapon? Which is the better form of the material to make that weapon? That's my question.

MR. NULTON: That would be the weapons-grade material.

MR. CHAPUT: As I understand it, there would probably be three reasons for that: Number one, reactor-grade material is more difficult to deal with. Secondly, reactor-grade material is more sensitive and more difficult to make critical. And third, if you have the same amounts of material, you get less of a nuclear yield with weapons-grade plutonium; is that correct?

MR. NULTON: Yes.

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MR. CHAPUT: In all three cases.

So you're better off, the world is safer with reactor -- all that plutonium being reactor-grade as opposed to weapons-grade, so what we ought to be doing is reducing the threshold, the attractiveness, and the usability of that material, the ability for people to use it and to make modern weapons, small weapons, reduce the ability to do that by denaturing that material, isotonically altering it and making it reactor-grade plutonium.

My second question is -- I don't know if you specifically addressed it or not, Dave Nulton, but if the -- there is a concern on the part of the Russians, as I understand it, about the U.S. plans for disposition.

If the U.S. goes 100-percent immobilization -- and I think you said you can recover weapons-grade plutonium from the immobilized form; is that correct?

MR. NULTON: Yes.

MR. CHAPUT: If the U.S. goes 100-percent immobilization, will the Russians sign up to this program and dispose of their material?

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MR. NULTON: No, they would not, if we go 100-percent immobilization.

MR. CHAPUT: So if we insist on 100-percent immobilization, the program falls apart, none of the material gets dealt with, the world does not -- we don't end up disposing of any of our materials either in this country or in Russia; is that correct?

MR. NULTON: That would be correct, yes.

MR. CHAPUT: I think if we looked at it from the standpoint of what's the right thing to do for our generation and the future generations, let's take the steps that we can take. Take that material. We'll go through a once-through cycle, keep jawboning the Russians, let them -- hopefully they will step away from reprocessing, address some of these other concerns, but the world is better off going MOX than going nothing. And if you insist on total immobilization, you get nothing.

SENATOR LEVENTIS: I think that probably is a question for the administration to ask because they may come back with a

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bilateral agreement that might be different than that. We have already heard the Department of Energy say that if the Russians step away from the program, that they will do away with MOX, but we also would have to be under the impression that if the Russians step up to a different program and accept our immobilization, that we would do that, so I don't know that we're going to resolve those issues right here, Mr. Chaput.

MR. CHAPUT: But everything I have heard, that is consistent with the answers I got tonight, is that the Russians will not accept a program where they believe the U.S. government can go back in and surreptitiously take the weapon grade plutonium out of the immobilized form. They don't trust us frankly probably any more than we trust them.

You know, there are hardliners in Russia, just like there are hardliners over here. They want to be assured. They may be looking for some excuse to put their program back.

I guess the important thing is: What are we trying to achieve? We're trying to

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take as much of this material and reduce it and its potential for application in nuclear weapons to the maximum extent possible. MOX seems to be the only way which that's going to happen. Let's not lose sight of that. For the sake of not necessarily us, but our future generations.

SENATOR LEVENTIS: Thank you.

MR. CHAPUT: Thank you, and here's my statement.

SENATOR LEVENTIS: Thank you very much. Ms. Kilpatrick. Then after her, Ms. Julia Pearson.

MS. KILPATRICK: Yes, good evening, and thank you for this opportunity to ask a couple questions. I will try to make them very brief, but we haven't had an opportunity like this to ask such questions.

I work for and am the director for an organization campaign for Prosperous Georgia. We're an energy consumer based organization.

I wanted to follow up on an issue that the fellow who laid out for us earlier the idea that MOX may significantly boost the

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energy supply to South Carolina -- I want to better understand what actually is estimated to be the amount of electricity in terms of capacity and demand that Duke Power, for example, would expect to generate from MOX fuel, and what is that in comparison to your total capacity demand per year?

MR. NESBIT: Okay, our system is approximately 60-percent nuclear right now, of which about two-thirds of which would be Catawba and McGuire, so about the time the program would be in place, we would be generating, depending on electricity demand, growth, et cetera, at the time the program were to start, maybe 30 to 40 percent of our electricity from units that have some mixed-oxide fuel in the cores.

I'd like to point out that in the case of Catawba, Duke is a 12-1/2 percent owner in that plant, and that the remainder of the plant is owned by four municipalities and co-ops that were not the complete owner of that plant. The electricity actually goes to other organizations.

MS. KILPATRICK: Do you know the

Page 1[illegible]

actual electricity output that the MOX itself would generate?

MR. NESBIT: It would be approximately 1,050 megawatts per unit, so if all four units are operating, that's on the order of 4,000 megawatts of electricity.

SENATOR LEVENTIS: But wouldn't it be fair to say that it's no different than they're doing now, or that they would do subsequent to --

MR. NESBIT: Yes, sir, absolutely. Those units will be operating irrespective of whether this program is in place or not.

SENATOR LEVENTIS: Is it your question, is it going to be a greater output?

MS. KILPATRICK: That's my question. What contribution does it actually have?

MR. NESBIT: Oh, the power generated by the station will not change.

MS. KILPATRICK: All right, that's what I had understood, and I just wanted to make sure I had the right understanding.

Another question has to do with polling. I know I asked you at the break time, and you didn't know the answer to the question

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of whether Duke Power has done any customer polling.

It's occurring more frequently now across the country where utilities are concerned when they face deregulation what their customers would choose in the way of a utility provider, fuel types, or concern in environmental impacts, cost impacts, et cetera.

I don't know if there's anyone from Duke Power here in the audience who might be able to speak to whether the company has carried out any polling of its customers to determine if any customers are showing a real strong interest in purchasing electricity generated by plutonium based MOX.

MR. NESBIT: As I indicated, I'm unaware of any such polling, but I can't guarantee that it hasn't taken place.

MS. KILPATRICK: Do you have anything to offer along those lines, either for Virginia Power, Duke Power customers? The polling information that we have is showing what we're understanding to be fairly consistent results, that when given a preference, the majority of consumers are

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indicating that they would prefer to buy energy that is drawn from renewable energy, energy conservation sources, rather than fossil fuels and certainly more than nuclear power.

So is there a -- what we would like to have a sense of is whether there's been any customer demand assessment polling done yet; or if not, is that anticipated in your plans?

MR. NULTON: I'm not aware of any polling that's been done. Utilities certainly know, and I don't know if they intend to do it.

MR. NESBIT: I don't think there has been. I can check and get back with you, Senator.

SENATOR LEVENTIS: In that regard, not Duke, but DOE -- Dave, I know that the Department of Energy gave a fairly substantial grant to the medical university to look into the matter of our acceptance of nuclear waste in the state.

So if you would -- it may be a part of the agency that looks into the those things, please let us know, and we can let Ms. Kilpatrick know.

Next would be Ms. Julia Pearson, and

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after her Mr. Kawaguchi.

MS. PEARSON: My question was already answered, if you'd like to go ahead.

SENATOR LEVENTIS: Thank you very much. In that case, Tomo. Then after him, Mr. Bob Guild.

Please pronounce your name correctly, and accept my apologies.

MR. KAWAGUCHI: Good evening. My name is Tomo Kawaguchi. I'm just a concerned citizen, also. I'm a marine biologist.

My first question is I think an issue of credibility of DOE. I recently read a newspaper article on waste treatment facility at the SRS, 500 million dollar total facility have failed, but basically I still haven't digested sort of the article itself.

In other words, that's lots of money, and so many people could have been hired by this money, but I guess we are not ready to sort of proceed a new project, I think. I think we still need a lot of time to really digest this sort of particular incident, because SRS is particularly designed for containment of those wastes, nuclear wastes.

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I've seen almost -- first time that radioactive fish, contaminated fish in Savannah River, so I think -- can we really trust the DOE to do this project? That's the first question.

The second question is: If this project is to start, are we -- in Columbia, are we getting plutonium contaminated clothes at INS located South of Edisto Avenue? That's second question.

And I guess the last question is the security issue. I think the U.S. taking dual position that -- one is immobilization, and the other one is this MOX fuel issue, MOX fuel, but I think you said that if one of them failed, you can choose one of them. But if the MOX fuel failed means not only the safety -- I mean, environmental safety, but also if terrorists gets this, it is sort of the end of the world in my concern.

So I think transporting this MOX fuel into three different locations to me means triple the sort of safety concern and the danger, so I think we really need to go slow on that, and so those are three sort of my

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concerns, and also the questions I'd like to know.

SENATOR LEVENTIS: Thank you very much. The question of proceeding, question of waste, especially as it applies to us here, and then the question of security and transport after it's MOX.

MR. NULTON: The first question -- can you trust DOE, well, I think you can. I certainly hope that you can.

Again, the Nuclear Regulatory Commission will license and regulate both the fuel fabrication facility and the reactors that will irradiate the MOX fuel.

Secondly, can you expect plutonium contamination. I don't think there will be any plutonium contamination, any measurable plutonium contamination from these facilities.

Thirdly, terrorists have not -- are more of a concern, I think, in Russia than in this country, but I think to the extent that terrorism is a concern, it's going to be a concern for both immobilization and MOX.

There's transportation associated with each of these technologies in getting the

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materials from their current location to the Savannah River Site, where this work will be done.

It is true that there will be the additional transportation of the fuel that is fabricated at Savannah River to the reactor site.

At that point, the plutonium is mixed with uranium. It's then pressed into pellets. Those pellets have been centered. They're in beveled tubes. The tubes are in fuel assemblies. The fuel assemblies are in a cast. The cast is in an SST truck. The chance for any diversion of material at that point is extremely remote.

I also want to say -- and this may respond to an earlier comment that was made -- that all transportation of materials will be conducted in the department safe, secure transport trailers.

And as Mr. Zeller pointed out, there was a situation in Nebraska where a truck went off the road, but these are extremely rare situations. In over 94 million miles of transportation of materials around the country,

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in many cases, perhaps most cases, transporting the weapons that the Senator mentioned were on his plane, we have had no release of radioactive materials.

These materials are transported in containers that are very, very robust. They go through a number of tests, fire. They're put in very hot temperatures, where they're dropped from pipes onto concrete pads, slammed into walls. They're put under water at high pressure. They are designed not to break open under even extraordinary circumstances. Then they are put into these SST trucks.

So we believe that the transportation of these materials is very safe.

SENATOR LEVENTIS: Thank you.

Bob Guild and then Mr. Peter Sipp.

MR. GUILD: Thanks, Senator. I very much appreciate, as do all of us, your willingness to invite the Department and others to address these important issues.

I would note that the Department would not be here had it not been for your request, despite the fact that the public has been clamoring for some time that DOE come to

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communities most directly affected by this proposed program and address the public's concerns. So thank you, again, Senator.

I want to just state unequivocally -- Bob Guild is my name. I'm an environmental lawyer. I was involved in the licensing proceeding for the Catawba reactor, so I have some familiarity with some of the quirkiness of their designs, as referred to by Mr. Zeller earlier. I share his concerns.

I wanted just to state that my view is that the government should be pursuing with full zeal the immobilization program exclusively.

I think it's just outrageous to suggest that the Russians are dictating terms of the program we're going to follow, particularly since we're paying the bill for whatever program they choose to adopt.

It seems to me we have all the cards here, and it's absolutely outrageous to suggest that somehow we're driven to a second best program, a program that involves experimentation and undue environmental risk because the Russians insist on it, so I

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encourage us to forget that notion that we have no choice in the matter and negotiate more toughly with the Russians until we come up with a program that involves the minimal handling of this material, the minimal processing of this material, the minimal plumbing, the minimal dilution with the aqueous solutions or acid solutions, the minimal opportunities for environmental release, instead of the maximum exposure of the public, maximum handling, the maximum opportunities for diversion and environmental risk, which is the MOX program.

I frankly am just absolutely astounded that it takes a democratic administration with an environmental vice-president for us to embark on this idiocy.

It takes Duke Power Company to volunteer to step up to invite the public to wonder what on earth are they doing inviting mixed-oxide fuel to power their commercial reactors which are in trouble enough.

Now, I heard the discussion about beyond design base accidents, and I read with interest the supplement to your Environmental Impact Statement that finally gets around to

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even touching on the subject of reactor accident risks, and does so in my judgment wholly inadequately.

But will the gentleman from Duke and DOE acknowledge, as I understand the case to be, that the people of Charlotte, North Carolina because they are surrounded by four ice condenser units, McGuire at Lake Norman 17 miles north of downtown Charlotte, and Catawba on Lake Wylie in South Carolina 17 miles south -- the people of downtown Charlotte are exposed to a higher risk of the beyond design basis accident fatalities than any other community in the entire United States.

Am I accurately recalling what either the reactor safety say or the NRC's comparative assessment of relative risk of people in reactor communities have concluded with respect to the people of Charlotte? Does anyone want to address that?

MR. NESBIT: Yes, I think your conclusion is an error.

The reactors at McGuire and Catawba meet a series of very strict regulatory

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standards that are imposed by the Nuclear Regulatory Commission.

We showed the NRC that we met those standards when we got them licensed back in the early 1980s, and they've operated safely ever since then.

In addition, in the mid 1980s, the Nuclear Regulatory Commission promulgated safety goals for nuclear power plants.

To summarize the goals briefly, those goals were that the risk to someone in the population surrounding the plant of a prompt fatality should be no greater than half of 1 percent of the overall risk of such fatalities.

In addition, the risk of cancer fatalities from the nuclear power plant operation should, again, be no greater than half of 1 percent of the overall risk of cancer fatalities. The NRC --

MR. GUILD: I don't think --

MR. NESBIT: Excuse me. Could I complete my question?

MR. GUILD: I don't think you're responding to my question. If I could simply

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restate the point.

Of the communities in the United States, is it not the case that the people of Charlotte face the greatest risk of death from beyond design basis accidents; and if they don't, what ranking is Charlotte? Is Charlotte number two, number three, number four, or is it indeed number one as I recall reading? That's the question I have for you, sir, not a soliloquy about how safe Catawba reactors are.

Relatively speaking, where does Charlotte stand with respect to the risk of fatalities from a beyond design basis accident?

SENATOR LEVENTIS: There's nothing inconsistent with what either one of you are saying, because I doubt seriously if there's a major metropolitan area with two reactors on the north and two reactors on the south so positioned.

Bob, what you're saying has to be probably correct if that's true, and the fact that it's highly unlikely probably is correct, as well, but from a statistical standpoint, are there millions of people so located in relation

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to four reactors anywhere else?

MR. NESBIT: Sir, I've not done the demographical studies to respond to that question, but I'd just like to complete my statement and say that --

SENATOR LEVENTIS: Sure.

MR. NESBIT: -- the NRC's own studies indicate that the risks from operations at Catawba and McGuire are one to two orders of magnitude lower than the NRC's own safety goal, with or without MOX fuel.

SENATOR LEVENTIS: But the question then becomes: Did the NRC have a probability of accidents among the reactors in the old Soviet Union? What was our take on that, and were we surprised when Chernoble went boom?

MR. NESBIT: I don't think the NRC studies at that time even considered the different Soviet designed reactors.

SENATOR LEVENTIS: Did they, Dave?

MR. NULTON: I don't know. But let me just say that the Chernoble reactors are a different design than the VVR1000 reactors that are the seven that I mentioned.

SENATOR LEVENTIS: I understand

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that. The point is: Did the NRC or DOE try to quantify what they thought were the probabilities of those reactors with those designs having a problem, and did this meet our expectation in terms of the incident and its intensity?

Those are valid questions because if the DOE, NRC, whomever, applied the same logic to the different technology and came up with a probability, and then there was an occurrence, then it would be useful to apply that same rationale to ours.

Nobody wants a problem. Everybody works to avoid a problem, but these are highly complex kind of things, so we have to do some kind of statistical approach to see where we ought to be applying a little more paint or glue or whatever it is that we're going to do.

But like I say, I don't think there's a difference of opinion. It's just the difference that you're looking at those particular things.

So can we move on to another question?

MR. GUILD: Well, of course, the

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3-mile Island accident was a beyond design basis accident, as well. The loss of coolant circumstance of TMI was not contemplated in the design of that reactor, nor was it contemplated in the design of the Catawba reactors.

Ice condensers, of course, address only the possibility of a steam explosion and the condensing of that steam. They don't address the concern of a hydrogen buildup in the containment for which Duke Power had to jerry-rig a glow plug design with the hopeful intention that the buildup of hydrogen would be burned off in a controlled burn as opposed to an uncontrolled explosion that would result in loss of containment.

Your supplement to the Environmental Impact Statement for this proposed program, page K24, addresses these beyond design basis accidents and, as the previous speaker alluded to, acknowledges that for a mixed-oxide, MOX, core there will be some 15,600 prompt and latent cancer fatalities projected from the operation of the Catawba reactor. In the event of a beyond design basis accident, 15,560 -- 15,600, excuse me, prompt fatalities in latent

Page 1

cancers, as compared to 14,000.

That's an acknowledgment of an excess of 1,600 prompt and latent fatalities associated with a beyond design basis accident at Catawba. That's according to the DOE's own study, associated with the choice by DOE and Duke to subject us to this increased risk for mixed-oxide fuel.

Now, President Clinton adopted an environmental justice Executive Order where, as part of the compliance process with the National Environmental Policy Act, he required government agencies, such as DOE, to assess whether or not actions you proposed to take will embody a disproportionate and adverse impact potentially on minority communities and communities with low income.

And you purport to do such an analysis that I find will be inadequate at Appendix M to your supplement to the EIS. And there you simply conclude that since there will be no bad impacts on anybody, there won't be many bad impacts on people of color or people of low income.

My question for you, sir, is:

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Having concluded that there will be an additional 1,600 fatalities in the event of a beyond design basis accident at Catawba, what analysis have you made of a population that will suffer those fatalities with respect to environmental justice considerations?

In other words, the people who will die of the 15,600, what proportion of they are persons of color and low income in downtown Charlotte, and how does that square with the President's Executive Order on environmental justice, and how are you going to address that in the thus far inadequate E.J. Appendix to your Environmental Impact Statement?

May I have an answer from DOE, please?

MS. WHERLEY: I know that the demographics were reviewed around the sites, and I know that that conclusion that you quoted, I believe, stated -- the conclusion was made with the concept of probability of the accident taking into account. There was no intention to say that any of those cancer fatalities were an insignificant impact.

MR. GUILD: I'm sorry. I missed the

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last part.
MS. WHERLEY: There was no intention for there to be any implication that any of the latent cancer fatalities was considered an insignificant impact.
MR. GUILD: Your environmental justice analysis simply looks at the proportion of a population within 50 miles that meet the description of being minority or low income.
But of course, that's not the same population that will suffer the immediate fatalities or latent cancer facilities in the event of a beyond design basis accident because that population is in the plume exposure pathway. They're the ones that are going to get the airborne release fission products.
My question for you is: Who in that plume exposure pathway meets the requirements under the President's environmental justice Executive Order of being low income and minority, what proportion, and will they be disproportionately impacted?
MR. STEVENSON: That certainly was taken into consideration because the guidelines that are given to us when we do environmental

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justice studies do include a requirement for plume studies.
So when that conclusion was reached, it did, in fact, take into consideration wind directions. There are certain wind roses to be used so that we can determine what are the most common directions of the wind as a function of time of year, and all of that supporting data is used in order to achieve the conclusion to which we have.
MR. GUILD: Well, I'd ask you to look at page M6 of your supplement, and I'd suggest to you that there's no such breakdown whatsoever in your environmental justice appendix. It's simply a gross characterization of the 50-mile radius, and no effort to focus a wind rose or to determine a plume exposure pathway.
If I'm mistaken, after the record is closed, I'd be pleased to be corrected, but I read it carefully.
MR. NULTON: We'll take just a minute to go back and look at that section, put more information in there.
MR. GUILD: I'd appreciate that.

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MR. STEVENSON: Certainly, we wanted to make sure that you understand that a great deal of data and analysis went into making sure that that was a correct and accurate statement.
MR. GUILD: Well, that analysis is not reflected in the text of your appendix, I might note, a couple of specific questions, please.
Once the MOX fabrication facility at Savannah River, if it ever is to take place, is -- finishes its useful life for this program, is there a current plan for its disposition or future use? And what is the risk that you will find the Department of Energy producing commercial mixed-oxide fuel for the commercial nuclear power industry after they've done their national plutonium disposition duty?
MR. NULTON: We have indicated from the beginning of the program that this would be a single mission facility.
The contract with DCS requires them to deactivate the facility at the end of their mission. It then reverts back to the Department. We will do the R&D on that

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facility, the decontamination and the decommissioning.
At that point, a determination will be made whether to tear the facility down or use it for some other mission. There is no chance that it will be used for commercial fabrication of mixed-oxide fuel --
MR. GUILD: I'm sorry. What other missions might those be?
MR. NULTON: Well, at the Savannah River Site, at that point in time, will be cleanup missions, so it might have some role in some site cleanup activity.
MR. GUILD: Once mixed-oxide fuel has been irradiated in the reactors, if it ever is, the Catawba reactors, McGuire, North Anna, must it be managed any differently than uranium based fuel? Will it be for any period of time stored in on-site fuel storage facilities at the subject reactors? Is there a capacity in those pools if such a requirement is needed? Is there a need for modifying on-site storage to manage those assemblies once they leave the reactor?
MR. NESBIT: That's a series of

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questions. Let me make sure I try to get them all.

MR. GUILD: Sure.

MR. NESBIT: The plans are to manage the mixed-oxide fuel similar to the way that we'll manage the uranium fuel.

Depending on what's going on with the overall spent fuel program at the time the mixed-oxide fuel is discharged, initially -- well, we would treat the mixed-oxide fuel the same as the uranium fuel initially. It will go into the pool.

The fuel stays in the pool for some number of years. If there's a shortage of pool capacity, then what we would do is eventually discharge the fuel from the pool into dry storage on-site. We're in the process of developing such a facility at McGuire. We've already developed such a facility at Oconee.

Our plans for mixed-oxide fuel are essentially to keep it in the pool. The mixed-oxide fuel long-term decay heat is higher at a given point in time than uranium fuel, so therefore, in order to put it in dry storage, we'd have to let it cool longer anyway, but our

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anticipation is just to keep it in the pool until we can ship it off-site.

MR. GUILD: Just to be clear, so if you needed extra space, you'd simply take out uranium based assemblies and dry-store them on-site to make room for the mixed-oxide assemblies. Is that what you're saying?

MR. NESBIT: That's correct. I should add that, during the course of the program, there's not a substantial increase in the number of total discharge fuel assemblies. There's a slight increase in the number of discharge fuel assemblies, so the generation of spent fuel is essentially the same with and without MOX fuel.

MR. GUILD: Do the mixed-oxide assemblies, spent assemblies, require any greater amount of storage space in the pools? Do they pose additional criticality issues than the uranium?

MR. NESBIT: We don't see any at this time, but that's one of the system studies that we will be performing over the next few years as part of our DOE based contract, and we'll establish what limitations we need to in

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order to ensure safe storage of the spent fuel assemblies.

MR. GUILD: I heard a gentleman from DOE speak to transportation of the fuel prior to irradiation of mixed-oxide fuel. I understood that -- one of my questions was answered. You will be using your DOE -- I think you called it your SST's.

MR. NULTON: Yes.

MR. GUILD: Not supersonic transport.

These are the arm-guarded DOE transport vehicles that carry weapons material. Is that basically the case?

MR. NULTON: Yes.

MR. GUILD: I mean, I just want to make a point to you that I was a participant in a transportation monitoring project some years ago, and I must tell you, I met one of these trucks, these SST's, at a steakhouse at the intersection of Interstate-20 and Interstate-26, and I followed it off the interstate, pulled into the parking lot, and watched while the crew all went in and had steaks for an hour and a half, and the truck

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with presumably nuclear weapons material -- the guys who were guarding it sure looked like they were on the job -- these guys took turns going and eating steak for an hour and a half while the truck sat in a parking lot at a public steakhouse within the city limits of Columbia, South Carolina.

So I'm a little concerned and not particularly comforted to hear that it will be the Department of Energy, the SST trucks, that are going to be hauling this stuff up and down the highways.

That's not a question. That's just an observation. You answered the question earlier. Thank you.

SENATOR LEVENTIS: Do you know how much longer you're going to be?

MR. GUILD: I have one more question.

SENATOR LEVENTIS: We're going to take a break and allow Ms. Jeter some time to get her thoughts together.

Everyone has been more than considerate, and we're going to stay until everyone who would like to say something does

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and is allowed to, but go ahead.
MR. GUILD: I'll finish mine. Thank you very much, Senator.
The last question I have is: The Price-Anderson Act insulates commercial nuclear utilities from -- for the exposure to liability for the consequences of your commercial activity.
If someone is killed as a result of a radiation accident at the Catawba Nuclear Station, one of those 15,600 people in the hypothetical beyond design basis accident, they literally have no right to sue Duke Power Company because the Price-Anderson Act that you successfully defended before the Supreme Court insulates you from liability.
The question is: Will receipt of mixed-oxide fuel at the Catawba and McGuire reactors require any change in the Price-Anderson Act? Will the Price-Anderson Act give you -- will it extend your insulation from liability for the marginal 1,600 additional deaths that are projected to occur if there were a beyond design basis accident? Are you going to need additional liability

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insurance, Mr. Duke Power Company?
SENATOR LEVENTIS: Do you know the answer to that about the Price-Anderson Act?
MR. NESBIT: I'm not an expert in that area, but I think that -- the way it was characterized may not be entirely accurate.
The Price-Anderson Act, as I understand it, puts a limitation on liability. It does not insulate us completely from liability.
We are required to hold nuclear insurance up to close to a billion dollars, I believe, which we do. We've had informal discussions with our insurers, and they've seen no need to increase our insurance premiums in the event that we transition to a different fuel source that's MOX fuel instead of uranium fuel.
SENATOR LEVENTIS: Would you, for us, submit that question to the folks who may know about whether or not the Price-Anderson Act would require any modification to --
MR. NULTON: It does not.
MR. NESBIT: Does not.
SENATOR LEVENTIS: All right.

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MR. GUILD: Again, I appreciate your indulgence in answering my questions. And I just would encourage DOE to really rethink this program. I think it's wholly misguided, and I appreciate very much that you are now answering some of our questions about this. Thank you.
SENATOR LEVENTIS: We'll take a break and try to be a little bit more prompt and try to reconvene at a quarter after.
(A recess transpired.)
SENATOR LEVENTIS: I'd like to call Mr. Sipp, please, Peter Sipp.
MR. SIPP: Thank you. Thank you. I'll make my questions real simple, because simple is best.
What I want to know is, what is it going to cost to build this plant, the MOX plant?
MR. SELBY: The estimate right now for the construction is approximately 450, 480 million dollars.
MR. SIPP: Uh-huh. Okay. And the next question is: What would it cost to build the immobilization plant?
MR. NULTON: It's about the same

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amount of money. Although, that's changing because of an increase in facility size that's recently been projected.
SENATOR LEVENTIS: Increased or --
MR. NULTON: Increased. So the price is increasing on the immobilization facility right now, but it's on the order of 500 million dollars.
MR. SIPP: So approximately the same?
MR. NULTON: Approximately the same, yes.
MR. SIPP: Okay. So then the plutonium, it will still be waste -- it will still be nuclear waste after it's been through a reactor?
MR. NULTON: Yes. On both cases, the waste form that's produced will go to a geological repository as high-level waste. From the MOX program, it will go in the form of spent reactor fuel. And in the case of the immobilization program, it will go in these large waste canisters with the plutonium imbedded in the glass waste.
MR. SIPP: Yeah. That's simple

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enough to understand.
The fourth -- I don't really have a question. It's really more of a comment. I was considering investing in Duke Power; but being that you're looking at it like this, I'm not going to.
SENATOR LEVENTIS: Thank you, Mr. Sipp.
Patricia McCracken. Then after that, Jimmy Mackey.
MS. MCCRACKEN: Hi. I want to put on the record that at each meeting I go to, I'm looking for a comprehensive transportation plan that I have failed to find at any of the libraries, and underneath it, I believe that would be required.
I didn't get a handout. I don't know if I came in late. It was kind of crowded.
The person from Cogema -- I don't have your name, sir -- could you tell me if you have given the DOE the 20-percent ownership of all the people who have ownership in your company?
SENATOR LEVENTIS: They have.

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MS. MCCRACKEN: If 80-percent is owned by the French, who owns the other 20 percent?
MR. HUGELMANN: A French oil company, Total, a French oil company.
MS. MCCRACKEN: A French oil company. I have a little trouble. By the way, I've not been able to understand you real well. I have a real bad southern accent. So you may want to have an interpreter here at the public hearings.
Can you tell me the name of the French oil company?
MR. HUGELMANN: Yes. The name is Total, T-o-t-a-l.
MS. MCCRACKEN: Okay. And I am glad -- you know, I feel like we could be standing here with just the Russians and the French. Thank you, Duke Power, for being here.
What really concerns me, after reading all these documents, is all the things we have done for the nuclear industry. We give them a dump. We subsidize them. We do research and development. They don't appear at the meetings. They don't visit Yucca Mountain.

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They're sitting there just, Okay. They have turned their backs. We've gone to the French. I'm totally embarrassed.
I think that these companies should have come forward with at least an advisory board. I think only 12 people made the decision to do this contract. I just think it's a total embarrassment that the American people knew and their customers knew that they had not participated any better in offering the expertise -- I guess that Duke Power has spent some money to do some expertise, to do some research, to work with our government. It is a total embarrassment to have to come here. I want to go in the back and sing America the Beautiful.
Again, I mentioned the transportation plan. I will give the rest of my comments, you know, at the -- I assume we can send in written comments.
SENATOR LEVENTIS: Well, the written comment period for input is to close when?
MR. NULTON: June 28th, but we will take comments as long as we get them and can still incorporate them into the document.

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We've always taken comments up to the point where we basically be able to print on the document.
MS. MCCRACKEN: I don't know who gives out invitations, but I've been put on every list to come to the meetings. I have called Mr. Nulton's office. I called today just to find out what was going to be going on at the meeting. I couldn't get a list of documents. There was no handouts for the meeting.
I think under such a serious subject matter, that we should at least have some handouts so we can follow along the discussions, you know, of the group, you know, that's here, so that we can address the panel and know the names of the people.
SENATOR LEVENTIS: How did you find out about the meeting?
MS. MCCRACKEN: I saw it in the Augusta Chronicle, because I did not get on a mailing list, of which I have requested, you know, many, many times. Even I called a 1-800 number.
And I appreciate you having, you

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know, the meetings, so that we do have an opportunity to come.

One more quick question. When you're doing the MOX fuel facility, what kind of energy will be used to run the facility?

MR. SELBY: Standard electricity. There will be some gas.

MS. MCCRACKEN: I mean, does it use a lot of energy to run this -- to do all these processes?

MR. SELBY: I believe the estimate is around, for the total -- do you remember what it is in -- we've estimated it at around -- I think, total energy cost around 5 million dollars, maybe.

MR. HUGELMANN: I can give you an answer on that. This is not a very analytical process. This is only electricity mainly for the machines, for the equipments, electricity for the venting system, for depression type -- this is not analytical process. This is very small concentration (inaudible).

MS. MCCRACKEN: Oh, okay. In your country -- you know, DOE meets with like military people. Do you have like clearances

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and meet with like military people in your country like we do here? You know, you're owned by the government. Do you meet with military people?

MR. HUGELMAN: The people who have jobs in the MOX plant and reprocessing plant are all civilian people. We don't meet military people.

MS. MCCRACKEN: Okay. But you don't meet with your government military people in any way? Like your plant doesn't deal with, like here, weapons things?

MR. HUGELMANN: In France military -- (inaudible) military question is inside a specific organization, but Cogema is only for the civilian use of nuclear energy. It is only civilian used.

MS. MCCRACKEN: Oh, okay. I'm not sure I understood all of that.

MR. NULTON: What he was saying is, it's a civilian facility for civilian purposes, no military purpose.

MS. MCCRACKEN: No. I mean, is he like on an advisory board that meets with military in any way? You know, are you like

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the leading -- obviously, if you are owned by the government, you do most of the nuclear things. Do you sit on any boards or meet with military people on panels or any, you know, like boards, advisory boards?

MR. HUGELMANN: No. This is fully separated in France. Military use of nuclear energy and civilian use of nuclear energy, fully separated.

MS. MCCRACKEN: Oh, okay. Because, you know, like here in this country, this started out as a domestic program to take care of domestic waste. It's kind of expanded beyond what I think anybody ever reasoned in looking at why we establish something to help our, you know, American companies.

It's a little disturbing to see how far reaching -- what started out to be a repository has now expanded, you know, without more participation of our American nuclear industry.

Thank you for the opportunity.

SENATOR LEVENTIS: Thank you very much. Mr. Mackey? Then after him, Glenn Carroll.

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SPEAKER: Mr. Mackey went back earlier.

SENATOR LEVENTIS: Okay. I'm sorry that we weren't able to get to him. Glenn Carroll, and then Joan King.

MS. CARROLL: Is this the microphone?

SENATOR LEVENTIS: Yes.

MS. CARROLL: My name is Glenn Carroll. I'm from Atlanta, Georgia. I'm representing GANE, Georgians Against Nuclear Energy, an all-volunteer group.

GANE applauds the disarmament efforts in the United States and Russia, which has brought us to the problem of what to do with unnecessary plutonium.

We thank you, Senator Leventis, for bringing us together tonight.

Plutonium has become nuclear waste. Plutonium is unacceptable as reactor fuel for many reasons, but we emphasize that plutonium for MOX fuel is a dangerous experiment, messy to make, and risky in a reactor.

There are environmental hazards attendant to transporting and dismantling

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nuclear warheads and in subsequent immobilization and storage, even temporary, of retired plutonium triggers, as well.

But the work force at Savannah River Site has the talent and needed experience for the honorable mission to immobilize plutonium, and we offer wholehearted support and encouragement for them in that activity.

I've heard some things tonight that have made me concerned about the potential of mining immobilized plutonium, which makes me think let's do this technology right. It shouldn't be minable. If we're going to immobilize plutonium, then we have to make it so it can't be mined.

But we support taking the plutonium out of the market. We do not support MOX.

We understand the allure the MOX project holds for the SRS community. It presents a lofty technical challenge and would provide many jobs.

GANE points out that many, many skilled, experienced people are also needed to deal with contamination to the environment and the huge legacy of nuclear waste left from the

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50-year Cold War.

SRS work force has the appropriate experience and facilities to contribute in the humane fields of environmental restoration and nuclear waste containment.

We support the plutonium immobilization effort; but in light of recent experience with intank precipitation, we urge that we perfect the technology at a pilot level first.

We are calling on Congress to direct funding away from the wasteful, harmful MOX project and give it to projects that support people and the environment we depend on for life and health.

Georgia shares the risks and benefits of the Savannah River Site's location on our boarder. We ask the South Carolina legislature to work to protect our people and ecology and to help educate your peers in Congress.

We have at long last the most welcome opportunity, jobs for a community that has long proven its patriotism, jobs that promote peace and environmental health for us

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and for future generations.

This has been a really provocative event, and I cannot thank you enough for holding it. It's been very different from the type of hearings I came prepared to address. And I do have a couple of questions.

You say that it's not going to be the RBMK trinoble type reactor that will be used. Did you say it was TVRI?

MR. NULTON: VVER1000.

MS. CARROLL: Do they have containment?

MR. NULTON: Yes.

MS. CARROLL: Is it square buildings or pressure domes?

MR. NULTON: Dome containment.

MS. CARROLL: That problem with the safe secure transport in Nebraska, was that the one that happened during the blizzard?

MR. NULTON: I believe it was. It slid off the highway, I think, into a ditch on the side of the road.

MS. CARROLL: Well, our Georgia Environmental Radiation manager was the one that told me about that accident, and he was

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concerned about transportation on Georgia's highways of these materials.

And one of the things he raised, and something he's working on, and I'd like to add GANE's voice to this is that, the significant problem there was that there was no trained personnel present with the shipment to measure the radiation.

So once the accident happened, the call went out, Come here, we don't even know if we've released radiation yet.

And we think that you've got to -- I mean, we understand that to deal with this problem we're going to have to transport stuff, but we have got to have trained personnel riding with the shipments.

Can you speak to that? Were you aware of that?

MR. STEVENSON: My information is incomplete on that, and what we can do is certainly get back to you with that.

Yes, I have heard that on certain trips the radiation detection gear was not on the trailers, because it was not required. Okay. That has been reassessed.

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What I'm not familiar with is the results of that reassessment, but we can provide you with that.

MS. CARROLL: Well, we just want to make sure that every single shipment has trained radiation personnel traveling with it.

If Russia doesn't comply with our agreement and they pursue a breeder program, what are we going to do about it?

MR. NULTON: Well, the Russians at this point don't have the funding to pursue a breeder program, but --

MS. CARROLL: Well, if they redirect our funds and pursue a breeder program, what are we going to do?

MR. NULTON: Well, our funds will be provided in incremental fashions. So if they -- I mean, we're not going to give them all the money up front and watch what happens.

So the funds will be provided as they complete elements of work. The work we're doing with the Russians right now, they get paid after they do the work, not before.

MS. CARROLL: Okay. They trust us to reimburse them. That's interesting.

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MR. NULTON: We get to see what we're paying for before we pay for it.

MS. CARROLL: I need to make an observation. All night long, there's been emphasis that the ratepayers will not take the hit -- if the expenses are unpredictable, the ratepayers' rates won't go up. And I wanted to say out loud on the record -- we all know this, but let's think about this for a minute. When the department shells out the money, that's us, that's our taxes. The department has no other source of income than us, the taxpayers.

MR. NULTON: Let me just say that any of these programs are requiring money from the taxpayers; and continuing to store the material and doing nothing requires a great deal of money. You have to pay for the buildings. You have to pay for the security around those buildings.

In fact, over the long hall, that's probably the most expensive alternative, because you never get rid of it, and you're going to be guarding it to the end of time.

So we realize that it costs money no matter what we do, and it's all taxpayers'

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money.

MS. CARROLL: Well, the MOX program ultimately leaves the legacy that it will be guarded forever. So I see it as a very circuitous path that does not take us to the goal, but takes a lot of money that diverts effort.

And another interesting point that was just brought up -- and I do want a specific answer -- how many watts of energy will the MOX fabrication plant use?

MR. NULTON: We don't have that number off the top of our head. Mr. Hugelman here was saying that -- it's in the EIS. I just don't have it off the top of my head.

MS. CARROLL: Well, you have an EIS handy, don't you?

MR. NULTON: Not with us here, no.

MS. CARROLL: You're kidding? Well, I just remember when TDA wanted to finish the Belfont plant in Northern Alabama, they needed an excuse, somebody to use the excess power that would be generated. And they said, Oh, well, we're going to build a uranium enrichment facility here. It would use half the power we

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generate.

I'm sure it's a very power-intensive process. So while we have the benefit of generating electricity from it, we will gobble a lot of electricity to do that. So it's --

MR. NULTON: Again, the immobilization facility also requires electricity to fire up melters and things of that nature.

MS. CARROLL: Good. We need to take this plutonium out of harm's way, if we have to refine the technology, if it's minable in the path we're pursuing, we can't go down that path until we figure this out.

I'm not technical. I'm an artist, and Arjun could probably help you design what you need. Could you do that, Arjun?

(Laughter.)

MS. CARROLL: For a price? I'm sorry. I don't mean to put you on the spot.

DR. MAKHIJANI: I appreciate it.

MS. CARROLL: All right. Well, I think the most important question that I'd like to know -- I'd like to make an observation on something else I heard you say, because I'm in

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Georgia, and the legacy from Jimmy Carter through every governor since has been, we are very concerned about activities over at Savannah River Site. And the policy has been, at the highest office in Georgia, that until cleanup occurs, no new facilities, no new missions. Cleanup of the environment, containment of the environment is the only thing that we will support.

And you made the comment, Well, what are we going to do when 10 years pass and we've built this -- we've R&D'ed the facility. I mean, you didn't give that fellow the real figure, because before we construct the facility, there's the R&D to do this. So it is probably twice as much as what you told that fellow.

So we're going to do that for 10 years. Then for 15 years, we're going to produce MOX, and then we're going to clean up the environment. Yeah, right, you know.

So I have a question for you. Our representative, Nan Orrock, who is represented here tonight, asked at a legislative meeting in Georgia, and DOE was present singing the

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praises of this program and the jobs it would bring to the Augusta area -- asked and did not receive an answer. So tonight I give you an opportunity to answer, or the question will be on the record, and you can supply the answer and maybe somehow or another I'll hear about it. I did not get an invitation to this either, but I get all the big books. You know, I got the PEIS. As a volunteer, I don't know when I'll read that.

What was said, as an assurance to Georgia, whose stake in this is to have jobs in the Augusta area, was DOE stated we have a very -- a high interest in maintaining the work force at a steady level, and will provide jobs at a steady level. We will need you at a steady level.

Ann Orrock's question was, and what we are very interested in the answer to is: Have you maximized your effort, both financially and in personnel, for environmental cleanup?

MR. NULTON: I'm not sure -- maybe you need to clarify the question. Maximize in what regard? I mean, how do we plan for it --

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MS. CARROLL: Well, this is my thing. In 1990, that was what we were going to do program wide, and we had a budget, and we've since fallen off on the level of will and the level of money we're putting into cleanup. So I'm kind of baiting the question.

MR. ANDERSON: Okay.

MS. CARROLL: I know we haven't maximized it, but I want to hear you tell maybe what the maximum is.

MR. ANDERSON: Let me try and address that a little bit. I'm not sure I can say whether we've maximized it or not. But the Savannah River Site does have an integrated priority list of all of its activities for the amount of budget that it gets.

And the share that the environmental restoration and the cleanup programs are receiving at Savannah River is a higher percentage than it has received in the past.

The other activities that are there that are related are stabilization activities, which I referred to earlier. And that makes up most of the Savannah River budget at this point.

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MS. CARROLL: Which is 90 percent or --

MR. ANDERSON: 90, 95. When I say most, I'm not talking about just the majority.

MS. CARROLL: Are you going to maintain spending on cleanup at that level while bringing up the MOX and the immobilization program?

MR. ANDERSON: That is the plan.

MS. CARROLL: So actually, jobs will increase quite a bit, because everybody working on cleanup will stay working on cleanup, and everything else will be extra on top of that?

MR. ANDERSON: If it's related to in peer of people, as far as that's concerned.

MS. CARROLL: So people should be moving to Augusta to get these jobs.

MR. ANDERSON: Now, the other aspect of this is that these contracts are being let -- you know, with bringing in some new talent, bringing in some additional -- you know, the joint -- I want to call it a joint venture, and that's the wrong term.

MR. NULTON: Consortium.

MR. ANDERSON: Consortium with Duke,

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Cogema, Stone and Webster. So the real intent, as far as the employment levels, we're looking at the longterm employment levels for the more permanent employment at the Savannah River Site.

In fact, there was -- on a routine basis, we do demonstrate and show people, you know, where we're doing environmental cleanup. We are making quite a bit of progress in cleaning up the sites and cleaning up waste and taking waste that was in forms and placed into the areas which were thought to be well planned years ago. We're pulling some of those back, vending drums, repackaging, checking. There's cleanup of groundwater systems that's occurring of plumes. There's closure of disposal sites that are occurring. The defense waste processing facility is operating and disposing of high-level waste in a stable form. And the canyons purpose at this point is to stabilize nuclear materials.

MS. CARROLL: That's one of the attractive things about the immobilization option. I'd like to see it increase. I mean, if we continue with our disarmament efforts,

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there's going to be a steady stream of plutonium triggers that need to be dealt with, and to increase the rate at which we're able to take that stuff out of the deteriorating paints and solidify it. That is a really attractive idea, and we support it. We want to be supportive of South Carolina in dealing with this.

So thank you so much for having this opportunity tonight.

SENATOR LEVENTIS: Thank you. Joan King, and then Ed Arnold.

MS. KING: I found a penny. Do you think it's lucky?

SENATOR LEVENTIS: I certainly hope so.

MS. KING: There. I'll put that to the DOE. I think they need it at this point.

I want to thank everybody here for their patience and for their endurance. I'm Joan King. I've worked on nuclear issues for a number of organizations for many years now. I'm also the spokesperson for WAND, which is Women's Action for New Directions. And I will try to be brief.

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I'm going to make some statements of things -- assumptions from what I've heard, and you can just say yes or no.

I am part of an activist community working on nuclear issues, and I hear that the -- on one hand, I hear that we're going to do this because we have to do MOX because the Russians want it. Am I hearing correctly? Because I also heard the opposite, that we suggested it to the Russians.

MR. NULTON: I think that this is a result of the negotiations with the Russians, where they wanted to do one thing, and we have evolved to this point, that they wanted to use it in breeder reactors.

MS. KING: Okay. Well, which Russians? I mean, I'm part of the activist community. They are -- my counterpoint has come to this country, activists who are Russian citizens, and they say, We don't want this.

MR. NULTON: Well, we negotiate with the Ministry of Atomic Energy in Russia. It's a government to government --

MS. KING: Uh-huh. So government to government. But people to people, the people

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don't seem to want it.

We have talked about plutonium. Is it true that the amount of commercially produced plutonium, reprocessed plutonium, in the world today is growing?

I have read that it is growing so that it will soon exceed the amount of military plutonium from the military reprocessing. Can anybody answer that?

MR. STEVENSON: The first statement that the amount of plutonium in the world as a result of civilian reactor operations is growing, yes.

MS. KING: Is growing.

MR. STEVENSON: That is correct. Whether the amount that's military in weapons-grade and the amount that's at civilian grade, one versus the other, I do not know.

MS. KING: Well, I've seen projections that if the amount of commercial -- well, I don't -- I've been working on how you phrase it. We'll just say commercial plutonium versus military plutonium. That the amount of commercial plutonium is growing, and if it continues the way it is, it will soon exceed

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the amount of military plutonium in the world.
Does anybody dispute that, or can they answer it?
SENATOR LEVENTIS: Yes. If you want to talk to Dr. Makhijani later, he can supply you with the numbers. I don't know that they are --
MS. KING: I just wondered if it was true or not. I don't really need the numbers.
The point I'm getting to is that I think our problems come with plutonium. I realize that a -- the weapons-grade is probably more desirable on the terrorist market and for Rogue nations. But we also have admitted that we can make nuclear bombs, and that our country has done it as a test from commercial plutonium.
So I'm saying that I think the plutonium itself is the problem, and that MOX will not decrease the amount of plutonium in the world. Even as it degrades some of it, it will contribute to the general increase of plutonium in the world. That is why I'm worried, as a citizen and as a member of a number of organizations.

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Then I'm very concerned as a citizen about the amount of money that's going into this, and I would like to ask the DOE about a rather local problem.
In Georgia, we're concerned about the contamination of the groundwater from the SRS. And they were doing some testing of the wells, and we had -- apparently there was money from it, and they found things that showed there was tritium in it. I'm not sure about what else they found in the groundwater. Then all of a sudden, there was no money for the -- when I asked our department, EPD, they said, the money -- we don't have the money to test the wells anymore.
Now, I'm disturbed that -- I mean, I'm a mother and a grandmother, and we have a policy with my -- if you made a mess, you clean it up before you start all over again. I just think we need to clean up what we've got before we begin on another major project that is going to be very expensive and produce more waste.
So thank you very much for this opportunity.
SENATOR LEVENTIS: Thank you,

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Ms. King.
Mr. Ed Arnold, and then Mr. Harry Rogers.
MS. CARROLL: If I could just give you that figure. I know we're all dying to know how many megawatts we're going to use to make MOX. May I?
SENATOR LEVENTIS: Yes.
MS. CARROLL: 17,520 megawatt hours a year. I don't know how that translates to a 1,000-megawatt plant.
SENATOR LEVENTIS: It sounds awful high.
MR. NESBIT: There's a lot of hours in a year.
MR. STEVENSON: Very low.
MS. CARROLL: It's low?
MR. NESBIT: It's not that much.
MS. CARROLL: There's the facts.
SENATOR LEVENTIS: The gentleman from Cogema had said that it's not an energy-intensive process.
MS. CARROLL: All right. I wanted a figure. Now we know.
SENATOR LEVENTIS: Okay. We've got

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several more people to hear from, and we will hear from everyone. Please address questions, if you can. And if you have statements, please limit them as may be appropriate.
MR. ARNOLD: Senator, this has been really great. Thank you so much.
My name is Ed Arnold. I'm the executive director of Physicians for Social Responsibility. Our office in Atlanta serves Georgia, South Carolina, Alabama, and Florida, in terms of staffing in the southeast.
Our health professionals and physicians are opposed to the MOX program. They think the risks are too great. And I want to know who are the health professionals and physicians that contributed to the EIS and the supplemental EIS?
MR. NULTON: We used the SIC organization to do our environmental analysis, and they have experts on this to do these analyses.
MR. ARNOLD: Would it be possible for our health professionals and physicians, numbering over 10,000 across the country, a representation of those, to sit down with your

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health professionals and figure out what the differences are, perhaps resolve our positions of difference?

MR. NULTON: That's why we've had over 90 public meetings up to this point. That's why we have an Environmental Impact Statement, to put that out, get the comments, and resolve the comments. We do that in the public meetings.

MR. ARNOLD: Have your health professionals been onhand to try to resolve the differences --

MR. NULTON: Yes. We've had experts at our meetings to answer questions, yes.

MR. ARNOLD: So in your view, it would be a repetition of the public events that have already occurred?

MR. NULTON: Well, we've had these people at these meetings, and we've had a number of representatives from Physicians for Social Responsibility in our meetings around the country in the northwest and --

MR. ARNOLD: But we still have our differences that aren't resolved.

Well, I'd like to make a statement

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that PSR would be interested in pursuing the issue so that we can -- certainly, the immobilization program has its risks, not burning -- not irradiating rods anymore has its risks, because we might have to use more coal in the interim until we -- (inaudible) -- energy sources.

I mean, there are risks with everything that we do. I wish I were hearing more about some acknowledgment that risks do exist.

But PSR thinks that the risks attendant with the MOX program are more serious than if we went strictly with immobilization.

I wish we had the opportunity to sit down with our professional people together to see if we could resolve the differences. And as I'm hearing it, you think that we've run our course on it, and I'm sorry that's the case.

SENATOR LEVENTIS: Well, let me just make a comment that what I have heard this evening and what I've heard as I've researched this, is, you may well be true that it's not an absolutely risk-based decision, and that they feel their responsibility is to reduce the risk

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as much as possible.

And probably the more significant thing you can contribute would be a way toward that end, as opposed to this simple notion that one option may be heavily risk weighted than another, because the idea of simply storing material has its risks, and the idea of allowing the Russians to have no organized disposition has its risks, as well.

So I would suggest that that's probably where you need to be, because I don't believe that the facts of your statement, although I think they're true, would change the direction of the department unless you can offer some opportunities that they can understand would reduce the risk. Is that a reasonable statement?

MR. NULTON: I'm not sure if I understood the whole statement. I think, again, we accept any and all comments, and we try to respond to each one. We do respond to each one. I think up to this point, we've responded to the comments we received in our previous EIS's, and we'll respond to the ones received in this EIS in our final document.

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MR. ARNOLD: Senator, thank you very much. This has been a wonderful meeting tonight.

SENATOR LEVENTIS: Thank you for coming.

Now we have Mr. Harry Rogers, and after him is Mel Jenkins.

MR. ROGERS: I'm Harry Rogers, outreach coordinator for Carolina Peace Resource Center. I appreciate first steps. Thank you, Senator Leventis.

I'm going to frame my question with an op-ed piece, and not read the whole op-ed piece.

First, from Brad Morris, was at a DOE reorganizing hearing. It's a quote from Warran Rudman, an ex-senator.

The focus here and in the Senate is understandably on security. I want to be clear. The security is only a system. Mismanagement and arrogance are pervasive everywhere at DOE.

I don't know that I agree completely with what Senator Rudman has said, but I have not felt a part of that public participation

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process. I think that you should realize that you're going to face significant opposition to the decisions that you've made here that are going to result in unnecessary costs, and I think that you've been dismissive of those that have been against MOX.

Mike Tuckman, executive vice-president of Nuclear Generation with Duke Power Company, says he has difficulty understanding why anyone would have a problem with the MOX, mixed-oxide, fuel option of weapons-grade plutonium disposition.

This is an arrogant statement. Had Mr. Tuckman attended either the legislative briefing conducted by Senator Phil Leventis in Columbia or the public hearing conducted by local and national groups at the University of South Carolina, he would have heard a panel of six experts outline the economic, environmental, security and health reasons against MOX.

Subsequently, I made two telephone calls, at least, to Duke Energy requesting that Mr. Tuckman provide me with contact information. That was two and a half months

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ago. To this date, they have not replied.

Briefly, through my work with the Carolina Peace Resource Center, along with other groups, we will be holding hearings throughout South Carolina concerning nuclear issues. We will hold ourselves answerable to the public. Will you?

And last, I work at V.C. Summer Nuclear Generating Station in Jenkinsville, a plant made world-class by its employees. If this were happening at my plant, I would oppose the use of MOX fuel just as vigorously.

If I can go back. Dr. Lyman said recently, While Duke Power claims that the use of MOX in France is safe, it does not plan to employ even the minimal safety adaptations used in France. It does not intend to install additional control rods in its reactors, or to place limits on the irradiation time of the plutonium fuel versus the uranium fuel, both of which are done in France. Duke is cutting corners here in a way that could seriously impact safety.

Now, I know the representative from Duke Energy is going to be able to give me some

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prepared answers.

What is at issue here is not the fact that you have the answers. It's what was brought out earlier. It's that an aggressive attempt to involve the public in such a significant decision is absent, and we should have had the opportunity to ask these questions. And it's unfortunate that you've placed us in an adversarial position where over the next year and a half we probably will ask these questions at a good deal of expense to both of us. And I really feel that it's unnecessary, and I would like for you to address the technical questions that I've asked.

MR. NESBIT: You cited Dr. Lyman's statement that implied that Duke would cut corners in a way that could seriously impact safety, not intending to install additional control rods or to place limits on irradiation time of the plutonium fuel.

Dr. Lyman's statement is erroneous. We never said that. As we've said today, we are going to thoroughly study the impacts of using mixed-oxide fuel on our plants and make

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whatever modifications are necessary to ensure the safety of the workers and the public.

Because at this present time we do not see the need to add control rods in order to achieve reactivity control at our reactors does not mean that we're cutting corners on safety. If it turns out that for some reason they are needed, we'll make those modifications.

I'd also like to address another point. Duke Power has been very open with the public and the media about its involvement in this program, going back to 1996, when we first responded to the Department of Energy's request for interest from commercial public utilities.

At that time, approximately 18 utilities responded to DOE's RFI. We made our response public. We have been open every step of the way about our involvement up to when we submitted a proposal back last fall, and when we received our contract this spring.

Furthermore, if the program goes forward and we're going to use MOX fuel at our plants, the NRC licensing process provides an ample opportunity for public involvement in the

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surrounding communities, and we look forward to those opportunities.

MR. ROGERS: Thank you. Just in closing, I don't find it comforting that we're going to do all these studies about how we're going to use this MOX fuel sometime after we've spent a significant amount of money to build the facility.

SENATOR LEVENTIS: Thank you.

Mr. Mel Jenkins, and after him is Claude Gilbert.

MR. JENKINS: It is still evening. Good evening. I'm Mel Jenkins. First of all, thank you, Senator Leventis, for bringing this about.

I'm here as a part of Environmentalists, Incorporated, and as an active participant in dealing with civic and community process toward direct advocacy and through the neighborhood project. In both of those roles, I have several simple questions, and you will be surprised that they are questions.

Number one: I would like to repeat Mr. Kawaguchi's question about International

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Nuclear Services here in Columbia. Will there be more contaminated materials coming to that INS plant? Call this 1A. Since logic impels the handling of this material will produce more contaminated items as a result of handling MOX materials, how much more will be coming here to Columbia? That's a specific question, which, of course, you can't answer tonight, but I would appreciate some workup on that. That is important to us here.

Number two -- again, I regret that there's not an agenda, so I don't know the names of the people participating here. So I'll simply say, DOE said tonight there have been over 90 public meetings on this issue. I would appreciate a list of those, giving dates, places and such, and that's a question. Will you provide that?

Number two: What public meetings have been held here in South Carolina?

Number three: What public meetings have been held in Georgia? And you can answer that tonight, I think.

MR. NULTON: I don't know the number of meetings that we've -- I don't know the

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dates and so forth or the exact number, but we've had several meetings in North Aiken, I guess -- in North Augusta, rather, Aiken.

MR. STEVENSON: I can name some of them.

MR. NULTON: Go ahead.

MR. STEVENSON: To name some of those meetings, one of the very first ones was a planning and scoping meeting for our programmatic -- in 1994 in North Augusta.

There was another meeting for the draft of the PEIS in North Augusta. There was one on highly enriched uranium disposition in Augusta itself.

There was another one on the scoping in the final of the HEU. There was a meeting on the scope of this draft EIS. There was a meeting on the draft of this EIS. There were some other group meetings where the public was invited between those meetings on specific topics. I don't remember exactly what they were, but that's the ones that I just remember off of the top of my head.

MR. JENKINS: So all these meetings were in the back yard of the Savannah River

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Site, some of which I have heard characterized as pep rallies, none of them held in Atlanta, none of them held in Columbia; is that correct?

MR. STEVENSON: Yes, there was one meeting held in Atlanta in this process. I believe, it was in -- and I'll double-check myself. It was in 1995 that we held the meeting in Atlanta.

MR. JENKINS: And I would, of course, be interested in the publicity that was given to those meetings.

So given that it seems like there was some decision made to limit public input on this issue, I would be very interested to know who arrived at the public input plan for this process.

Again, I think we here in Columbia certainly would feel that we have been excluded from the process; and therefore, I would be very curious as to who it was specifically, by department and by names, that decided that there would be a limited public input on this.

And three: Is this the new DOE policy regarding public input?

Thank you.

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SENATOR LEVENTIS: By the way, if you have asked for a specific response --
MR. JENKINS: I don't expect it tonight.
SENATOR LEVENTIS: -- please give that person that you asked -- this applies to anyone who asked -- your name and address so that they may be able to access you.
MR. JENKINS: That's on the sign-in form. Do I need to do that separately?
SENATOR LEVENTIS: No. You need to do it in addition, because it's hard for us to pull out each individual person that may have made a request to any of these gentlemen on the panel here.
MR. JENKINS: Thank you.
SENATOR LEVENTIS: Did anybody want to address that?
MR. STEVENSON: Was the number of them -- within the department as to who makes the policy of what meetings we have, that is a process as opposed to one individual.
But typically, it is the head of our office, and it -- we've had several office directors who make that. It's also done in

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consultation with our Office of General Counsel, our lawyers, and with the Office of Environmental Policy and Assistance. So that it's reviewed by the people who are in charge of the National Environmental Policy Act Enforcement, our lawyers, and the people within our office, as a minimum.
MR. JENKINS: Thank you. I realize that you're saying it's difficult to arrive at a person or a particular -- but I've worked with the government myself and have dealt with them enough to know that paperwork is the essence of government, and that you have to sign off on things like that.
So there is a paper trail that could be arrived at.
MR. STEVENSON: That is correct, because part of the requirement of the National Environmental Policy Act is that you prepare the administrative record, and that administrative record contains that type of information upon which those decisions are arrived at.
MR. JENKINS: That will be interesting.

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SENATOR LEVENTIS: Thank you.
MR. JENKINS: Thank you.
MR. ROGERS: Senator Leventis, I just wanted to submit this for the record.
SENATOR LEVENTIS: Just bring it around.
Next would be Mr. Claude Gilbert, and after him is Mr. Bert Cutts.
MR. GILBERT: Thank you, Senator, for this meeting tonight. I'll be very brief, because I think we've touched on most everything.
I would like to say for the record I think that I would like more discussion on the environmental record of Cogema. I think we let him off mighty light tonight. There's a lot of questions concerning what's going on in France, and the contamination, and it's pretty well-known. So I know there's some violations there. I'm very much concerned with Cogema working on this project.
I have a statement I would just like to leave for the record, I think.
I have one question for Duke Power concerning the fuel rods. I remember reading

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before that I think you all have removed them from reactor to another reactor.
Are you planning on doing that type of thing with this MOX?
MR. NESBIT: No. You're referring to transshipment, which occurred between Oconee and McGuire, when we were running out of space in the Oconee spent fuel pool. We've since instituted on-site dry storage of the sites that need it. We have no plans for doing that with mixed-oxide fuel.
MR. GILBERT: Thank you. If I can just submit this.
SENATOR LEVENTIS: Thank you. Just bring it on around.
I think it's Mr. Bert Cutts, C-u-t-t-s.
SPEAKER: He's already gone, sir.
SENATOR LEVENTIS: Brian Carnes and then Mr. Michael Moore. Are they here? We've outlasted. Okay.
Merison Niri, N-i-r-i? Shin Yun? It seems Mr. Cutts signed up twice, and he's not here once.
(Laughter.)

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SENATOR LEVENTIS: Mr. Poe?
MR. POE: Thank you, Senator. I appreciate the opportunity to be here tonight. And Mr. Nulton, thank you for coming and sharing with us.
Up front I'll tell you that I'm pro-MOX. Okay? I'm just disappointed we don't go further than one pass with it, but that's not the question at hand tonight.
I will say that I am -- consider myself to be informed, and I've been very slightly tasked here tonight to be informed. This is a complex subject that we're talking about.
I've heard citizens on both sides of the coin. I learned from both. I said I'm pro-MOX. So I'm in favor of this activity.
The most compelling story that I've heard tonight was the one that Mr. Chaput talked to when he talked to the fact that by denaturing this material we're moving in the right direction. If we don't get all the way there, we at least are moving in the right direction.
I do have two points that I want to

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make. They'll turn out to be questions, I hope.
The first one is: You know, there's been a lot of discussion about we don't understand what all is going on here tonight. They are questions which tells me, in my limited knowledge, that we're not meeting often enough.
So I would like to address you, Mr. Nulton, and say what are we going to do about that? You've got citizens of South Carolina, citizens of Georgia that are interested in your program. Some opposed to it. Some for it. But nonetheless, there are probably questions among all of us that don't have the benefit of all the time and effort that you guys have put at it to understand that.
Let me just tell you that I spend probably three or four days a week working to understand the goings on at Savannah River. I'll tell you that my judgment is that after you work the problems well, you and they meet in a meeting of the minds, and you understand where each other is coming from and where

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they're going. I haven't gotten to that point with this program yet.
So what are we going to do about that?
MR. NULTON: Part of our effort, now that we have DCS under contract, is to develop an outreach program. We're in the process of doing that. I'm not sure what nature it will take, but it is one of our activities that we're undertaking.
MR. POE: Well, I would encourage you to do that strenuously because there have been an awful lot of people here who are stakeholders of this activity that you're planning for us here, and we don't understand, and we have nagging concerns that continue with us.
Now, the second question. Senator, I guess I address this one to you. You were nice enough to set up this meeting. And for the first two hours, about 60 of us sat out here and listened to you all talk back and forth about things we didn't even know what you were talking about, because there were pieces of paper -- and I made a list of seven things

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that you talked about in that two hours that we don't have copies of. Now, if we're going to be informed citizens, we need to have that information.
The list that I ended up with were the environmental synopsis somebody mentioned, and I don't remember who that was; the cost report; the contract, a copy of what the contract looks like; the contract cost analysis that someone referred to. In September, when we get the U.S. Russian agreement, we need to see that. Then so that we can remember all these good things that you guys have talked about, Senator, I would like to suggest that this group of papers that have been talked about here be mailed out to the people who came here, along with a copy of the transcript of the meeting so we can hear the questions and read some of the information.
I'll tell you, for one, that I don't like to read, but I do read an awful lot of this kind of stuff to keep myself informed so that I can become a reasonable stakeholder and understand the process.
So can we arrange something like

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that? I don't know whether it's you or whether it's Mr. Nulton. Everybody had different pieces of paper that most of us sitting out here in the audience didn't have.

SENATOR LEVENTIS: Certainly it's a valid criticism. We didn't know how many folks to expect, and we will try to arrange the results of this meeting and the transcript into some logical fashion and see who among those who are here would like it because -- and I see one taker already -- because that's the purpose of having the meeting.

So we'll try to get that together in conjunction with the Department of Energy, who was very supportive in our efforts to get the meeting together.

In relation to one criticism that we had earlier about a notice that the meeting was going on, of course, we did publish it widely in the public media. We did also mail to a list provided to us by the department, and I don't know precisely the origin of that list, but -- how was it constructed?

MR. STEVENSON: I think I can answer that and would like to offer my comments.

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The list -- over the past five years that we have been a program, we have been collecting a stakeholder database. That stakeholder database is now up to 7,500 individuals of which 1,300 are South Carolinians.

MR. POE: Good. I'm glad we're represented.

MR. STEVENSON: Of the 1,300 South Carolinians, they represent 100 individual communities around the state who are on our routine mailing list.

We try very hard to keep that mailing list up to date, but people move, and we only make mailings every so often. But we really do try to make sure that everybody who wants to receives copies of our information.

Further, Senator, I'd like to make a suggestion that might help out here. When the transcript is prepared and you're going to make distribution, if you could, put a statement in there that if people are interested, who have access to the worldwide web, they could get all of the documents that you mentioned from there, or we have a mailing address where, if they

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wish to get those by mail, they can also do that.

One other new piece of information also that I would add is that, since we entered into a partnership with DCS, our website will now include linkages to these partners that we have so that you also can gain information from their websites, so that you have an ability -- if you were interested in more of the Cogema information, you could go directly to that site and obtain what information that they have there --

MR. POE: Thank you.

MR. STEVENSON: -- which also includes mailing addresses, so that you aren't fully dependent on the web for these documents.

MR. POE: Well, I, for one, received my invitation in a white envelope. It didn't look like a DOE envelope. Senator, I thought you had mailed it to me. It was a plain white wrapper. I saw in the Augusta paper yesterday the announcement of the meeting. I had received the announcement out of The State several days earlier.

So I was aware of the meeting, and

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the Aiken/Augusta area stakeholders do communicate with each other, and we talk a whole lot. So that word gets around.

I want to thank you again for having us here tonight and sharing this information with us. It's a little bit frustrating to try to understand and take it all in. So help us, bear with us, and continue this sort of thing. Thank you.

SENATOR LEVENTIS: I should point out, of course, that the Department supplied us with a large list of folks to mail to, and they also supported us with the postage and whatnot to make that mailing.

In relation to a comment you made, when we do prepare the transcript, we will try to prepare an index of the documents that we used or were referenced so that you might be able to go get them.

Mr. Poe, do you use the worldwide web?

MR. POE: I'm a -- while my friends up here -- let me just -- yes, I do a little bit. I'm not terribly fluent. I got a copy of a defense board thing sent to me this morning

that I couldn't open and read, and I had to get somebody else to come help me figure out what was wrong with my web.

SENATOR LEVENTIS: But you do access that?

MR. POE: Yes, sir, I do.

SENATOR LEVENTIS: That's fine. Ms.--

MS. THOMAS: I wanted to correct an oversight. I wanted to thank you, Senator Leventis, and I wanted to speak to Mr. Stevenson.

Even though I've been doing it all these years, I'm still not comfortable standing up and talking to people, but I think I do better on the telephone one to one. So thank you both.

SENATOR LEVENTIS: Is there anyone else that I have not recognized that would like to speak?

In fact, of course, I didn't get to raise all the questions that I would like. That may sound strange, but it's true. I have passed some questions on to some of the gentlemen here.

But my main purpose, I think, has been met, and that is to bring everyone together and to create more of a record available to these gentlemen, to us, as we discuss these issues.

I would like to thank first and foremost those people who supported this meeting, Ms. Jeter, and the people from security who have been here all day, because I've been here with them. We appreciate you being here a great deal, and those folks who have come from out of town. I know a lot of you have. From DOE, Mr. Stevenson, Mr. Nulton, Mr. Selby, and a lady whose name I did not get. I'm sorry.

MR. NULTON: Pat Wherley.

SENATOR LEVENTIS: Ms. Wherley. Those folks from Melox and Cogema, Mr. Ihde from Duke, Cogema, Stone and Webster, and Mr. Nesbit from Duke. All those folks who came representing Representative Orrock from Atlanta, and our Representative Clyburn, Senator Courson, Dr. Makhijani, Mr. Brown.

We did what I intended to do. We took about as much time as I thought we would

to do it.

So with that, unless anyone else would like to comment --

MR. NULTON: Senator, can I just make one brief comment? Can we enter, for the record, from Cogema some reports on their facilities?

SENATOR LEVENTIS: Yes, please. We would like that, and if we need any more, we can certainly give you those.

MR. NULTON: And also, I would suggest, if you want to enter for the record, the question and answers that we sent to you in there under the Cogema section of that document are two websites that were identified that also provides access to Cogema environmental data that would perhaps help some folks.

SENATOR LEVENTIS: All right. We'll do that. Anyone else? Thank you for your great patience and all of your input and participation.

(The proceedings concluded at about 11:22 p.m.)

CERTIFICATE OF REPORTER

I, Lisa D. Jeter, Court Reporter and Notary Public in and for the State of South Carolina at Large, do hereby certify:

That the foregoing proceedings was taken before me on the date and at the time and location stated on Page 1 of this transcript and was recorded stenographically by me and were thereafter transcribed; that the foregoing proceedings as typed is true, accurate and complete record of the proceedings to the best of my ability.

Witness my hand, I have hereunto affixed my official seal this 2nd day of September, 1999, at Columbia, Richland County, South Carolina.

Lisa D. Jeter
Court Reporter, Notary Public
State of South Carolina at Large
My Commission expires
September 11, 2002