

# THE NRC AND MIXED OXIDE FUEL



JULY 12, 2000  
COLUMBIA, SC

# THE NRC AND MIXED OXIDE FUEL



JULY 13, 2000  
NORTH AUGUSTA, SC

# INTRODUCTIONS

# WHAT ARE OUR GOALS TODAY?

Initiate a Dialog with the Affected Public

- Listen to your comments
- Respond to your questions

# HOW THE MEETING WILL WORK

- Everyone has opportunity to speak
- Note cards are also available
- Please attack issues and not people
- Parking lot
- NRC summary of meeting
- Please sign in
- Please complete feedback form

# WHAT ARE OUR GOALS TODAY?

Discuss NRC's Role in MOX

- The NRC
- The NRC's Role and Responsibilities
- The Licensing Process
- Current and Future Activities
- Public Participation

# **AN OVERVIEW OF MIXED OXIDE FUEL AND THE NRC**

Melanie A. Galloway, Chief  
Enrichment Section  
Special Projects Branch

# WHAT IS THE NRC?

- Independent regulatory agency
- Experienced

# WHAT IS THE NRC?

## Mission

- Public health and safety
- Environment
- Security

# WHAT IS THE NRC'S ROLE FOR MOX?

- Nuclear safety, environment, and security
  - ▶ MOX fuel facility
  - ▶ Transportation
  - ▶ Reactors
  - ▶ Spent fuel disposal

# A BRIEF HISTORY

- Agreement with Russia
- National policy
- Reduce the spread of nuclear weapons

# A BRIEF HISTORY

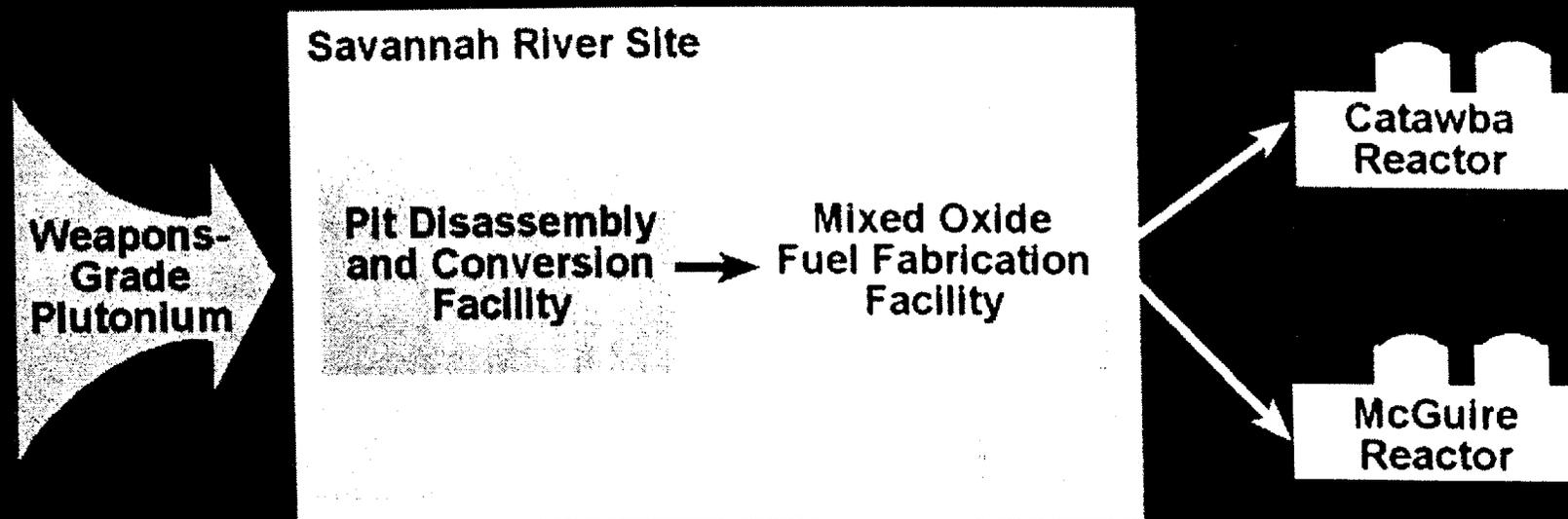
Department of Energy (DOE) Role

- Maintains nuclear stockpile
- Responsible for surplus plutonium
- Implement national policy

# A BRIEF HISTORY

- DOE has decided to:
  - ▶ Convert some plutonium to MOX fuel
  - ▶ Contract to build and operate the plant
  - ▶ Fabricate the MOX fuel at Savannah River Site

# NRC Role in Regulating Mixed Oxide Fuel

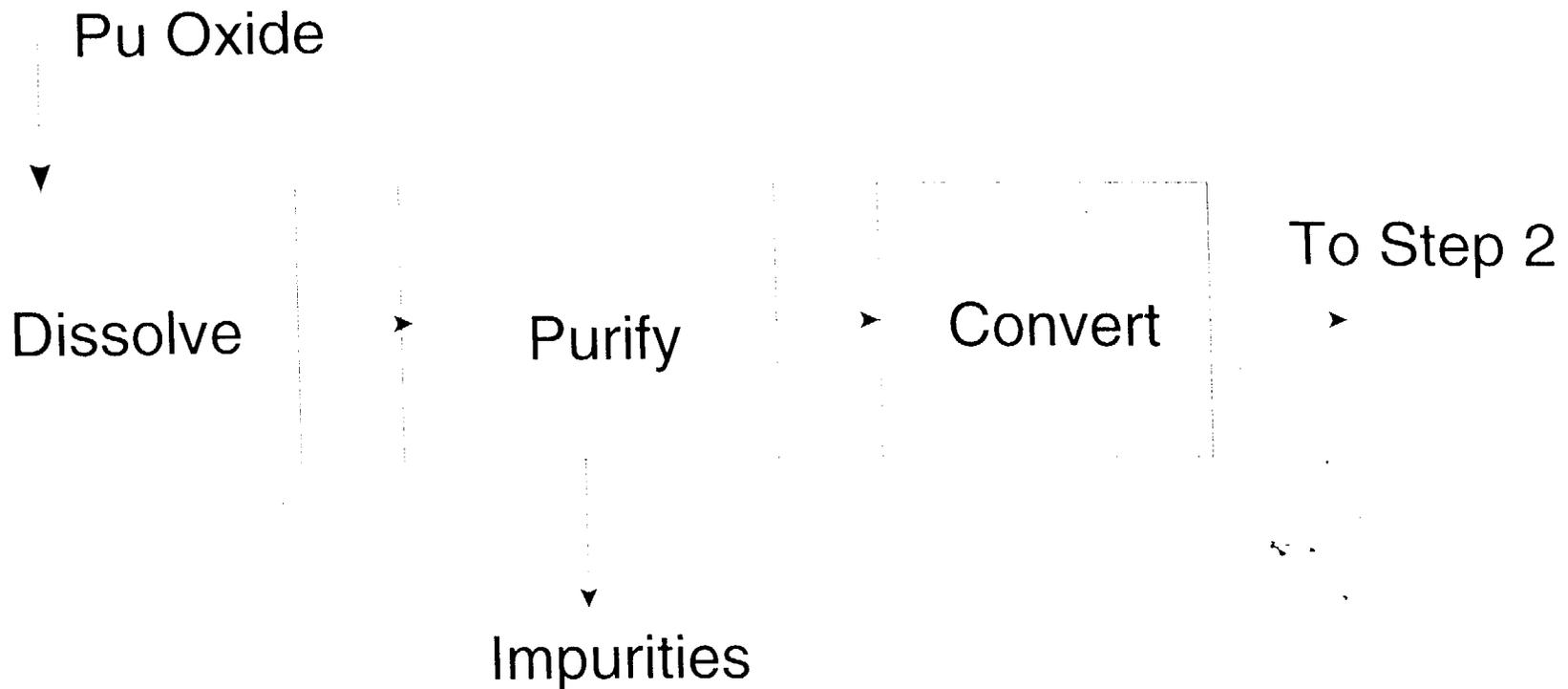


Yellow = NRC regulated

Blue = DOE regulated

# THE MOX PROCESS

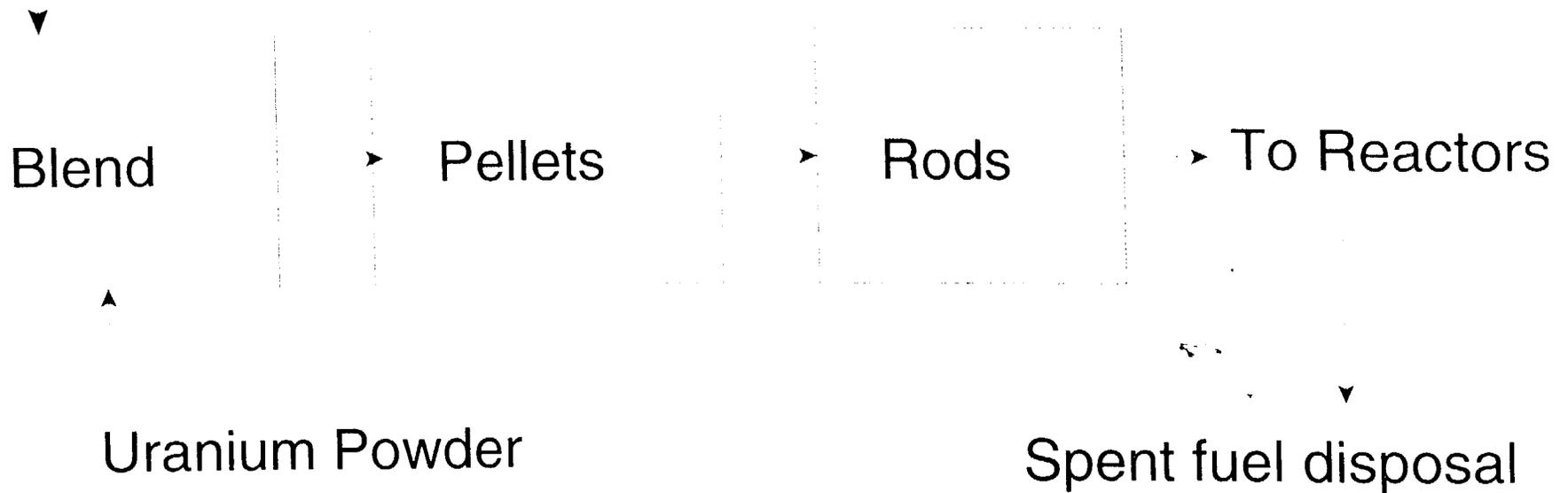
## STEP 1: Purify Plutonium (Aqueous Polishing)



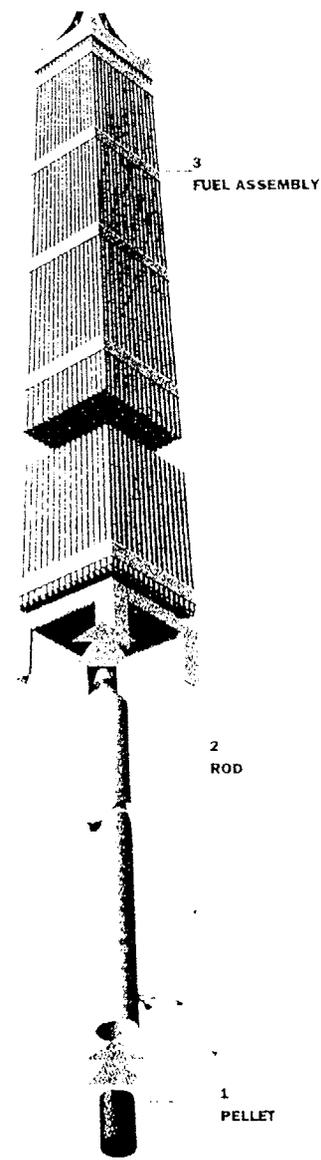
# THE MOX PROCESS

## STEP 2: Fuel Fabrication

Pu Powder, From Step 1



# MOX FUEL ASSEMBLY



# **NRC Assignments**

- Andrew Persinko--Project Manager
- Jennifer Davis--NEPA Lead

# THE NRC LICENSING PROCESS

Andrew Persinko

MOX Project Manager

# AREAS OF NRC REVIEW

- Fuel fabrication
- Transportation
- Reactors
- Spent fuel disposal

# NRC SAFETY REQUIREMENTS

- Code of Federal Regulations (CFR - Title 10)
  - ▶ Fuel facilities (Part 70)
  - ▶ Environmental protection (Part 51)
  - ▶ Transportation (Part 71)
  - ▶ Public hearings (Part 2)
  - ▶ Reactors (Part 50)
  - ▶ Spent fuel disposal (proposed Part 63)

# ACTIVITIES REQUIRING NRC APPROVAL

Fuel Facility

- Construction
- Operation

# INFORMATION TO START CONSTRUCTION

## Fuel Facility

- Site description
- Safety design
- Quality assurance program

# NRC REVIEW PROCESS

## Fuel Facility Construction

- Review
- Request additional information
- Perform analyses
- Document results

# RESULTS OF NRC REVIEW

## Fuel Facility Construction Possible Outcomes

- Grant approval
- Deny approval
- Grant approval with conditions

# INFORMATION FOR OPERATION

## Fuel Facility

- Safety analysis
- Safety equipment / operator actions
- Management measures
- Emergency plan
- Physical protection plan
- Material accounting plan

# NRC REVIEW PROCESS

## Fuel Facility Operation

- Review
- Request additional information
- Perform analyses
- Verify construction
- Document results

# RESULTS OF NRC REVIEW

Fuel Facility Operation  
Possible Outcomes

- Grant license
- Deny license
- Grant license with conditions

# REACTOR LICENSING

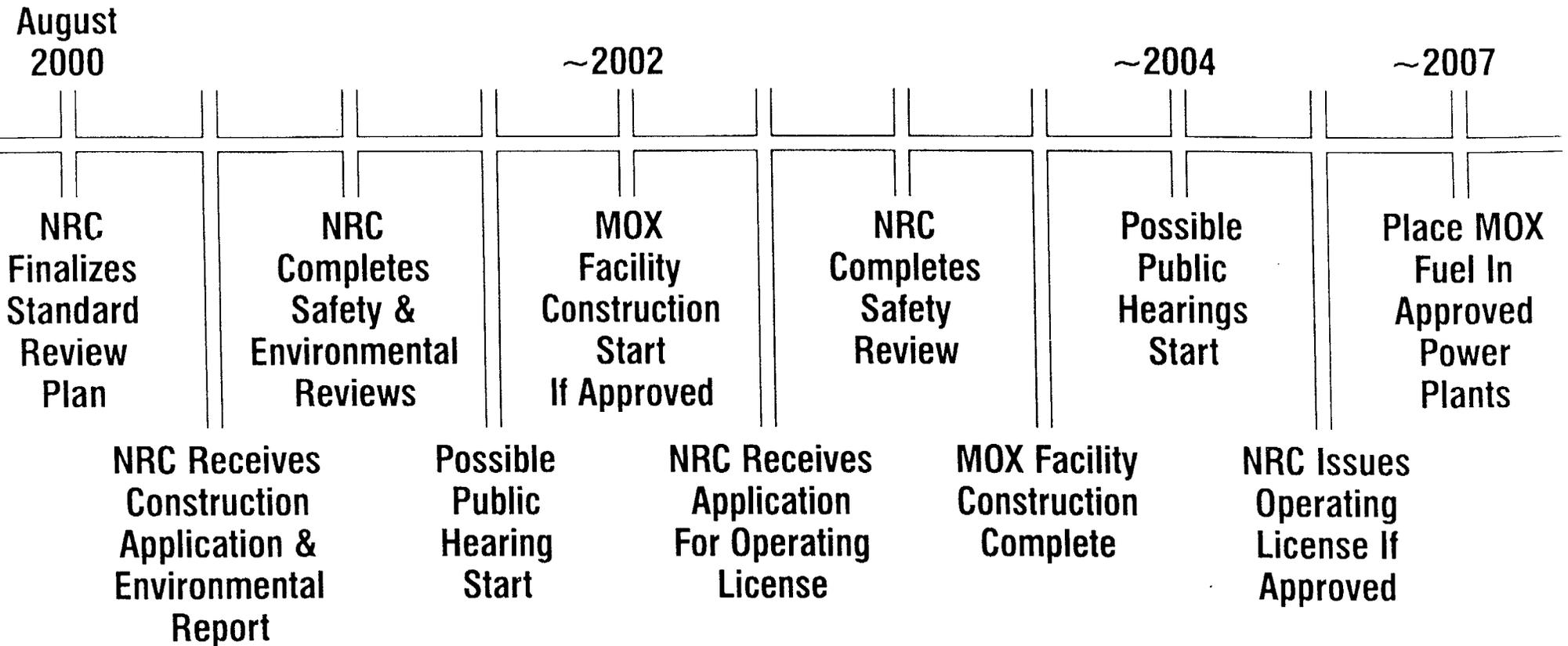
## Use of MOX in Reactors

- Reactor regulations
- License amendment

# ACTIVITIES TO DATE

- Standard Review Plan for MOX fuel facility (NUREG-1718)
- Technical meetings
- Planning

# NRC's Mixed Oxide Fuel Future Activities



*Protection of the Public Health and Safety, the Common  
Defense and Security, and the Environment*

# **NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)**

10 CFR Part 51

Jennifer Davis, Environmental Review Team Lead  
Division of Waste Management

# NRC ENVIRONMENTAL REVIEW

## Introduction

- Law:
  - ▶ NEPA regulations
- NRC requirements:
  - ▶ Environmental protection (Part 51)
  - ▶ Implement NEPA

# ENVIRONMENTAL IMPACT STATEMENT (EIS)

- Required for major federal actions
- Licensing the MOX facility

# DOE's EIS

Previous NEPA Work By DOE

- DOE EIS for MOX
- Record of Decision
- Link to NRC EIS

# THE NEPA PROCESS

Receive Environmental Report



Issue Notice of Intent



Public  
Input



Initiate Scoping Process



Coordinate with  
Federal/State agencies



Public  
Input



Receive Public Comments



# THE NEPA PROCESS



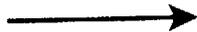
Issue Scoping Summary Report



Issue Draft EIS



Public  
Input



Receive Public Comments



Issue Final EIS

# HEARINGS

John Hull  
Office of the General Counsel

# WHAT HEARING PROCEDURES APPLY?

- NRC Regulations (Part 2)
- Applications for Materials Licenses
- Informal Hearings

# WHEN CAN I ASK FOR A HEARING?

- After construction information received
- After Federal Register Notice published

# WHAT INFORMATION WILL I NEED?

- Information submitted to NRC to start construction
- Federal Register Notice
- Follow NRC Part 2 regulations

# HOW DO I REQUEST A HEARING?

- Written hearing request
- Detailed statement describing
  - ▶ Affected interests
  - ▶ Areas of concern

# WHAT HAPPENS TO MY HEARING REQUEST?

- NRC administrative judge rules
- Judge specifies issues
- Parties make written presentations

# ARE THE JUDGE'S DECISIONS FINAL?

- They may be appealed
- NRC Commissioners decide appeals
- Federal courts may review NRC decisions

# **PUBLIC PARTICIPATION**

Mindy Landau  
Office of Public Affairs

**PUBLIC MEETINGS ON THE PROPOSED MOX FUEL FACILITY**  
**July 12, 2000 - Columbia, SC**  
**July 13, 2000 - North Augusta, SC**

On July 12 and 13, 2000, the Nuclear Regulatory Commission (NRC) conducted public meetings in Columbia and North Augusta, South Carolina. The purpose of the meetings was to inform the public about the NRC's role in licensing a proposed mixed-oxide (MOX) fuel fabrication facility and to answer related questions. The Department of Energy (DOE) plans to locate the facility at the Savannah River Site (SRS) near Aiken, South Carolina, and has contracted with the consortium Duke Cogema Stone & Webster (DCS) to build and operate the facility.

NRC representatives explained the licensing process and the anticipated schedule, including opportunities for public involvement. During the meetings, the NRC also invited comments and questions from participants. NRC representatives provided answers, occasionally passing questions on to representatives of the DOE and other organizations involved in the project. In addition, the NRC invited participants to write their questions on note cards and committed to provide answers.

Questions asked at the meetings and the answers given at the time are paraphrased below. The questions and answers have been arranged by topic, and questions that were answered more than once have been combined into a single question and answer. In some cases, in order to be more informative, answers have been supplemented by additional information that was not provided at the time of the meetings.

Questions and comments that were not answered at the meetings were posted to a "Parking Lot." "Parking Lot" questions (identified below by PL) and questions submitted on note cards (identified by NC) are also answered below.

## **QUESTIONS & ANSWERS FROM THE PUBLIC MEETINGS**

### **SITE SELECTION and DOE DECISION**

1. *How was South Carolina selected as the site for the proposed facility? Who made the decision to locate the MOX facility at the SRS? Since only 2 tons of weapons-grade plutonium are located at SRS and the remaining plutonium will have to be transported there, why was it chosen?* The Savannah River Site was selected by the Department of Energy. More about the DOE's decision can be found at the DOE Office of Fissile Materials Disposition's website <http://www.doe-md.com>.
2. *What process was used in choosing the SRS?* The process is described in the DOE Record of Decision. The Record of Decision can be found at the DOE web address given in the response to Question 1 above.
3. *Was there public input in the selection process?* Yes. As part of the selection process, the DOE prepared an Environmental Impact Statement (EIS) and solicited public input through meetings and comments on the EIS.

4. *Why is the weapons-grade plutonium not immobilized?* The DOE selected immobilization and MOX fuel as parallel paths to dispose of excess plutonium. To assure that 50 tons of surplus plutonium will not be used in weapons, DOE decided to immobilize at least 17 tons and to use 33 tons as MOX fuel in commercial power reactors. This decision is consistent with review by the National Academy of Science and with the agreement between the U.S. and Russia.
5. *Will the new MOX facility be tied in with the tritium reactor?* No.
6. *(PL) Is the NRC putting process ahead of answers? Is it reasonable to build a MOX facility when there are unresolved questions such as the response of the reactor vessel to MOX fuel? Shouldn't we decide if this [MOX] is what we really want before the NRC goes through the licensing process for the fuel fabrication facility?* The decision to build a MOX fuel fabrication facility to dispose of surplus weapons material is explained in the DOE's Record of Decision, which can be found on the DOE website. The facility has been placed under NRC oversight by Congress, and, in fulfilling its responsibilities, the NRC will respond to the license applications as they are submitted.
7. *(NC) Shouldn't the fuel issues be dealt with first (safety, application, etc.), before spending money on the fuel fabrication facility?* NRC staff members are currently investigating fuel issues as well as fuel fabrication facility issues. Nevertheless, NRC regulations require the NRC to respond to license applications as they are submitted.
8. *(NC) Is this not an issue mostly of money and not of what is best for the public and environment?* This is an issue of national security and nuclear non-proliferation policy. Treaties signed by the U.S. Government and the Russian Federation included agreement that some of the surplus plutonium from Russian and American weapons programs would be used to produce MOX fuel because, after it had been used to generate electricity, it would be unattractive for use in nuclear weapons.

#### **CHOICE of DCS**

9. *Why was Cogema chosen to participate in the MOX facility?* DOE selected the consortium, DCS, through a competitive contracting process.
10. *What is Cogema's safety record? Will the NRC review Cogema's and Stone&Webster's records? Is Cogema's record really irrelevant? How can the NRC consider a plant based on the Cogema design and not investigate Cogema?* Since the license application has not been submitted, the NRC has not begun its review process. However, as part of NRC's technical review of the DCS license application, NRC will review information about the qualifications of the applicant, DCS, to operate the facility safely and securely. NRC personnel have visited Cogema facilities in France to gain familiarity with safety systems in place at those facilities. NRC personnel have also discussed operational safety information with the French regulators and the International Atomic Energy Agency in order to be aware of any safety issues that may bear on the proposed U.S. MOX facility.
11. *What is DCS's safety record?* As a new consortium, DCS has no record.
12. *(NC) If Cogema's safety record and past experience in Europe are not relevant, how does the contractor qualify?* Although Cogema is one member of the consortium that the DOE has selected, the legal entity applying for a fuel fabrication facility license is DCS. If DCS does not

meet NRC regulations, the NRC will not issue DCS a license. Conversely, if DCS does meet NRC regulations, the NRC has an obligation to issue a license.

### **GOVERNMENT POLICY**

13. *Whose money is financing the MOX project, the taxpayer's or the utility's?* Based on available information, NRC understands that DCS is developing the MOX fuel fabrication facility under contract with the DOE. Therefore, the MOX project will be financed largely, if not entirely, by taxpayers.
14. *Is it appropriate for the public to subsidize the nuclear power industry by producing MOX fuel? Should the U.S. Government subsidize nuclear power, which competes with solar power, when the government does not subsidize solar power? Is the MOX project a cover-up for saving the failing nuclear power industry?* The construction and operation of a MOX fuel fabrication facility and the use of MOX fuel in the reactors is based on an agreement between the U.S. government and the Russian Federation. The purpose is to dispose of surplus plutonium from weapons programs, not to subsidize the nuclear power industry.
15. *Is it true that the NRC does not consider the burden to the taxpayer in its review?* The NRC's main focus is on public health and safety, national security, and the environment. The review includes the financial status of the applicant, but not the burden to the taxpayer.
16. *Didn't the Carter Administration outlaw the use of plutonium in commercial reactors?* President Carter imposed a moratorium on wide-scale reprocessing of plutonium from spent nuclear fuel from power reactors in 1977. President Reagan lifted this moratorium in 1981.
17. *Does the production of MOX fuel violate President Carter's policy?* No.
18. *Is the NRC reviewing reprocessing of the spent MOX fuel?* No. The DOE does not plan to reprocess the spent MOX fuel.
19. *Does the proposed use of MOX fuel imply that the U.S. will be into reprocessing next?* No.
20. *Won't the use of MOX fuel for this project assure that plutonium will continue to be used around the world?* This project is unrelated to the use of MOX fuel in reactors by countries other than Russia and the U.S.
21. *Will the U.S. Government consider allotting 1% of this contract for funding intervention as is done in Canada?* The NRC staff is not aware of any plans of this nature. The NRC is prohibited from using appropriated funds to support intervention by federal statute.
22. *(PL) Will the Price-Anderson Act apply to the MOX facility? Who will be liable if an accident occurs and who will be liable for future clean-up costs?* The Price Anderson Act will apply to the MOX fuel fabrication facility. Pursuant to provisions of the Price-Anderson Act, NRC staff understands that DOE intends to indemnify DCS for any damages due to accidents, clean-up costs, or other similar expenses which involve the risk of public liability connected with the MOX project at the Savannah River site.

23. *(PL) Since neither the NRC nor the DOE says reactors using MOX fuel are safer, does this violate the Price-Anderson Act?* Using MOX fuel in a reactor would not violate the Price-Anderson Act.
24. *(PL) Does the NRC support the Energy Security Act (S. 2557)?* The NRC is reviewing S. 2557, but has not been asked by Congress for its opinion, nor has it offered one. Any NRC comment on the bill would be limited to areas that would affect NRC authority.
25. *(NC) How will the creation of the National [Nuclear] Security Agency affect what regulatory authority the NRC has over the MOX program?* The creation of the National Nuclear Security Agency will have no effect on the NRC's regulatory authority over the MOX fuel fabrication facility. The NRC's regulatory authority derives from Federal law. The creation of the National Nuclear Security Agency did not affect this law.
26. *(NC) Will MOX production have any impact on the levels for nuclear weapons in the START II or Start III Agreements?* MOX production will not have an impact on START II or III Agreement levels for nuclear weapons.

#### **ENVIRONMENTAL IMPACT STATEMENT**

27. *How much will the amount of radioactivity in the environment increase with MOX fuel? (PL) Will there be an increase in radiation to the environment?* At this early stage in the licensing process, the NRC has not completed the review that will answer this question. The question of the increase, if any, in radiation to the environment from the MOX facility will be answered in the context of the Environmental Impact Statement (EIS). NRC will complete the EIS before making a licensing decision on the MOX facility. According to the DOE Surplus Plutonium Disposition Final EIS, there would be no radiological risk to members of the public during construction and the impact to human health from operation of the facility would be very low. Details can be found at the Office of Fissile Materials Disposition's web address given in the response to Question 1 above. The NRC expects these impacts to be confirmed or further refined by DCS in their license application. The NRC limits the amount of radioactivity that can be released from an operating nuclear facility, and the regulations will apply to the MOX facility.
28. *Will the NRC be taking into consideration what a valuable energy resource MOX fuel is? Yes.* A cost/benefit analysis is part of the EIS.
29. *(PL) What is the value of MOX fuel as an energy resource?* NRC will review this in the EIS. The DOE Surplus Plutonium Disposition Final EIS states, "A conservative estimate of this effective value of fuel is \$565 million in FY 2000 dollars." This document is available on the Office of Fissile Materials Disposition's web address given in the response to Question 1 above.
30. *Does the NRC plan to accept the DOE's EIS?* The NRC will be responsible for developing its own EIS and will do its own analysis. NRC may reference and/or adopt parts of the DOE EIS.
31. *Will the NRC use the DOE's EIS?* The NRC will use as much of the DOE's EIS as appropriate. In its EIS, the DOE examined all options for the surplus plutonium, while the NRC will focus on the MOX fuel fabrication facility.

32. *(NC) Why does the NRC plan to use as much of DOE's EIS information as possible? Wouldn't it be beneficial to duplicate the DOE's EIS study and thereby confirm or deny its validity? What are the NRC guidelines for accepting DOE's EIS standards?* There are two reasons why the NRC plans to use as much of DOE's SPD EIS as appropriate. First, it is more efficient to use information that has already been developed, rather than recreating that information. Second, the Council on Environmental Quality regulations (Title 40 of the Code of Federal Regulations, Part 1500) that implement the National Environmental Policy Act (NEPA), and the NRC's own regulations (Title 10 of the Code of Federal Regulations, Part 51) recommend using previous environmental review documents to "eliminate repetitive discussions of the same issues and to focus on the actual issues...." The NRC is responsible for independently evaluating any information presented in its EIS, and will not include any information that has not been independently confirmed.
33. *Has the NRC looked at the information compiled by the DOE in its EIS?* Yes, the NRC reviewed the information in the DOE's EIS.
34. *(NC) Has the NRC ever disagreed with the DOE EIS?* In a letter to DCS, which is publicly available, the NRC identified specific topics in the SPD EIS that need to be updated or supplemented as part of the DCS environmental report. (Letter from M. Galloway, NRC to P. Hastings, DCS, "U.S. Nuclear Regulatory Commission Staff Review of the U.S. Department of Energy Surplus Plutonium Disposition Final Environmental Impact Statement," dated May 3, 2000, ADAMS Accession Number ML003702707)
35. *Why is the NRC in its EIS looking only at the fuel fabrication facility and not beyond?* In preparing the EIS, the NRC will look first at the fuel fabrication facility. It will also consider the entire project, but not in as much detail. An environmental review for the reactors will be performed later as part of the reactor licensing review.
36. *When will the first public scoping meeting related to the EIS take place?* If a license application is received from DCS in December, the first public scoping meeting related to the EIS is expected to occur in February 2001.
37. *Does the NRC's EIS review look only at the design specifications? Will the NRC have the power to look at the process?* The NRC's EIS will look at the design specifications. The NRC will be reviewing, inspecting, and assessing the safety and security of operations throughout design, construction, and operation (if it is authorized).
38. *Will the EIS give attention to the impact of MOX fuel on the food supply given the facts that South Carolina is a predominately agricultural state and that the water-table at the SRS high?* Yes.
39. *Will the EIS take into consideration the number of people in the area of the SRP?* Yes.
40. *(NC) Does the NRC have an evacuation plan in case of accidents at the Savannah River Site? If yes, do people know about it?* NRC regulations governing the licensing of a MOX fuel fabrication facility (in Part 70 of 10 CFR) require that each application must contain either: (a) an evaluation showing that the maximum dose to a member of the public offsite due to a release of radioactive materials would not exceed 1 rem effective dose equivalent or an intake of 2 milligrams of soluble uranium, or (b) an emergency plan for responding to the radiological hazards of an accidental release of special nuclear material and any associated

chemical hazards directly incident thereto. The regulations do not require specifically that the emergency plan include a plan for evacuating the surrounding public. A plan for emergency evacuation of on-site personnel is required.

41. *Are emotional concerns of the public included in the EIS evaluation?* An EIS does not generally evaluate emotions, but the NRC does try to take public concerns into consideration.
42. *Will communities such as Savannah, which is down-stream from the MOX fuel fabrication facility, be part of the EIS process?* Yes, the EIS study will investigate indirect effects from the proposed facility.
43. *Is anyone advocating for the health of the people down-stream from the SRS?* The NRC's mission is to protect the public health and safety, including people downstream from the SRS. Meetings that are part of the EIS study will be announced, and anyone interested may attend.
44. *(NC) Does the NRC think about the future effect on the community in monetary terms if a plant approved by the NRC later has to use public funds for cleanup, illnesses that occur, etc.?* A cost/benefit analysis will be performed as part of the NRC EIS process. Funding for emergency preparedness (including cleanup, etc.) will be included in that cost/benefit analysis.
45. *(NC) In the conversion from plutonium to MOX fuel, has it been tested what toxic chemicals are released into the air and how far they travel?* Since we are at an early stage in the process, the NRC has not evaluated potential releases of the proposed process. The information available at this time consists of discussions in the SPD EIS of air pollutants for construction and operation of all three facilities (pit disassembly and conversion, MOX fuel fabrication, and immobilization) at the Savannah River Site. The NRC expects to receive information specifically related to the MOX facility with the license application and environmental report in December 2000.
46. *(NC) How can you do an environmental impact study without an example to study?* NRC does not need an example to study in order to do an environmental impact study. NRC conducts environmental reviews by comparing proposed activities to Government regulations. However, it should be noted that MOX facilities are not something new. There are MOX fuel fabrication facilities in operation throughout the world, including facilities in France using the same process that NRC understands will be used in the U.S. MOX fuel fabrication facility.
47. *(NC) Who will be responsible for the sickness, mutations and deaths associated with mishaps from handling and using plutonium not covered under regulations?* NRC will require the MOX fuel fabrication facility to be built and operated in accordance with NRC requirements. NRC's objective is to protect the public health and safety and, thus, guard against sickness and death that may be caused by exposure to plutonium.

#### **MOX FUEL CHARACTERISTICS**

48. *What is the difference between weapons-grade plutonium and reactor-grade plutonium?* The main difference between weapons-grade plutonium and reactor-grade plutonium is the percentage of the different isotopes of plutonium. Weapons-grade plutonium contains more of the isotope plutonium-239 than reactor-grade, while reactor-grade plutonium has more plutonium-240 than weapons-grade. Weapons-grade plutonium is more fissionable but

reactor-grade is more radioactive. However, both require safe-handling and that will be the focus of NRC's review.

49. *Is weapons-grade plutonium more dangerous than reactor-grade? (NC)What are the concerns about using weapons-grade plutonium?* Several important differences between weapons-grade and reactor-grade plutonium, which relate to the use of fuel in a reactor, are discussed in the report attached to the letter of Framatome Cogema Fuels to the NRC dated July 14, 2000. This letter can be accessed using the NRC ADAMS system (ADAMS # ML003738957). With respect to whether weapons-grade is "more dangerous" than reactor-grade plutonium, the NRC staff will review how the fuel design, manufacture and its use in a reactor will account for these differences and thus ensure that all NRC regulatory requirements are met and that the reactor will operate safely using weapons-grade plutonium.
50. *What experience is there world-wide using weapons-grade material in MOX fuel? What is the experience with weapons-grade fuel that the NRC will use to judge how it behaves in a reactor?* Experience in handling weapons-grade plutonium is limited to nuclear weapons fabrication, maintenance, and disassembly. There is world-wide experience using reprocessed plutonium from commercial reactors in MOX fuel.
51. *Do we know how a reactor vessel will respond to MOX fuel from weapons-grade plutonium?* When a license application for using MOX fuel is submitted to the NRC, the NRC staff, as part of its evaluation, will answer whether or not the MOX fuel can be used safely in the reactor before authorizing its use.
52. *(NC) Since the reactors were not designed to use plutonium, how do we know that the modifications will be safe?* Although the reactors were not specifically designed to use weapons-grade plutonium, they were designed to use the reactor-grade plutonium that is generated in the uranium fuel during normal operation. There is substantial world-wide experience with the use and behavior of reactor-grade plutonium, because all operating reactors contain plutonium created during the fission process. The NRC will assure that any changes made to the reactors in order to use weapons-grade plutonium will protect the public health and safety.
53. *Where will the data for using weapons-grade plutonium come from?* DCS will provide the information on the characteristics and performance of weapons-grade plutonium used in MOX fuel. NRC staff will verify this information sufficiently to support its licensing decisions.
54. *To what degree will the NRC rely on Cogema data?* If DCS provides Cogema data to support its application, the NRC will evaluate it. The data will be evaluated by confirming its consistency with scientific knowledge and comparing it with independent sources of information.
55. *Has weapons-grade plutonium ever been "handled" at the industrial scale anywhere?* Weapons-grade plutonium has been "handled" extensively on an industrial scale within the DOE weapons complex.
56. *Has the NRC analyzed the use of reactors with plutonium in the fuel?* Yes. All operating reactors have plutonium in their fuel because plutonium is generated as a normal result of irradiating the uranium dioxide fuel that is used in U.S. reactors.

57. *(PL) How much plutonium is currently in commercial reactors?* The amount of plutonium in an operating commercial reactor varies with time. The amount depends on where the reactor is in the cycle between refuelings (when spent fuel assemblies are removed from the reactor and replaced with fresh fuel assemblies). Fresh fuel assemblies contain only trace amounts of plutonium. During operation, irradiation of the uranium fuel produces plutonium. The plutonium created during reactor operation produces energy along with the uranium. At the end of the fuel cycle, about one-third of the energy of the reactor core is produced by the plutonium, with the rest produced by the uranium. A typical spent fuel assembly removed from an operating commercial pressurized-water reactor, such as Catawba or McGuire, contains about 4 to 5 kilograms of plutonium, depending on how long the fuel assembly has been used in the reactor. The total amount of plutonium in a PWR is estimated to vary from around 500 kilograms at the start of a cycle to around 1000 kilograms at the end of a cycle.
58. *Will the NRC be allowed to review DOE classified data and Cogema proprietary data? (PL) What information concerning the Pu used in the MOX process will be classified?* The Department of Energy has indicated that no information needed by the NRC to conduct its review will be classified and that the form of plutonium transferred to the MOX facility will no longer be classified. However, if review of classified data is necessary, the NRC has provisions, under its regulations, for receiving and reviewing it. The NRC also has provisions, under its regulations, for receiving and reviewing proprietary information.
59. *Will criticality information related to differences between weapons-grade and commercial-grade plutonium be made available to the public? Yes.*
60. *(PL) Will the NRC have access to DOE/DOD criticality information? Yes*
61. *Will americium and gallium have to be removed? Yes, to the extent necessary to safely handle and use the plutonium in MOX fuel.*

#### **PUBLIC ADJUDICATORY HEARINGS AND EIS SCOPING MEETINGS**

62. *Why isn't the NRC scheduling earlier public hearings on the reactors?* To use MOX fuel, a reactor licensee must submit a license amendment application to the NRC. The NRC hearing process regarding use of MOX fuel in a reactor cannot begin until a license amendment application is submitted to the NRC. A license amendment application to use MOX fuel in a commercial reactor is not expected before August 2001.
63. *When will there be an opportunity for public hearings related to the use of MOX fuel in the Catawba and McGuire reactors?* Once the Catawba and McGuire licensees have submitted applications for license amendments, which would, if granted, allow them to use MOX fuel, notices of opportunity for hearing will be published in the Federal Register. A public hearing is held only if it is requested by the public, and if a Licensing Board determines that the requirements for a public hearing are met. The requirements for hearings on reactors are in Title 10 of the Code of Federal Regulations, Part 2, Subpart G. The first use of MOX fuel in a commercial reactor is expected to occur in the McGuire 2 reactor, and will involve the use of MOX lead test assemblies. A license amendment application for authority to conduct such testing at McGuire 2 is expected no earlier than August 2001. The license amendment applications for authority to load the first production batch of MOX fuel into the Catawba and McGuire reactors are scheduled to be submitted in January 2004.

64. *Will the public hearings be adjudicatory, allowing for testimony?* Hearings, if held, would be adjudicatory. In Subpart G hearings, the direct testimony of witnesses is generally presented in written form, and oral cross-examination of the witnesses is permitted. However, if the hearing pertains to the licensing of the MOX fuel fabrication facility, the informal hearing procedures in Title 10 of the Code of Federal Regulations, Part 2, Subpart L, are applicable. Whether to allow any oral testimony in Subpart L hearings is at the discretion of the presiding NRC judge, and this decision is made after written presentations of the parties are filed.
65. *Does the NRC base its decision on the number of participants in a public hearing that favor a certain position, such as a majority consisting of SRP employees?* No. NRC bases its licensing decisions on whether the applicant has demonstrated on the record of the proceeding that it has fulfilled NRC requirements.
66. *Considering that it is difficult for local stakeholders to communicate with NRC headquarters because it is located in Maryland, will the NRC presence in the Georgia and South Carolina area be increased?* The NRC plans to hold additional public meetings related to MOX in the vicinity of the Savannah River Site, including South Carolina and Georgia. Some meetings related to the use of the fuel in the reactors would be held near the reactors, including South Carolina and North Carolina.
67. *Is it possible to increase the length of the public comment period if the license application is submitted in December?* The public comment period does not begin immediately upon receipt of the license application, so there should be sufficient time after the end of December for public comment. If the application is submitted in December, the first public meeting related to the EIS scoping process will probably be held in February with a period for written comments to follow. Prior to an NRC decision on licensing the construction of the MOX fuel fabrication facility, there would be additional opportunities for public comment, such as during the public review of the draft EIS.
68. *What is the deadline for a hearing request?* The deadline for filing a request for hearing on the MOX application will be stated in the notice of opportunity for hearing to be published in the Federal Register. The timing of this notice depends on when DCS submits its application to the NRC. If the NRC receives an application in December 2000, and if the application passes the NRC's initial acceptance review, NRC expects that the notice of an opportunity for hearing would be published in February 2001, with 30 days to request a hearing.
69. *Is it correct that the Charlotte area is not eligible for a public hearing until 2004?* No. Charlotte will be considered as a possible site for the next public meeting, which will be in connection with the EIS for the MOX fuel fabrication facility. If the application is received in December 2000 as expected, the first public meeting on the EIS would occur in February 2001. If Catawba and McGuire apply for license amendments to use MOX fuel, which may occur as early as mid- 2001, public meetings may be held in the Charlotte area.
70. *(PL) Can the public hearing process be changed (Subpart L)? Who made decisions about public input? Are recent NRC rule-changes designed to restrict public involvement? What was the process used in establishing the current public involvement process?* Requests to change the Subpart L hearing procedures may be filed, pursuant to Title 10 of the Code of Federal Regulations § 2.802. In any given case, the NRC Commissioners have the authority to order the use of alternate hearing procedures. NRC developed the Subpart L hearing procedures in the late 1980's for materials licenses (which include fuel fabrication facilities like the MOX

fuel fabrication facility). The NRC established these requirements through the normal rulemaking process, which included opportunity for public comment in 1987. There have been no recent changes to the Subpart L regulations which would restrict public involvement.

## THE REACTORS

71. *The McGuire and Catawba reactors are scheduled for decommissioning around 2020. Will there be time to use the MOX fuel in these reactors?* The licensee has plans to request the renewal of the licenses for these reactors on a schedule that would enable their licenses to be renewed before they irradiate all the MOX fuel under the U.S.-Russian agreement. If they closed down before irradiating all the fuel, alternative reactors would have to be selected.
72. *Is it "written in concrete" that the MOX fuel produced at the SRS will go to the Catawba and McGuire reactors?* No. However Catawba and McGuire are the reactors that the NRC staff expects to submit license applications to use MOX fuel.
73. *Will the Oconee reactor be brought into this project?* The NRC staff is not aware of any plans to involve the Oconee reactor in the MOX project. However, DOE may decide to include other reactors in the project.
74. *What will the tests at the McGuire reactor involve?* According to Duke Power, the plan is for several MOX assemblies to be loaded in the McGuire reactor in 2003, then removed after irradiation and taken to Oak Ridge National Laboratory for inspection. Test assemblies are common when changes are introduced.
75. *Where will the MOX fuel for the tests in the McGuire reactor come from?* DOE is exploring options for building the MOX test assemblies.
76. *Will the MOX fuel for the tests in the McGuire reactor contain weapons-grade Pu?* Yes.
77. *People want clean power, not nuclear power: is Duke Power polling its customer base?* Yes. Duke Power reported at the North Augusta meeting that its surveys indicate that its customers are supportive of nuclear power.
78. *(PL) Are other reactors surreptitiously inserting MOX clauses in their license renewal applications?* A reactor operator wanting to use MOX fuel would have to apply for a license amendment, specifying in writing the change to MOX fuel. A license renewal alone could not authorize the use of MOX fuel, because a renewed reactor license would authorize only those actions already permitted by the existing license. Because the Technical Specifications for operation of the reactor contain clauses that specify the type of fuel to be used in the plant, a specific license amendment would be required to use MOX fuel. Also, any changes secretly added without going through the formal amendment process would have no legal effect, because what matters is what the NRC actually authorizes in the license.
79. *(NC) Is it true that the nuclear reactor industry is trying to help Duke out with its upcoming amendments for Catawba and McGuire?* The NRC staff is not aware of any nuclear power industry effort that could be characterized as "trying to help Duke out" on this issue. There are no NRC regulations that prohibit the industry from providing such assistance.

## NRC TECHNICAL REVIEW / LICENSING PROCESS

80. *Who will submit the license application and when? (NC) What is the anticipated time-frame for the "contractor's" licensing application?* The applicant, DCS, has informed the NRC that it intends to submit an application for approval to start construction of the fuel fabrication facility in December 2000. If the NRC review and construction proceed according to DCS's plan, the applicant intends to submit an application in June 2002 for an operating license.
81. *(NC) Once the application is received, how long will it take to process and approve or deny the application?* The NRC anticipates that it will take approximately 18 months to complete its technical review of the application for construction and to complete its review of the applicant's environmental report and issue the EIS. Before the NRC approves the start of construction, assuming that the application is found to be acceptable, an opportunity for public hearing will be provided. The time associated with public hearings is unknown. However, construction can begin before any public hearings are completed unless directed otherwise by the presiding NRC judge.
82. *Why build the facility at SRS given the seismic hazard? How can a plant be placed on a major fault-line? (NC) Why was the SRS chosen as the site for this MOX process when it is known that the SRS is on a fault-line?* The Department of Energy chose the Savannah River Site for the reasons discussed in its Record of Decision, which can be found at the web address given in the response to Question 1. The DCS design, which will be subject to NRC review and approval, must provide adequate protection against the seismic hazard associated with the SRS site.
83. *How can an outline such as the one in NUREG-1718 concerning earthquakes provide public confidence?* NUREG-1718 is a guidance document. NRC regulations require that the MOX fuel fabrication facility be designed to withstand credible hazards, including seismic hazards. NRC staff will review geological, geotechnical, and seismological information about the site to ensure that the facility is designed to safely withstand earthquakes.
84. *(NC) Will the NRC consider the accelerated embrittlement of the reactor core created by the MOX process?* It is not evident that the use of MOX fuel will change the aging characteristics of the vessel from what would otherwise be experienced using low enriched uranium fuel. Nevertheless, this issue has been recognized by DCS as one of the technical issues to be addressed in its application and will be reviewed by the NRC staff.
85. *Are there plans for dealing with a release of radioactive material to the environment?* The license applicant is required to address safety measures and environmental controls in the application. NRC staff will review the applicant's proposed measures as part of its licensing review. The applicant's emergency measures are reviewed as part of both the emergency plan, if one is necessary, and the environmental plan. As explained in the answer to Question 40, the regulations require the licensee to show that potential public doses, in case of an emergency, are low or to prepare an emergency plan. The environmental review includes emergency measures for protecting people, crops, and animals.
86. *If an application for a MOX facility license is submitted, could it be denied?* Yes.
87. *Won't there be intense political pressure to go ahead with the MOX facility in order to maintain employment?* NRC will consider employment as part of its environmental review. However, NRC will base its licensing decision on fulfillment of NRC requirements.

88. *Why doesn't the NRC look into all aspects of the project at once, from manufacturing the fuel to placing it in reactors through disposal?* DOE has already considered the entire program, including fuel fabrication and reactor use, in the SPD EIS. In the current phase of the program, the NRC will evaluate the safety, security, and environmental aspects of the specific facilities. The application expected for December 2000 pertains only to the MOX fuel fabrication facility, and the NRC Division of Fuel Cycle Safety and Safeguards will review the application when it is submitted. Reactor use of the MOX fuel will be reviewed later by a different office of the NRC.
89. *What is the period of the fuel fabrication facility license?* The duration of the fuel fabrication facility license will be considered when a license application to cover operation is submitted. The typical term for a fuel cycle license is ten years. If the planned MOX fuel fabrication facility process requires less time for operation, a shorter term will be specified.
90. *(PL) Are precedents such as Allied General [a reprocessing facility] being considered?* Lessons learned from previous experience with plutonium and other special nuclear material processing, as well as MOX fuel fabrication and irradiation, will be taken into account as part of the technical review. Also, the public has the option of raising issues related to Allied General in a request for a hearing. Any evidence produced during the Allied General proceeding may be considered if it is established that it is relevant to consideration of the DCS application. However, the NRC's technical review will focus on the safety, safeguards and environmental protection aspects of the MOX fuel fabrication facility application.
91. *(NC) How can the NRC know how to regulate the building of a facility in regard to strength, materials, etc., if it hasn't studied all aspects of the fuel that the facility will be processing?* The NRC has experience regulating plutonium facilities and other facilities that process special nuclear material (enriched uranium). The properties of plutonium, as well as the differences between weapons-grade plutonium and reactor-grade plutonium, are known and will be factored into the NRC review of the MOX fuel fabrication facility. In addition, plans have been made to construct test assemblies from weapons-grade plutonium, place them in the McGuire reactor, irradiate them, and subsequently remove and inspect them. Data from these tests will be factored into NRC's review.
92. *(NC) How can you determine potential risks without experiencing the risk?* As is the case with the assessment of any new facility (e.g., nuclear power plant, fuel fabrication facility, radioactive storage and disposal), the NRC reviews the processes that will be performed in the facility and assesses the hazards/risks associated with the processes. The facility is then designed to ensure that the risk for the facility is sufficiently low, including performance under upset and accident conditions.
93. *(NC) Is the NRC restricted to "safe" MOX or could it decide MOX is not safe and "nix" it?* The NRC will review the MOX application to ensure that NRC regulations are met. If NRC regulations are not met, the NRC will not issue a license. Conversely, if NRC regulations are met, the NRC has an obligation to issue a license.
94. *(NC) What conditions would lead the NRC to say NO? (Sounds like you just keep revising the application until it fits.)* The NRC reviews all applications to ensure that NRC regulations are met. Often during NRC review of an application, additional information is provided, an application is revised, and/or the facility is modified in some way in response to NRC

questions and to meet NRC regulations. Only after NRC regulations are met will the NRC issue a license.

95. *(NC) What type of radiation training do local emergency responders receive and who is doing the training?* The type of training that local emergency responders receive varies based on the facility and the plan it develops for meeting NRC requirements. The NRC incident response organization has an out reach program to provide training to state and local organizations on Federal response to nuclear emergencies. The NRC also invites local government and emergency responders to participate in NRC exercises.

## **NRC POLICY**

96. *Has the NRC ever denied a license? (NC) Has the NRC ever refused to license a facility?* Yes. For example, the NRC recently denied a license for a portable irradiator based on safety concerns. In other instances, license applications have been withdrawn, and there have been delays in approving license applications while the applicant made changes to the facility or required programs in order to comply with NRC requirements. Approvals have often followed years of construction changes made necessary by further regulatory requirements and the findings of quality assurance examinations. Neither the NRC nor its predecessor, the Atomic Energy Commission (AEC), has ever denied an application for an operating power reactor license, largely because the facility was in compliance with NRC regulations after the changes were made and before approval. The AEC did informally convince utilities to withdraw applications that it opposed (such as Ravenswood and Bodega Bay) or to change sites from places that the AEC thought were unsuitable (such as Burlington). More information on some of these cases can be found in the book *Containing the Atom* by the NRC historian, J. Samuel Walker.
97. *Is the NRC immune to political pressure?* The NRC is an independent government agency and is overseen by the U.S. Congress. As a federal agency, NRC is subject to federal law and Congressional oversight.
98. *Is the NRC independent from other government agencies?* Yes. The NRC asks for and receives input from other agencies, but its decisions are its own.
99. *Is the NRC financed by the utilities? If the NRC is financed by means of licensee fees, how can it claim independence?* The NRC is funded by Congressional appropriations as part of the national budget. In accordance with federal law, the NRC collects fees from applicants and licensees, which it sends to the U. S. Treasury. However, the source of the funding does not influence the way NRC employees carry out the NRC mission to protect the public health and safety, promote the common defense and security and protect the environment.
100. *Does the MOX project mean the NRC will be supporting Defense Department activities?* No. As explained at the DOE web address given in the response to Question 1, the MOX project involves material which has been declared excess to defense needs. Nevertheless, civilian activities conducted by the Defense Department are regulated by the NRC.
101. *As the NRC is responsible only for commercial uses of nuclear material, at what point does the plutonium from weapons become commercial?* DOE would retain jurisdiction over the plutonium during the pit disassembly and conversion process, where the weapons-grade plutonium would be converted into plutonium oxide powder. When the plutonium oxide powder is transferred to the proposed MOX fuel fabrication facility to be fabricated into fuel,

DCS would take possession, subject to NRC regulations, but the material would still be owned by the DOE. The reactor licensee assumes ownership of the material when the fresh fuel assembly is placed in the reactor.

102. *With regard to protecting the public health and safety, is the DOE responsible to the NRC?* The NRC has responsibility for civilian use of nuclear material. In cases where nuclear material is used for military purposes, the NRC has no authority over the DOE beyond the specific activities listed for regulation by the NRC under the Energy Reorganization Act (Section 202). However, Congress has assigned the NRC regulatory authority over activities at a MOX fuel fabrication facility, if it is built and operated. DOE would own the facility. DCS would construct and operate the facility for the DOE and would be subject to NRC regulatory authority. Safe and secure handling of licensed material would be the responsibility of DCS.
103. *To whom is the NRC accountable?* The NRC is accountable to Congress and the courts. As Congress is composed of elected public representatives, NRC is ultimately accountable to the U.S. public.
104. *Can the public expect independence, openness, efficiency, clarity, and reliability from the NRC?* Yes. The public should expect nothing less from the NRC. These goals are reflected in our Performance Goals in the Strategic Plan and in our Principles of Good Regulation. The NRC's track record over the last 25 years generally demonstrates our adherence to these goals. In instances where the NRC, public, Congress, or other stakeholders identified deviations, we have exerted great effort to live up to these goals.
105. *Is the NRC pushing for lower standards [less stringent] than the EPA desires?* The NRC has been directed by Congress to reach agreement with the Environmental Protection Agency (EPA) to ensure adequate protection of the public and environment. The limit established by the NRC for exposure from residual radioactivity from decommissioned sites that are released for unrestricted use is 25 millirem per year with additional reductions to maintain doses as low as reasonably achievable. The EPA draft limit is 15 millirem per year. In addition, EPA believes that a separate limit is necessary to protect groundwater. When considered in light of the facts that the average American is exposed to 300 millirem per year from natural sources of radiation, the two proposed limits are not that different.
106. *(PL) Are all license amendments reviewed by the NRC?* Yes, the NRC performs a thorough review of every license application to ensure that its regulations are met. In the case of an application for an amendment to a commercial nuclear reactor license, the NRC reviews the application and publishes in the Federal Register a notice of opportunity to request a hearing regarding the proposed amendment. The NRC then either grants or denies the license amendment and prepares a report explaining why. If NRC regulations are not met, the NRC will not issue the amendment. However, if NRC regulations are met, the NRC has an obligation to issue the amendment.
107. *(PL) Are all license amendments monitored?* NRC staff inspect facilities that the NRC has licensed. One aspect of these inspections is assuring that the license conditions and amendments are followed.
108. *(NC) Are regulations continuous daily? Are regulations enforced?* The answer to both questions is "yes". The NRC performs periodic inspections of its licensees to determine if activities are being carried out in accordance with the regulations and the conditions

contained in licenses. NRC anticipates that a resident inspector will be located at the MOX fuel fabrication facility. If an inspector determines that a licensee is in violation, enforcement actions will be taken in accordance with the NRC's Enforcement Policy. Enforcement actions include notices of violations, civil penalties, orders and other sanctions. The severity of the enforcement action is proportional to the risk significance of the violation. For example, failure to perform a routine radiation survey may result in a notice of violation, while overexposure of a worker may result in a notice of violation and civil penalty. The General Statement of Policy and Procedure for NRC Enforcement Actions and the NRC Enforcement Manual may be found on the NRC website <http://www.nrc.gov>.

109. *(PL) Will the NRC answer questions and respond to all comments? Yes, to the best of its ability.*
110. *(PL) Who has the ultimate authority over the proposed MOX facility? The responsibility for ensuring that the facility is designed, constructed, and operated safely resides with the facility operator, DCS. NRC's role is to provide sufficient oversight and regulation to ensure that public health and safety, the common defense and security, and the environment remain protected. DOE also oversees the MOX facility because DCS is a contractor for the Department.*
111. *(PL) Is the NRC aware of lessons learned? In order to meet its obligations, the NRC must keep abreast of developments in the nuclear industry. The NRC makes an effort to be aware of "lessons learned" and encourages licensees to identify root causes of problems and to correct these causes to enhance or maintain safety, safeguards and environmental performance.*
112. *(NC) What is the NRC's track record for issuing licenses to facilities that later had problems (leaks, expenses, etc.)? In January 2000, the NRC published the book, "A Short History of Nuclear Regulation, 1946-1999" (NUREG/BR-0175, Revision 1) by NRC historian J. Samuel Walker. This book provides a brief overview of the most significant events in the agency's past. In recent years, the NRC staff has devoted much effort to developing an improved regulatory oversight process. Details of the improved process for power reactors are described in the NRC publication "Reactor Oversight Process" (NUREG-1649, Rev. 3, published July 2000). NRC efforts to improve the oversight process for fuel cycle facilities are described at the website <http://www.nrc.gov/NMSS/FCSS/FCOB/INSP/REVISED/fcindex.htm>.*

#### **WASTE / TRANSPORTATION / DECOMMISSIONING**

113. *Where will the waste be disposed of? At this point, plans call for the liquid waste to go to the existing SRS waste treatment facility, solid low-level waste to a DOE low-level waste disposal facility, and the transuranic waste to the Waste Isolation Pilot Plant. Additional information should be contained in DCS's license application.*
114. *Considering that there are already 34 million gallons of high level waste at the SRS, won't the MOX project just add more waste? The MOX fuel fabrication facility is expected to add to the waste that is already present at the Savannah River Site. However, the amounts of waste are expected to be very low in comparison to the waste already present and currently being generated on the site. Estimated waste generation is discussed in the DOE Surplus Plutonium Disposition Final EIS, but the quantities cover all three of the proposed processes (pit conversion, MOX fuel fabrication and immobilization), and the MOX facility is not*

separated out. Waste information specific to the MOX facility will be submitted with DSC's license application.

115. *Since there is currently no geological repository, what will happen to the spent fuel?* The spent fuel will be treated in the same way as any other spent fuel, that is, it will be stored until the geological repository is available and then disposed of at the repository.
116. *What is the NRC doing about the disposal of spent fuel?* The NRC regulates the construction, operation, and closure of the geologic repository. NRC anticipates receiving an application for repository construction in 2002. In the interim, before a repository is licensed and operational, NRC regulates the handling, storage, and transportation of the spent fuel to ensure protection of the public health and safety, common defense and security, and environment.
117. *Will the NRC be involved in transportation of the plutonium? Will the NRC address problems associated with the transportation of MOX?* The NRC will look at transportation as part of the analysis for the EIS. Transport of plutonium to the SRS is the responsibility of the DOE. However, the transportation package used to transport fresh MOX fuel from the facility to the reactor must be approved by the NRC. NRC will also regulate transportation of spent fuel to storage installations and the geologic repository.
118. *(NC) Will plutonium or MOX be traveling through or near neighborhoods [during transport]?* The shipments will follow applicable Department of Transportation routing requirements based on fuel characteristics. For such shipments, the Department of Transportation requires the use of the interstate highway system, including beltways where available. In general, these shipments will not travel on residential streets. Shipment plans are reviewed by NRC to assure that there are no problems related to physical protection.
119. *(NC) Will the public be notified when plutonium or MOX is transported?* Under current NRC regulations, shipment schedules are not published. Disclosure of schedule information is prohibited to help prevent theft or sabotage.
120. *(NC) If an accident occurs, does a nuclear transport sit in traffic with the waste or does it have a preplanned alternate route?* Depending on the accident situation, the transport vehicle would proceed to a pre-designated "safe-haven," where shipment options would be evaluated. The options could include continuing the shipment, taking an alternate approved route, or returning to the point of origin.
121. *What will happen to the site once processing is complete? Will it be decommissioned or will it be abandoned? The DCS contract refers to "deactivation" instead of "decommissioning." Will the fuel fabrication facility license extend through deactivation? Who is responsible for the facility once production ceases?* DCS will be responsible through deactivation, and the NRC license will extend until deactivation is completed. Following deactivation, responsibility for the facility will return to the DOE, and the DOE will be responsible for decommissioning.

#### **OTHER**

122. *(NC) When safe levels of possible radiation exposure are set, who is the standard, adult males, pregnant women, babies, etc.?* All of these. NRC regulations specify (in Title 10 of the Code of Federal Regulations, Part 20) a number of different radiation standards, each of