UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

December 13, 2001

MEMORANDUM TO: ACRS Members

FROM: Maggalean W. Weston, Senior Staff Engineer
ACRS/ACNW

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE ACRS SUBCOMMITTEE ON REACTOR FUELS, NOVEMBER 16, 2001, ROCKVILLE, MD

The minutes of the Reactor Fuels subcommittee meeting on the Mixed Oxide Fuel Fabrication Facility construction authorization held on November 16, 2001, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc via Email: J. Larkins
S. Bahadur
H. Larson

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

December 5, 2001

MEMORANDUM TO: Maggalean W. Weston, Senior Staff Engineer
ACRS

FROM: Dana A. Powers, Chairman
Reactor Fuels Subcommittee, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE ACRS SUBCOMMITTEE ON REACTOR FUELS, NOVEMBER 16, 2001, ROCKVILLE, MD

I hereby certify that, to the best of my knowledge and belief, the minutes of the Reactor Fuels subcommittee meeting on Mixed Oxide Fuel Fabrication Facility issued December 5, 2001, are an accurate record of the proceedings for that meeting.

Dana A. Powers 5/Dec/2001

Dana A. Powers, Chairman Date

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

December 5, 2001

MEMORANDUM TO: Dana A. Powers, Chairman
Reactor Fuels Subcommittee, ACRS

FROM: Maggalean W. Weston, Senior Staff Engineer
ACRS

SUBJECT: WORKING COPY OF THE MINUTES OF THE ACRS SUBCOMMITTEES ON REACTOR FUELS, NOVEMBER 16, 2001, ROCKVILLE, MD

A working copy of the minutes for the Reactor Fuels subcommittee meeting on the Mixed Oxide Fuel Fabrication Facility is attached for your review. Please provide me with any comments that you might have.

Attachment:
As Stated

Certified by: Dana A. Powers
December 5, 2001

CERTIFIED

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
REACTOR FUELS SUBCOMMITTEE
MIXED OXIDE (MOX) FUEL FABRICATION FACILITY
ROOM T-2B3, 11545 ROCKVILLE PIKE
ROCKVILLE, MARYLAND
NOVEMBER 16, 2001
MEETING MINUTES

The ACRS subcommittee on Reactor Fuels held a meeting on November 16, 2001, with representatives of the NRC staff to discuss the Mixed Oxide (MOX) Fuel Fabrication Facility construction authorization. The meeting was open to the public. Mrs. Maggalean W. Weston was the cognizant ACRS staff engineer and designated federal official (DFO) for this meeting. A request to make an oral statement at the meeting was made by Mr. Edwin Lyman, Nuclear Control Institute (NCI). Written comments were received from Georgians Against Nuclear Energy (GANE) and distributed to those members in attendance. The meeting was convened by the Reactor Fuels Subcommittee Chairman, Dr. Dana A. Powers, at 8:38 a.m. and adjourned at 3:15 p.m. on November 16, 2001.

Attendees

Attendees at the meeting included ACRS members and staff; NRC staff; representatives of the Department of Energy (DOE), Duke Cogema Stone & Webster (DCS), and the Center for Nuclear Waste Regulatory Analyses (CNWRA), and members of the public as follows:

ACRS Members/Staff

D.A. Powers, Chairman	T.S. Kress, Member	J.D. Sieber, Member
M.V. Bonaca, Member	G.M. Leitch, Member	W.J. Shack, Member
M.W. Weston, DFO		

NRC Staff

Bill Gleaves, NMSS	Tim Harris, NMSS	Wilkins Smith, NMSS
David Brown, NMSS	John Hull, OGC	Vanice Perin, NMSS
Rex Wescott, NMSS	Margaret Chatterton, NMSS	Tim Johnson, NMSS
John Calvert, RES	Norma Santos, NMSS	Christopher Tripp, NMSS
Fred Burrows, NMSS	Christina Antonescu, RES	Andrew Persinko, NMSS
Alex Murray, NMSS	Undine Shoop, NRR	Joseph Glitter, NMSS
Sharon Steele, NMSS	Heather Astwood, NMSS	Tamara Powell, NMSS

DOE/DCS/CNWRA

David Alberstein, DOE	Peter Hastings, DCS	Gary Kaplan, DCS
Patrick Rhoads, DOE	John Stamatakos, CNWRA	

Members of the public were also in attendance at this meeting. A list of those attendees who registered is attached to the Office Copy of these minutes.

Presentations and Discussion

The presentations to the subcommittee and the related discussions are summarized below. The presentation slides and handouts used during the meeting are attached to the Office Copy of the minutes.

Chairman's Comments

Dr. Powers, Subcommittee Chairman, convened the meeting. He stated that the purpose of the meeting was to discuss the MOX Fuel Fabrication Facility (MOX FFF) construction authorization. He noted the request to make an oral presentation by Mr. Lyman, NCI, and the written comments received from GANE, pointing out that GANE had raised 13 issues. Dr. Powers indicated that this was not the first processing facility ever constructed in this country and that he was involved with three of them, Rocky Flats, PUREX, and the Plutonium Finishing Plant. He further indicated that there was a need to recognize that this would be a new facility designed with a 50-year lifetime and fairly well-established technology, whereas the older facilities were designed with short lifetimes and evolving technology. He stated that a reexamination of 10 CFR Part 70 might be in order, as well as a look at Parts 800 and above for codification of some of DOE's orders for insight regarding how facilities within DOE are operated. The proposed facility is located on a large, government-controlled reservation where there is a large population of people. This means less risk to the offsite public, but risk is posed to the co-located workforce. Consequently, the definition of what we mean by the public in looking at this facility becomes interesting.

NRC Presentation

The NRC presentation included input from NRR, RES, and CNWRA, as summarized below.

Mr. Drew Persinko, NMSS, presented a general introduction of the facility. The reason for the facility is an agreement between the United States and Russia, under which each country has agreed to dispose of 34 metric tons of excess plutonium (Pu). DOE, who is responsible for implementing this policy, decided to convert 25 metric tons of the excess Pu to MOX fuel. DOE contracted with DCS to construct and operate the facility, which will be located at the Savannah River Site (SRS) in Aiken, SC. Some elements of the program may change because the Bush administration is currently reviewing all of DOE's plutonium disposition programs. Weapons-grade Pu coming into SRS will go to a Pit Disassembly and Conversion Facility, under the jurisdiction of DOE, and then to the MOX FFF. The above ground facility will be approximately 400 x 400 feet and about 65 feet tall. This building comprises an aqueous polishing area, shipping and receiving, and the MOX processing area. The MOX facility is about 5-6 miles from the SRS boundary, and there are public roads that run through the SRS.

Mr. Persinko continued with a discussion of the two-step chemical process. During Step 1, the dissolution phase (based on the LaHague, France process), plutonium oxide is dissolved in nitric acid; purified of its americium, gallium, and other impurities via pulse columns and solvent extraction; and converted back to plutonium oxide. Step 2 is the fabrication process phase (based on that at the MELOX Facility, Marcoule, France), in which the plutonium oxide powder

from Step 1 is blended in a two-step process. After each phase, there is a ball milling, and homogenization of material (using a process referred to in France as the MIMAS process), it is then pressed into pellets, sintered in ovens, and assembled into rods and assemblies.

Applicable regulations (10 CFR) are Fuel Facilities-Part 70, Environmental Protection-Part 50, Radiation Protection-Part 20, Transportation-Part 71, Public Hearings-Part 2, Reactors-Part 50, and Spent Fuel Disposal-Proposed Part 63.

The presentation continued with the following topics:

- Safety Analysis
- Radiological Consequences
- Chemical Process and Products
- Nuclear Criticality Safety
- Fire Safety
- Confinement Ventilation
- Electrical
- Instrumentation and Control (I&C)
- Seismic
- Material Control and Accountability (MC&A)
- Physical Security
- Summary

Subcommittee Comments

During the above discussions, subcommittee members commented on these topics as summarized in the following subsections.

Safety Analysis

Mr. Rex Wescott, the safety analysis reviewer, discussed the safety assessment of the design basis to identify the hazards and events associated with the design and operations. The review is also designed to identify the specific design basis and the principal structures, systems, and components (PSSCs) required to mitigate or prevent the identified hazards and events.

- Dr. Kress asked if PSSCs required to mitigate or prevent hazards or events are the same as items relied on for safety (IROFS). The response was no.

- Dr. Kress followed up by asking how you will decide what an PSSC is if not an IROFS. You don't have an equivalence measure that you'd have with the PRA to determine what is an SSC. The response was that some PSSCs are IROFS, but not all IROFS are PSSCs, and the distinction will be discussed later.

- Dr. Powers asked how much DOE historical information had been looked at because the PSSCs will be similar. The response was that they had access to everything that was documented.

- Dr. Bonaca asked what flexibility there is to change a system to safety-related if you find the need to do so at the operations stage. The response was it was a question already asked of the applicant.

- Dr. Bonaca asked if a set of defense-in-depth criteria would be consistently applied throughout the review as a way of bringing 20-30 years of nuclear experience to bear. Mr. Wescott replied the nuclear engineering practice would weigh heavily in the review. The response was yes.

Radiological Consequences

Mr. Brown, the radiation safety reviewer, talked about how source terms were derived, the major pathways for release, and how they calculated doses and concentrations in the environment once the material reaches its receptor. The applicant assumed a 99% efficiency for each stage of the high-efficiency particulate air (HEPA) filtration.

- D. Powers commented that it was hard to believe that the applicant could achieve 99% filtration with particles that are not normally filtered.

- Dr. Powers also commented that he was surprised that SRS had chosen to use HEPA filters since they had used sand filters in the past.

Chemical Process and Products

Mr. Alex Murray, chemical safety reviewer, talked about aqueous polishing, proposed PSSCs, design basis, and controls.

- Dr. Powers asked if sintering is done under an atmosphere of argon or hydrogen at 4 % hydrogen. The response was that they use gases with a range of compositions.

- Mr. Leitch asked if there were an emergency control room. The response was yes.

- Dr. Powers indicated that he thought that with regard to the issue of "red oil" (nitrated tributyl phosphate esters), that the principal safety control was temperature. The response was that this is what the applicant proposed.

- Mr. Leitch wanted to know if to this point there had been any discussions about staffing levels or operator qualifications or training. The response was that it was premature to discuss this.

Nuclear Criticality Safety

Mr. Christopher Tripp talked about the criticality safety design as one of the dominant risks at the facility along with fire safety. He said that the criticality risk associated with this plant is similar to that of other facilities that involve high-enriched uranium (HEU). Of the 22 process accidents, 19 involved plutonium and HEU and all 22 involved solutions in process tanks. The areas of greatest risk are aqueous polishing (solutions of ^{239}Pu) and the MOX process (uncontained plutonium oxide and MOX powder).

- Mr. Leitch asked if he understood correctly that criticality prevention is primarily a function of geometry, supplemented perhaps by operator actions and administrative procedures. The response was yes.

- Dr. Bonaca asked what was the dominant cause of the 22 accidents at HEU facilities and if the reviewer would comment on the consequences. The response was that the accidents have all occurred in process tanks or vessels of some type where you have an inadvertent transfer to an unfavorable geometry, such as a wastewater tank or other large geometry vessel. As far as the consequences, two or three have involved fatalities.

Fire Safety

Ms. Sharon Steele, the fire protection reviewer, discussed the applicant's proposal relative to the Standard Review Plan and some major aspects of fire safety. The two major aspects of fire safety focused on were administrative controls and development of a fire protection program for prevention, automatic detection, and suppression systems.

- Dr. Powers questioned whether the staff really gave credit for automatic systems that are used to extinguish fires. The response was sometimes, in some places, but for the most part, they are used as defense-in-depth strategies.

- Mr. Leitch asked if there were process stream combustibles, since he thought of transient combustibles as trash. The response was some may be, but most are assumed to be pieces of polycarbonate window materials left over from maintenance activities.

- Dr. Powers commented that there should be a focus of fire protection such as a separate shutdown train that is fire protected.

- Dr. Bonaca questioned whether fire personnel were trained to handle releases and fire simultaneously. The response was yes.

Confinement Ventilation

Mr. Tim Johnson, the confinement system reviewer, discussed the proposed system's HEPA filter removal efficiencies.

- Dr. Kress asked what criteria determine whether you take credit for HEPA filters. The response was that it depends upon the fire hazard itself. In the immediate vicinity of the fire, the HEPA filter could degrade and become ineffective.

- Dr. Kress asked if the particulate removal efficiency applies to the most respirable size of the particulates. The response was that tests on sand filters with dioctyl phalate (DOP) come out at 99.8 %, while a HEPA bank when DOP tested generates 99.95 %. The staff is including a discussion of the use of sand filters as an alternative in the environmental impact analysis.

Electrical

Mr. Fred Burrows, electrical reviewer, gave an overview of the electrical system. The SRS had two 13.8-KV feeds, each with a 100 % capacity transformer. There are two 4-KV buses and two 4-KV emergency buses, and crosstied, manually controlled, 480-V load center buses used for maintenance. The normal AC system is designed to IEEE standards as a non-principal SSC.

- Mr. Leitch commented that the electrical system should be locked so that you cannot replace normal switchgear with emergency buses.

- Mr. Sieber asked what loads were on the emergency bus. The response was the filtration fans.

Instrumentation & Control

Mr. John Calvert, I&C reviewer, talked about the PSSCs or safety related systems, the system architecture, and the design bases. There are four major systems in the facility are the MOX process control, aqueous process (AP) control, utility control, and emergency control. These all have subsystems identified as normal, protective, and safe. There are six control rooms associated with MOX, one with AP, an alternate control room in utility control, and two separate and redundant control rooms in emergency control.

- Dr. Powers asked that since the manufacturing status device and the MMIS are mirror images of each other, can they send conflicting signals. The response was that at this time, they did not know because they did not know the details.

- Mr. Sieber asked if the depth of the review will include a line-by-line review of software. The response was that it would for the PSSCs.

- Mr. Leitch wanted to know if there is a manual override on the safety controller. The response was that it overrides anything coming from the normal controller and if that doesn't work, administrative controls provide for going to the emergency control center and actually shutting off the power.

- Mr. Sieber asked if the process sensors and protection sensors two different sensors. The response was no.

- Dr. Powers stated that this system is sufficiently complex as to possibly require some consulting help.

Seismic

Mr. John Stamatakos, CNWRA, stated that the task before them was to evaluate the seismic hazards of the facility. The applicant has chosen to use the RG 160 design spectrum, anchored at .2G, which is similar to a nearby nuclear facility. They developed a probabilistic seismic hazard assessment that is generic to the entire SRS.

adopted by the licensee after DAEC received its operating license. Consequently, the DAEC FES does not contain a uranium fuel cycle environmental analysis similar to Table S–3. The impacts of transportation are addressed in the Environmental Report and the FES, although the conclusions are not presented in the format of Table S–4. An NRC assessment (53 FR 30355, dated August 11, 1988, as corrected by 53 FR 32322, dated August 24, 1988) evaluated the applicability of Table S–3 and S–4 to higher burnup cycles and concluded that there is no significant change in environmental impacts for fuel cycles with uranium enrichments up to 5 weight-percent U–235 and burnups less than 60 gigawatt-day per metric ton of uranium (GWd/MTU) from the parameters evaluated in Tables S–3 and S–4. Because the fuel enrichment for the EPU would not exceed 5 weight-percent U–235 and the rod average discharge exposure would not exceed 60 GWd/MTU, the environmental impacts of the proposed EPU would remain bounded by these conclusions and would not be significant.

Summary

The proposed EPU would not significantly increase the probability or consequences of an accident, would not introduce any new radiological release pathways, would not result in a significant increase in occupational or public radiation exposures, and would not result in significant additional fuel cycle environmental impacts. Accordingly, the NRC concludes that no significant radiological environmental impacts are associated with the proposed action. Table 2 summarizes the radiological environmental impacts of the proposed EPU.

TABLE 2.—SUMMARY OF RADIOLOGICAL ENVIRONMENTAL IMPACTS OF EPU AT DAEC

Radiological Waste Stream Impacts:	
Gaseous Waste	An increase in release rate that is linearly proportional to the power increase would be expected.
Liquid Waste	No change in DAEC zero liquid release policy.
Solid Waste:	
Wet Waste	Backwashes would increase to create approximately 3 cubic meters of resin per year.
Dry Waste	No significant changes.
Irradiated Components	No significant changes.
Dose Impacts	May potentially increase radiation levels; dose would remain within permitted levels in-plant and offsite.
Accident Analysis Impacts	No significant increase in the probability or consequences of an accident.
Fuel Cycle and Transportation	Increase in bundle average enrichment; impacts would remain within the conclusions of Table S–3 and Table S–4 of 10 CFR Part 51.

Alternatives to the Proposed Action

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., the "no-action" alternative). Denial of the application would result in no change in current environmental impacts. The environmental impacts of the proposed action and the alternative action are similar.

As stated previously, the estimated cost of adding this nuclear generating capacity is approximately half the cost projected for purchasing the power and one-third the cost of producing the power by constructing a new combined-cycle, natural-gas-fueled facility. Alliant concluded that increasing DAEC's capacity would be the most economical option for increasing power supply. Furthermore, unlike fossil fuel plants, DAEC does not routinely emit sulfur dioxide, nitrogen oxides, carbon dioxide, or other atmospheric pollutants that contribute to greenhouse gases or acid rain.

Alternative Use of Resources

This action does not involve the use of any resources different than those previously considered in the FES for DAEC, dated March 1973.

Agencies and Persons Consulted

In accordance with its stated policy, on August 23, 2001, the NRC staff consulted with the Iowa State official, Mr. D. McGhee of the Department of Public Health, regarding the environmental impact of the proposed action. The State official had no comment.

Finding of No Significant Impact

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's application dated November 16, 2000, as supplemented April 16 (two letters) and 17; May 8 (two letters), 10, 11 (two letters), 22, and 29; June 5, 11, 18, 21, and 28; July 11, 19, and 25; and August 1, 10, 16, and 21; and October 17, 2001, and NMC's "Supplement to DAEC Environmental Report," submitted on September 22, 2000. Documents may be examined and/or copied for a fee at the NRC's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the ADAMS Public Library component on the NRC Web site, *http://www.nrc.gov* (the Electronic Reading Room). If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room Reference staff at 1–800–397–4209, or 301–415–2737, or by e-mail at *pdr@nrc.gov*.

Dated at Rockville, Maryland, this 31st day of October 2001.

For the Nuclear Regulatory Commission.

William D. Reckley,

Acting Chief, Section 1, Project Directorate III, Division of Licensing Project Management, Office of Nuclear Reactor Regulation.

[FR Doc. 01–27716 Filed 11–1–01; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Meeting of the Subcommittee on Reactor Fuels

Notice of Meeting

The ACRS Subcommittee on Reactor Fuels will hold a meeting on November

16, 2001, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Friday, November 16, 2001—8:30 a.m. until the conclusion of business.

The Subcommittee will discuss the Duke Cogema Stone Webster MOX Fuel Fabrication Facility construction application authorization. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineer named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff, its consultants, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting the cognizant ACRS staff engineer, Ms. Maggalean W. Weston (telephone 301/415–3151) between 7:30 a.m. and 4:15 p.m. (EST). Persons planning to attend this meeting are urged to contact the above named individual one or two working days prior to the meeting to be advised of any potential changes in the proposed agenda, etc., that may have occurred.

Dated: October 25, 2001.

Sher Bahadur,

Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 01–27537 Filed 11–1–01; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards and Advisory Committee on Nuclear Waste Joint Subcommittee Meeting; Notice of Meeting

The Advisory Committee on Reactor Safeguards (ACRS) and the Advisory Committee on Nuclear Waste (ACNW) Joint Subcommittee will hold a meeting on November 14, 2001, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Wednesday, November 14, 2001—8:30 a.m. until the conclusion of business

The ACRS and ACNW Joint Subcommittee will continue its discussion on risk-informed regulation in the Office of Nuclear Material Safety and Safeguards (NMSS) including Standard Review Plan (SRP) Chapter 3 for integrated safety analysis (ISA), use of risk-informed case studies, and development of a PRA for dry cask storage. The purpose of this meeting is to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the ACRS and ACNW full Committees.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman. Written statements will be accepted and made available to the ACRS and ACNW full Committees. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS/ACNW staff member named below five days prior to the meeting, if possible, so that appropriate arrangements can be made. During the initial portion of the meeting, the Subcommittee, along with any consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff, its consultants, and other interested persons regarding these matters.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, the Subcommittee's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting the cognizant senior staff engineer, Michael T. Markley (telephone 301/415–6885) between 7:30 a.m. and 4:15 p.m. (EST) or by e-mail *MTM@NRC.gov*. Persons planning to attend this meeting are urged to contact the above-named individual one to two working days prior to the meeting to be advised of any potential changes in the proposed agenda, etc., that may have occurred.

Dated: October 26, 2001.

Howard J. Larson,

Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 01–27574 Filed 11–1–01; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards Joint Meeting of the Subcommittees on Human Factors and Safety Research Program; Notice of Meeting

The ACRS Subcommittees on Human Factors and Safety Research Program will hold a joint meeting on November 15, 2001, in Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Thursday, November 15, 2001—8:30 a.m. until the conclusion of business

The Subcommittees will discuss the staff's proposed human reliability analysis (HRA) research plan for fiscal years 2001–2005. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittees, their consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineers named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittees, along with any of their consultants who may be

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
REACTOR FUELS MIXED OXIDE (MOX) FUEL FABRICATION FACILITY
SUBCOMMITTEE MEETING

NOVEMBER 16, 2001
Today's Date

ATTENDEES PLEASE SIGN IN FOR ACRS MEETING

PLEASE PRINT

NAME	AFFILIATION
Heather Astwood	NRC/FCSS
George Gaydos	Bechtel Power Corp - SERCH
Peter Hastings	DCS
Gary Kaplan	DCS
David Alberstein	DOE/NNSA
Sharon Steele	NRC/NMSS
Patrick Rhoads	DOE
Daniel Horne	McGraw-Hill
Louis Zeller	BREDL
Janet Zeller	BREDL
Sidney Crawford	Consultant
John Stamatakos	CNWRA

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
REACTOR FUELS MIXED OXIDE (MOX) FUEL FABRICATION FACILITY
SUBCOMMITTEE MEETING

NOVEMBER 16, 2001
Today's Date

NRC STAFF PLEASE SIGN IN FOR ACRS MEETING

PLEASE PRINT

NAME	NRC ORGANIZATION
Bill Gleaves	NMSS/FCSS
David Brown	NMSS/FCSS
Rex Wescott	NMSS/FCSS
JOHN A. CALVERT	RES/ERAB/IRC
FRED BURROWS	NMSS/FCSS
ALEX MURRAY	NMSS/FCSS/SPB.
JEREMY A. SMITH	NMSS/FCSS
Tim Harris	NMSS/DWM
John Hull	OGC
Margaret (Muffet) Chatterton	NMSS/FCSS/FSPB
Norma Garcia Santos	NMSS/FCSS/SPR.
Christina Antonescu	RES/DET/ERAB
UNDINE SHOOP	NRR/SRXB.
WILKINS SMITH	NMSS/FCSS
VANICE A. PERIN	NMSS/FCSS
TIM JOHNSON	NMSS/FCSS
Christopher Tripp	NMSS/FCSS
Andrew Persinko	NMSS/
JOSEPH GUTTER	NMSS/FCSS
Tamara Powell	NMSS/FCSS

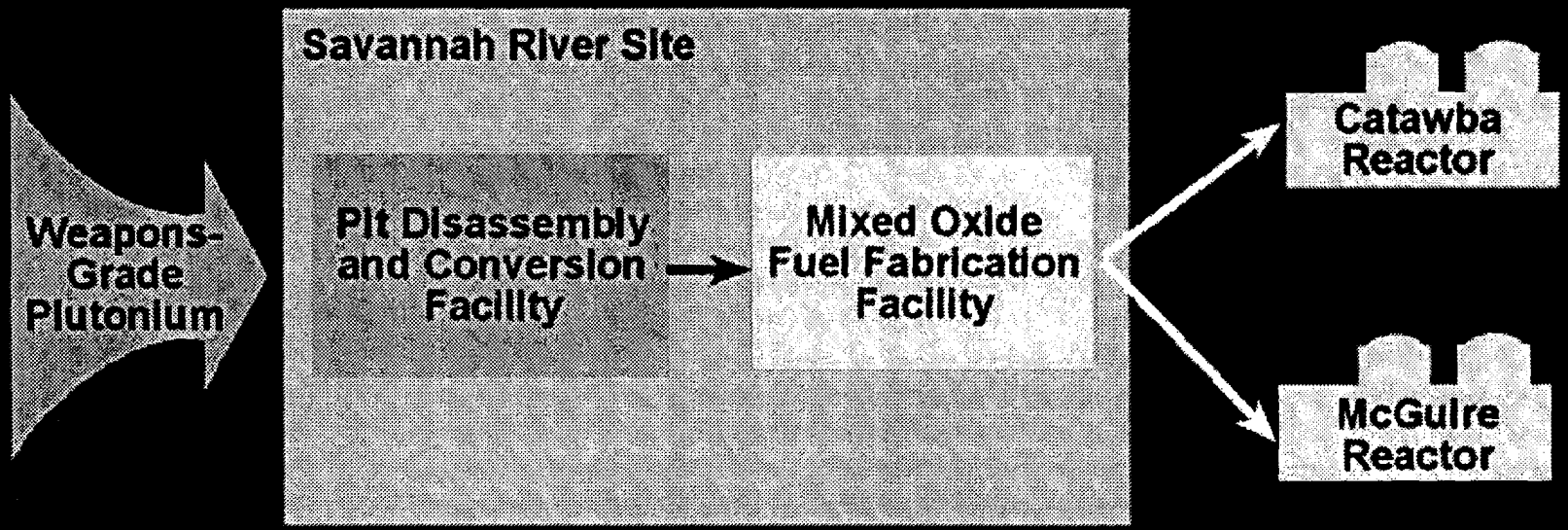
MIXED OXIDE FUEL FABRICATION FACILITY

ACRS PRESENTATION
November 16, 2001

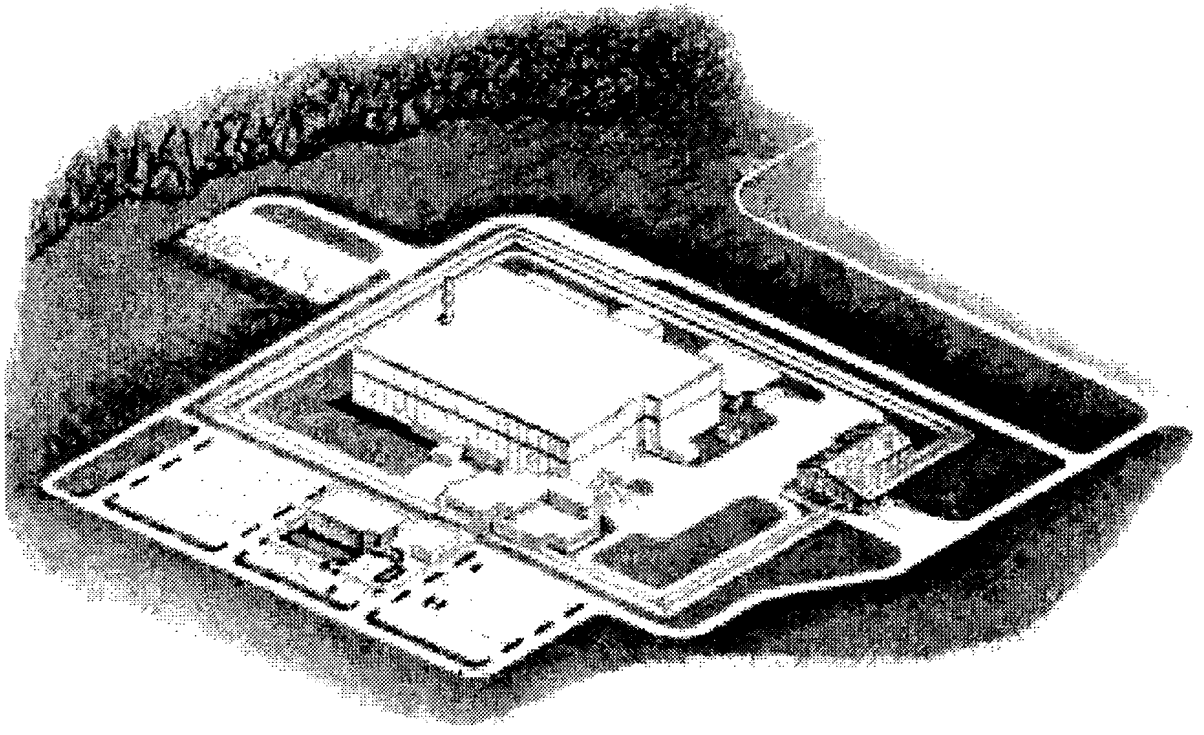
A BRIEF HISTORY

- U.S. agreement with Russia
- Policy implemented through Department of Energy (DOE)
- DOE has decided to:
  - Convert some excess plutonium to MOX fuel
  - Contract with Duke Cogema Stone & Webster (DCS) to build and operate a fuel fabrication plant located at Savannah River Site near Aiken, SC

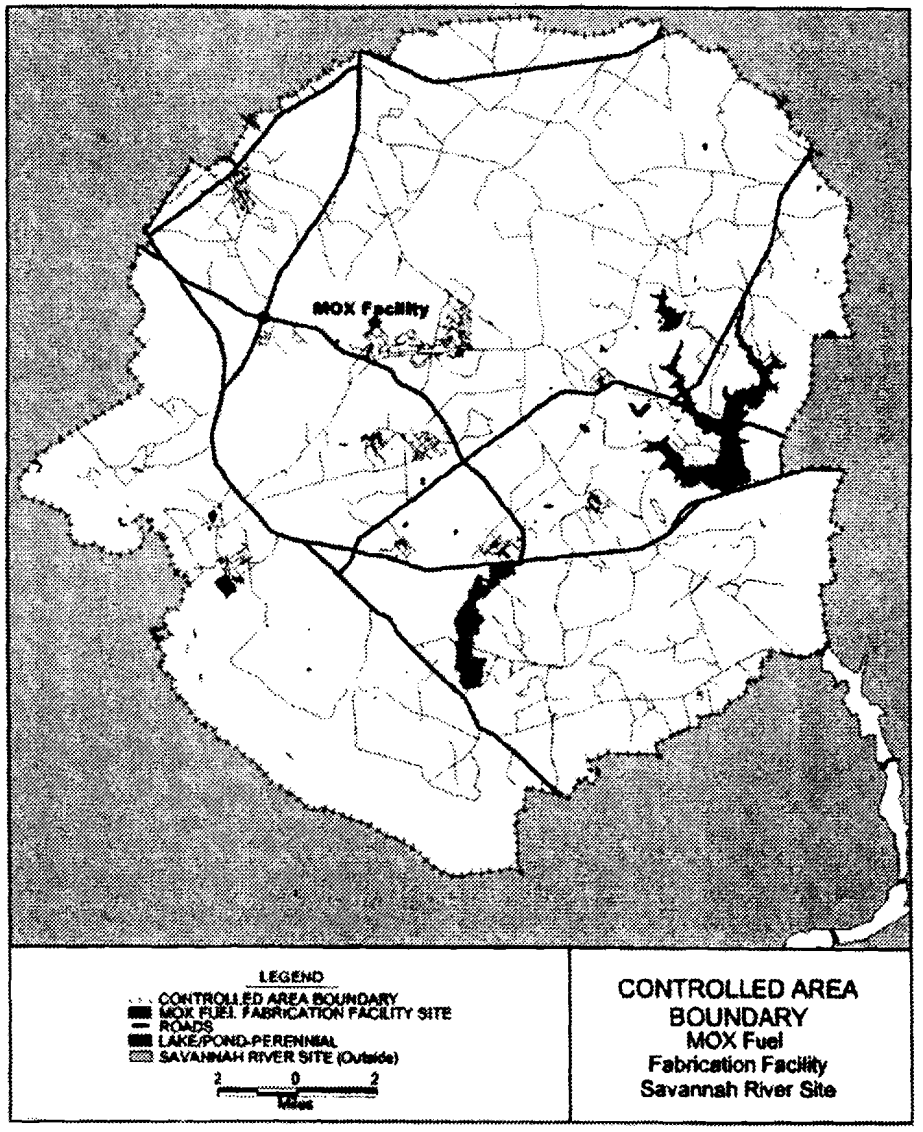
NRC Role in Regulating Mixed Oxide Fuel



MOX FFF

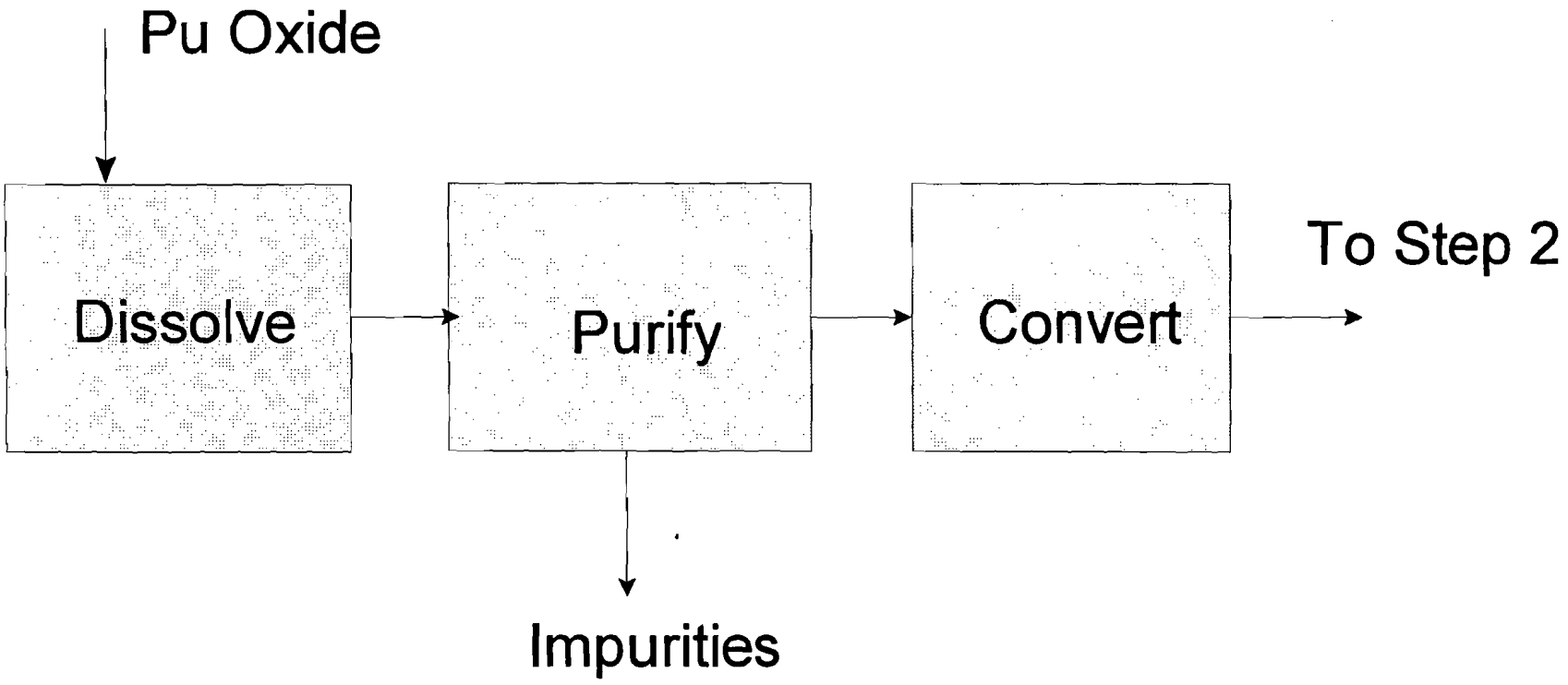


MOX FACILITY LOCATION



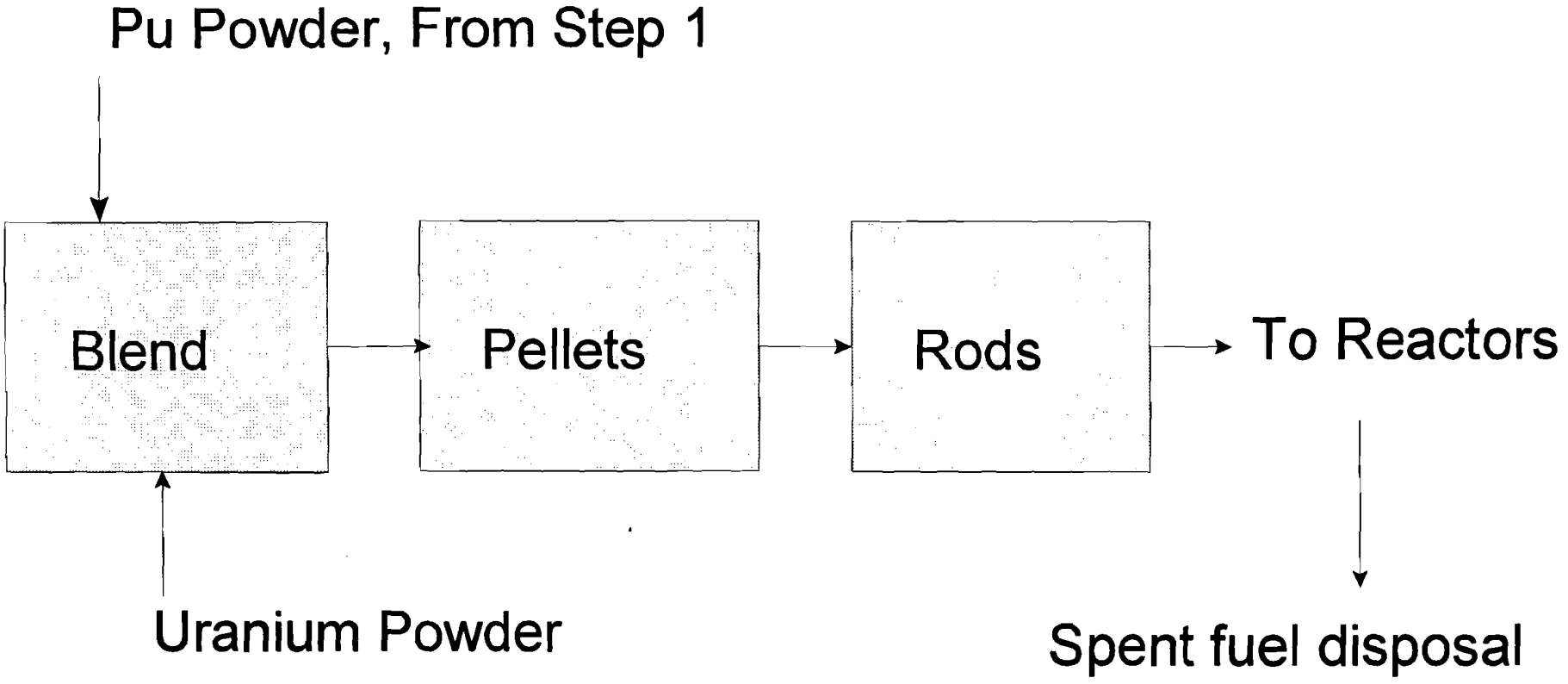
THE MOX PROCESS

STEP 1: Purify Plutonium
(Aqueous Polishing based on LaHague)



THE MOX PROCESS

STEP 2: Fuel Fabrication
(based on MELOX)



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)

10 CFR PART 70

Fuel Facility

- Allows two-step licensing
  - Construction
  - Operation

CONSTRUCTION

Fuel Facility
10 CFR 70.23 Requirements

- Approvals to start construction plutonium facility
  - Design bases of principal structures, systems, and components (SSCs)
  - Quality assurance program
  - Environmental impact statement

CONSTRUCTION

Design Bases

- 10 CFR 50.2 Definition: "Design Bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility and the specific values or ranges of values chosen for controlling parameters as reference bounds for design..."

OPERATION

Fuel Facility
10 CFR 70.22 and 70.65

- Integrated Safety Analysis (ISA)
- Items relied on for safety (IROFS) (safety equipment / operator actions)
- Management measures
- Other
  - Physical protection plan
  - Material accounting plan

10 CFR 70.61 PERFORMANCE REQUIREMENTS

	Highly Unlikely	Unlikely	Not unlikely
High Consequence Publ Dose > 25 rem Worker Dose > 100 rem	Acceptable	Not Acceptable	Not Acceptable
Medium Consequence Publ Dose 5 - 25 rem Worker Dose 25 -100 rem Env releases > 5000 Tbl 2	Acceptable	Acceptable	Not Acceptable
Low Consequence Publ Dose < 5 rem Worker Dose < 25 rem	Acceptable	Acceptable	Acceptable

ACTIVITIES TO DATE

- Standard Review Plan for MOX fuel facility (NUREG-1718)
- MOX website
  - http://www.nrc.gov/NRC/NMSS/MOX/index.html
- Technical meetings
- Request for additional information/DCS response
- Public meetings in South Carolina and North Carolina

SCHEDULE

Fuel Fabrication Facility

- Environmental report (12/00)
- Application for construction authorization fuel fabrication facility (2/01)
- Draft EIS (2/02)
- Draft construction SER (4/02)
- License application for operation of fuel fabrication facility (7/02)
- Final EIS and construction SER (10/02)

CONSIDERATIONS

- Use of revised 10 CFR 70
- Design bases level of detail
- Plutonium facility
- EIS
- Public Hearings

MOX FFF Safety Analysis Review

Rex Wescott

OUTLINE OF PRESENTATION

- Objectives of the safety assessment
- Safety assessment tasks at the CA stage
- Safety assessment at the OL stage
- NRC safety analysis review responsibilities
- Overview of the MOX safety assessment
- Status of the MOX safety assessment review

OBJECTIVES OF THE SAFETY ASSESSMENT

CONSTRUCTION AUTHORIZATION STAGE

- To identify hazards and events
- To identify the principal SSCs
- To provide reasonable assurance that the identified principal SSCs can reduce the risk to a level consistent with 10CFR70.61

DCS SAFETY ASSESSMENT TASKS

CONSTRUCTION AUTHORIZATION STAGE

- Identify hazards and corresponding events
- Identify unmitigated consequences for event sequences
- Identify bounding events
- Formulate safety strategies
- Identify principal SSCs and design bases

DCS SAFETY ASSESSMENT TASKS

CONSTRUCTION AUTHORIZATION STAGE

- Determine the mitigated consequences for bounding events, where applicable
- Identify support systems required by principal SSCs
- Determine Natural Phenomena Hazards for Principal SSCs
- Provide a general description of the principal SSCs

ADDITIONAL TASKS FOR THE ISA

OPERATING LICENSE STAGE

- Identify and describe IROFS at the component level
- Demonstrate that IROFS are sufficiently effective, reliable, and available to meet the specified design basis and consequently demonstrate that the event sequence satisfies the performance requirements of 10 CFR 70.61.
- Identify specific operation requirements

NRC REVIEW STRATEGY FOR SAFETY ASSESSMENT OF THE DESIGN BASES OF THE PRINCIPAL SSCs

- Evaluate completeness of hazard evaluation (team activity)
- Evaluate appropriateness of selected safety strategies (SA level activity)
- Evaluate adequacy of design bases of principal SSCs (discipline level activity)
- Coordinate resolution of multi-disciplinary issues/concerns

OVERVIEW OF MOX SAFETY ASSESSMENT

Natural phenomena (7 phenomena evaluated out of 43 phenomena considered)

External man-made events (19 hazards evaluated out of 32 considered)

Loss of confinement category (28 events evaluated and divided into 10 event groups)

Fire event category (35 events evaluated and divided into 12 event groups)

Load handling category (27 events evaluated and divided into 12 event groups)

Explosion event category (18 events evaluated and divided into 10 event groups)

OVERVIEW OF MOX SAFETY ASSESSMENT

(CONTINUED)

- Chemical event category (13 events evaluated and divided into 3 event groups
- Criticality event category (8 events evaluated and placed in 1 event group)
- 44 Principal SSCs identified with safety functions and cross reference to design bases

STATUS OF MOX SAFETY ASSESSMENT REVIEW

- Staff reviewing the hazards analysis/safety assessment for completeness
- Requests for additional information pending in areas of fire protection, load handling, and confinement to define adequacy of proposed safety strategies
- Design bases concerns still being evaluated in most areas of review

Safety Assessment of the Design Bases: Radiological Consequences

David Brown

Radiological Consequences

Outline of Presentation

- Derivation of source terms for accidents
- Major pathways for environmental contamination and human dose
- Calculation of consequences and the results of the applicant's analysis

Radiological Consequences

Derivation of Radiological Source Term

- "Five Factor" Formula approach
  - NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook"

- Source Term = MAR x DR x ARF x RF x LPF

Radiological Consequences

Derivation of Radiological Source Term

- Source Term = MAR x DR x ARF x RF x LPF
- MAR = material at risk = inventory in process unit
- DR = damage ratio = 1.0 for most events
- ARF = atmospheric release fraction
- RF = respirable fraction
- LPF = leak path factor, often for HEPA filters

Radiological Consequences

Source Term Issues

- The applicant used the respirable fraction (RF) to calculate concentrations *in the environment*. This was not acceptable to the staff.

- The applicant assumed 99% efficiency for each of two stages of HEPA filtration. This may not be acceptable to the staff for certain events that could degrade filter function.

Radiological Consequences

Significant Pathways to Humans & Environment

- Facility Workers
  - Inhalation (from breach of confinement)
  - Direct radiation (from a criticality event)
  - All unmitigated consequences are unacceptable
- SRS Employees and Other Members of the Public
  - Inhalation
  - Immersion (criticality)
  - Groundshine
- Atmospheric Dispersion calculated using MACCS2 (public) and ARCON96 (worker).

Radiological Consequences

Pathway Issues

- The applicant calculated airborne concentrations at the controlled area boundary (SRS boundary), not the restricted area boundary.

- The SRS Employees may be Workers under Part 70, but are still Members of the Public under Part 20.

Radiological Consequences

Dose Calculations

- Material at risk includes both soluble and insoluble forms (e.g., PuO_2 powder and $Pu(NO_3)_4$ solution).
- Due to aqueous polishing process, the material at risk (MAR) also includes both purified and impure, aged weapons grade plutonium.
- No issues have been identified in the dose calculations.

Radiological Consequences

Bounding Doses by Event Category

Event	SRS Employee	Public
Loss of Confinement	**0.087 rem**	**0.00074 rem**
Internal Fire	**0.087 rem**	**0.00074 rem**
Load Handling	**0.075 rem**	**0.00067 rem**
Criticality	**1.50 rem**	**0.012 rem**
Explosion	**0.31 rem**	**0.0027 rem**

Radiological Consquences

Environmental Concentrations by Event Category

Event	Environmental Concentration* (Sum of Fractions)
Loss of Confinement	**0.00088**
Internal Fire	**0.00088**
Load Handling	**0.00076**
Criticality	**0.0055**
Explosion	**0.028**

*** These will be higher after resolving issues related to use of the correct compliance point, use of the respirable fraction, and HEPA filter removal efficiencies.**

Radiological Consequences

Summary of Current Issues

- Source Term
  - RF should not have been used to estimate environmental concentrations
  - An LPF for "degraded" HEPAs was not considered
- Pathways
  - Compliance with Env. Performance Requirement was calculated at the SRS boundary, not restricted area
  - The SRS employee will still be a member of the public under Part 20
- Consequence Assessment
  - None identified

Chemical Process, Products, and Safety at the MFFF

Alex Murray

Overview

- Main Chemical Process Areas
- DCS Proposed Design Bases/Controls
- Status of Review
- Current Issues

1. Main Chemical Process Areas

- AP - Aqueous Polishing - Purifies Pu
- MP - MOX Process - Makes fuel
- Chemical storage and mixing areas support AP and MP
- Both chemical and radiochemical hazards

AP - Aqueous Polishing Area

AP Approach

- Electrochemical dissolution of PuO_2 from DOE
- "Tweeked" PUREX Process
  - separates/purifies Pu from Ga, Am, and U
  - adjustments maximize Pu purification
  - dry process ineffective
- Pu oxalate precipitation/calcination to PuO_2
- Similar to some activities at the La Hague site (France)

AP - Aqueous Polishing

Dissolution

- Anticipate PuO_2 from DOE (PDCF)
- Use nitric acid medium
- Silver(II) electrochemically generated, improves kinetics
- Excess silver(II) reduced (to silver[I])
- Generates heat and gases
- Isotopic dilution of uranium to circa 20% assay

AP - Aqueous Polishing

Purification

- PUREX process with columns and mixer/settlers
- Pu(6+) adjusted to Pu(4+) for extraction
- Hydrazine/hydroxlyamine nitrate (HAN) for Pu(3+) stripping
- Nitrous fumes for oxidation to Pu(4+)
- Solvent washing and purification
- TBP and Dodecane System

AP - Aqueous Polishing

Plutonium Precipition and Recovery

- pH adjustments and oxalate precipitation
- Pu oxalate filtered
- Filtered material calcined in oxygen
- Purified material sent to powder processing
- Can be similar in appearance to UO_2

AP - Aqueous Polishing

Waste Processing and Recovery

- Many items recovered, recycled from high alpha contaminated streams
- Silver electrolytically recovered
- Nitric acid recovered by evaporator/columns.

MP - MOX Powder Area

- Powder processing/blending to pellets
- Sintered pellets into rods and assemblies
- Main chemical areas are inert gas use and sintering operations (hydrogen and argon)
- Similar to operations at MELOX, France