Georgia Department of Natural Resources

4244 International Parkway, Suite 114, Atlanta, Georgia 30354
Lonice C. Barrett, Commissioner
Environmental Protection Division
Harold F. Reheis, Director

May 21, 2001

Mr. Mike Lesar, Chief
Rules and Directives Branch
Division of Administrative Services
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555

66 FR 13794
3/7/01
(57)

Re: Scoping of MOX Fuel Fabrication Facility EIS

Dear Mr. Lesar:

The Georgia Environmental Protection Division (EPD) appreciates the opportunity to provide scoping comments on the preparation of an Environmental Impact Statement (EIS) for the construction, operation and deactivation of a proposed Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF) to be constructed on the U.S. Department of Energy (DOE) Savannah River Site (SRS), in response to the Notice of Intent published in the Federal Register on March 7, 2001 (66 FR 13794).

As a matter of general principle, this EIS and NRC safety documents should look at all facets of MFFF operations as if the entire enterprise were privately-owned and operated, and located on private property. In particular, NRC should look at the ultimate disposition of all wastes and effluents generated as a result of this NRC-licensed activity. To the extent that successful licensure of the MFFF is dependent on existing government-owned contractor operated (GOCO) infrastructure at SRS (e.g., security, transportation, emergency management, radiation safety services, environmental monitoring, and waste management), these should be included within the scope of NRC's review in the EIS and corresponding safety documents. NUREG-1708, "External Regulation of Department of Energy Nuclear Facilities: A Pilot Program", which, among others, examined NRC external regulation of the Receiving Basin for Offsite Fuel (RBOF) at SRS, may shed some insight into the nature and extent of these interfaces.

As one small example of our "infrastructure" concerns, the applicant's Environmental Report contains the following statement, on page 3-15:

> "Liquid high alpha activity waste (i.e., americium) will be transferred through a dedicated pipeline to the SRS F-Area Outside Facility. At the F-Area Outside Facility, the pH and the waste chemistry of the waste will be adjusted to conform to the WAC requirements for the F-Area Tank Farm. The F-Area Outside Facility is being pgraded through the addition of new tankage to be used for pretreatment

Template = ADM-013

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of MOX process streams. The liquid high alpha activity waste will be transferred to the F-Area Tank Farm and managed by SRS accordingly."

We note on page 3-51 that a portion of this high alpha waste stream, the "liquid americium stream", may contain up to 24.5 kg per year of Am-241. We first find it strange that the applicant, which obviously has a great deal of experience in dealing with radioactive materials, would choose to cite a quantity of radioactive materials using units of mass (kilograms) instead of activity (Curies or Bequerels), especially when the waste stream is so well characterized, and since another waste stream on the same page, the "acid recovery condensate", is characterized as having an activity of 10^8 Bq/yr. For the record, it appears that the "liquid americium stream" may involve the transfer of 79,000 Ci/yr (2.9×10^{15} Bq/yr) of Am-241 to the SRS F-Area Tank Farm. Over the life of the MFFF, it appears that more than 1,000,000 Ci (3.7×10^{16} Bq) may be added to the inventory of the F-Area Tank Farm. We are certain that NRC will agree that this matter deserves a more rigorous treatment in the EIS than the applicant provided in the above statement in the Environmental Report.

There are many references in the applicant's Environmental Report to the "Surplus Plutonium Disposition Final Environmental Impact Statement" (DOE/EIS-0283). In many cases, these references are in the context of issues that are not discussed in the applicant's Environmental Report. This office commented extensively on DOE/EIS-0283, and our comments and DOE's response, as they appeared in the Final EIS, are attached for your information. We note that, in our opinion, DOE was not fully responsive to comments submitted by this office, and we also have attached our critique of DOE's response to comments provided by this office. We strongly urge NRC to take a close look at both our comments and DOE's response to them, and to give serious consideration towards re-examination of many of the issues raised in these comments, particularly those involving emergency preparedness and transportation, in this EIS and in safety documents.

Thank you again for the opportunity to comment in this matter. If you have any questions regarding these comments, please contact me by letter, by telephone at (404) 362-2675, or by electronic mail at Jim_Hardeman@mail.dnr.state.ga.us

Sincerely,

James C. Hardeman, Jr.

James C. Hardeman, Jr., Manager
Environmental Radiation Program

Attachments as noted

Critique on DOE Comment Response
Surplus Plutonium Disposition Final Environmental Impact Statement
DOE/EIS-0283

General Comments

Most of Georgia's comments on the draft EIS, particularly those dealing with emergency preparedness and response issues related to plutonium processing facilities and transportation of plutonium, were simply dismissed by DOE, and not addressed in the final EIS.

In many instances, DOE relies on analyses or data presented in its own orders and handbooks, such as *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE-HDBK-3010-94) and DOE Order 151.1, *Comprehensive Emergency Management System,* in its arguments to dismiss Georgia's concerns. For the most part, DOE has not allowed public and/or stakeholder participation in the development of these documents, and Georgia does not consider these documents to be authoritative references.

In dismissing Georgia's comments regarding transportation accidents, DOE's argument appears to be that since they have not experienced any serious accidents involving safeguarded shipments, that such accidents will not occur, and that Georgia should not be concerned about the consequences, both to emergency response personnel (who most likely will not have at their disposal the specialized equipment required to monitor for weapons-grade plutonium — nor will the convoy crew) and the general public.

DOE is particularly insensitive to our concerns regarding malevolent acts — including "insider sabotage", dismissing them as "conjecture". By dismissing these concerns, DOE can limit the consequences of spills, transfer errors and similar process upsets by assuming, for the sake of analysis, that all such events can be detected and mitigated within 10 minutes. Despite DOE's claim that this 10-minute duration does not result in truncation of source term (and reduction is the estimate of onsite and offsite consequences), such truncation does occur for process-related events such as the ones mentioned above.

DOE dismisses our comments regarding the consequences of plutonium deposition by claiming (a) that the consequences of plutonium inhalation are greater, and therefore bounding, and (b) that these consequences are predominantly economic. The long-term consequences of deposited radioactive materials, however, particularly plutonium, can result in significant public protective measures (condemnation of crops, interdiction, etc.) for significant land areas for an extended period of time, whereas the effects of plutonium inhalation are limited both in scope and duration. In addition, the EIS includes estimates of other economic impacts (such as the impacts of facility construction, transportation networks, etc.), so it is unclear how merely saying that an impact is "economic" automatically excludes such impacts from consideration in the EIS. In previous correspondence with DOE emergency preparedness personnel, DOE insisted that the effects of deposited radioactive materials were "environmental" effects instead of effects that should be considered in the development of planning basis documents for emergency preparedness. DOE can't have it both ways — these effects must be considered in at least one (and preferably both) contexts.

MD322-1

"Therefore, this SPD EIS only presents the alternatives involving a completely new immobilization facility at SRS."

Georgia EPD concurs.

MD322-2

"DOE's preferred immobilization technology (can-in-canister) and immobilization site (SRS) are dependent upon DWPF providing vitrified HLW with sufficient radioactivity. DOE is confident that the technical solution will be available at SRS by using radioactive cesium from the ion exchange or small tank precipitation process."

Georgia EPD concurs with the finding that DWPF must provide vitrified HLW with sufficient radioactivity, but does not share DOE's confidence that a solution to this problem will be found in the near future. Our view is supported by DOE's recent experience in new facility startups.

MD322-19

"The 10-min release duration assumption does not imply that the source term has been truncated; it is simply assumed that the entirety of the source term is released at a constant rate over a 10-min duration."

This comment arose from our extensive reviews of Emergency Preparedness Hazard Assessment (EPHA) documents for SRS, in which the source term for process spills and leaks IS truncated by assuming a 10-minute release. It is not obvious that the same type of source term truncation is not included in the calculations in this EIS.

MD322-21

The dose calculations were performed in a conservative manner. To maximize the radionuclide concentrations in the atmosphere (and thus the inhalation dose), the deposition velocity of radionuclides onto the ground from the plume was taken to be zero. While this precludes the resuspension pathway, the increased dose associated with inhaling the radioactivity in the plume from which no radioactivity has been removed by deposition, is greater than the dose that would result from inhaling radioactivity in resuspended material.

Although the dose calculations may indeed be conservative with regard to short-term risk due to inhalation, they do not accurately reflect the long-term health risks and economic consequences associated with deposited radioactive materials, including, but not limited to: the need for short- or long-term interdiction of lands, condemnation of foodstuffs, residential and business relocations, etc.. These effects may far outweigh the short-term risks due to plutonium inhalation.

MD322-23

DOE's internal and external reviews and assessments [of the DOE Transportation Safeguards Division] are designed to achieve a path of continuous improvement in its transportation and emergency management programs. However, the comments are beyond the scope of this SPD EIS and have been forwarded to DOE's Transportation Safeguards Division for review.

We disagree. Comments regarding emergency preparedness capabilities during transport of radioactive materials ARE within the scope of the EIS, since transportation is essential to the overall success of the program. This is particularly true since the EIS itself, in Appendix L, page L-6, mentions that one of the key characteristics of the SST/SGT system includes "Established operational and emergency plans and procedures governing the shipment of nuclear materials". Apparently DOE feels that it can chose which environmental impacts it wishes to include in the EIS.

MD322-24

"DOE has a system to liaison with State transportation and safety organizations on SST/SGT shipments."

This liaison historically has not included state radiological emergency response personnel, despite repeated requests. DOE has been reluctant to discuss hazards associated with such shipments, even in the most generic terms.

MD322-25

"Because the total mileage in urban and suburban zones is much lower than in rural zones, accidents are less likely to occur in urban and suburban zones."

We contend that even a cursory review of accident statistics comparing accidents in the metropolitan Atlanta area to those in the rest of Georgia would not result in the reviewer reaching this conclusion. Increased traffic volume (particularly on I-285) and high speeds (approaching or even exceeding the "rural" speed limit) make accidents more numerous (and potentially more serious) on suburban and urban interstates that on rural interstates. We are aware of two (2) accidents in the metropolitan Atlanta area within the past several years in which accident forces (impact, crushing, fire) appear to have approached or even exceeded those for Class VIII accidents..

MD322-30

"Sabotage scenarios are considered conjecture and not reasonably foreseeable."

DOE elaborates in Appendix L (pages L-25 & 26) with the following statement: "This section provides an evaluation of impacts that could potentially result from a malicious act on a shipment of hazardous or radioactive material during transportation. In no instance, even in severe cases such as those discussed below, could a nuclear explosion or permanent contamination of the environment leading to condemnation of land occur. Because of the Transportation Safeguards System described in Appendix L.3.2, DOE considers sabotage or terrorist attack on an SST/SGT to be unlikely enough such that no further risk analysis is required."

We are appalled at DOE's arrogance in this matter. DOE's own policies require the use of the Design Basis Threat (DBT) to determine event consequences and security requirements. DBT includes consideration of an insider as one

potential threat vector. Particularly for facility scenarios, we contend that a knowledgeable insider could defeat detection mechanisms.

WD023-2

DOE Order 151.1, *Comprehensive Emergency Management System*, contains requirements for emergency-related offsite interfaces addressing accident conditions. This order states that Hazards Survey/Assessment results should be used to generate a listing of all services which may be needed to respond to postulated accident conditions.

This discussion in the final EIS addresses only support to be provided to DOE by offsite agencies in support of onsite responses; it does not discuss the responses of these agencies to offsite issues such as the need for public protective measures, monitoring for radioactive materials, etc.

WD023-3

Appendix K.1.4.2 provides the rationale for focusing on the inhalation pathway when calculating plutonium dose. This is the pathway of significance for estimating doses due to the postulated accidents analyzed in this SPD EIS. While these accidents would deposit plutonium on the ground, there would be ample opportunity to interdict any potential significant doses from resuspension or through food or water pathways. The consequences, therefore, would be mainly economic rather than health related.

Again it appears that DOE believes that it can pick and choose which environmental impacts it wishes to include in the EIS. There are several "economic" impacts included in the existing EIS, thus eliminating DOE's ability to exclude discussions of deposited radionuclides by claiming that they are "economic". DOE must provide emergency planners with a planning basis, including the potential for deposited radioactive materials, in order for them to develop required plans and determine response needs. DOE can't have it both ways — it can't refuse to address these issues in emergency preparedness documents because they are "environmental" and then refuse also to discuss them in environmental documents.

WD023-4

"The definition of reasonably foreseeable requires that the analysis is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. Malevolent acts are considered conjecture and were therefore excluded from analysis.

See the comment on WD023-3, above. DOE again appears to pick and choose which impacts it wishes to analyze.

MD023-5

"The estimation of doses to emergency response personnel is not within the scope of the SPD EIS analysis. Response personnel are trained, protected, monitored for exposure, and restricted to specific dose limits. As discussed in Appendix K.1.4.1, calculation of specific doses to emergency response personnel is subject to the same analytical difficulties as calculation of doses to facility workers, so is not considered meaningful.

Transportation of special nuclear materials would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo, including pits, over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material.

DOE's argument here appears to be that since we haven't had any transportation accidents, they can't (or won't) have any. DOE refuses to even discuss the range of possible consequences to emergency response personnel, making decisions regarding the nature of the response and the need for monitoring and personal protective equipment almost impossible.

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JAMES L. SETSER
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205 Butler St. S.E., East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
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(404) 656-4713

September 21, 1998

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

Dear Sir or Madam:

The Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR) is pleased to provide the following comments on the "Surplus Plutonium Disposition Draft Environmental Impact Statement", DOE/EIS-0283-D. Attached you will find a discussion of issues related to the draft EIS that we feel are significant, as well as detailed page-by-page comments.

Thank you for the opportunity to comment on this document.

Sincerely,

James L. Setser, Chief
Program Coordination Branch

JLS:lm
Attachment

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Georgia Environmental Protection Division
Issues Related to
Surplus Plutonium Disposition Draft Environmental Impact Statement (DEIS)
DOE/EIS-0283-D

Use of Existing Facilities at Savannah River Site (SRS)

Many of the SRS alternatives involve utilization of the ageing facilities at SRS. Some of these facilities, particularly the F and H Canyons, have been in operation for more than 45 years. The risk of design-based accidents and the potential that a severe earthquake or other natural disaster such as a severe tornado could occur are of vital concern for the utilization of these facilities. Whereas new nuclear facilities are constructed to seismically withstand the forces of such natural disasters (i.e., 0.2g for a design-basis earthquake), the older facilities are not constructed according to these standards. The magnitude of such an earthquake would be expected to cause severe structural damage that could lead to partial structure collapse and unmitigated releases of radioactive and hazardous material to the environment. 1

Scheduling

The technology for immobilization of plutonium at SRS is unrealistic from a time schedule viewpoint. The purpose of the current Defense Waste Processing Facility (DWPF) at SRS is to convert the high level wastes in the tank farm to a borosilicate glass form which will be shipped to a National Repository when one becomes available. Because of DOE's failure to successfully conduct In Tank Precipitation (ITF) an ion-exchange system is being considered. If implemented, this system is expected to cost $500 million and require between 6 and 14 years to implement. The ITF was initially completed in 1988 at a cost of $32 million and now, more than $500 million in estimated costs have been incurred and the facility is not operational. While DOE's expectations that all high level waste tanks be emptied and completely processed by 2020, the modifications to the DWPF and related operations for plutonium immobilization at SRS will most likely cause even further delay in processing the existing 32 million gallons of high level waste. This further delay raises the question of an increased risk to public health and safety due to a failure of the old carbon steel tanks that contain the high level radioactive waste. 2

Proximity of Plutonium Processing Facilities

The separation of an MOX fuel fabrication facility from the pit conversion facility (i.e., pit conversion at Pantex and MOX facility at SRS) could lead to significant control problems related to gallium contamination in the MOX fuel fabrication process. Because hafnium and gadolinium are both neutron absorber poisons that will contaminate the MOX fuel, in a manner similar to the requirement for Hafnium removal in reactor grade zircaloy for commercial LWR's, a polishing process has to be put in place to get rid of the gadolinium. This polishing process needs to be employed at the pit conversion facility if new construction is envisioned because this contamination in the MOX fuel fabrication facility is extremely difficult to control. 3

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MD322–1 **Human Health Risk**

As explained in the *Supplement to the SPD Draft EIS*, DOE has eliminated as unreasonable the eight alternatives in the SPD Draft EIS that would involve use of portions of Building 221–F with a new annex at SRS for plutonium conversion and immobilization. It was determined that the amount of space required for the immobilization facility would be significantly larger than originally planned. These new space requirements mean that the annex to be built alongside Building 221–F would be very close in size and environmental impacts to the new immobilization facility alternatives at SRS. Therefore, this SPD EIS only presents the alternatives involving a completely new immobilization facility at SRS.

MD322–2 **Immobilization**

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

MD322–3 **Plutonium Polishing and Aqueous Processing**

Pit disassembly and conversion is a common technology required for implementation of both the hybrid alternatives and the immobilization-only alternatives. The plutonium dioxide produced by the pit conversion facility can be used for either the immobilization or MOX approach. Neither gadolinium nor hafnium is present in pit plutonium metal in concentrations of concern for MOX fuel production. On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity (e.g., gallium) removal from the plutonium dioxide. Appendix N was deleted from the SPD Final EIS, and the impacts discussed therein were added to the impacts sections presented for the MOX facility in Chapter 4 of Volume I. Section 2.18.3 was also revised to include the impacts associated with plutonium polishing.

Additional processing needed only for MOX fuel fabrication would occur in the MOX facility, not the pit conversion facility. Controls would be put in place to ensure that any contaminants removed during the plutonium-polishing process would not contaminate the MOX fuel fabrication line. As indicated by the analyses, the addition of this process is not expected to materially affect the ability of the candidate sites to handle MOX fuel fabrication.

Location of Facilities
The types of technical problems (i.e., the In Tank Precipitation issue) that have arisen at SRS and DOE's approach to resolving them do not instill assurance that a plutonium pit conversion facility can be developed and constructed in a timely manner at SRS within any reasonable cost estimates. The DOE tiered approach needs supplemental Research and Development (R&D) technology for conceptual design and full scale operational throughput of surplus plutonium material. 4

In addition, it is noted that Pantex with a new Pit conversions facility will provide minimal radiological impact on the population and workers, where there will be a major impact on the workers (349 person rem) and a factor of 10 increase in population radiological exposure if the facility is located at SRS. 5

Facility Accidents
The respirable fraction (the fraction of release consisting of Plutonium particles with a diameter of less the 10 microns is questioned). The DOE use of the fraction (0.1-0.01) 0.01 or smaller for the inhalation pathway to man is questioned. For inhalation of the lung; and TBLN it is noted than the fraction of respirable particles less the 10 microns does indeed affect the dose. What is left out is the fact that going from 1.0 microns to 0.1 micron, there is a 1000 fold increase in particle concentration for a 10 fold reduction in medium particle diameter for Pu-239. 6

Review of deposition and scavenging data reveal the difference for dry deposition vs. wet deposition of PuO2 particles. The average bounds for wet deposition removal rate for particles is 10-4 for stable meteorological conditions and 10-3 for unstable wind conditions. For dry deposition of PuO2 particles the deposition velocity is a constant value of 10-2 regardless of meteorological conditions. For bounding of particle deposition the maximum expected for wet deposition is 10-2 and for dry deposition 10-1. This 10 fold factor should not be overlooked in considering "respirable fraction". 7

The fraction of energy absorbed in tissue (f1) is always small for PuO2. The value of f1 equals 3x10-3 is used for plutonium oxides. The value of f1 for the other actinides is conservatively set at f1 equals 10-3. Thus, the actual value has little effect on the estimation of inhalation dose. 8

Ingestion modeling (ICRP-23 1975) indicates that direct ingestion of PuO2 particles would be a much lesser radiological impact than inhalation. It should be noted that part of inhaled material, however, would be translocated by bodily processes to the gastrointestinal tract. For sake of accuracy the model for the gastrointestinal tract must include all nuclides considered in the inhalation model. 9

The Melcor Accident Consequence Code System (MACCS2) used to calculate the consequences of facility accidents (appendix K) is a sector averaged code as opposed to the straight-line Gaussian. The sector-average equation uses the cross wind integrated model but distributes the Y-concentration evenly over a sector. The width of 10

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MD322–4 **Alternatives**

DOE acknowledges the commentor's concerns regarding the technical issues associated with pit disassembly and conversion. These issues are the subject of ongoing R&D activities at INEEL, LANL, LLNL, and ORNL. These activities are expected to reduce technical risk and ensure that design, construction, and operation of the proposed surplus plutonium disposition facilities can be conducted efficiently and effectively, and within reasonable cost and schedule constraints. The largest of these activities is the pit disassembly and conversion demonstration project at LANL, a full-scale pit disassembly and conversion line similar to what would be used in the proposed facility. This demonstration project and other R&D activities are described in *Pit Disassembly and Conversion Demonstration EA* (DOE/EA-1207, August 1998), which is available on the MD Web site at http://www.doe-md.com.

MD322–5 **Human Health Risk**

Sections 4.4.2.4 and 4.6.2.4 present radiological impacts of operating the pit conversion facility at SRS and Pantex, respectively. As shown in the tables regarding impacts to the public, the anticipated dose to the population surrounding SRS from pit conversion facility operations would be 1.6 person-rem/yr (average dose would be 0.0020 mrem/yr), and for Pantex would be 0.58 person-rem/yr (average dose would be 0.0019 mrem/yr); this difference of about 2.8 times is due mainly to the larger population surrounding SRS. As shown in the tables regarding impacts to workers, the worker population dose at the pit conversion facility is 192 person-rem/yr whether the facility is located at Pantex or SRS. The average worker dose is expected to be 500 mrem/yr to involved workers at either site.

Regardless of where the pit conversion facility is operated, DOE policy places safety and environmental considerations above other program goals. DOE dose limit requirements (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and 10 CFR 835, *Occupational Radiation Protection*) have been established to protect and ensure the safety and health of the public and workers. In addition, protection of the public and workers is considered by DOE in the design, location, and construction of its facilities.

MD322–6 **Facility Accidents**

As used in this SPD EIS, the respirable fraction is the mass fraction of airborne material estimated to have less than a 10-micron aerodynamic equivalent diameter (AED). Use of this definition is common practice within DOE and is included in *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE-HDBK-3010-94, October 1994). Section 1.2 of the handbook discusses respirable fraction in detail, citing other definitions that have been used historically by a variety of organizations, and concludes that "use of a 10 [micron] AED cut-size for respirable particles is considered conservative, and may even be overly conservative since the mass is a cube function of particle diameter."

MD322–7 **Facility Accidents**

There is no direct connection between deposition velocity and respirable fraction. Deposition velocity reflects the rate of removal of material from the plume to ground-level surfaces, whereas respirable fraction is the mass fraction of the particulate matter that can be inhaled. As implemented, respirable fraction was used in defining the source term, so that the released plume can be considered 100 percent respirable. Deposition velocity was set to zero, so that no material is assumed to be removed from the plume by this mechanism, thus increasing predicted downwind concentrations and inhalation dose (the most significant dose pathway).

MD322–8 **Facility Accidents**

MACCS2 is a standard, accepted code for analyzing the impacts of accidents in EISs and for comparison of alternatives in NEPA documents. The MACCS2 dose conversion factor of 8.33×10^{-5} sieverts/becquerel (3.08×10^{-8} rem/ci) for a 50-year committed effective dose equivalent from plutonium 239 for the inhaled chronic dose pathway to the whole body alleviated the need to assess dose on an organ-specific basis. The presence of other nuclides from the aged plutonium was accounted for by scaling the plutonium 239 dose factor against like factors for the other contributing nuclides in proportion to their presence.

MD322–9 **Facility Accidents**

Discussion on the use of the inhalation pathway for consequence estimation is in Appendix K.1.4.2. The inhalation dose as presented provides an appropriate basis for assessment of impacts and for comparison of alternatives in this SPD EIS.

MD322–10 **Facility Accidents**

The MACCS2 code does calculate the centerline ground-level plume concentration; it is not a (crosswind) sector averaged model. Perhaps the commentor is thinking of the GENII code, which is a sector-averaged code. It is not clear what the commentor means by, "DOE need to further elaborate why the MEL's (sic) maximum exposure would be 100 meters under neutral (Class D) atmospheric conditions and 500 meters under stable (Class F) atmospheric conditions."

As implemented, MACCS2 sampled over a year's worth of meteorological data. For each sample, doses were determined along the plume centerline (for MEI and noninvolved worker) and for each fine grid element within each sector under the plume (for the population dose). Appendix K discusses the assumptions used and the accident analyzes conducted.

GEORGIA DEPARTMENT OF NATURAL RESOURCES
JAMES L. SETSER

a sector is equal to the circumference (2πX) at distance X from the source divided by the number of Sectors, n (typically n=16 as that there are 16 22 ½ degree Sectors. The concentration in each Sector is weighted by the fraction of the time that the wind blows into the Sector of Interest (0.01 times the percentage of the time), f1 that the wind is blowing into the Sector of Interest. Sector averaging is an artifice for representing long-term meandering of the Plume. For accident considerations the center-line ground level source, and ground-level receptor may be more appropriate. DOE need to further elaborate why the MEL's maximum exposure would be 100 meters under neutral (Class D) atmospheric conditions and 500 meters under stable (class F) atmospheric conditions. 10

Direct ingestion of Pu02 is a less important dose exposure than inhalation because Pu02 is highly insoluble even in body fluids. The f1 values (i.e. fraction of a quality that is absorbed from the gastrointestinal track to blood) range from 10-3 to 10-5. The safety requirement should insure that: 11

a) accident analysis adequately consider all credible scenarios
b) all appropriate engineering safety systems which are necessary to prevent accidents or mitigate the on-site and off-site consequences of those accidents are identified 12
c) the fire hazards analysis be consistent with other accident analysis.

DOE estimates of the risk from design based accidents and natural disturbances such as a severe earthquake is judged to be adequate. The highest risk to the maximally exposed off-site individual is a bounding accident because its risk is higher than the risk of other accidents in the same frequency range. The consideration of the risks associated with bounding events or accidents for a facility can establish an understanding of the average risk to workers, members of the public, and the environment from operating the facility. The risks of different facilities can be compared relatively by comparing the risks associated with bounding accidents for each facility. DOE should provide additional consideration of bounding of risks due to accidents. 13

If the specific ground activity is associated mostly with particles of size greater than 50μm, a very small air concentration would result from the respirable size particles less than 10 microns. 14

For the Gaussian diffusion model (applicable for continuous and instantaneous sources). The vertical component of turbulence intensity is a strong function of thermal stability, which in turn may be quite variable with height above ground. 15

It is noted that the buoyancy flux is a factor in both stable & unstable meteorological conditions. However, it is questioned why DOE has used different MEI locations as a function of atmospheric stability and this should be explained further. Also it is noted that there will be no plume rise (i.e. buoyancy flux) for normal transportation accidents unless there is a fire. 16

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MD322–11 **Facility Accidents**

DOE acknowledges the comment that inhalation pathways represent the greatest risk of exposure. This is accounted for in the MACCS2 model as discussed in Appendix K.1.4.2.

MD322–12 **Facility Accidents**

The selection of accidents for this SPD EIS was done in accordance with *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE Office of NEPA Oversight, May 1993). Design basis events were developed based on categorizing accidents into types of events, and a bounding consequence was determined for each type. The potential for accidents beyond the design basis was examined down to a frequency of 1.0×10^{-7} per year. This differs from the process-specific analysis, such as fire-hazards analysis, that would be performed in conjunction with the conceptual design package and the analysis performed for the SAR. It is these latter analyses that are used to determine the adequacy of engineered and administrative safety systems, and through which a commitment is made to preserve these protections as part of the operational safety basis.

MD322–13 **Facility Accidents**

The Facility Accidents sections in Chapter 4 of Volume I present a characterization of the spectrum of potential accident scenarios that are implicit in the particular alternatives. Each accident is conservatively developed by type, so is therefore considered to bound the accident risk.

MD322–14 **Facility Accidents**

There is no connection between ground activity and respirable-size particles. The respirable fraction is determined by the material form and scenario phenomenology and is based on recommendations in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. For example, the respirable fraction associated with fires in the MOX facility is 0.01, or 1 percent of the airborne material.

MD322–15 **Facility Accidents**

This SPD EIS uses 10-m (33-ft) meteorological data. These are the most appropriate data for use in calculating ground-level concentrations for nonbouyant plumes released at the stack heights analyzed. The vertical component of turbulence is not an important factor in determining downwind concentrations under the assumed release conditions.

MD322–16 **Facility Accidents**

All plumes released as a result of facility accidents were conservatively assumed to be nonbuoyant. This is reasonable for fires because significant cooling is possible in transit from the fire site to the release point. DOE has not used different MEI locations as a function of atmospheric stability. The MEI is located at the fence line, in the direction downwind from the release point. The MEI location changes for each run within the MACCS2 code because the wind direction changes for each run. This is why there is no single location associated with the MEI dose.

For new construction at SRS the Design Basis earthquake, the source term is assumed to be 3.8x10-4 grams. The dose at the site boundary is 1.7x10-5 rem.

For the case of accidents resulting from ceramic immobilization in F-canyon Bldg 221 F and DWPF at SRS, the source term is 3.8 grams. The dose at site boundary is 4.1x10-1 rem. Note that a factor 4 orders of magnitude increase in the severity of the accidents dose at the site boundary. 17

Therefore new construction at SRS is recommended (design basis earthquake) because of the decreases in radioactive emissions of Pu-239. The new facilities would be designed to reduce the frequency of accidents and to mitigate the consequences.

It is noted that for facility accidents, DOE has chosen to only consider the inhalation pathway to the pulmonary region and not consider the effect of resuspension of particles (MACCS2 code). In so doing, the code sets the deposition velocity the zero so that the material that might otherwise be deposited on the ground surfaces remains airborne and available for inhalation. This may not be as conservative for some types of accidents (i.e. particular Pu02 fires and explosions). Airborne releases of Pu will be in the oxide form and contain a substantial percentage of particles in the "respirable range" (i.e. less that 10 micron). 18

DOE has limited the duration of accidental releases from SPD facilities to 10 minutes except for fires. This may be a rather limiting value compared to actual release times from other DOE facilities accidents. For fires and explosions it is recommended that the dose pathway from respension of Pu particles be included in the dose calculations. 19

Analysis indicate that when a contaminating event occurs most of the radiation dose associated with the event is committed within a short time (a period of a few weeks or months) unless protective actions are taken. Intervention criteria are based on a projection of the ultimate consequence of the event and a judgement of how certain actions could reduce the impact. Development of intervention criteria requires advance planning, so that emergency response plans can be implemented in a minimum period of time. 20

The objective of environmental sampling and analysis is to derive information for the purpose of estimating dose rates to pulmonary lung and to bone of exposed individuals. In general, resuspension will relatively high immediately after initial deposition, gradually decrease with time, and approach a long term constant within about one year after deposition. The resuspension rate for newly deposited contamination has been estimated to be higher by a factor of 1000 or more than that for aged sources of plutonium, and therefore, represents a proportionately greater radiological hazard.

The principal difference between the initial phase and long-term phase is that the newly deposited contamination is generally much more mobile and more easily resuspended. 21

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MD322–17 **Facility Accidents**

The commentor is correct in identifying large differences between new construction and Building 221–F with respect to structural response to a design basis seismic event.

The remainder of this comment is addressed in response MD322–1.

MD322–18 **Facility Accidents**

The practice of setting the deposition velocity to zero so that the material that might otherwise be deposited on the ground surface remains airborne and available for inhalation is considered conservative for all analyzed accidents. The respirable fractions used for plutonium fires and explosions are from DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, and are based on experiments of the phenomena in question. Airborne material that is not respirable will not subsequently become respirable because there is no mechanism for getting energy inside the particles to further subdivide them. The process of deposition and subsequent resuspension would tend to result in agglomeration rather than subdivision, so that the quantity of resuspended material that is respirable would be much less than that amount of respirable material in the original plume whose presence can be attributed to the neglect of deposition.

MD322–19 **Facility Accidents**

The 10-min release duration assumption does not imply that the source term has been truncated; it is simply assumed that the entirety of the source term is released at a constant rate over a 10-min duration. The effect of differing assumptions concerning release duration is discussed in Appendix K.1.4.2. The two factors affecting doses as release duration changes are plume meander and the larger variety of meteorological conditions involved in any given run for longer-duration releases. The effect on dose of these two considerations is as follows. Plume meander decreases individual dose with increasing release duration and tends to narrow the distribution of population doses with increasing release duration. A larger variety of meteorological conditions tends to narrow the distribution of both individual and population doses toward the mean dose with increasing release duration. Both factors would tend to lower (i.e., reduce conservatism of) predicted doses reported in this SPD EIS.

The remainder of this comment is addressed in response MD322–18.

MD322–20 **Facility Accidents**

As discussed in the Emergency Preparedness sections in Chapter 3 of Volume I, each candidate site has an established emergency management program, including response time requirements, that would be activated in the event of an accident.. Site hazard surveys are periodically updated and would be modified to reflect any new hazards including those based on the decisions made in the SPD EIS ROD. These modifications would include development of revised intervention criteria, if needed, in accordance with DOE Order 151.1, *Comprehensive Emergency Management System*. The MOX facility would also be required to comply with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*, which requires emergency plans that include provisions for notification, response, and coordination.

MD322–21 **Facility Accidents**

The dose calculations were performed in a conservative manner. To maximize the radionuclide concentrations in the atmosphere (and thus the inhalation dose), the deposition velocity of radionuclides onto the ground from the plume was taken to be zero. While this precludes the resuspension pathway, the increased dose associated with inhaling the radioactivity in the plume from which no radioactivity has been removed by deposition, is greater than the dose that would result from inhaling radioactivity in resuspended material.

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It has been estimated that resuspension from newly deposited Pu02 material may be as high as 10-4/m, or four orders of magnitude greater than for stabilized Pu02 contamination. 21

Transportation
The DEIS discusses in detail the analysis of both incident-free transportation and the effects of transportation accidents. The discussion below deals specifically with transportation of either plutonium metal or plutonium oxide to SRS under Alternatives 3 and 5, but also applies to transportation of "pit parts" and high-enriched uranium (HEU) components from Savannah River Site (SRS) to other DOE facilities. It is assumed, 22
based on information presented in the DEIS, that all shipments of plutonium or high-enriched uranium, including new Mixed Oxide (MOX) fuel shipments will be made using a Safe Secure Trailer (SST), operated by the Transportation and Safeguards Division (TSD) in DOE's Albuquerque office.

In July 1998, the DOE Deputy Assistant Secretary for Oversight issued a report titled "Independent Oversight Evaluation of Emergency Management Programs Across the DOE Complex". Included in this report is a critique of the TSD emergency management program. The Office of Oversight noted several "issues" related to TSD, including:

1) "In September 1996, TSD management mandated the removal of radiation monitoring instruments from all convoy shipments ... [s]ome Emergency Action Levels (EALs) require radiation readings.
2) "On November 1996, a TSD Safe Secure Trailer transporting nuclear weapons slid off a road and rolled over near Valentine, Nebraska. According to a Department of Defense Nuclear Command and Control System Support Staff report, almost four hours elapsed before DOE Headquarters was notified, and it was almost 20 hours before a Radiological Assistance Program (RAP) team determined that there had been no radiological release. The report recommended equipping convoys with radiological instruments to provide timely 23
warning of potential personnel hazards.
3) "There is a discrepancy between an Emergency Action Level (EAL) in the TSD Hazards Assessment and the emergency management plan. One specifies an alert, while the other specifies a general emergency for the same conditions.
4) "The document provided to Convoy Commanders to provide initial protective action recommendations for the public include decision paths that cannot be completed due to lack of observable criteria (requires information not directly observable or measurable).
5) "The TSD hazards assessment (May 4, 1994) does not provide an adequate technical basis for ground transportation emergency planning, preparedness and response. No radiological assumptions, models, methodologies or evaluations for TSD convoy event hazards are documented or referenced in the TSD Hazards assessment.
6) "The emergency response organizations, procedures and training for TSD and its contractor, Ross Aviation, do not adequately support accurate and prompt

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MD322–22 **Transportation**

The commentor is correct. All shipments of plutonium and HEU, including new MOX fuel shipments, would be made using DOE's SST/SGT system. LLW and TRU waste would be shipped in commercial trucks, not SST/SGTs.

MD322–23 **Transportation**

DOE's internal and external reviews and assessments are designed to achieve a path of continuous improvement in its transportation and emergency management programs. However, the comments are beyond the scope of this SPD EIS and have been forwarded to DOE's Transportation Safeguards Division for review. DOE is currently analyzing the issues raised in the independent oversight evaluation and will take appropriate action as necessary.

categorization and classification of operational emergencies during transport of nuclear materials or devices." 23

The DEIS discusses "24-hour-a-day real-time communications to monitor the location and status of all SST shipments via DOE'S Security Communications system". For several years, state radiological emergency response organizations, including Georgia's, have had access to the TRANSCOM real-time shipment tracking system. Particularly within the past year, the TRANSCOM system has proven to be unreliable in tracking of domestic and foreign research reactor spent nuclear fuel shipments and Waste Isolation Pilot Plant (WIPP) dry run shipments. It is our understanding that the Transportation and Safeguards Division (TSD) shipments uses the same basic tracking software system, but states will not have access to the tracking information; nor will they have access to advance shipment information which normally precedes highway route controlled quantity (HRCQ) shipments of radioactive materials. 24

The text of the DEIS describes the postulated accident scenarios as "the maximum forseeable offsite transportation accident", while Appendix L describes them as "the most severe accident conditions". We agree with DOE that Accident Severity Category VIII accidents would be considered "worst case" but assuming that such an accident can occur only in a rural setting does not appear to be conservative. For example, we note that "rural" mileage accounts for approximately 78% of the route between Pantex and SRS, while "suburban" mileage accounts for nearly 20% of the route. In the Atlanta metropolitan area, suburban speed limits outside I-285 are generally 65 miles per hour (mph); rural speed limits are 70 mph. Higher traffic volumes within the "suburban" area, and nearly equivalent speeds as in the "rural" area would seem to increase the relative probability of severe vehicle accidents in the "suburban" areas, and such accidents would potentially have far greater consequences than those presented in the DEIS. 25

The discussion of vehicle accidents specifically addresses the potential for a release of plutonium from the transport vehicle, with subsequent inhalation of plutonium by persons nearby. The DEIS however, states on page L-30, that "postaccident mitigative actions are not considered for dispersal accidents. For severe accidents involving the release and dispersal of radioactive materials into the environment, no postaccident mitigative actions, such as interdiction of crops or evacuation of the nearby vicinity, have been considered in this risk assessment."

The DEIS does not present sufficient information related to recovery. In Appendix K, which in general discusses the effects of facility incidents, the DEIS states "the longer-term effects of plutonium deposited on the ground and surface waters after the accident, including the resuspension and inhalation of plutonium and the ingestion of contaminated crops, were not modeled for the SPD (Surplus Plutonium Disposition) EIS. These pathways have been studied and been found not to contribute as significantly to dosage as inhalation, and they are controllable through interdiction". In previous correspondence with DOE in other programs, we have also met with some resistance to discussing the effects of deposited radioactive materials, as these effects 26

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MD322–24 **Transportation**

DOE is working very closely with State and tribal representatives to upgrade the transportation tracking and communication (TRANSCOM) system. The shipment of special nuclear materials using SST/SGTs does not involve the use of TRANSCOM. DOE Order 5610.14, *Transportation Safeguards System Program Operations*, specifically requires independent and redundant communications systems between vehicles in an SST/SGT convoy and with SECOM (a secure communications system operated by DOE). For security reasons, State and tribal representatives are not given access to this system. DOE has a system to liaison with State transportation and safety organizations on SST/SGT shipments.

MD322–25 **Transportation**

The consequences of a Category VIII accident occurring in suburban and urban zones are shown in Tables L–8 and L–9. However, a Category VIII accident in suburban and urban zones would have a frequency of less than 1 in 10 million years and would not be a foreseeable accident. Appendix L was revised to describe the maximum foreseeable offsite transportation accident as occurring in a rural zone. Because the total mileage in urban and suburban zones is much lower than in rural zones, accidents are less likely to occur in urban and suburban zones.

MD322–26 **Transportation**

DOE acknowledges the commentor's concern about transporting surplus plutonium. The subject of emergency response and subsequent cleanup of an accident that involves the release of nuclear materials, both special nuclear material and waste, is a topic of continuing discussion and planning between DOE and State, local, and tribal officials. Several venues, such as DOE's State and Tribal Governments Working Group and the Southern States Energy Board, are being used to facilitate these discussions. DOE's Transportation Safeguards Division has a formal liaison program with the States related to the transportation of special nuclear materials.

No credit was taken for interdiction or other activities that could be taken after a transportation accident involving a radioactive release, so the doses reported in this SPD EIS are considered conservative. As indicated in

Appendix L.8.4, mitigative actions would be taken following such an accident in accordance with EPA guidelines for nuclear accidents. These actions would result in lowering the actual dose to the surrounding population. As with any transportation accident, local, tribal, and State police, fire departments, and rescue squads are the first to respond to accidents involving radioactive materials. DOE maintains eight regional coordinating offices across the country, staffed 24 hours per day, 365 days per year, to offer advice and assistance. Radiological Assistance Program teams are available to provide field monitoring, sampling, decontamination, communication, and other services as requested. Dose to emergency response personnel is accident-specific and can not be globally estimated. Responders are trained to minimize dose.

The RADTRAN computer code evaluates the dose to the public from the resuspension pathway by calculating a resuspension dose factor. The resuspension dose factor takes into account dose from deposited material that is resuspended by various mechanisms such as wind or traffic. The factor is calculated using the methodology developed by NRC in the *Calculation of Reactor Accident Consequences, Appendix VI to the Reactor Study* (WASH-1400, 1975).

Transportation would be required for both the immobilization and MOX approaches to surplus plutonium disposition. Transportation of special nuclear materials, including fresh MOX fuel, would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material Furthermore, as discussed in Appendixes L.3.1.5 and L.3.1.6, DOE would ship all plutonium in Type B containers which must satisfy stringent testing criteria specified in 10 CFR 71, *Packaging and Transportation of Radioactive Materials*. The testing criteria were developed to simulate severe accident conditions, including impact, puncture, fire, and water immersion.

were seen as being more "environmental" than "emergency response".

In order to plan for, equip themselves to deal with, and train their response personnel for dealing with a transportation incident involving plutonium, state and local officials need information regarding both immediate protective measures, and also information related to post-emergency issues such as resuspension and relocation of deposited radioactive materials. For example, regarding vehicular disturbances, Sehmel (1975) has examined the importance of auto and truck traffic in the increasing of resuspension. It was concluded that such disturbance, in the case of an asphalt surface with newly deposited material, will lead to increased resuspension, with a fraction resuspended of the order of 10-5 to 10-2 per vehicle passage. The higher rates occurred at speeds typical of freeway driving. After passage of about 100 cars only a small fraction of the original contamination remained on the road surface. Unless emergency officials promptly close the accident scene to vehicle traffic (an unlikely situation), emergency responders may face an incident scene that is, unknown to them, extremely hazardous due to respirable plutonium. Post-emergency actions may also be complicated due to the enhanced spread of contamination by vehicle traffic. It is worthy of note here that the DEIS presents no information regarding potential radiation doses to response personnel. 26

Public acceptance of transportation of plutonium (Pu) in the U.S. is not a given. The true risk posed by transportation of plutonium may indeed be very small, but it is not zero, and public perception regarding these risks, and public acceptance of them, is critical to the success of this program. The existence of knowledgeable emergency response personnel at the state and local level, armed with both the training and equipment which would be required to respond to a transportation incident involving plutonium is a critical component in obtaining this public acceptance.

Utilization of Mixed Oxide (MOX) Fuel
There is a major unresolved question regarding the DOE decision to build a MOX fuel fabrication facility. The answer lies with the existing 41 operating commercial nuclear utilities in the United States that DOE expects o use the MOX fuel. There is the potential need for core redesign and other stability and power dynamic provisions imposed on the utility industry. This raises the issue of whether or not rate schedules will absorb the inherent cost of conversion. This may shift the decision away from inclusion of plutonium in MOX fuel and toward the placement of surplus weapons useable plutonium directly into geologic disposal (expected to be located at Yucca Mountain). 27

Decommissioning and Decontamination of Plutonium Facilities
There is not enough attention given to the end of the plutonium fuel cycle missions in the Draft EIS. Conceptual designs should be provided indicating where decommissioning and disposal (Dad D) considerations have been a driving force in the technology development, fabrication, and operational readiness for chemical and 28

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MD322–27 **MOX Approach**

Section 4.28 was revised to discuss the potential environmental impacts of operating the reactors that would use MOX fuel. Commercial reactors in the United States are capable of safely using MOX fuel. Modifications would need to be made to the fuel assemblies that would be placed in the reactor vessel to support the use of MOX fuel, but the dimensions of the assemblies would not change. DOE has used selection criteria in the procurement process which ensure that the domestic, commercial reactors chosen would be capable of safely and successfully completing the surplus plutonium disposition program. In addition, NRC would evaluate license amendment applications and monitor the operation of the proposed reactors selected to use MOX fuel. After irradiation is complete, the spent fuel would be stored on the site pending eventual disposal pursuant to the NWPA.

The provisions of the DOE contract with DCS to use the Catawba, McGuire, and North Anna reactors would not result in additional cost to the electricity customer.

MD322–28 **General SPD EIS and NEPA Process**

As described in Section 4.31, features are being incorporated into the designs that would allow future deactivation and stabilization activities to be performed more quickly and easily to reduce the risk of radiological exposure, reduce the costs associated with long-term maintenance, and prepare the buildings for potential future use. Whether DOE would reuse or D&D the facilities following surplus plutonium disposition cannot be determined at this time. DOE will perform engineering evaluations, environmental studies, and further NEPA review to assess the consequences of different courses of action.

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nuclear material. There is inadequate assurance that the consideration of risk trade offs in reducing and separating risks, along with well-intended costly measures, will deliver, the expected protection of the environment, safety, and health (i.e., the cumulative risk of 50 tons of plutonium immobilization with that of up to 33 tons of plutonium in MOX fuel). DOE's historical approach to evaluating D&D options or the reuse of the facilities only at the end of the useful life of plutonium facilities is unacceptable and serves to detract from the true cost of the front end decisions for facility siting and construction. 28

Chemical Form and Safety

There are concerns about the final chemical and physical form of Plutonium Oxide in the proposed immobilization process. DOE should indicate what technical analyses have been provided to show that plutonium will be uniformly dispersed and subcritical, with no hot spots, eutectics, heat transfer peaks and with acceptable geometric configuration. It is interesting to note that DOE did use values for the airborne release fraction of up to 0.1 and respirable fractions of up to 1.0 for some of the severe accident scenarios; however, DOE failed to include justification for their use of these values for airborne release fraction, respirable fractions, leak path factor, and material at risk. 29

Malevolent Acts

Several of the facility incidents discussed in Appendix K of the DEIS, particularly those events for which the initiating event is an "operator error", could also be intentionally initiated by an operator with malicious intent (an informed insider). It is unclear that the analyses presented in this DEIS consider malicious intent as an incident initiator. A knowledgeable operator with malicious intent could disable or bypass systems which normally would be used to detect or mitigate an incident.

The transportation section of the DEIS, Appendix L, dismisses the possibility of malevolent acts with these words – "[i]n no instance, even in severe cases such as discussed below, could a nuclear explosion or permanent contamination of the environment leading to condemnation of land occur. ... [s]uch attacks would be unlikely to occur ... [o]ther materials, including uranium hexafluoride, uranium oxide, TRU waste and LLW, are commonly shipped, and to not represent particularly attractive targets for sabotage or terrorist attacks". 30

We disagree with the conclusions drawn in this section of the EIS, and request that DOE perform calculations of the consequences of incidents initiated by malevolent acts, including transportation incidents. Results of these analyses should be classified as appropriate, as recommended by DOE Order 151.1, and incorporated into both this EIS and the Emergency Preparedness Hazard Assessment (EPHA) documents for both TSD and the plutonium facilities.

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MD322–29 **Immobilization**

Numerous R&D studies of the immobilized plutonium forms have been conducted by DOE and the national laboratories, in part to ensure that all environmental health and safety requirements are met. Several technical studies continue. For enhanced readability of this SPD EIS, supporting documentation and detailed analyses of the chemical, physical, and nuclear properties of the immobilized forms were published separately. Information on specific technical aspects of the immobilized forms can be found in the following documents: (1) the immobilization data reports published in conjunction with this SPD EIS; (2) *Report on Evaluation of Plutonium Waste Forms for Repository Disposal* (DI: A-00000000-01717-5705-00009, Rev. 00A, March 1996); (3) *Immobilization Technology Down-Selection Radiation Barrier Approach* (UCRL-ID-127320, May 1997); and (4) *Fissile Material Disposition Program Final Immobilization Form Assessment and Recommendation* (UCRL-ID-128705, October 1997). These documents are available to the public at DOE sites and regional reading rooms; the latter two are also available on the MD Web site at http://www.doe-md.com.

The airborne release fractions/rates and respirable fractions used in this SPD EIS for accident analysis are consistent with those stated in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities.* Appendix K contains scenario-specific summaries detailing the material at risk, damage ratios, airborne release fractions, respirable fractions, and leakpath factors used in the analysis of facility accidents. Additional information supporting values of material at risk, damage ratio, and leakpath factor can be found in the data reports referenced in Appendix K.

MD322–30 **Facility Accidents**

Sabotage scenarios are considered conjecture and not reasonably foreseeable. Although they were excluded from this SPD EIS, the results of such sabotage (including sabotage by an "insider" and transportation incidents) would be bounded by the accidents presented in Appendixes K and L. The possibility of sabotage would be controlled through the safeguards and security provisions including security requirements associated with facility workers.

The proposed surplus plutonium disposition facilities would be designed and operated in accordance with DOE Orders 470.1, *Safeguards and Security Program* and 151.1, *Comprehensive Emergency Management System*. The MOX facility and proposed reactors that would use the MOX fuel would be subject to similar NRC requirements.

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Specific Comments Related to
Surplus Plutonium Disposition Draft Environmental Impact Statement (DEIS)
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Pg 1-2 What is DOE's rationale for the alternative of converting 33t of surplus plutonium to MOX fuel? Is there a useful energy recovery goal for the surplus plutonium? 31

Pg 1-3 Why does DOE not further discuss the ultimate D&D of the three types of facilities? DOE has a vast experience of the technology and operation of Pu production facilities. 32

Pg 1-5 When will DOE provide the separate cost study (DOE 1998a) that should be analyzed along with this SPD EIS. 33

Pg 1-5 What will be the cost to the utilities and rate payers for MOX fuel utiliz ɔn? Will it be similar to spent fuel charges under the NWPA provisions? Are all of the process development costs for MOX fuel a responsibility of DOE? 34

Pg 1-8 Why is the lack of homogeneity in less favor than the mobilization and vitrification in the ceramic can-in-canister approach? Has the criticality and heat transfer impacts been fully evaluated? 35

Pg 1-9 Why hasn't the Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities Report (DOE 1998b) not accompany this SPD EIS? 36

Pg 1-9 Why does the ceramic can-in canister approach provide greater proliferation resistance than the glass can-in-canister approach? What lesser environmental impacts justify the ceramic over the glass can-in-canister approach? 37

Pg 1-9 DOE states that Hanford's cleanup mission is the site's top priority. Does SRS not have the same top priority of weapons site remedial site cleanup? 38

Pg 1-10 Why does the postirradiation examination of the MOX lead test assemblies not be a most desired requirement? This examination is most important in the determination of fuel defects, contamination, neutron absorber capability, hydrogen embrittlement and lastly physical characteristics of creep and swelling of the fuel material. 39

Pg 1-11 Will the pit conversion facility commence about 2001 before final evaluation is completed of the DOE/EA-1207 which intended to last up to four years? 40

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MD322–31 **MOX Approach**

Under the hybrid alternatives analyzed, up to 33 t (36 tons) of surplus plutonium would be made into MOX fuel. DOE reviewed the chemical and isotopic composition of the surplus plutonium and determined in the *Storage and Disposition PEIS* ROD that about 8 t (9 tons) of surplus plutonium were not suitable for use in making MOX fuel. Furthermore, DOE has identified an additional 9 t (10 tons) for a total of 17 t (19 tons) that have such a variety of chemical and isotopic compositions that it is more reasonable to immobilize these materials and avert the processing complexity that would be added if these materials were made into MOX fuel. The criteria used in this identification included the level of impurities, processing requirements, and the ability to meet the MOX fuel specifications. If at any time it were determined that any of the 33 t (36 tons) currently proposed for MOX fuel fabrication was unsuitable, that portion would be sent to the immobilization facility. While there is a benefit gained from the use of this MOX fuel in domestic, commercial reactors, the goal of the surplus plutonium disposition program is not energy recovery, but instead disposition of the plutonium in a safe, timely, and cost-effective manner.

MD322–32 **General SPD EIS and NEPA Process**

This comment is addressed in response MD322–28.

MD322–33 **Cost**

The cost analysis report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009), was issued in July 1998. Another report, the *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013) was issued in November 1999. These reports are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

MD322–34 **MOX Approach**

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

The utilities will continue to pay the standard surcharge per kilowatt-hour of electricity used for spent fuel under the NWPA, as amended, regardless of whether the spent fuel is from commercial MOX fuel or LEU fuel. There are no known process development costs for MOX fuel.

MD322–35 **Immobilization**

The immobilization analysis included in the *Storage and Disposition PEIS* focused on the use of technologies that would blend the surplus plutonium directly with either HLW glass or ceramic in a homogenous mixture. Based on public comments on the *Storage and Disposition PEIS* and technology developments, DOE accelerated research, development, and testing of various aspects of the can-in-canister approach to establish the optimum plutonium concentration and chemical composition of a form that could be readily processed, satisfy nonproliferation concerns, and perform well after emplacement in a potential geologic repository. Included in these efforts were evaluations of criticality and heat transfer issues in addition to those that had been conducted for the homogenous forms. In the *Immobilization Technology Down-Selection Radiation Barrier Approach* (UCRL-ID-127320, May 1997), LLNL recommended that DOE pursue only the can-in-canister immobilization approach based upon its superiority to the homogenous approaches in terms of timeliness, higher technical viability, lower costs, and to a lesser extent, lower environmental and health risks. Based on further recommendations from a committee of experts representing DOE, the national laboratories, and outside reviewers, DOE subsequently determined that immobilizing surplus plutonium materials would be best accomplished using the ceramic process. NAS is also currently studying the ability of the immobilization approach to meet the Spent Fuel Standard, including the heat transfer impacts of this approach.

MD322–36 **Pit Demonstration EA**

There is no need for the *Pit Disassembly and Conversion Demonstration EA* (DOE/EIS-1207, August 1998) and its FONSI (August 1998) to accompany this SPD EIS because the environmental impacts of the pit demonstration will not affect the cumulative impacts of dispositioning surplus plutonium. This EA is referenced in this EIS for the purpose of keeping the decisionmaker and the public fully informed about all aspects of the surplus plutonium disposition program.

MD322–37 **Immobilization**

This SPD EIS considers the immobilization of surplus weapons-usable plutonium in two forms, ceramic and glass; both would be produced using similar processes based on a can-in-canister approach. Past analyses have indicated that both ceramic and glass would be acceptable for immobilizing surplus plutonium. Recently, DOE completed a series of evaluations to determine whether the properties associated with ceramic or glass would be better suited for immobilizing plutonium (*Fissile Material Disposition Program Final Immobilization Form Assessment and Recommendation* [UCRL-ID-128705, October 1997]). These studies indicated that the use of ceramic would be more resistant to the threat of theft, diversion, or reuse, due to the greater difficulty associated with trying to chemically extract and separate plutonium from the ceramic form than is required for the glass form. The studies also found that ceramic form would likely be more durable over a longer period of time under geologic repository conditions, would require less shielding to protect workers, and would potentially provide significant cost savings. Only minor differences between the two forms are expected in terms of potential environmental impacts, as described in Section 4.29. Whereas the ceramic form would result in slightly higher potential offsite radiological exposures from normal operations, facility accident impacts, and water and electricity requirements, the glass form would result in higher routine and accidental transportation impacts. Overall radiological exposure to workers, as well as anticipated waste types and volumes, would not be expected to differ appreciably between the two forms.

MD322–38 **Alternatives**

DOE believes that Hanford's efforts should remain focused on its current high-priority cleanup mission. The importance of cleanup at Hanford was taken into consideration in identifying preferred sites for surplus plutonium disposition activities; however, no decision has been made. While it is true that SRS also has cleanup activities underway, SRS is preferred for the proposed facilities because the site has extensive experience with plutonium processing, and these facilities complement existing missions and take advantage of existing infrastructure.

MD322–39 **Lead Assemblies**

At the time the SPD Draft EIS was issued, the DOE procurement process to acquire MOX fuel fabrication and reactor irradiation services was not completed. DOE was unsure whether the team that would be selected would be able to use its existing knowledge to determine MOX fuel performance, or if the team would require lead assembly testing to ascertain fuel performance. In consultation with DCS, the team selected during the procurement process, DOE believes that limited lead assembly fabrication and postirradiation examination will be required.

MD322–40 **Pit Demonstration EA**

Should DOE decide to build a pit conversion facility, this facility would begin operating about 2004 by which time the pit disassembly and conversion demonstration would be completed. Facility design, however, would take place during approximately 1999 through 2001. While the pit demonstration would continue for up to 4 years, the information from the demonstration would be generated, gathered, and available on an ongoing basis. This means that information transfer regarding the fine-tuning of the operational parameters of a pit conversion facility could be provided on a continuous basis throughout the facility design phase. Also, because the information from the demonstration would be used to supplement other information developed to support the design of a pit conversion facility, it would not be necessary for the demonstration to be completed before beginning facility design and construction.

GEORGIA DEPARTMENT OF NATURAL RESOURCES
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Pg 1-12	Is D and D a major category in the direction of DOE's blueprint for waste cleanup (DOE/EM-0342) ? To what extent does this SPD reflect the implications of waste management and environmental restoration in the paths to closure document?	41
Pg 1-14	The SRS Actinide Packaging and Storage Facility is a planned facility, not in operation at this time according to DOE. What is the specific relationship between this planned facility at SRS and SPD? Special concerns relating to the environmental impacts for stabilization of the neptunium-237 aqueous solutions is required.	42
Pg 1-15	Has DOE completed further study and evaluation for safety and final thermal loading for the HLW canisters, using the criterion (ie, surrounding radiation barrier for immobilized plutonium)?	43
Pg 2-8	DOE needs to indicate the potential environmental impacts of the ceramic and glass can-in-canister technologies based on generic designs and compare to those impacts of the homogeneous facilities. DOE needs to evaluate the conceptual design and modifications required by full operational readiness of these facilities. The (DOE 1996a) Storage and Disposition Final PEIS is not adequate in present form for SPD facilities siting.	44
Pg 2-10	DOE's development of alternatives should clearly state that useful fissile material energy resource is either to be immobilized and buried as long-term HLW in geologic repository or that a portion of the surplus plutonium is to be utilized as MOX fuel for commercial LWRs.	45
Pg 2-12	DOE Feed Preparation Methods for immobilization is considering a major change from the wet-feed preparation process (aqueous processing) to a dry-feed process. It is stated that the dry-feed process requires less quantity of water and generates less amounts of waste, and has been chosen for use in this SPD EIS. This decision based on actinide removal from waste streams needs further evaluation primarily based on the long experience and operations for aqueous processing.	46
Pg 2-13	DOE needs to state clearly that for plutonium processing and storage considered in this SPD EIS, material unaccounted for (MUF) will not be allowed for the special nuclear material. The accountability must satisfy the proliferation concerns and inspections of IAEA.	47
Pg 2-13	DOE needs to further evaluate to determine if the Pit Disassembly and Conversion is adequate for the removal of gallium. The fuel poison will result in impurity in plutonium dioxide feed for MOX fuel fabrication. This	48

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MD322–41 **Waste Management**

Comments on the draft and final *Accelerating Cleanup: Paths to Closure* documents (DOE/EM-0342, February 1998 and DOE/EM-0362, June 1998) are beyond the scope of this SPD EIS, although Section 1.8.2 of this SPD EIS describes the relationship between this EIS and those documents. Section 1.8.2 states that this EIS reflects the proposals in *Accelerating Cleanup: Paths to Closure*, to the extent possible, and that subsequent versions of that document will reflect the waste management and environmental restoration implications of the decisions made as a result of this EIS.

MD322–42 **Waste Management**

DOE has recently decided to delay the construction of APSF, and the *Supplement to the SPD Draft EIS* reflects modifications to disregard any benefit to the proposed facilities of APSF being built at SRS. Stabilization of neptunium 237 solutions would not occur within APSF, if built, and this process is not required to support the disposition of surplus plutonium.

MD322–43 **Immobilization**

This comment is addressed in responses MD322–35 and MD322–37.

MD322–44 **Immobilization**

DOE believes the analyses presented are adequate to support the decisions being addressed in this SPD EIS, including the facilities' siting. As a means of bounding the estimate of potential environmental impacts of the immobilization approaches to surplus plutonium disposition, the *Storage and Disposition PEIS* analyzed in detail the construction and operation of generic homogeneous ceramic immobilization and vitrification facilities. Although generic designs were the focus of the study, these designs were analyzed against parameters specific to each of the candidate sites to determine potential site-specific environmental impacts. Several variant immobilization technologies were also discussed in the *Storage and Disposition PEIS*. The subsequent ROD for that EIS states that DOE would make a determination on the specific technology on the basis of "the follow-on EIS" (this SPD EIS). In the tiered SPD EIS, the can-in-canister approach was identified as the preferred immobilization technology and evaluated in detail as part of each alternative. As a basis for evaluating the alternative immobilization technologies and forms presented in the two documents, the environmental impacts associated with operating the ceramic and glass can-in-canister immobilization facilities evaluated in this SPD EIS were compared with the impacts associated with operating the homogenous ceramic immobilization and vitrification facilities evaluated in the *Storage and Disposition PEIS*. This comparison is presented in Section 4.29.

MD322–45 Alternatives

In Volume I, Chapter 1 discusses the purpose of the proposed action and Chapter 2 describes the development of the alternatives.

MD322–46 Plutonium Polishing and Aqueous Processing

DOE does not agree that aqueous processing for immobilization feed preparation requires further evaluation in this SPD EIS. In addition to higher water consumption and waste generation cited as examples in this EIS, the aqueous process would also present a higher potential for worker exposure to radioactive materials and greater risk to the public. An aqueous process for the conversion of plutonium for immobilization would also require much more control to provide adequate protection against proliferation and to provide for proper oversight by IAEA. Therefore, aqueous processing/wet feed for immobilization is not a reasonable alternative.

MD322–47 Nonproliferation

Security for the proposed surplus plutonium disposition facilities would be implemented commensurate with the usability of the special nuclear material in a nuclear weapon or improvised nuclear device. At any time, the total amount of special nuclear material in each facility, or in any material balance area within each facility, would be known and so material unaccounted for would be avoided. Physical inventories, measurements, and inspections of material both in process and in storage would be used to verify inventory records. In addition, each of the proposed facilities includes design requirements for space, and to varying degrees, access for an international body to verify compliance with international nonproliferation policies.

However, the actual implementation process for ensuring international safeguards of the Russian and U.S. material is not as yet fully defined. That process is part of ongoing sensitive negotiations between the two countries. Under the details of those negotiations, the verification process for compliance of the proposed facilities with international nonproliferation policy could be conducted by a bilateral arrangement that includes access to the proposed facilities only by members of the U.S. and Russian governments, or it could include access to the facilities by an international body, such as IAEA.

MD322–48 **Plutonium Polishing and Aqueous Processing**

On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity removal from the plutonium dioxide. Appendix N was deleted from the SPD Final EIS, and the impacts discussed therein were added to the impacts sections presented for the MOX facility in Chapter 4 of Volume I. Section 2.18.3 was also revised to include the impacts associated with plutonium polishing.

is a major problem and may require a separate Plutonium Polishing Process. DOE has not made a decision on the Plutonium Polishing Process or whether, if needed, it would be placed in the facilities for Pit Conversion or at the MOX fuel fabrication facilities. Gallium contamination, like other neutron absorbing poisons, is a major concern in MOX fuel fabrication. 48

Pg 2-23 DOE needs to develop accident scenarios for the case of HEPA filter failure. The occurrence will not provide the DF of 10-4 that is required for 99.99% particle removal as small as 0.3 micron in a flowing airstream. DOE has postulated a LPF value of 1.0X10-5 for two HEPA filters. This is an operational problem and if sand filters are not used in conjunction, will the HEPA filter provide an LPF of 1X10-5 and will not be maintained. 49

Pg 2-23 DOE needs to clearly state that SRS has the edge over other facilities by providing the least transportation impacts and necessary experience in plutonium production. 50

Pg 2-27 DOE needs to clearly state the time schedules for construction and operation of the MOX Facility Description. Depending upon DOE's decision on immobilization of surplus plutonium, the DOE decision on MOX fuel fabrication depends on a number of other considerations (ie, lead test assemblies, utility acceptance, etc.). The tiered approach of SPD EIS is barely appropriate for siting of MOX fuel fabrication when so many other variants exist. 51

Pg 2-30 It is vital that a homogeneous mixture exists in the mixed oxide (ie, blending and milling the PuO2) to achieve the required enrichment and isotopic concentration of the uranium and plutonium powders and to adjust the particle size of the MOX powder. The determination of accurate particle size of the MOX fuel is a most important factor in estimation of severity of facility accidents. 52

Pg 2-32 DOE notes that the dose from pit-handling activities at Pantex could be reduced by 40% because the majority of pits are already in storage at Pantex. 53

Pg 2-56 DOE needs to determine if the time schedules, reduced cost, infrastructure and other advantages of using the 44-year-old contaminated and aging F-canyon Bldg 221-F outweighs the new building construction at SRS. It is also noted that use of Bldg. 221-F would result in about 0.5 LCF for a designed basis earthquake at SRS. 17

Pg 2-98 DOE needs to stress what is the meaning of site limit 10 mrem/year from all facility sources. This is the annual effective dose equivalent to the MEI 54

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MD322–49 **Facility Accidents**

The assumed leakpath factor of 1.0×10^{-5} for operational HEPA filters is achievable and conservative. However, this SPD EIS also analyzed a number of accidents that involve various degrees of containment failure, including HEPA filter failures. Two of the most significant are the beyond-design-basis seismic event and the beyond-design-basis fire. Details on these and other scenarios are provided in Appendix K and the Facility Accident sections in Chapter 4 of Volume I. None of the proposed surplus plutonium disposition facilities are planning to use a sand filter, so credit has not been taken for that in the accident analysis.

MD322–50 **Alternatives**

In Volume I, transportation impacts at SRS are summarized in Chapter 4 and described in Appendix L. Infrastructure is also discussed in Chapter 4. As indicated in Chapter 1 of Volume I, the existing infrastructure at SRS is one of the reasons SRS was chosen as the preferred site for the proposed surplus plutonium disposition facilities. As indicated in Section 2.18, no traffic fatalities from nonradiological accidents or LCFs from radiological exposures or vehicle emissions are expected.

MD322–51 **Purpose and Need**

Appendix E includes schedules for each of the three proposed surplus plutonium disposition facilities and the lead assembly facility. This SPD EIS is tiered from the *Storage and Disposition PEIS* because the latter evaluated the disposition of weapons-usable fissile materials at a programmatic level. DOE committed in the ROD on the *Storage and Disposition PEIS* to do follow-on, site-specific NEPA analyses to determine the exact locations for the disposition facilities. The *Storage and Disposition PEIS* considered a broad range of technology options and candidate sites for the disposition of surplus plutonium, and the ROD narrowed the options to those evaluated in the SPD EIS.

The MOX approach includes the testing of up to 10 lead assemblies. However, the facilities where these assemblies would be built and tested already exist and can be quickly modified to support the MOX approach. Utility acceptance has already been addressed with the award of a contract to DCS and the proposal to use the Catawba, McGuire, and North Anna commercial reactors with partial MOX cores.

MD322–52 **Facility Accidents**

DOE agrees that accurate particle size of the MOX fuel is an important factor in estimation of severity of facility accidents. The issue of MOX powder particle size was considered in the course of analysis for this SPD EIS as documented in the memorandum, *Particle Size of PuO_2 Generated by HYDOX-Ga Removal Process and Impact on Usability of DOE-HDBK-3010-94 ARF and RF Values* (personal communication from J. Mishima to J. Eichner, Science Applications International Corporation, December 15, 1997). The conclusion was that the values in DOE-HDBK-3010-94 were conservative and appropriate for use in the SPD EIS analysis. This is discussed in Appendix K.1.5.1.

MD322–53 **Human Health Risk**

Decisions on the repackaging of pits at Pantex have been revisited since the SPD Draft EIS was published. Section 2.18 and Appendix L.5.1 were revised to incorporate a modified transportation dose analysis. If the pit conversion facility is located at Pantex, the dose associated with repackaging the pits for shipment off the site could be avoided, thus eliminating approximately 10 person-rem/yr in worker exposure.

MD322–54 **Human Health Risk**

In the Human Health Risk portions of Section 4.32, the 10-mrem/yr limit is described in detail. It is stated that there is a 10-mrem/yr NESHAP dose limit from total site airborne emissions, as required by the Clean Air Act regulations and DOE Order 5400.5, *Radiation Protection of the Public and the Environment.*

at the site boundary. This places a limit on the lifetime risk for maximally exposed individuals and average individuals in large population groups. 54

Pg 2-99 This is not one of DOE's best examples of commitment for removing spent fuel from the utility storage by January 1998. 55

Pg 2-102 With the exception of sulfur dioxide in the ceramic can-in-canister process all criteria pollutant emissions associated with either can-in-canister technology is within limits. If DOE determines that if scrubbers for the sulfur dioxide are required in the conceptual design, it should be clearly stated. 56

Pg 3-142 The radiation doses to workers from normal SRS operation in 1996 yields a total effective dose equivalent of 19 mrem for the average radiation worker from on-site releases and direct radiation. This same value of 19 mrem is shown for the Hanford workers in 1996; however, a lower person-rem does of 237 for SRS vs 266 for Hanford. 57

Pg 3-152 It is noted that DOE must exhibit constant attention and vigilance to reduce off-site liquid pathway radionuclide contamination. There is widespread contamination on-site at SRS. 58

Pg K-1 If the frequency of the initiating event is known, then the point estimate of increased risk of LCF per year may be helpful in understanding individual risk instead of population risk.

Pg K-1 One type of risk, average individual risk is the product of the total consequence (if known) experienced by the population and the accident frequency, divided by the population. 59

Pg K-2 It is noted that the MACCS2 accident model code is capable of calculating individual consequences at the point of maximum consequences but it is not configured to calculate individual risk at the point of maximum risk.

Pg K-5 It is noted that the accident factors for source term (ie, MAR, DR, ARF, RF and LPF) as indicated by DOE Handbook 3010-94 is questioned. DOE needs to justify the use of these factors in realistic accident scenarios. If the value of each of these factors depends on the details of the specific accident scenario postulated, then that detail must be provided to compare accident risk. Otherwise, the factors are judged to provide source term reduction without justification. 60

It is most appropriate to use realistic model input parameters; conservative parameters should be used only to the extent necessary to compensate for uncertainties.

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MD322–55 **Waste Management**

Section 4.28 was revised to discuss the potential environmental impacts of operating the reactors that would use the MOX fuel. As described in Sections 2.18.3 and 4.28.2.8, additional spent fuel would be produced by using MOX fuel instead of LEU fuel in domestic, commercial reactors. Spent fuel management at the proposed reactor sites is not expected to change dramatically due to the substitution of MOX assemblies for some of the LEU assemblies. Likewise, the additional spent fuel would be a very small fraction of the total that would be managed at the potential geologic repository. Issues related to a potential geologic repository for HLW and spent nuclear fuel are beyond the scope of this SPD EIS, but are being evaluated in the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999).

MD322–56 **Air Quality and Noise**

The sulfur dioxide emissions for the ceramic can-in-canister process are within limits as shown in the immobilization sections of Appendix G (e.g., Table G–9).

MD322–57 **Human Health Risk**

The reason for the difference in total number of person-rem between the two sites is due to the different number of workers at SRS and Hanford. Total workforce dose (in units of person-rem) is calculated by multiplying the average worker dose by the number of workers at a given site. Thus, for SRS, 19 mrem multiplied by 12,500 workers yields 237 person-rem (237,000 person-mrem). At Hanford, 19 mrem multiplied by 14,000 workers yields 266 person-rem (266,000 person-mrem).

MD322–58 **Water Resources**

DOE acknowledges the commentor's concerns regarding contamination at SRS. Although beyond the scope of this SPD EIS, activities to remediate existing contamination at SRS are ongoing. In addition, SRS maintains an aggressive waste minimization and pollution prevention program as described in Section 3.5.2.7. Analyses presented in Section 4.26.4.2 indicate that there would be no discernible impacts to groundwater or surface water quality at SRS from construction and normal operation of the proposed surplus plutonium disposition facilities. If all the proposed facilities were located at SRS, a very small incremental annual dose to the surrounding public from normal operations would result via radiological emission deposition on agricultural products, fisheries, and water sources (i.e., the Savannah River). This dose (about 1.6 person-rem/yr) would be 0.0007 percent of the radiation dose that would be incurred annually from natural background radiation. It has also been estimated that a small fraction of this dose (about 0.10 person-rem/yr) would be specifically due to the consumption of aquatic biota (fish or crustaceans) and drinking water (i.e., from the Savannah River) from minute quantities of air deposition and/or from any potential wastewater releases. This estimation is based on historical characteristics associated with F-Area releases to Savannah River outfalls. Nevertheless, public doses incurred from the uptake of these sources were determined to be well below Federal, State, and local regulatory limits.

MD322–59 **Facility Accidents**

Appendix K.1.1.2, Uncertainties and Conservatism, presents the rationale for preserving the consequences and frequency metrics as the primary accident analysis results, as opposed to risk metrics. However, to assist the interested reader in using the results to calculate average individual risks, the discussion of risk measures was revised to include reference to population figures, which are needed for calculating average individual risk for those living within 80 km (50 mi) of the site. As discussed in Appendix K.1.1.1, average individual risk is sensitive to the choice of the population that is included in the calculation, so care must be taken when interpreting such results.

MD322–60 **Facility Accidents**

DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, is the accepted standard for determining ARF and RF values. The values specified in that handbook are phenomenology dependent. Application of the values to a specific accident scenario requires characterization of the phenomena associated with that accident and matching of those phenomena with like phenomena in the handbook. Where phenomena do not match exactly, scaling of values may be needed to better characterize the accident. Chapter 7 of the handbook contains application examples that can be reviewed to clarify the appropriate use of the values. The recommended values in the handbook are bounding, which adds an element of conservatism to any analysis in which they are used but they are also considered realistic for analysis in this SPD EIS. MAR, DR, and LPF factors are developed purely in the context of the analyzed accidents and do not originate from DOE-HDBK-3010-94. Appendix K.1.5 provides information on the specific accident scenarios postulated. Further details are provided in the referenced data reports which are available in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

Pg K-12 For an aircraft crash scenario, the DOE Handbook 3010-94 recommends values for debris impact in powder and recommends bounding ARF and RF values of 1X10-2 and 0.2 respectively. However, DOE attempts to justify use of a value of 3X10-2 for RF and a value of 1X10-2 for ARF corresponding to a decreased source term of 104g for the MOX facility and 18g for pit conversion facility accident. 61

Pg K-22 It is interesting to note that for an explosion in sintering furnace a bounding ARF of 0.01 and RF of 1.0 is assumed and based on an LPF of 1x10-5 for two HEPA filters, a stack release of 5.6X10-4 g of Pu-239 (in the form of MOX powder) is postulated. 62

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MD322–61 **Facility Accidents**

While, from a risk standpoint, the use of an arithmetic average RF is appropriate, the use of this method is inconsistent with the use of bounding values from DOE-HDBK-3010-94 for other accidents. Appendix K.1.5 was revised to use a respirable fraction of 0.2 and an airborne release fraction of 1.0×10^{-2} for aircraft debris impact into plutonium dioxide powder.

MD322–62 **Facility Accidents**

DOE acknowledges the comment.

Georgia Department of Natural Resources
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205 Butler St. S.E., East Floyd Tower, Atlanta, Georgia 30334
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September 21, 1998

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

Dear Sir or Madam:

The Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR) is pleased to provide the following comments on the "Surplus Plutonium Disposition Draft Environmental Impact Statement", DOE/EIS-0283-D. Attached you will find a discussion of issues related to the draft EIS that we feel are significant, as well as detailed page-by-page comments.

Thank you for the opportunity to comment on this document.

Sincerely,

James L. Setser, Chief
Program Coordination Branch

JLS:lm
Attachment

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MD322

**Georgia Environmental Protection Division
Issues Related to
Surplus Plutonium Disposition Draft Environmental Impact Statement (DEIS)
DOE/EIS-0283-D**

Use of Existing Facilities at Savannah River Site (SRS)

Many of the SRS alternatives involve utilization of the ageing facilities at SRS. Some of these facilities, particularly the F and H Canyons, have been in operation for more than 45 years. The risk of design-based accidents and the potential that a severe earthquake or other natural disaster such as a severe tornado could occur are of vital concern for the utilization of these facilities. Whereas new nuclear facilities are constructed to seismically withstand the forces of such natural disasters (i.e., 0.2g for a design-basis earthquake), the older facilities are not constructed according to these standards. The magnitude of such an earthquake would be expected to cause severe structural damage that could lead to partial structure collapse and unmitigated releases of radioactive and hazardous material to the environment. 1

Scheduling

The technology for immobilization of plutonium at SRS is unrealistic from a time schedule viewpoint. The purpose of the current Defense Waste Processing Facility (DWPF) at SRS is to convert the high level wastes in the tank farm to a borosilicate glass form which will be shipped to a National Repository when one becomes available. Because of DOE's failure to successfully conduct In Tank Precipitation (ITF) an ion-exchange system is being considered. If implemented, this system is expected to cost $500 million and require between 6 and 14 years to implement. The ITF was initially completed in 1988 at a cost of $32 million and now, more than $500 million in estimated costs have been incurred and the facility is not operational. While DOE's expectations that all high level waste tanks be emptied and completely processed by 2020, the modifications to the DWPF and related operations for plutonium immobilization at SRS will most likely cause even further delay in processing the existing 32 million gallons of high level waste. This further delay raises the question of an increased risk to public health and safety due to a failure of the old carbon steel tanks that contain the high level radioactive waste. 2

Proximity of Plutonium Processing Facilities

The separation of an MOX fuel fabrication facility from the pit conversion facility (i.e., pit conversion at Pantex and MOX facility at SRS) could lead to significant control problems related to gallium contamination in the MOX fuel fabrication process. Because hafnium and gadolinium are both neutron absorber poisons that will contaminate the MOX fuel, in a manner similar to the requirement for Hafnium removal in reactor grade zircaloy for commercial LWR's, a polishing process has to be put in place to get rid of the gadolinium. This polishing process needs to be employed at the pit conversion facility if new construction is envisioned because this contamination in the MOX fuel fabrication facility is extremely difficult to control. 3

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MD322–1 **Human Health Risk**

As explained in the *Supplement to the SPD Draft EIS*, DOE has eliminated as unreasonable the eight alternatives in the SPD Draft EIS that would involve use of portions of Building 221–F with a new annex at SRS for plutonium conversion and immobilization. It was determined that the amount of space required for the immobilization facility would be significantly larger than originally planned. These new space requirements mean that the annex to be built alongside Building 221–F would be very close in size and environmental impacts to the new immobilization facility alternatives at SRS. Therefore, this SPD EIS only presents the alternatives involving a completely new immobilization facility at SRS.

MD322–2 **Immobilization**

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

GEORGIA DEPARTMENT OF NATURAL RESOURCES
JAMES L. SETSER

MD322–3 Plutonium Polishing and Aqueous Processing

Pit disassembly and conversion is a common technology required for implementation of both the hybrid alternatives and the immobilization-only alternatives. The plutonium dioxide produced by the pit conversion facility can be used for either the immobilization or MOX approach. Neither gadolinium nor hafnium is present in pit plutonium metal in concentrations of concern for MOX fuel production. On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity (e.g., gallium) removal from the plutonium dioxide. Appendix N was deleted from the SPD Final EIS, and the impacts discussed therein were added to the impacts sections presented for the MOX facility in Chapter 4 of Volume I. Section 2.18.3 was also revised to include the impacts associated with plutonium polishing.

Additional processing needed only for MOX fuel fabrication would occur in the MOX facility, not the pit conversion facility. Controls would be put in place to ensure that any contaminants removed during the plutonium-polishing process would not contaminate the MOX fuel fabrication line. As indicated by the analyses, the addition of this process is not expected to materially affect the ability of the candidate sites to handle MOX fuel fabrication.

Location of Facilities

The types of technical problems (i.e., the In Tank Precipitation issue) that have arisen at SRS and DOE's approach to resolving them do not instill assurance that a plutonium pit conversion facility can be developed and constructed in a timely manner at SRS within any reasonable cost estimates. The DOE tiered approach needs supplemental Research and Development (R&D) technology for conceptual design and full scale operational throughput of surplus plutonium material. 4

In addition, it is noted that Pantex with a new Pit conversions facility will provide minimal radiological impact on the population and workers, where there will be a major impact on the workers (349 person rem) and a factor of 10 increase in population radiological exposure if the facility is located at SRS. 5

Facility Accidents

The respirable fraction (the fraction of release consisting of Plutonium particles with a diameter of less the 10 microns is questioned). The DOE use of the fraction (0.1-0.01) 0.01 or smaller for the inhalation pathway to man is questioned. For inhalation of the lung; and TBLN it is noted than the fraction of respirable particles less the 10 microns does indeed affect the dose. What is left out is the fact that going from 1.0 microns to 0.1 micron, there is a 1000 fold increase in particle concentration for a 10 fold reduction in medium particle diameter for Pu-239. 6

Review of deposition and scavenging data reveal the difference for dry deposition vs. wet deposition of Pu02 particles. The average bounds for wet deposition removal rate for particles is 10-4 for stable meteorological conditions and 10-3 for unstable wind conditions. For dry deposition of Pu02 particles the deposition velocity is a constant value of 10-2 regardless of meteorological conditions. For bounding of particle deposition the maximum expected for wet deposition is 10-2 and for dry deposition 10-1. This 10 fold factor should not be overlooked in considering "respirable fraction". 7

The fraction of energy absorbed in tissue (f1) is always small for Pu02. The value of f1 equals 3x10-3 is used for plutonium oxides. The value of f1 for the other actinides is conservatively set at f1 equals 10-3. Thus, the actual value has little effect on the estimation of inhalation dose. 8

Ingestion modeling (ICRP-23 1975) indicates that direct ingestion of Pu02 particles would be a much lesser radiological impact than inhalation. It should be noted that part of inhaled material, however, would be translocated by bodily processes to the gastrointestinal tract. For sake of accuracy the model for the gastrointestinal tract must include all nuclides considered in the inhalation model. 9

The Melcor Accident Consequence Code System (MACCS2) used to calculate the consequences of facility accidents (appendix K) is a sector averaged code as opposed to the straight-line Gaussian. The sector-average equation uses the cross wind integrated model but distributes the Y-concentration evenly over a sector. The width of 10

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MD322–4 **Alternatives**

DOE acknowledges the commentor's concerns regarding the technical issues associated with pit disassembly and conversion. These issues are the subject of ongoing R&D activities at INEEL, LANL, LLNL, and ORNL. These activities are expected to reduce technical risk and ensure that design, construction, and operation of the proposed surplus plutonium disposition facilities can be conducted efficiently and effectively, and within reasonable cost and schedule constraints. The largest of these activities is the pit disassembly and conversion demonstration project at LANL, a full-scale pit disassembly and conversion line similar to what would be used in the proposed facility. This demonstration project and other R&D activities are described in *Pit Disassembly and Conversion Demonstration EA* (DOE/EA-1207, August 1998), which is available on the MD Web site at http://www.doe-md.com.

MD322–5 **Human Health Risk**

Sections 4.4.2.4 and 4.6.2.4 present radiological impacts of operating the pit conversion facility at SRS and Pantex, respectively. As shown in the tables regarding impacts to the public, the anticipated dose to the population surrounding SRS from pit conversion facility operations would be 1.6 person-rem/yr (average dose would be 0.0020 mrem/yr), and for Pantex would be 0.58 person-rem/yr (average dose would be 0.0019 mrem/yr); this difference of about 2.8 times is due mainly to the larger population surrounding SRS. As shown in the tables regarding impacts to workers, the worker population dose at the pit conversion facility is 192 person-rem/yr whether the facility is located at Pantex or SRS. The average worker dose is expected to be 500 mrem/yr to involved workers at either site.

Regardless of where the pit conversion facility is operated, DOE policy places safety and environmental considerations above other program goals. DOE dose limit requirements (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and 10 CFR 835, *Occupational Radiation Protection*) have been established to protect and ensure the safety and health of the public and workers. In addition, protection of the public and workers is considered by DOE in the design, location, and construction of its facilities.

MD322–6 **Facility Accidents**

As used in this SPD EIS, the respirable fraction is the mass fraction of airborne material estimated to have less than a 10-micron aerodynamic equivalent diameter (AED). Use of this definition is common practice within DOE and is included in *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE-HDBK-3010-94, October 1994). Section 1.2 of the handbook discusses respirable fraction in detail, citing other definitions that have been used historically by a variety of organizations, and concludes that "use of a 10 [micron] AED cut-size for respirable particles is considered conservative, and may even be overly conservative since the mass is a cube function of particle diameter."

MD322–7 **Facility Accidents**

There is no direct connection between deposition velocity and respirable fraction. Deposition velocity reflects the rate of removal of material from the plume to ground-level surfaces, whereas respirable fraction is the mass fraction of the particulate matter that can be inhaled. As implemented, respirable fraction was used in defining the source term, so that the released plume can be considered 100 percent respirable. Deposition velocity was set to zero, so that no material is assumed to be removed from the plume by this mechanism, thus increasing predicted downwind concentrations and inhalation dose (the most significant dose pathway).

MD322–8 **Facility Accidents**

MACCS2 is a standard, accepted code for analyzing the impacts of accidents in EISs and for comparison of alternatives in NEPA documents. The MACCS2 dose conversion factor of 8.33×10^{-5} sieverts/becquerel (3.08×10^{-8} rem/ci) for a 50-year committed effective dose equivalent from plutonium 239 for the inhaled chronic dose pathway to the whole body alleviated the need to assess dose on an organ-specific basis. The presence of other nuclides from the aged plutonium was accounted for by scaling the plutonium 239 dose factor against like factors for the other contributing nuclides in proportion to their presence.

MD322–9 **Facility Accidents**

Discussion on the use of the inhalation pathway for consequence estimation is in Appendix K.1.4.2. The inhalation dose as presented provides an appropriate basis for assessment of impacts and for comparison of alternatives in this SPD EIS.

MD322–10 **Facility Accidents**

The MACCS2 code does calculate the centerline ground-level plume concentration; it is not a (crosswind) sector averaged model. Perhaps the commentor is thinking of the GENII code, which is a sector-averaged code. It is not clear what the commentor means by, "DOE need to further elaborate why the MEL's (sic) maximum exposure would be 100 meters under neutral (Class D) atmospheric conditions and 500 meters under stable (Class F) atmospheric conditions."

As implemented, MACCS2 sampled over a year's worth of meteorological data. For each sample, doses were determined along the plume centerline (for MEI and noninvolved worker) and for each fine grid element within each sector under the plume (for the population dose). Appendix K discusses the assumptions used and the accident analyzes conducted.

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a sector is equal to the circumference ($2\pi X$) at distance X from the source divided by the number of Sectors, n (typically n=16 as that there are 16 22 ½ degree Sectors. The concentration in each Sector is weighted by the fraction of the time that the wind blows into the Sector of Interest (0.01 times the percentage of the time), f1 that the wind is blowing into the Sector of Interest. Sector averaging is an artifice for representing long-term meandering of the Plume. For accident considerations the center-line ground level source, and ground-level receptor may be more appropriate. DOE need to further elaborate why the MEL's maximum exposure would be 100 meters under neutral (Class D) atmospheric conditions and 500 meters under stable (class F) atmospheric conditions. 10

Direct ingestion of Pu02 is a less important dose exposure than inhalation because Pu02 is highly insoluble even in body fluids. The f1 values (i.e. fraction of a quality that is absorbed from the gastrointestinal track to blood) range from 10-3 to 10-5. The safety requirement should insure that: 11

a) accident analysis adequately consider all credible scenarios
b) all appropriate engineering safety systems which are necessary to prevent accidents or mitigate the on-site and off-site consequences of those accidents are identified 12
c) the fire hazards analysis be consistent with other accident analysis.

DOE estimates of the risk from design based accidents and natural disturbances such as a severe earthquake is judged to be adequate. The highest risk to the maximally exposed off-site individual is a bounding accident because its risk is higher than the risk of other accidents in the same frequency range. The consideration of the risks associated with bounding events or accidents for a facility can establish an understanding of the average risk to workers, members of the public, and the environment from operating the facility. The risks of different facilities can be compared relatively by comparing the risks associated with bounding accidents for each facility. DOE should provide additional consideration of bounding of risks due to accidents. 13

If the specific ground activity is associated mostly with particles of size greater than 50μm, a very small air concentration would result from the respirable size particles less than 10 microns. 14

For the Gaussian diffusion model (applicable for continuous and instantaneous sources). The vertical component of turbulence intensity is a strong function of thermal stability, which in turn may be quite variable with height above ground. 15

It is noted that the buoyancy flux is a factor in both stable & unstable meteorological conditions. However, it is questioned why DOE has used different MEI locations as a function of atmospheric stability and this should be explained further. Also it is noted that there will be no plume rise (i.e. buoyancy flux) for normal transportation accidents unless there is a fire. 16

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MD322–11 **Facility Accidents**

DOE acknowledges the comment that inhalation pathways represent the greatest risk of exposure. This is accounted for in the MACCS2 model as discussed in Appendix K.1.4.2.

MD322–12 **Facility Accidents**

The selection of accidents for this SPD EIS was done in accordance with *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE Office of NEPA Oversight, May 1993). Design basis events were developed based on categorizing accidents into types of events, and a bounding consequence was determined for each type. The potential for accidents beyond the design basis was examined down to a frequency of 1.0×10^{-7} per year. This differs from the process-specific analysis, such as fire-hazards analysis, that would be performed in conjunction with the conceptual design package and the analysis performed for the SAR. It is these latter analyses that are used to determine the adequacy of engineered and administrative safety systems, and through which a commitment is made to preserve these protections as part of the operational safety basis.

MD322–13 **Facility Accidents**

The Facility Accidents sections in Chapter 4 of Volume I present a characterization of the spectrum of potential accident scenarios that are implicit in the particular alternatives. Each accident is conservatively developed by type, so is therefore considered to bound the accident risk.

MD322–14 **Facility Accidents**

There is no connection between ground activity and respirable-size particles. The respirable fraction is determined by the material form and scenario phenomenology and is based on recommendations in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. For example, the respirable fraction associated with fires in the MOX facility is 0.01, or 1 percent of the airborne material.

MD322–15 **Facility Accidents**

This SPD EIS uses 10-m (33-ft) meteorological data. These are the most appropriate data for use in calculating ground-level concentrations for nonbouyant plumes released at the stack heights analyzed. The vertical component of turbulence is not an important factor in determining downwind concentrations under the assumed release conditions.

MD322–16 **Facility Accidents**

All plumes released as a result of facility accidents were conservatively assumed to be nonbuoyant. This is reasonable for fires because significant cooling is possible in transit from the fire site to the release point. DOE has not used different MEI locations as a function of atmospheric stability. The MEI is located at the fence line, in the direction downwind from the release point. The MEI location changes for each run within the MACCS2 code because the wind direction changes for each run. This is why there is no single location associated with the MEI dose.

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For new construction at SRS the Design Basis earthquake, the source term is assumed to be 3.8x10-4 grams. The dose at the site boundary is 1.7x10-5 rem.

For the case of accidents resulting from ceramic immobilization in F-canyon Bldg 221 F and DWPF at SRS, the source term is 3.8 grams. The dose at site boundary is 4.1x10-1 rem. Note that a factor 4 orders of magnitude increase in the severity of the accidents dose at the site boundary. 17

Therefore new construction at SRS is recommended (design basis earthquake) because of the decreases in radioactive emissions of Pu-239. The new facilities would be designed to reduce the frequency of accidents and to mitigate the consequences.

It is noted that for facility accidents, DOE has chosen to only consider the inhalation pathway to the pulmonary region and not consider the effect of resuspension of particles (MACCS2 code). In so doing, the code sets the deposition velocity the zero so that the material that might otherwise be deposited on the ground surfaces remains airborne and available for inhalation. This may not be as conservative for some types of accidents (i.e. particular Pu02 fires and explosions). Airborne releases of Pu will be in the oxide form and contain a substantial percentage of particles in the "respirable range" (i.e. less that 10 micron). 18

DOE has limited the duration of accidental releases from SPD facilities to 10 minutes except for fires. This may be a rather limiting value compared to actual release times from other DOE facilities accidents. For fires and explosions it is recommended that the dose pathway from respension of Pu particles be included in the dose calculations. 19

Analysis indicate that when a contaminating event occurs most of the radiation dose associated with the event is committed within a short time (a period of a few weeks or months) unless protective actions are taken. Intervention criteria are based on a projection of the ultimate consequence of the event and a judgement of how certain actions could reduce the impact. Development of intervention criteria requires advance planning, so that emergency response plans can be implemented in a minimum period of time. 20

The objective of environmental sampling and analysis is to derive information for the purpose of estimating dose rates to pulmonary lung and to bone of exposed individuals. In general, resuspension will relatively high immediately after initial deposition, gradually decrease with time, and approach a long term constant within about one year after deposition. The resuspension rate for newly deposited contamination has been estimated to be higher by a factor of 1000 or more than that for aged sources of plutonium, and therefore, represents a proportionately greater radiological hazard. 21

The principal difference between the initial phase and long-term phase is that the newly deposited contamination is generally much more mobile and more easily resuspended.

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MD322–17 **Facility Accidents**

The commentor is correct in identifying large differences between new construction and Building 221–F with respect to structural response to a design basis seismic event.

The remainder of this comment is addressed in response MD322–1.

MD322–18 **Facility Accidents**

The practice of setting the deposition velocity to zero so that the material that might otherwise be deposited on the ground surface remains airborne and available for inhalation is considered conservative for all analyzed accidents. The respirable fractions used for plutonium fires and explosions are from DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, and are based on experiments of the phenomena in question. Airborne material that is not respirable will not subsequently become respirable because there is no mechanism for getting energy inside the particles to further subdivide them. The process of deposition and subsequent resuspension would tend to result in agglomeration rather than subdivision, so that the quantity of resuspended material that is respirable would be much less than that amount of respirable material in the original plume whose presence can be attributed to the neglect of deposition.

MD322–19 **Facility Accidents**

The 10-min release duration assumption does not imply that the source term has been truncated; it is simply assumed that the entirety of the source term is released at a constant rate over a 10-min duration. The effect of differing assumptions concerning release duration is discussed in Appendix K.1.4.2. The two factors affecting doses as release duration changes are plume meander and the larger variety of meteorological conditions involved in any given run for longer-duration releases. The effect on dose of these two considerations is as follows. Plume meander decreases individual dose with increasing release duration and tends to narrow the distribution of population doses with increasing release duration. A larger variety of meteorological conditions tends to narrow the distribution of both individual and population doses toward the mean dose with increasing release duration. Both factors would tend to lower (i.e., reduce conservatism of) predicted doses reported in this SPD EIS.

The remainder of this comment is addressed in response MD322–18.

MD322–20 **Facility Accidents**

As discussed in the Emergency Preparedness sections in Chapter 3 of Volume I, each candidate site has an established emergency management program, including response time requirements, that would be activated in the event of an accident.. Site hazard surveys are periodically updated and would be modified to reflect any new hazards including those based on the decisions made in the SPD EIS ROD. These modifications would include development of revised intervention criteria, if needed, in accordance with DOE Order 151.1, *Comprehensive Emergency Management System*. The MOX facility would also be required to comply with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*, which requires emergency plans that include provisions for notification, response, and coordination.

MD322–21 **Facility Accidents**

The dose calculations were performed in a conservative manner. To maximize the radionuclide concentrations in the atmosphere (and thus the inhalation dose), the deposition velocity of radionuclides onto the ground from the plume was taken to be zero. While this precludes the resuspension pathway, the increased dose associated with inhaling the radioactivity in the plume from which no radioactivity has been removed by deposition, is greater than the dose that would result from inhaling radioactivity in resuspended material.

It has been estimated that resuspension from newly deposited Pu02 material may be as high as 10-4/m, or four orders of magnitude greater than for stabilized Pu02 contamination. 21

Transportation

The DEIS discusses in detail the analysis of both incident-free transportation and the effects of transportation accidents. The discussion below deals specifically with transportation of either plutonium metal or plutonium oxide to SRS under Alternatives 3 and 5, but also applies to transportation of "pit parts" and high-enriched uranium (HEU) components from Savannah River Site (SRS) to other DOE facilities. It is assumed, based on information presented in the DEIS, that all shipments of plutonium or high-enriched uranium, including new Mixed Oxide (MOX) fuel shipments will be made using a Safe Secure Trailer (SST), operated by the Transportation and Safeguards Division (TSD) in DOE's Albuquerque office. 22

In July 1998, the DOE Deputy Assistant Secretary for Oversight issued a report titled "Independent Oversight Evaluation of Emergency Management Programs Across the DOE Complex". Included in this report is a critique of the TSD emergency management program. The Office of Oversight noted several "issues" related to TSD, including:

1) "In September 1996, TSD management mandated the removal of radiation monitoring instruments from all convoy shipments ... [s]ome Emergency Action Levels (EALs) require radiation readings.
2) "On November 1996, a TSD Safe Secure Trailer transporting nuclear weapons slid off a road and rolled over near Valentine, Nebraska. According to a Department of Defense Nuclear Command and Control System Support Staff report, almost four hours elapsed before DOE Headquarters was notified, and it was almost 20 hours before a Radiological Assistance Program (RAP) team determined that there had been no radiological release. The report recommended equipping convoys with radiological instruments to provide timely warning of potential personnel hazards. 23
3) "There is a discrepancy between an Emergency Action Level (EAL) in the TSD Hazards Assessment and the emergency management plan. One specifies an alert, while the other specifies a general emergency for the same conditions.
4) "The document provided to Convoy Commanders to provide initial protective action recommendations for the public include decision paths that cannot be completed due to lack of observable criteria (requires information not directly observable or measurable).
5) "The TSD hazards assessment (May 4, 1994) does not provide an adequate technical basis for ground transportation emergency planning, preparedness and response. No radiological assumptions, models, methodologies or evaluations for TSD convoy event hazards are documented or referenced in the TSD Hazards assessment.
6) "The emergency response organizations, procedures and training for TSD and its contractor, Ross Aviation, do not adequately support accurate and prompt

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MD322–22 **Transportation**

The commentor is correct. All shipments of plutonium and HEU, including new MOX fuel shipments, would be made using DOE's SST/SGT system. LLW and TRU waste would be shipped in commercial trucks, not SST/SGTs.

MD322–23 **Transportation**

DOE's internal and external reviews and assessments are designed to achieve a path of continuous improvement in its transportation and emergency management programs. However, the comments are beyond the scope of this SPD EIS and have been forwarded to DOE's Transportation Safeguards Division for review. DOE is currently analyzing the issues raised in the independent oversight evaluation and will take appropriate action as necessary.

categorization and classification of operational emergencies during transport of nuclear materials or devices." 23

The DEIS discusses "24-hour-a-day real-time communications to monitor the location and status of all SST shipments via DOE'S Security Communications system". For several years, state radiological emergency response organizations, including Georgia's, have had access to the TRANSCOM real-time shipment tracking system. Particularly within the past year, the TRANSCOM system has proven to be unreliable in tracking of domestic and foreign research reactor spent nuclear fuel shipments and Waste Isolation Pilot Plant (WIPP) dry run shipments. It is our understanding that the Transportation and Safeguards Division (TSD) shipments uses the same basic tracking software system, but states will not have access to the tracking information; nor will they have access to advance shipment information which normally precedes highway route controlled quantity (HRCQ) shipments of radioactive materials. 24

The text of the DEIS describes the postulated accident scenarios as "the maximum forseeable offsite transportation accident", while Appendix L describes them as "the most severe accident conditions". We agree with DOE that Accident Severity Category VIII accidents would be considered "worst case" but assuming that such an accident can occur only in a rural setting does not appear to be conservative. For example, we note that "rural" mileage accounts for approximately 78% of the route between Pantex and SRS, while "suburban" mileage accounts for nearly 20% of the route. In the Atlanta metropolitan area, suburban speed limits outside I-285 are generally 65 miles per hour (mph); rural speed limits are 70 mph. Higher traffic volumes within the "suburban" area, and nearly equivalent speeds as in the "rural" area would seem to increase the relative probability of severe vehicle accidents in the "suburban" areas, and such accidents would potentially have far greater consequences than those presented in the DEIS. 25

The discussion of vehicle accidents specifically addresses the potential for a release of plutonium from the transport vehicle, with subsequent inhalation of plutonium by persons nearby. The DEIS however, states on page L-30, that "postaccident mitigative actions are not considered for dispersal accidents. For severe accidents involving the release and dispersal of radioactive materials into the environment, no postaccident mitigative actions, such as interdiction of crops or evacuation of the nearby vicinity, have been considered in this risk assessment."

The DEIS does not present sufficient information related to recovery. In Appendix K, which in general discusses the effects of facility incidents, the DEIS states "the longer-term effects of plutonium deposited on the ground and surface waters after the accident, including the resuspension and inhalation of plutonium and the ingestion of contaminated crops, were not modeled for the SPD (Surplus Plutonium Disposition) EIS. These pathways have been studied and been found not to contribute as significantly to dosage as inhalation, and they are controllable through interdiction". In previous correspondence with DOE in other programs, we have also met with some resistance to discussing the effects of deposited radioactive materials, as these effects 26

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MD322–24 **Transportation**

DOE is working very closely with State and tribal representatives to upgrade the transportation tracking and communication (TRANSCOM) system. The shipment of special nuclear materials using SST/SGTs does not involve the use of TRANSCOM. DOE Order 5610.14, *Transportation Safeguards System Program Operations*, specifically requires independent and redundant communications systems between vehicles in an SST/SGT convoy and with SECOM (a secure communications system operated by DOE). For security reasons, State and tribal representatives are not given access to this system. DOE has a system to liaison with State transportation and safety organizations on SST/SGT shipments.

MD322–25 **Transportation**

The consequences of a Category VIII accident occurring in suburban and urban zones are shown in Tables L–8 and L–9. However, a Category VIII accident in suburban and urban zones would have a frequency of less than 1 in 10 million years and would not be a foreseeable accident. Appendix L was revised to describe the maximum foreseeable offsite transportation accident as occurring in a rural zone. Because the total mileage in urban and suburban zones is much lower than in rural zones, accidents are less likely to occur in urban and suburban zones.

MD322–26 **Transportation**

DOE acknowledges the commentor's concern about transporting surplus plutonium. The subject of emergency response and subsequent cleanup of an accident that involves the release of nuclear materials, both special nuclear material and waste, is a topic of continuing discussion and planning between DOE and State, local, and tribal officials. Several venues, such as DOE's State and Tribal Governments Working Group and the Southern States Energy Board, are being used to facilitate these discussions. DOE's Transportation Safeguards Division has a formal liaison program with the States related to the transportation of special nuclear materials.

No credit was taken for interdiction or other activities that could be taken after a transportation accident involving a radioactive release, so the doses reported in this SPD EIS are considered conservative. As indicated in

Appendix L.8.4, mitigative actions would be taken following such an accident in accordance with EPA guidelines for nuclear accidents. These actions would result in lowering the actual dose to the surrounding population. As with any transportation accident, local, tribal, and State police, fire departments, and rescue squads are the first to respond to accidents involving radioactive materials. DOE maintains eight regional coordinating offices across the country, staffed 24 hours per day, 365 days per year, to offer advice and assistance. Radiological Assistance Program teams are available to provide field monitoring, sampling, decontamination, communication, and other services as requested. Dose to emergency response personnel is accident-specific and can not be globally estimated. Responders are trained to minimize dose.

The RADTRAN computer code evaluates the dose to the public from the resuspension pathway by calculating a resuspension dose factor. The resuspension dose factor takes into account dose from deposited material that is resuspended by various mechanisms such as wind or traffic. The factor is calculated using the methodology developed by NRC in the *Calculation of Reactor Accident Consequences, Appendix VI to the Reactor Study* (WASH-1400, 1975).

Transportation would be required for both the immobilization and MOX approaches to surplus plutonium disposition. Transportation of special nuclear materials, including fresh MOX fuel, would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material Furthermore, as discussed in Appendixes L.3.1.5 and L.3.1.6, DOE would ship all plutonium in Type B containers which must satisfy stringent testing criteria specified in 10 CFR 71, *Packaging and Transportation of Radioactive Materials*. The testing criteria were developed to simulate severe accident conditions, including impact, puncture, fire, and water immersion.

were seen as being more "environmental" than "emergency response".

In order to plan for, equip themselves to deal with, and train their response personnel for dealing with a transportation incident involving plutonium, state and local officials need information regarding both immediate protective measures, and also information related to post-emergency issues such as resuspension and relocation of deposited radioactive materials. For example, regarding vehicular disturbances, Sehmel (1975) has examined the importance of auto and truck traffic in the increasing of resuspension. It was concluded that such disturbance, in the case of an asphalt surface with newly deposited material, will lead to increased resuspension, with a fraction resuspended of the order of 10-5 to 10-2 per vehicle passage. The higher rates occurred at speeds typical of freeway driving. After passage of about 100 cars only a small fraction of the original contamination remained on the road surface. Unless emergency officials promptly close the accident scene to vehicle traffic (an unlikely situation), emergency responders may face an incident scene that is, unknown to them, extremely hazardous due to respirable plutonium. Post-emergency actions may also be complicated due to the enhanced spread of contamination by vehicle traffic. It is worthy of note here that the DEIS presents no information regarding potential radiation doses to response personnel. 26

Public acceptance of transportation of plutonium (Pu) in the U.S. is not a given. The true risk posed by transportation of plutonium may indeed be very small, but it is not zero, and public perception regarding these risks, and public acceptance of them, is critical to the success of this program. The existence of knowledgeable emergency response personnel at the state and local level, armed with both the training and equipment which would be required to respond to a transportation incident involving plutonium is a critical component in obtaining this public acceptance.

<u>Utilization of Mixed Oxide (MOX) Fuel</u>
There is a major unresolved question regarding the DOE decision to build a MOX fuel fabrication facility. The answer lies with the existing 41 operating commercial nuclear utilities in the United States that DOE expects o use the MOX fuel. There is the potential need for core redesign and other stability and power dynamic provisions imposed on the utility industry. This raises the issue of whether or not rate schedules will absorb the inherent cost of conversion. This may shift the decision away from inclusion of plutonium in MOX fuel and toward the placement of surplus weapons useable plutonium directly into geologic disposal (expected to be located at Yucca Mountain). 27

<u>Decommissioning and Decontamination of Plutonium Facilities</u>
There is not enough attention given to the end of the plutonium fuel cycle missions in the Draft EIS. Conceptual designs should be provided indicating where decommissioning and disposal (Dad D) considerations have been a driving force in the technology development, fabrication, and operational readiness for chemical and 28

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MD322–27 **MOX Approach**

Section 4.28 was revised to discuss the potential environmental impacts of operating the reactors that would use MOX fuel. Commercial reactors in the United States are capable of safely using MOX fuel. Modifications would need to be made to the fuel assemblies that would be placed in the reactor vessel to support the use of MOX fuel, but the dimensions of the assemblies would not change. DOE has used selection criteria in the procurement process which ensure that the domestic, commercial reactors chosen would be capable of safely and successfully completing the surplus plutonium disposition program. In addition, NRC would evaluate license amendment applications and monitor the operation of the proposed reactors selected to use MOX fuel. After irradiation is complete, the spent fuel would be stored on the site pending eventual disposal pursuant to the NWPA.

The provisions of the DOE contract with DCS to use the Catawba, McGuire, and North Anna reactors would not result in additional cost to the electricity customer.

MD322–28 **General SPD EIS and NEPA Process**

As described in Section 4.31, features are being incorporated into the designs that would allow future deactivation and stabilization activities to be performed more quickly and easily to reduce the risk of radiological exposure, reduce the costs associated with long-term maintenance, and prepare the buildings for potential future use. Whether DOE would reuse or D&D the facilities following surplus plutonium disposition cannot be determined at this time. DOE will perform engineering evaluations, environmental studies, and further NEPA review to assess the consequences of different courses of action.

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nuclear material. There is inadequate assurance that the consideration of risk trade offs in reducing and separating risks, along with well-intended costly measures, will deliver, the expected protection of the environment, safety, and health (i.e., the cumulative risk of 50 tons of plutonium immobilization with that of up to 33 tons of plutonium in MOX fuel). DOE's historical approach to evaluating D&D options or the reuse of the facilities only at the end of the useful life of plutonium facilities is unacceptable and serves to detract from the true cost of the front end decisions for facility siting and construction. 28

Chemical Form and Safety
There are concerns about the final chemical and physical form of Plutonium Oxide in the proposed immobilization process. DOE should indicate what technical analyses have been provided to show that plutonium will be uniformly dispersed and subcritical, with no hot spots, eutectics, heat transfer peaks and with acceptable geometric configuration. It is interesting to note that DOE did use values for the airborne release fraction of up to 0.1 and respirable fractions of up to 1.0 for some of the severe accident scenarios; however, DOE failed to include justification for their use of these values for airborne release fraction, respirable fractions, leak path factor, and material at risk. 29

Malevolent Acts
Several of the facility incidents discussed in Appendix K of the DEIS, particularly those events for which the initiating event is an "operator error", could also be intentionally initiated by an operator with malicious intent (an informed insider). It is unclear that the analyses presented in this DEIS consider malicious intent as an incident initiator. A knowledgeable operator with malicious intent could disable or bypass systems which normally would be used to detect or mitigate an incident.

The transportation section of the DEIS, Appendix L, dismisses the possibility of malevolent acts with these words – "[i]n no instance, even in severe cases such as discussed below, could a nuclear explosion or permanent contamination of the environment leading to condemnation of land occur. ... [s]uch attacks would be unlikely to occur ... [o]ther materials, including uranium hexafluoride, uranium oxide, TRU waste and LLW, are commonly shipped, and to not represent particularly attractive targets for sabotage or terrorist attacks". 30

We disagree with the conclusions drawn in this section of the EIS, and request that DOE perform calculations of the consequences of incidents initiated by malevolent acts, including transportation incidents. Results of these analyses should be classified as appropriate, as recommended by DOE Order 151.1, and incorporated into both this EIS and the Emergency Preparedness Hazard Assessment (EPHA) documents for both TSD and the plutonium facilities.

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MD322–29 **Immobilization**

Numerous R&D studies of the immobilized plutonium forms have been conducted by DOE and the national laboratories, in part to ensure that all environmental health and safety requirements are met. Several technical studies continue. For enhanced readability of this SPD EIS, supporting documentation and detailed analyses of the chemical, physical, and nuclear properties of the immobilized forms were published separately. Information on specific technical aspects of the immobilized forms can be found in the following documents: (1) the immobilization data reports published in conjunction with this SPD EIS; (2) *Report on Evaluation of Plutonium Waste Forms for Repository Disposal* (DI: A-00000000-01717-5705-00009, Rev. 00A, March 1996); (3) *Immobilization Technology Down-Selection Radiation Barrier Approach* (UCRL-ID-127320, May 1997); and (4) *Fissile Material Disposition Program Final Immobilization Form Assessment and Recommendation* (UCRL-ID-128705, October 1997). These documents are available to the public at DOE sites and regional reading rooms; the latter two are also available on the MD Web site at http://www.doe-md.com.

The airborne release fractions/rates and respirable fractions used in this SPD EIS for accident analysis are consistent with those stated in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. Appendix K contains scenario-specific summaries detailing the material at risk, damage ratios, airborne release fractions, respirable fractions, and leakpath factors used in the analysis of facility accidents. Additional information supporting values of material at risk, damage ratio, and leakpath factor can be found in the data reports referenced in Appendix K.

MD322–30 **Facility Accidents**

Sabotage scenarios are considered conjecture and not reasonably foreseeable. Although they were excluded from this SPD EIS, the results of such sabotage (including sabotage by an "insider" and transportation incidents) would be bounded by the accidents presented in Appendixes K and L. The possibility of sabotage would be controlled through the safeguards and security provisions including security requirements associated with facility workers.

The proposed surplus plutonium disposition facilities would be designed and operated in accordance with DOE Orders 470.1, *Safeguards and Security Program* and 151.1, *Comprehensive Emergency Management System*. The MOX facility and proposed reactors that would use the MOX fuel would be subject to similar NRC requirements.

Georgia Environmental Protection Division
Specific Comments Related to
Surplus Plutonium Disposition Draft Environmental Impact Statement (DEIS)
DOE/EIS-0283-D

Pg 1-2 What is DOE's rationale for the alternative of converting 33t of surplus plutonium to MOX fuel? Is there a useful energy recovery goal for the surplus plutonium? 31

Pg 1-3 Why does DOE not further discuss the ultimate D&D of the three types of facilities? DOE has a vast experience of the technology and operation of Pu production facilities. 32

Pg 1-5 When will DOE provide the separate cost study (DOE 1998a) that should be analyzed along with this SPD EIS. 33

Pg 1-5 What will be the cost to the utilities and rate payers for MOX fuel utiliz ɔn? Will it be similar to spent fuel charges under the NWPA provisions? Are all of the process development costs for MOX fuel a responsibility of DOE? 34

Pg 1-8 Why is the lack of homogeneity in less favor than the mobilization and vitrification in the ceramic can-in-canister approach? Has the criticality and heat transfer impacts been fully evaluated? 35

Pg 1-9 Why hasn't the Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities Report (DOE 1998b) not accompany this SPD EIS? 36

Pg 1-9 Why does the ceramic can-in canister approach provide greater proliferation resistance than the glass can-in-canister approach? What lesser environmental impacts justify the ceramic over the glass can-in-canister approach? 37

Pg 1-9 DOE states that Hanford's cleanup mission is the site's top priority. Does SRS not have the same top priority of weapons site remedial site cleanup? 38

Pg 1-10 Why does the postirradiation examination of the MOX lead test assemblies not be a most desired requirement? This examination is most important in the determination of fuel defects, contamination, neutron absorber capability, hydrogen embrittlement and lastly physical characteristics of creep and swelling of the fuel material. 39

Pg 1-11 Will the pit conversion facility commence about 2001 before final evaluation is completed of the DOE/EA-1207 which intended to last up to four years? 40

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MD322–31 **MOX Approach**

Under the hybrid alternatives analyzed, up to 33 t (36 tons) of surplus plutonium would be made into MOX fuel. DOE reviewed the chemical and isotopic composition of the surplus plutonium and determined in the *Storage and Disposition PEIS* ROD that about 8 t (9 tons) of surplus plutonium were not suitable for use in making MOX fuel. Furthermore, DOE has identified an additional 9 t (10 tons) for a total of 17 t (19 tons) that have such a variety of chemical and isotopic compositions that it is more reasonable to immobilize these materials and avert the processing complexity that would be added if these materials were made into MOX fuel. The criteria used in this identification included the level of impurities, processing requirements, and the ability to meet the MOX fuel specifications. If at any time it were determined that any of the 33 t (36 tons) currently proposed for MOX fuel fabrication was unsuitable, that portion would be sent to the immobilization facility. While there is a benefit gained from the use of this MOX fuel in domestic, commercial reactors, the goal of the surplus plutonium disposition program is not energy recovery, but instead disposition of the plutonium in a safe, timely, and cost-effective manner.

MD322–32 **General SPD EIS and NEPA Process**

This comment is addressed in response MD322–28.

MD322–33 **Cost**

The cost analysis report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009), was issued in July 1998. Another report, the *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013) was issued in November 1999. These reports are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

MD322–34 **MOX Approach**

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

The utilities will continue to pay the standard surcharge per kilowatt-hour of electricity used for spent fuel under the NWPA, as amended, regardless of whether the spent fuel is from commercial MOX fuel or LEU fuel. There are no known process development costs for MOX fuel.

MD322–35 **Immobilization**

The immobilization analysis included in the *Storage and Disposition PEIS* focused on the use of technologies that would blend the surplus plutonium directly with either HLW glass or ceramic in a homogenous mixture. Based on public comments on the *Storage and Disposition PEIS* and technology developments, DOE accelerated research, development, and testing of various aspects of the can-in-canister approach to establish the optimum plutonium concentration and chemical composition of a form that could be readily processed, satisfy nonproliferation concerns, and perform well after emplacement in a potential geologic repository. Included in these efforts were evaluations of criticality and heat transfer issues in addition to those that had been conducted for the homogenous forms. In the *Immobilization Technology Down-Selection Radiation Barrier Approach* (UCRL-ID-127320, May 1997), LLNL recommended that DOE pursue only the can-in-canister immobilization approach based upon its superiority to the homogenous approaches in terms of timeliness, higher technical viability, lower costs, and to a lesser extent, lower environmental and health risks. Based on further recommendations from a committee of experts representing DOE, the national laboratories, and outside reviewers, DOE subsequently determined that immobilizing surplus plutonium materials would be best accomplished using the ceramic process. NAS is also currently studying the ability of the immobilization approach to meet the Spent Fuel Standard, including the heat transfer impacts of this approach.

MD322–36 **Pit Demonstration EA**

There is no need for the *Pit Disassembly and Conversion Demonstration EA* (DOE/EIS-1207, August 1998) and its FONSI (August 1998) to accompany this SPD EIS because the environmental impacts of the pit demonstration will not affect the cumulative impacts of dispositioning surplus plutonium. This EA is referenced in this EIS for the purpose of keeping the decisionmaker and the public fully informed about all aspects of the surplus plutonium disposition program.

MD322–37 **Immobilization**

This SPD EIS considers the immobilization of surplus weapons-usable plutonium in two forms, ceramic and glass; both would be produced using similar processes based on a can-in-canister approach. Past analyses have indicated that both ceramic and glass would be acceptable for immobilizing surplus plutonium. Recently, DOE completed a series of evaluations to determine whether the properties associated with ceramic or glass would be better suited for immobilizing plutonium (*Fissile Material Disposition Program Final Immobilization Form Assessment and Recommendation* [UCRL-ID-128705, October 1997]). These studies indicated that the use of ceramic would be more resistant to the threat of theft, diversion, or reuse, due to the greater difficulty associated with trying to chemically extract and separate plutonium from the ceramic form than is required for the glass form. The studies also found that ceramic form would likely be more durable over a longer period of time under geologic repository conditions, would require less shielding to protect workers, and would potentially provide significant cost savings. Only minor differences between the two forms are expected in terms of potential environmental impacts, as described in Section 4.29. Whereas the ceramic form would result in slightly higher potential offsite radiological exposures from normal operations, facility accident impacts, and water and electricity requirements, the glass form would result in higher routine and accidental transportation impacts. Overall radiological exposure to workers, as well as anticipated waste types and volumes, would not be expected to differ appreciably between the two forms.

MD322–38 **Alternatives**

DOE believes that Hanford's efforts should remain focused on its current high-priority cleanup mission. The importance of cleanup at Hanford was taken into consideration in identifying preferred sites for surplus plutonium disposition activities; however, no decision has been made. While it is true that SRS also has cleanup activities underway, SRS is preferred for the proposed facilities because the site has extensive experience with plutonium processing, and these facilities complement existing missions and take advantage of existing infrastructure.

MD322–39 **Lead Assemblies**

At the time the SPD Draft EIS was issued, the DOE procurement process to acquire MOX fuel fabrication and reactor irradiation services was not completed. DOE was unsure whether the team that would be selected would be able to use its existing knowledge to determine MOX fuel performance, or if the team would require lead assembly testing to ascertain fuel performance. In consultation with DCS, the team selected during the procurement process, DOE believes that limited lead assembly fabrication and postirradiation examination will be required.

MD322–40 **Pit Demonstration EA**

Should DOE decide to build a pit conversion facility, this facility would begin operating about 2004 by which time the pit disassembly and conversion demonstration would be completed. Facility design, however, would take place during approximately 1999 through 2001. While the pit demonstration would continue for up to 4 years, the information from the demonstration would be generated, gathered, and available on an ongoing basis. This means that information transfer regarding the fine-tuning of the operational parameters of a pit conversion facility could be provided on a continuous basis throughout the facility design phase. Also, because the information from the demonstration would be used to supplement other information developed to support the design of a pit conversion facility, it would not be necessary for the demonstration to be completed before beginning facility design and construction.

Pg 1-12 Is D and D a major category in the direction of DOE's blueprint for waste cleanup (DOE/EM-0342) ? To what extent does this SPD reflect the implications of waste management and environmental restoration in the paths to closure document? 41

Pg 1-14 The SRS Actinide Packaging and Storage Facility is a planned facility, not in operation at this time according to DOE. What is the specific relationship between this planned facility at SRS and SPD? Special concerns relating to the environmental impacts for stabilization of the neptunium-237 aqueous solutions is required. 42

Pg 1-15 Has DOE completed further study and evaluation for safety and final thermal loading for the HLW canisters, using the criterion (ie, surrounding radiation barrier for immobilized plutonium)? 43

Pg 2-8DOE needs to indicate the potential environmental impacts of the ceramic and glass can-in-canister technologies based on generic designs and compare to those impacts of the homogeneous facilities. DOE needs to evaluate the conceptual design and modifications required by full operational readiness of these facilities. The (DOE 1996a) Storage and Disposition Final PEIS is not adequate in present form for SPD facilities siting. 44

Pg 2-10 DOE's development of alternatives should clearly state that useful fissile material energy resource is either to be immobilized and buried as long-term HLW in geologic repository or that a portion of the surplus plutonium is to be utilized as MOX fuel for commercial LWRs. 45

Pg 2-12 DOE Feed Preparation Methods for immobilization is considering a major change from the wet-feed preparation process (aqueous processing) to a dry-feed process. It is stated that the dry-feed process requires less quantity of water and generates less amounts of waste, and has been chosen for use in this SPD EIS. This decision based on actinide removal from waste streams needs further evaluation primarily based on the long experience and operations for aqueous processing.. 46

Pg 2-13 DOE needs to state clearly that for plutonium processing and storage considered in this SPD EIS, material unaccounted for (MUF) will not be allowed for the special nuclear material. The accountability must satisfy the proliferation concerns and inspections of IAEA. 47

Pg 2-13 DOE needs to further evaluate to determine if the Pit Disassembly and Conversion is adequate for the removal of gallium. The fuel poison will result in impurity in plutonium dioxide feed for MOX fuel fabrication. This 48

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MD322–41 **Waste Management**

Comments on the draft and final *Accelerating Cleanup: Paths to Closure* documents (DOE/EM-0342, February 1998 and DOE/EM-0362, June 1998) are beyond the scope of this SPD EIS, although Section 1.8.2 of this SPD EIS describes the relationship between this EIS and those documents. Section 1.8.2 states that this EIS reflects the proposals in *Accelerating Cleanup: Paths to Closure*, to the extent possible, and that subsequent versions of that document will reflect the waste management and environmental restoration implications of the decisions made as a result of this EIS.

MD322–42 **Waste Management**

DOE has recently decided to delay the construction of APSF, and the *Supplement to the SPD Draft EIS* reflects modifications to disregard any benefit to the proposed facilities of APSF being built at SRS. Stabilization of neptunium 237 solutions would not occur within APSF, if built, and this process is not required to support the disposition of surplus plutonium.

MD322–43 **Immobilization**

This comment is addressed in responses MD322–35 and MD322–37.

MD322–44 **Immobilization**

DOE believes the analyses presented are adequate to support the decisions being addressed in this SPD EIS, including the facilities' siting. As a means of bounding the estimate of potential environmental impacts of the immobilization approaches to surplus plutonium disposition, the *Storage and Disposition PEIS* analyzed in detail the construction and operation of generic homogeneous ceramic immobilization and vitrification facilities. Although generic designs were the focus of the study, these designs were analyzed against parameters specific to each of the candidate sites to determine potential site-specific environmental impacts. Several variant immobilization technologies were also discussed in the *Storage and Disposition PEIS*. The subsequent ROD for that EIS states that DOE would make a determination on the specific technology on the basis of "the follow-on EIS" (this SPD EIS). In the tiered SPD EIS, the can-in-canister approach was identified as the preferred immobilization technology and evaluated in detail as part of each alternative. As a basis for evaluating the alternative immobilization technologies and forms presented in the two documents, the environmental impacts associated with operating the ceramic and glass can-in-canister immobilization facilities evaluated in this SPD EIS were compared with the impacts associated with operating the homogenous ceramic immobilization and vitrification facilities evaluated in the *Storage and Disposition PEIS*. This comparison is presented in Section 4.29.

MD322–45 Alternatives

In Volume I, Chapter 1 discusses the purpose of the proposed action and Chapter 2 describes the development of the alternatives.

MD322–46 Plutonium Polishing and Aqueous Processing

DOE does not agree that aqueous processing for immobilization feed preparation requires further evaluation in this SPD EIS. In addition to higher water consumption and waste generation cited as examples in this EIS, the aqueous process would also present a higher potential for worker exposure to radioactive materials and greater risk to the public. An aqueous process for the conversion of plutonium for immobilization would also require much more control to provide adequate protection against proliferation and to provide for proper oversight by IAEA. Therefore, aqueous processing/wet feed for immobilization is not a reasonable alternative.

MD322–47 Nonproliferation

Security for the proposed surplus plutonium disposition facilities would be implemented commensurate with the usability of the special nuclear material in a nuclear weapon or improvised nuclear device. At any time, the total amount of special nuclear material in each facility, or in any material balance area within each facility, would be known and so material unaccounted for would be avoided. Physical inventories, measurements, and inspections of material both in process and in storage would be used to verify inventory records. In addition, each of the proposed facilities includes design requirements for space, and to varying degrees, access for an international body to verify compliance with international nonproliferation policies.

However, the actual implementation process for ensuring international safeguards of the Russian and U.S. material is not as yet fully defined. That process is part of ongoing sensitive negotiations between the two countries. Under the details of those negotiations, the verification process for compliance of the proposed facilities with international nonproliferation policy could be conducted by a bilateral arrangement that includes access to the proposed facilities only by members of the U.S. and Russian governments, or it could include access to the facilities by an international body, such as IAEA.

MD322–48 Plutonium Polishing and Aqueous Processing

On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity removal from the plutonium dioxide. Appendix N was deleted from the SPD Final EIS, and the impacts discussed therein were added to the impacts sections presented for the MOX facility in Chapter 4 of Volume I. Section 2.18.3 was also revised to include the impacts associated with plutonium polishing.

	is a major problem and may require a separate Plutonium Polishing Process. DOE has not made a decision on the Plutonium Polishing Process or whether, if needed, it would be placed in the facilities for Pit Conversion or at the MOX fuel fabrication facilities. Gallium contamination, like other neutron absorbing poisons, is a major concern in MOX fuel fabrication.	48
Pg 2-23	DOE needs to develop accident scenarios for the case of HEPA filter failure. The occurrence will not provide the DF of 10-4 that is required for 99.99% particle removal as small as 0.3 micron in a flowing airstream. DOE has postulated a LPF value of 1.0X10-5 for two HEPA filters. This is an operational problem and if sand filters are not used in conjunction, will the HEPA filter provide an LPF of 1X10-5 and will not be maintained.	49
Pg 2-23	DOE needs to clearly state that SRS has the edge over other facilities by providing the least transportation impacts and necessary experience in plutonium production.	50
Pg 2-27	DOE needs to clearly state the time schedules for construction and operation of the MOX Facility Description. Depending upon DOE's decision on immobilization of surplus plutonium, the DOE decision on MOX fuel fabrication depends on a number of other considerations (ie, lead test assemblies, utility acceptance, etc.). The tiered approach of SPD EIS is barely appropriate for siting of MOX fuel fabrication when so many other variants exist.	51
Pg 2-30	It is vital that a homogeneous mixture exists in the mixed oxide (ie, blending and milling the PuO2) to achieve the required enrichment and isotopic concentration of the uranium and plutonium powders and to adjust the particle size of the MOX powder. The determination of accurate particle size of the MOX fuel is a most important factor in estimation of severity of facility accidents.	52
Pg 2-32	DOE notes that the dose from pit-handling activities at Pantex could be reduced by 40% because the majority of pits are already in storage at Pantex.	53
Pg 2-56	DOE needs to determine if the time schedules, reduced cost, infrastructure and other advantages of using the 44-year-old contaminated and aging F-canyon Bldg 221-F outweighs the new building construction at SRS. It is also noted that use of Bldg. 221-F would result in about 0.5 LCF for a designed basis earthquake at SRS.	17
Pg 2-98	DOE needs to stress what is the meaning of site limit 10 mrem/year from all facility sources. This is the annual effective dose equivalent to the MEI	54

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MD322–49 **Facility Accidents**

The assumed leakpath factor of 1.0×10^{-5} for operational HEPA filters is achievable and conservative. However, this SPD EIS also analyzed a number of accidents that involve various degrees of containment failure, including HEPA filter failures. Two of the most significant are the beyond-design-basis seismic event and the beyond-design-basis fire. Details on these and other scenarios are provided in Appendix K and the Facility Accident sections in Chapter 4 of Volume I. None of the proposed surplus plutonium disposition facilities are planning to use a sand filter, so credit has not been taken for that in the accident analysis.

MD322–50 **Alternatives**

In Volume I, transportation impacts at SRS are summarized in Chapter 4 and described in Appendix L. Infrastructure is also discussed in Chapter 4. As indicated in Chapter 1 of Volume I, the existing infrastructure at SRS is one of the reasons SRS was chosen as the preferred site for the proposed surplus plutonium disposition facilities. As indicated in Section 2.18, no traffic fatalities from nonradiological accidents or LCFs from radiological exposures or vehicle emissions are expected.

MD322–51 **Purpose and Need**

Appendix E includes schedules for each of the three proposed surplus plutonium disposition facilities and the lead assembly facility. This SPD EIS is tiered from the *Storage and Disposition PEIS* because the latter evaluated the disposition of weapons-usable fissile materials at a programmatic level. DOE committed in the ROD on the *Storage and Disposition PEIS* to do follow-on, site-specific NEPA analyses to determine the exact locations for the disposition facilities. The *Storage and Disposition PEIS* considered a broad range of technology options and candidate sites for the disposition of surplus plutonium, and the ROD narrowed the options to those evaluated in the SPD EIS.

The MOX approach includes the testing of up to 10 lead assemblies. However, the facilities where these assemblies would be built and tested already exist and can be quickly modified to support the MOX approach. Utility acceptance has already been addressed with the award of a contract to DCS and the proposal to use the Catawba, McGuire, and North Anna commercial reactors with partial MOX cores.

MD322–52 **Facility Accidents**

DOE agrees that accurate particle size of the MOX fuel is an important factor in estimation of severity of facility accidents. The issue of MOX powder particle size was considered in the course of analysis for this SPD EIS as documented in the memorandum, *Particle Size of PuO_2 Generated by HYDOX-Ga Removal Process and Impact on Usability of DOE-HDBK-3010-94 ARF and RF Values* (personal communication from J. Mishima to J. Eichner, Science Applications International Corporation, December 15, 1997). The conclusion was that the values in DOE-HDBK-3010-94 were conservative and appropriate for use in the SPD EIS analysis. This is discussed in Appendix K.1.5.1.

MD322–53 **Human Health Risk**

Decisions on the repackaging of pits at Pantex have been revisited since the SPD Draft EIS was published. Section 2.18 and Appendix L.5.1 were revised to incorporate a modified transportation dose analysis. If the pit conversion facility is located at Pantex, the dose associated with repackaging the pits for shipment off the site could be avoided, thus eliminating approximately 10 person-rem/yr in worker exposure.

MD322–54 **Human Health Risk**

In the Human Health Risk portions of Section 4.32, the 10-mrem/yr limit is described in detail. It is stated that there is a 10-mrem/yr NESHAP dose limit from total site airborne emissions, as required by the Clean Air Act regulations and DOE Order 5400.5, *Radiation Protection of the Public and the Environment.*

at the site boundary. This places a limit on the lifetime risk for maximally exposed individuals and average individuals in large population groups. 54

Pg 2-99 This is not one of DOE's best examples of commitment for removing spent fuel from the utility storage by January 1998. 55

Pg 2-102 With the exception of sulfur dioxide in the ceramic can-in-canister process all criteria pollutant emissions associated with either can-in-canister technology is within limits. If DOE determines that if scrubbers for the sulfur dioxide are required in the conceptual design, it should be clearly stated. 56

Pg 3-142 The radiation doses to workers from normal SRS operation in 1996 yields a total effective dose equivalent of 19 mrem for the average radiation worker from on-site releases and direct radiation. This same value of 19 mrem is shown for the Hanford workers in 1996; however, a lower person-rem does of 237 for SRS vs 266 for Hanford. 57

Pg 3-152 It is noted that DOE must exhibit constant attention and vigilance to reduce off-site liquid pathway radionuclide contamination. There is widespread contamination on-site at SRS. 58

Pg K-1 If the frequency of the initiating event is known, then the point estimate of increased risk of LCF per year may be helpful in understanding individual risk instead of population risk.

Pg K-1 One type of risk, average individual risk is the product of the total consequence (if known) experienced by the population and the accident frequency, divided by the population. 59

Pg K-2 It is noted that the MACCS2 accident model code is capable of calculating individual consequences at the point of maximum consequences but it is not configured to calculate individual risk at the point of maximum risk.

Pg K-5 It is noted that the accident factors for source term (ie, MAR, DR, ARF, RF and LPF) as indicated by DOE Handbook 3010-94 is questioned. DOE needs to justify the use of these factors in realistic accident scenarios. If the value of each of these factors depends on the details of the specific accident scenario postulated, then that detail must be provided to compare accident risk. Otherwise, the factors are judged to provide source term reduction without justification. 60

It is most appropriate to use realistic model input parameters; conservative parameters should be used only to the extent necessary to compensate for uncertainties.

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MD322–55 **Waste Management**

Section 4.28 was revised to discuss the potential environmental impacts of operating the reactors that would use the MOX fuel. As described in Sections 2.18.3 and 4.28.2.8, additional spent fuel would be produced by using MOX fuel instead of LEU fuel in domestic, commercial reactors. Spent fuel management at the proposed reactor sites is not expected to change dramatically due to the substitution of MOX assemblies for some of the LEU assemblies. Likewise, the additional spent fuel would be a very small fraction of the total that would be managed at the potential geologic repository. Issues related to a potential geologic repository for HLW and spent nuclear fuel are beyond the scope of this SPD EIS, but are being evaluated in the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999).

MD322–56 **Air Quality and Noise**

The sulfur dioxide emissions for the ceramic can-in-canister process are within limits as shown in the immobilization sections of Appendix G (e.g., Table G–9).

MD322–57 **Human Health Risk**

The reason for the difference in total number of person-rem between the two sites is due to the different number of workers at SRS and Hanford. Total workforce dose (in units of person-rem) is calculated by multiplying the average worker dose by the number of workers at a given site. Thus, for SRS, 19 mrem multiplied by 12,500 workers yields 237 person-rem (237,000 person-mrem). At Hanford, 19 mrem multiplied by 14,000 workers yields 266 person-rem (266,000 person-mrem).

MD322–58 **Water Resources**

DOE acknowledges the commentor's concerns regarding contamination at SRS. Although beyond the scope of this SPD EIS, activities to remediate existing contamination at SRS are ongoing. In addition, SRS maintains an aggressive waste minimization and pollution prevention program as described in Section 3.5.2.7. Analyses presented in Section 4.26.4.2 indicate that there would be no discernible impacts to groundwater or surface water quality at SRS from construction and normal operation of the proposed surplus plutonium disposition facilities. If all the proposed facilities were located at SRS, a very small incremental annual dose to the surrounding public from normal operations would result via radiological emission deposition on agricultural products, fisheries, and water sources (i.e., the Savannah River). This dose (about 1.6 person-rem/yr) would be 0.0007 percent of the radiation dose that would be incurred annually from natural background radiation. It has also been estimated that a small fraction of this dose (about 0.10 person-rem/yr) would be specifically due to the consumption of aquatic biota (fish or crustaceans) and drinking water (i.e., from the Savannah River) from minute quantities of air deposition and/or from any potential wastewater releases. This estimation is based on historical characteristics associated with F-Area releases to Savannah River outfalls. Nevertheless, public doses incurred from the uptake of these sources were determined to be well below Federal, State, and local regulatory limits.

MD322–59 **Facility Accidents**

Appendix K.1.1.2, Uncertainties and Conservatism, presents the rationale for preserving the consequences and frequency metrics as the primary accident analysis results, as opposed to risk metrics. However, to assist the interested reader in using the results to calculate average individual risks, the discussion of risk measures was revised to include reference to population figures, which are needed for calculating average individual risk for those living within 80 km (50 mi) of the site. As discussed in Appendix K.1.1.1, average individual risk is sensitive to the choice of the population that is included in the calculation, so care must be taken when interpreting such results.

MD322–60 **Facility Accidents**

DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, is the accepted standard for determining ARF and RF values. The values specified in that handbook are phenomenology dependent. Application of the values to a specific accident scenario requires characterization of the phenomena associated with that accident and matching of those phenomena with like phenomena in the handbook. Where phenomena do not match exactly, scaling of values may be needed to better characterize the accident. Chapter 7 of the handbook contains application examples that can be reviewed to clarify the appropriate use of the values. The recommended values in the handbook are bounding, which adds an element of conservatism to any analysis in which they are used but they are also considered realistic for analysis in this SPD EIS. MAR, DR, and LPF factors are developed purely in the context of the analyzed accidents and do not originate from DOE-HDBK-3010-94. Appendix K.1.5 provides information on the specific accident scenarios postulated. Further details are provided in the referenced data reports which are available in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

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Pg K-12	For an aircraft crash scenario, the DOE Handbook 3010-94 recommends values for debris impact in powder and recommends bounding ARF and RF values of 1X10-2 and 0.2 respectively. However, DOE attempts to justify use of a value of 3X10-2 for RF and a value of 1X10-2 for ARF corresponding to a decreased source term of 104g for the MOX facility and 18g for pit conversion facility accident.	61
Pg K-22	It is interesting to note that for an explosion in sintering furnace a bounding ARF of 0.01 and RF of 1.0 is assumed and based on an LPF of 1x10-5 for two HEPA filters, a stack release of 5.6X10-4 g of Pu-239 (in the form of MOX powder) is postulated.	62

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MD322–61 **Facility Accidents**

While, from a risk standpoint, the use of an arithmetic average RF is appropriate, the use of this method is inconsistent with the use of bounding values from DOE-HDBK-3010-94 for other accidents. Appendix K.1.5 was revised to use a respirable fraction of 0.2 and an airborne release fraction of 1.0×10^{-2} for aircraft debris impact into plutonium dioxide powder.

MD322–62 **Facility Accidents**

DOE acknowledges the comment.