June 21, 2001

Mr. Peter Hastings, Licensing Manager
Duke Cogema Stone & Webster
P.O. Box 31847
Charlotte, NC 1847

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY CONSTRUCTION AUTHORIZATION-REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Hastings:

We have completed our initial technical review of the Duke Cogema Stone & Webster Mixed Oxide Fuel Fabrication Facility Construction Authorization Request, submitted to the U.S. Nuclear Regulatory Commission (NRC) on February 28, 2001. Our review has identified additional information or clarification that is needed to determine its acceptability for approving construction of the proposed facility. During the review, we used the "Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility," NUREG-1718, dated August 2000. We have enclosed our requests for additional information in the attachment. In order for NRC to meet its schedule for making a determination on your request, please provide a response by August 31, 2001. If you wish, we are available to meet with you to discuss our requests for additional information. We believe a meeting would be useful to ensure that you understand our comments prior to preparing a detailed response.

If you have any questions, please contact me at (301) 415-7485 or Mr. Timothy C. Johnson at (301) 415-7299.

Sincerely,

/RA/

Joseph G, Giitter, Chief
Enrichment Section
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket: 70-3098

Attachment: Request for Additional Information

cc: R. Ihde, DCS
J. Johnson, DOE
H. Potter, SC Dept. of HEC
J. Conway, DNFSB
D. Moniak, BREDL
E. Foster
R. Thomas, Environmentalists, Inc.
G. Carroll, GANE

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Request for Additional Information (RAI)
Application Dated February 28, 2001
Mixed Oxide Construction Authorization Request
Duke Cogema Stone & Webster
Docket 70-3098

CHAPTER 1, GENERAL INFORMATION

1. Section 1.1.2.1, pp. 1.1-1 thru 1.1-2

Revise the description of Savannah River Site workers who are outside the mixed oxide fuel fabrication facility (MFFF) restricted area but within the controlled area boundary that is provided in the second paragraph of Section 1.1.2.1 to state that these workers are deemed to be "members of the public."

The description in Section 1.1.2.1 should reflect the NRC's policy that individuals who are not closely and frequently connected to the licensed activity should be considered members of the public. This policy is described in an NRC Staff Requirements Memorandum on a similar and related issue at the U.S. Department of Energy's (DOE's) Hanford site (SECY-98-038, "Hanford Tank Waste Remediation System Privatization Co-located Worker Standards.")

2. Section 1.1.2.1, pp. 1.1-1 thru 1.1-2

Revise the description of the controlled area boundary to include only those areas to which Duke Cogema Stone & Webster (DCS) can limit access for any reason.

Section 70.61(f) states that each licensee must establish a controlled area for which they retain the authority to exclude or remove personnel and property. The area that is defined by DCS in Section 1.1.2.1 includes areas within the Savannah River Site that the DOE does not currently control access by physical structures, such as gates, barriers or fences. This includes, for example, the area north of South Carolina Route 278 and the area southwest of South Carolina Route 125.

3. Section 1.1.2.1, pp. 1.1-1 thru 1.1-2

Complete the description of the 10 CFR 70.61(f) protocol described in Section 1.1.2.1 to include members of the public who are in the controlled area and outside the Savannah River Site F-Area.

Section 70.61(f) describes a method of complying with the 10 CFR 70.61 performance requirements when non-workers are expected to perform ongoing activities in the controlled area. It is NRC policy that individuals who are not closely and frequently connected to the licensed activity should be considered members of the public. Therefore, though Section 1.1.2.1 describes a protocol that the applicant intends to use to justify the application of performance requirements for workers to individuals in the Savannah River Site F-Area, the applicant should also describe whether or not performance requirements applicable to individuals outside the controlled area will be applied to non-workers on the Savannah River Site outside F-Area.

4. Section 1.2.1, pp. 1.2-1 thru 1.2-2

Provide information on the presence and operations of any other companies on the site. If no such companies or operations are applicable, the application should so state.

NUREG-1718, “Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility,” (SRP) Section 1.2.3.A.vi indicates that information of the presence and operations of any other companies on the site is needed to review institutional arrangements. The application has not provided information on the presence and operations of other companies.

5. Section 1.1.3.5.3, p. 1.1-6

Specify the location where radioactive solid waste is sorted, packaged or stored until transferred to DOE facilities.

Sections 7.4.3.2.C and 7.4.3.2.F of the SRP recommend that information be provided on fire resistivity and combustibility of radioactive waste and radioactive material storage facilities. The application does not describe fire protection measures for the temporary storage of radioactive solid waste.

6. Section 1.2.4.1, p. 1.2-3

Address the requirements in 10 CFR 70.17 in an exemption request applicable to the submittal of a decommissioning funding plan.

Under 10 CFR 70.25(a), a applicant for a specific license for possession and use of unsealed special nuclear material having the possession limits requested must provide a decommissioning funding plan. In the application, DCS requested an exemption stating that the facility will be turned over to DOE at the conclusion of the contract and DOE will assume responsibility for decommissioning.

7. Section 1.2.4.2, p. 1.2-3

Address the requirements in 10 CFR 70.17 in an exemption request applicable to using DOE authority under the Price Anderson Act for liability coverage.

Under 10 CFR 140.13a, applicants for plutonium processing and fuel fabrication plants must provide protection in the form specified in 10 CFR 140.14 in the amount of $200,000,000. In the application, DCS is proposing to request an exemption from the regulations to use the DOE provisions of the Price Anderson Act for liability coverage. In Section 2.5 of the application, the applicant describes the intended arrangements with DOE for indemnification.

8. Section 1.3.2.1.2, p. 1.3.2-2

Revise the statement in Section 1.3.2.1.2 which states "There are no facilities or populations within 5 mi (8 km) of the MFFF site that are not part of the Savannah River Site complex," to include the 1,400 acre Three Rivers Solid Waste Authority landfill.

Section 1.3 of the SRP requests that the applicant provide a description, distance, and direction to nearby public facilities. The Three Rivers Solid Waste Authority landfill is located north of Upper Three Runs creek and east of South Carolina Route 125.

9. Section 1.3.3.4.1, p. 1.3.3-3

Provide the maximum rotational speed (V_{rot}), the maximum translational speed (V_{tr}), the radius (R_m) of maximum rotational speed in the Table 1.3.3-7, and the equations for atmospheric pressure change (APC) and the rate of APC in the Table 1.3.3-8.

Regulatory Guide 1.76 provides design basis tornado characteristics of maximum wind speed, maximum rotational speed, maximum translational speed, radius of maximum rotational speed, pressure drop, and rate of pressure drop. However, the Table 1.3.3-8 did not provide these characteristic and equations for pressure drop and rate of pressure drop. The staff could not verify the 70 psf at 31 psf/sec for PC-3 and 150 psf at 55 psf/sec for PC-4 without V_{rot}, V_{tr}, R_m, and corresponding equations.

10. Section 1.3.3.4.1, p. 1.3.3-3

Provide the justification for the missile criteria in Table 1.3.3-8.

For example, the impacting velocity for an automobile in Table 1.3.3-8 is about 10 percent of design basis tornado windspeed. Section 3.5.1.4 of SRP recommends all plants be designed to protect safety-related equipment against damage from missiles which might be generated by the design basis tornado for that plant. They should include at least three objects: a massive high kinetic energy missile (4000 lb. automobile) which deforms on impact, a rigid missile (125 kg 8" armor piercing artillery shell) to test penetration resistance, and a small rigid missile (1" solid steel pipe) of a size sufficient to just pass through any openings in protective barriers, all impacting at 35 percent of the maximum horizontal windspeed of the design basis tornado. They are assumed to have the same velocity in all directions. The automobile impact should be considered at elevations up to 30 ft above all grade levels within 0.5 mile of the facility structures, and the other missiles at all elevations.

11. Section 1.3.3.4.2, pp. 1.3.3-3 and 1.3.3-4

Justify the straight-line wind speeds in Table 1.3.3-7.

The Section 3.3.1 of SRP recommends the design wind speed be 100-year return period fastest mile of wind. American Society of Civil Engineers (ACSE) 7-98 provides map of basic wind speeds of 50-year return period fastest mile of wind for U.S., which have to be converted to 100-year return period fastest mile of wind. For example, the ACSE 7-98 shows about 100 mph with annual probability of 0.02 for MFFF location. With annual probability of 0.01, the ASCE 7-98 wind speed might be 115 mph (i.e., 1.15 x 100 mph). However, the Table 1.3.3-7 shows 88 mph with annual probability of 0.01. Therefore, the adequacy of the Table 1.3.3-7 is questionable.

12. <u>Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86</u>

Provide the following items for the Probabilistic Seismic Hazard Assessment (PSHA):

a. PSHA inputs (e.g., logic tree or what other input was used to define the input distribution parameters).

b. Integrated PSHA hazard curves at several important frequencies (e.g., Peak Ground Acceleration, 1, 2.5, 5 and 10 Hz) for both rock and soil surfaces.

c. Magnitude-distance desegregation results.

d. Uniform hazard spectra for both rock and soil surfaces.

The application states that, "An SRS-specific PSHA was developed using bedrock outcrop EPRI and LLNL hazards and SRS site-specific properties including soil column thickness ..., " yet the relevant inputs and hazard results of these original probabilistic seismic hazard analyses were not provided. These items are essential for evaluating the adequacy of the PSHA, PSHA results, and whether these results are applicable to the seismic design of a particular site, as delineated in Position 3 of Regulatory Guide 1.165 (U.S. Regulatory Commission, 1997b), Section 2.5.2 (Vibratory Ground Motion) of NUREG-0800 (U.S. Regulatory Commission, 1997c), and Section 7 (Guidance on Documenting the PSHA Process and Results) of NUREG/CR-6372 (U.S. Nuclear Regulatory Commission, 1997a).

13. <u>Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86</u>

Clarify whether updated PSHA has been or will be conducted for the MFFF site that accounts for soil properties derived from geological, geophysical, geotechnical, and seismic investigations that are specific to the MFFF site.

It appears that the applicant did not conduct an updated PSHA for the MFFF site that accounts for soil property data that is specific to the MFFF site. Instead, the existing Lawrence Livermore National Laboratory (LLNL) and Electric Power Research Institute (EPRI) bedrock hazard results were used to evaluate surface uniform hazard spectra and design basis spectra. However, on page 1.3.6-18, the application states, "The PSHA for MFFF <u>will account for</u> soil properties derived from site geological, geophysical, geotechnical, and seismic investigations." (underline added for emphasis). This statement is misleading.

14. <u>Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86</u>

Demonstrate that the current site-wide hazard results and Performance Category PC-3 and PC-4 spectra are appropriate for the MFFF site.

The applicant did not justify that the current Savannah River Site site-wide PC-3 and PC-4 spectra are appropriate for the MFFF site. As indicated in Lee, et al. (1997), the site-wide PC-3 and PC-4 spectra were issued as "committed" because of the potential for stratigraphic variation in excess of what was considered and these design spectra need to be "confirmed" using soil parameters at the specific site or facility where the design spectra are being used. Position 4 of Regulatory Guide 1.165 (U.S. Regulatory Commission, 1997b) and other guidance documents (such as U.S. Regulatory Commission, 1997a,c) recommend site-specific soil amplification analysis for seismic design of non-rock sites.

15. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Provide soil property data specific to the MFFF site and compare the MFFF soil parameters with those used to derive site-wide design spectra for Performance Categories PC-3 and PC-4 documented in Lee, et al. (1997) and for PC-1 and PC-2 documented in Lee (1998).

The applicant did not provide soil property data specific to the MFFF site. These data are necessary to demonstrate that the Savannah River Site site-wide design spectra could be "confirmed" (see RAI Number 14) and used as bases for MFFF seismic design. The application gives conflicting information with regard to the validation of Savannah River Site site-wide soil parameters for the MFFF site. For example, on page 1.3.6-18, the application states, "The PSHA for MFFF will account for soil properties derived from site geological, geophysical, geotechnical, and seismic investigations." (underline added for emphasis). This sentence implies that the site geological, geophysical, geotechnical, and seismic investigations were not yet completed nor incorporated into seismic design considerations. However, on page 1.3.6-17, the application states, "The soil parameters for the MFFF site have been checked for consistency with the data parameterized in the study, and the spectra have been confirmed to be applicable to the MFFF." Position 4 of Regulatory Guide 1.165 (U.S. Regulatory Commission, 1997b) and other guidance documents (such as U.S. Regulatory Commission, 1997a,c) recommend site-specific soil amplification analysis for seismic design of non-rock sites and site-specific soil amplification analysis requires site-specific soil property data.

16. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Provide references that document the modification of the Savannah River Site site-wide Performance Category PC-3 spectrum developed in Lee, et al. (1997) to that used in Westinghouse Savannah River Company (WSRC) Engineering Standard 01060 (WSRC 1999a). Provide the memorandum entitled, "Revised Envelope of the Site Specific PC-3 Surface Ground Motion," from Brent Gutierrez to Lawrence Salonmone and Fred Loceff, dated September 9, 1999.

The applicant did not document or give references on how and why the PC-3 spectrum developed in Lee, et al. (1997) was modified. The application only stated (page 1.3.6-22) that "Following the development of PC-3 and PC-4 design basis spectra and the PC-1 and PC-2 design basis spectra, additional conservatism was applied to the PC-3 spectral shape at high and intermediate frequencies."

17. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Demonstrate that the selected MFFF design spectrum envelopes the uniform hazard spectra at the soil surface that is specific to the MFFF site.

The applicant did not demonstrate that the selected design spectrum envelopes the surface uniform hazard spectra specific to the MFFF site at the selected return periods. Instead, the applicant showed that the selected design spectrum envelops the Savannah River Site site-wide PC-3 spectrum. Position 4 of Regulatory Guide 1.165 (U.S. Regulatory Commission, 1997b) and Section 2.5.2.6 (Safe Shutdown Earthquake Ground Motion) of NUREG-0800 (U.S. Regulatory Commission, 1997c) recommend that the development of design spectra be site-specific.

18. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Provide the bases for selecting vertical spectrum as two thirds of the horizontal spectrum at corresponding frequencies.

The applicant did not provide justifications for the selection of vertical spectrum. Section 2.5.2.6 of NUREG-0800 (U.S. Regulatory Commission, 1997c) states, "Both horizontal and vertical component site-specific response spectra should be developed statistically from response spectra of recorded strong motion records ... ."

19. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Provide the following items with regard to ground motion modeling:

a. Details of the input and output in ground motion prediction.

b. Description of approaches used to account for uncertainties in ground motion prediction.

c. Results that show sensitivities of predicted ground motion to important input parameters such as stress drop.

d. Documentation on how the ground motion prediction models were used in calculating site-specific seismic hazard and in selecting seismic design spectra specific to the MFFF.

The applicant did not provide these items. Section 1.3.6.4 of MFFF application indicates that Random Vibration Theory (RVT) was used in predicting ground motion attenuation at the Savannah River Site. It further presented earthquake source parameters, bedrock and crustal path properties, and soil properties at the Savannah River Site. It is, however, not clear how the RVT model and path and site properties data were used in calculating the MFFF seismic hazard and in selecting the MFFF seismic design spectra. If Savannah River Site spectra were estimated based on LLNL and EPRI bedrock hazard results, as stated in the application as well as Lee, et al. (1997) and Lee (1998), ground motion models should include those used in the original LLNL and EPRI studies. These RAI items are consistent with regulatory requirements described in Position 4 and Appendix E of Regulatory Guide 1.165 (U.S. Regulatory Commission, 1997b), Section 2.5.2.5 (Seismic Wave Transmission Characteristics of the Site) of NUREG-0800 (U.S. Regulatory Commission, 1997c), and Section 5 (Methodology for Estimating Ground Motion on Rock) of NUREG/CR-6372 (U.S. Nuclear Regulatory Commission, 1997a).

20. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Clarify how and why the return periods were evaluated on page 1.3.6-13 of the application.

It appears from the application that the return periods were chosen from 5 Hz spectrum accelerations (Table 1.3.6-7 and Figure 1.3.6-16). The applicant did not give the bases and purposes for evaluation of return periods from 5 Hz spectrum accelerations.

21. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Document how the spectral ground accelerations were converted to velocities as shown in Figure 1.3.6-16.

The ground motion in PC-3, PC-4, and 0.2g Regulatory Guide 1.60 Spectra are given as acceleration, whereas ground motion is given as velocity in Figure 1.3.6-16. The applicant did not show how the spectral ground accelerations were converted to velocities to obtain the return period from Figure 1.3.6-16.

22. Section 1.3.6, pp. 1.3.6-1 thru 1.3.6-86

Clarify the description given on page 1.3.6-19 (first paragraph) for Figure 1.3.6-16.

It appears that the description given on page 1.3.6-19 is inconsistent with the figure itself.

23. Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3

Provide technical basis for excluding slope instability hazard, with a detailed topographic contour map (1-ft interval) of the site including the locations of the principal structures, systems, and components (SSCs).

The application does not discuss adequately slope instability at the site. Slope instability is one of the natural phenomena hazards that could affect the performance of the principal structures and systems. Regulatory requirement 10 CFR 70.22(f) requires an application to contain a safety assessment of the design bases of the principal SSCs for the proposed facility, including provisions for protection against natural phenomena. Regulatory requirement 10 CFR 70.62(c)(iv) requires the applicant to conduct an integrated safety analysis to identify potential accident sequences. The analysis should include natural phenomena hazards. Also, 10 CFR 70.64(a)(2) requires applications to address the baseline design criteria related to the natural phenomena hazards. In Section 5.5 of the application, avalanche and landsliding events are determined to be not credible because the site is relatively flat. Figure 1.3.1-2 of the application seems to support the statement that the site is relatively flat. However, Figure 1.3.1-2 is a regional topographic map with a relatively large scale. Consequently, this map does not contain sufficient information for staff to determine with reasonable assurance that the slope instability hazard can be excluded as a baseline design criterion.

24. Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3

Provide the following items which are related to the effect of the Actinide Packaging and Storage Facility spoil at the site on the principal SSCs.

a. Discuss the location of the spoil pile relative to the site, particularly to the principal structures and systems.

b. Discuss the characteristics of the spoil pile including material properties.

c. Assess the static and dynamic stability of the spoil pile, if necessary.

d. Discuss the potential effects of the spoil pile, if determined to be unstable, on the principal structures and systems, if necessary.

e. Discuss remedial measures if the spoil pile is determined to be potentially unstable and the performance of a structure or system will be affected.

Although the spoil pile is a man-made feature, its instability may still affect the performance of the principal SSCs at the site. It is, therefore, necessary to be addressed as a baseline design criterion unless the analysis performed pursuant to 10 CFR 70.62(c) demonstrates that the spoil pile instability is not a credible event or will not affect the performance of the principal SSCs. These RAI items are consistent with Section 2.5.5 (Stability of Slopes) of NUREG-800 (U.S. Nuclear Regulatory Commission, 1997c) and Regulatory Guide 3.11 (U.S. Nuclear Regulatory Commission, 1977).

25. Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3

Provide analysis on the liquefaction susceptibility of loose subsurface materials at the site. The analysis results should include the following items:

a. Analysis/interpretation of the data collected from the field programs and laboratory testing to characterize site conditions and to define behavior characteristics of the native soils at the site.

b. Results of the liquefaction potential analysis at the site.

c. Effects of liquefaction on the principal SSCs.

The application does not contain a technical discussion on liquefaction susceptibility, its potential effect, and remedial measures although it identifies liquefaction as a potentially credible event (Section 5.5 of the application). Liquefaction is a natural phenomena hazard required to be included in the integrated safety analysis and baseline design criteria pursuant to 10 CFR 70.62(c) and 10 CFR 70.64(a)(2). Also, 10 CFR 70.22(f) requires the application to contain a safety assessment of the design bases of the principal SSCs for the proposed facility, including provisions for protection against natural phenomena. These RAI items are consistent with Section 2.5.4 (Stability of Subsurface Materials and Foundations) of NUREG-800 (U.S. Nuclear Regulatory Commission, 1997c) and Regulatory Guide 3.11 (U.S. Nuclear Regulatory Commission, 1977).

26. Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3

Define the lateral extent/boundary of each soft zone identified at the site.

Section 1.3.7.2 of the application states that, "The exploration programs indicated that soft zones at the MFFF site are isolated and found as soft soil pockets at depth." However, the lateral extent of these soft zones were not provided in the application or its supporting documents.

27. Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3

Clarify the following two statements:

a. "Once the location and extent of the soft zones on the MFFF site were identified, the MFFF principal SSCs, such as the MOX Fuel Fabrication Building and the Emergency Diesel Generator Building were relocated to areas of the site found to be free of soft zones." (Section 1.3.5.2, MFFF Site Geology)

b. "MFFF principal SSCs, such as the MOX Fuel Fabrication Building and the Emergency Diesel Generator Building, were located on the MFFF site to avoid placement directly over significant soft zones." (Section 1.3.7.2, Evaluation of Soft Zones)

These two statements appear to be contradictory with each other. Furthermore, definition on "significant" soft zones needs to be provided. Compare Figure 11.1-1 of the MFFF Construction Authorization Request with Figure 2 of the MOX Fuel Fabrication Facility Site Geotechnical Report (DCS, 2000), the MOX Fuel Fabrication Building seems to be located above the soft zones, particularly the northern portion of the building.

28. <u>Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3</u>

Provide an analysis on soft zones regarding:

a. Mechanical and strength properties of the soft zone soils and the representativeness of these properties.

b. Potential load increase in soft zone soils due to static and seismic design loads.

c. Deformations that may result in the soft zones from static and dynamic foundation loading.

d. Structure settlement that may result from the deformations of the soft zones to critical structures.

The application does not provide analysis on the stability of the soft zones identified when subjected to foundation and dynamic loads. Consequently, the effect of the soft zone deformation on the design of the critical structures cannot be evaluated by the staff. Regulatory requirement 10 CFR 70.64(a)(2) requires that the design to provide adequate protection against natural phenomena hazards.

29. <u>Section 1.3.7, pp. 1.3.7-1 thru 1.3.7-3</u>

Provide the following references to facilitate review of the application:

a. Westinghouse Savannah River Company, 1999. *Significance of soft zone sediments at the Savannah River site-Historical review of significant investigations and current understanding of soft zone origin, extent and stability*, Report No. WRSC TR 99 4083, Rev 0, September.

b. Duke Cogema Stone & Webster. 2000a. *Specification for Geotechnical Test Borings and Sampling*. DCS01-WRS-DS-SPE-G-00002-A, April 11.

c. Duke Cogema Stone & Webster. 2000b. *Specification for Laboratory Testing of Soils Quality*. DCS01-WRS-DS-SPE-G-00003-A, May.

d. Duke Cogema Stone & Webster. 2000c. *Specification for Cone Penetration Testing of Soil*. DCS01-WRS-DS-SPE-G-00001-A, April 11.

e. "Revised Envelope of the Site Specific PC-3 Surface Ground Motion", Memorandum from Brent Gutierrez to Lawrence Salonmone and Fred Loceff, September 9, 1999.

f. Stokoe, K.H., et al., 1995. "Correlation Study of Nonlinear Dynamic Soil Properties: Savannah River Site, Aiken, South Carolina," Rev. 0, File No. Savannah River Site-RF-CDP-95, University of Texas at Austin, Department Civil Engineering, September 13.

CHAPTER 2, FINANCIAL QUALIFICATIONS

30. Section 2.1, p. 2-1

Provide information on project costs.

Under Section 2.3.A of SRP, the applicant needs to provide information of project costs. In the application, DCS stated that project cost information has been prepared and submitted to DOE for approval. Once approved this information will be submitted under separate cover. This information has not yet been submitted to the NRC for review.

31. Section 2.4, p. 2-3

Provide financial statements and Securities and Exchange Commission Report 10-K applicable to fiscal year 2000. If no Report 10-K is required, provide such a statement.

Under Section 2.3.D of the SRP, the applicant needs to provide the most recent financial statements and Securities and Exchange Commission Report 10-K. In the application, the applicant provided financial statements for the period March 22, 1999, to December 31, 1999. No Report 10-K was provided. The most recent financial statements and Report 10-K for the fiscal year ending December 31, 2000, is needed to assess the applicant's current financial status.

CHAPTER 4, ORGANIZATION AND ADMINISTRATION

32. Chapter 4, General

Explain experience requirements.

Section 4.4.3.A.iii.a of the SRP states, for key management positions, "The personnel to design and construct the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities ..." [A similar requirement exists for operations. Section 4.4.3.B.iii.a of the SRP states, for key management positions, "The personnel to operate the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities ..."]

Section 4 provides the experience requirements for the management at the proposed facility. However, no requirement is identified for experience in fuel fabrication for any of the managers. In addition, there is no requirement for plutonium handling experience and training. More information is needed to demonstrate that the positions proposed for the facility will have the necessary experience and qualifications for safe operations at the MOX.

33. Chapter 4, pp. 4-1 thru 4-6

Provide a full description of the applicant's organization for construction.

SRP Section 4.3 states that the applicant's identification and functional description of the specific organizational groups responsible for designing and constructing the facility should include contractors, consultants, and other outside service organizations in addition to the applicant. This should also include, but not be limited to, the process designers, architect engineering firm, and the construction contractor.

Chapter 4 of the application has brief descriptions relating to "construction management," but does not address the actual construction responsibilities and interfaces. Clarify if there will be major delegation of work such as to an architect/engineer, a MOX plant constructor, an integration contractor, system suppliers or other on- or off-site organizations. The authorities and responsibilities among the organizational groups and the means of communication should be addressed, including the DCS design and engineering functions and the various contractors during construction. Organization charts should reflect the lines of responsibility and authority. Clear and unambiguous controls and communications, and responsibility and authority between the construction, equipment and system suppliers and DCS design, engineering, project management, procurement, construction management and quality assurance (QA), should be identified. All key management positions for construction activities should be adequately addressed. Specific activities such as inspection and testing of construction activities, equipment and SSCs should be adequately addressed as to what organization performs them, and what, how and by whom, QA controls and management measures are applied.

(Note: The same issue applies to Application Section 15.1.1, DCS Organization.)

34. Chapter 4, pp. 4-1 thru 4-6

Specifically explain the organizational responsibilities, authorities, interfaces, and means of communications for configuration management, in particular change control, during construction, both within DCS and for subcontractors, including those for fabrication, assembly and construction.

SRP Section 4.3.A.ii. states that the applicant's organization should commit to formal management measures and that the organization and plans for transition from design and construction to operation should be adequate to maintain the design bases at all times.

35. Chapter 4, pp. 4-1 thru 4-6

Please explain the organizational responsibilities, authorities, interfaces, and means of communications with DOE and Savannah River Site contractor organizations that may affect principal SSCs.

SRP Section 4.3 states that the applicant's identification and functional description of the specific organizational groups responsible for designing and constructing the facility should include.....other outside service organizations in addition to the applicant. SRP Section 4.3.A.ii. states that the applicant's organization should commit to formal management measures and that the organization and plans for transition from design and construction to operation should be adequate to maintain the design bases at all times.

The organizational responsibilities, authorities, interfaces, and means of communications with DOE and Savannah River Site contractor organizations that supply, maintain, perform or provide services, systems or utilities that may affect principal SSCs and the responsibilities to assure that management measures are adequate, including configuration management, in particular change control, and procedures should be addressed.

36. Chapter 4, pp. 4-1 thru 4-11

Indicate responsibility for fire protection.

SRP Section 7.4.3.1 recommends that responsibilities for fire protection management, implementation and assessment be identified. The application does not show how fire protection is integrated into the Environmental Safety and Health oversight or construction design reviews.

37. Figures 4-1 and 4-2, pp. 4-9 thru 4-11

Provide greater specificity in the management organization plan.

Section 4.4.3.A.iii.a of the SRP states, for key management positions, "The personnel to design and construct the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities, as indicated in the organizational structure ..." [A similar requirement exists for operations. Section 4.4.3.B.iii.a of the SRP states, for key management positions, "The personnel to operate the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities, as indicated in the organizational structure ..."]

Figures 4-1 and 4-2 provide organizational charts. The NRC would anticipate that Figure 4-1 would be more explicit vis-a-vis positions, the location of the Safety Assessment manager and safety activities, and current design and regulatory activities. Current names and qualifications of individuals should be supplied. In addition, on Figure 4-2, the NRC would anticipate, there should be a link between regulatory manager and corporate management, including corporate safety management.

CHAPTER 5, INTEGRATED SAFETY ANALYSIS

38. Section 5.2, p. 5.2-1

Clarify the makeup and functions of the "Safety Assessment Team."

Section 4.4.3.A.iii.a of the SRP states, for key management positions, "The personnel to design and construct the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities, as indicated in the organizational structure ..." [A similar requirement exists for operations. Section 4.4.3.B.iii.a of the SRP states, for key management positions, "The personnel to operate the facility have the appropriate breadth and level of experience for their respective authorities and responsibilities, as indicated in the organizational structure ..."]

Section 5.2 of the application is entitled, "Safety Assessment Team Description." However, no specific individuals and their qualifications are identified. In addition, fuel fabrication and/or MOX experience is not mentioned. The NRC would anticipate that personnel of appropriate experience and qualifications would be identified to ensure that safety and safety-related issues are adequately assessed.

39. Section 5.4.3, pp. 5.4-8 and 5.4-9; Section 5.5.2.4.6, pp. 5.5-27 thru 5.5-31

Provide more quantification or other specificity for likelihood definitions and reliability requirements of the process safety I&C system.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 5.4.3 mentions likelihood definitions and states, "In general, qualitative methods will be used ..." Section 5.5.2.4.6, "Safety Evaluation," relies upon the process safety I&C system as the principal SSC/IROFS for many events. However, it is not clear how the likelihood/reliability of the process safety I&C system - and other principal SSCs/IROFSs for that matter - meets the likelihood requirements of Part 70. This is exacerbated by the lack of quantification or numerical values and ranges for the reliability of the process safety I&C system. An explanation of the layers of protection and their reliability/likelihoods is not included. For example, commitment to a Class 1 safety instrumentation system might have a Probability of Failure on Demand (PFOD) of 0.1, a class 2 system a PFOD of 1E-2, and a Class 3 system a PFOD of 1E-3. In the absence of more quantitative information, it is not possible to make a safety determination.

40. Section 5.4.3, pp. 5.4-8 and 5.4-9

State whether "unlikely" as defined in Section 5.4.3 of the application for intermediate consequence events is considered equivalent to "unlikely" as defined in the double contingency principle.

"Unlikely" is defined in this section for the purposes of performing the ISA, but no definition of the term in the double contingency principle is provided. This term is part of the definition of double continency, and the staff must understand what the applicant means by this to determine whether the requirements of 10 CFR 70.64(a)(9) have been met.

41. Section 5.4.3, pp. 5.4-8 and 5.4-9

Explain the statement in Application Section 5.4.3 that "application of the double contingency principle and/or single-failure criteria (in accordance with traditional engineering methods) is sufficient to satisfy the performance requirements of 10 CFR §70.61." Demonstrate how application of the double contingency principle ensures that criticality is "highly unlikely".

10 CFR Part 70 contains two different requirements (among others) that must be met for criticality safety: the requirement in §70.61(b) that high-consequence events must be "highly unlikely", and the requirement in §70.64(a)(9) for criticality control including adherence to the double contingency principle. These are not necessarily equivalent.

42. Section 5.4.4, pp. 5.4-9 thru 5.4-14

Revise the description in Section 5.4.4 that members of the public and the environment are considered to be outside the controlled area boundary approximately 5 miles (8 km) from the MFFF building stack.

NRC considers Savannah River Site workers who are outside the MFFF restricted area but within the controlled area boundary and who are not closely and frequently connected to the licensed activity as members of the public. Further, the definition of a member of the public does not preclude these individuals from being present in the controlled area.

Section 10.4.3.C.ii.c of the SRP recommends that the applicant use acceptable methods for estimating consequences from accident sequences that result in radiological releases to the environment. With regard to considering the affected environment to be outside a 5 mile radius from the MFFF building stack, NRC regulation 10 CFR 70.61(c) describes several intermediate consequence events, including a "24-hour average release of radioactive material outside the restricted area in concentrations exceeding 5000 times the values in Table 2 of Appendix B to Part 20." The calculation of this 24-hour average release concentration is described in Equation 5.4-3 on page 5.4-11 of the application. A term in this equation is the atmospheric dispersion factor for a member of the public. The derivation of the value for this factor is described in section 5.4.4.1.3.1, which states that the factor was derived using a distance of 5 miles (8 km) from the point of release. However, 10 CFR 70.61(c)(3) describes the intermediate consequence event as a release outside the restricted area. In section 1.1.2.1, DCS describes the restricted area boundary as "coincident with the protected area, an area encompassed by physical barriers and to which access is controlled, as shown in Figure 1.1-2." From Figure 1.1-2, it appears that the protected area boundary is approximately 650 feet from the plant stack, not 5 miles (8 km).

43. Section 5.4.4.1.1, pp. 5.4-9 thru 5.4-10

Explain how the duration of entrainment events is limited in deriving the source term for entrainment events.

Section 10.4.3.C.ii.c of the SRP recommends that the applicant use acceptable methods for estimating consequences from accident sequences that result in radiological releases to the environment. In Section 5.4.4.1.1, DCS states that "for entrainment events, the airborne release fraction is replaced with the airborne release rate (ARR) multiplied by the entrainment duration (i.e., ARF = ARR x duration)." However, in Section 5.4.4, DCS states that "no evacuation is credited for the assessment of the unmitigated radiological consequences." Since exposure to material at risk is not limited by evacuation for entrainment events, DCS should explain how the exposures are otherwise limited. For example, does the duration of the event coincide with the complete expenditure of the material at risk?

44. <u>Section 5.4.4.1.2, pp. 5.4-10 thru 5.4-12</u>

Calculate the effluent concentration ratio without taking credit for the respirable fraction.

SRP Section 9.1.4.6.3.A recommends that the applicant use appropriate and verified assessment methods, computer codes, and literature values. Equation 5.4-3, the equation for 24-hour average effluent concentration ratio, contains a term for source term (ST) which is the same term as that used in Equation 5.4-2 for total effective dose equivalent to human receptors. The definition of source term, which is provided in Equation 5.4-1, has a term for the respirable fraction (RF). However, the inclusion of RF in source term derivations for demonstrating compliance with 10 CFR 70.61(c)(3) is not appropriate. This performance requirement relates to protection of the environment, not to protection of human health. Therefore, the applicant should demonstrate that the performance requirement is met for the entire range of particle sizes released to the environment, not just the respirable particle sizes.

45. <u>Section 5.4.4.1.2, pp. 5.4-10 thru 5.4-12</u>

Clarify how dose conversion factors from Federal Guidance Report No. 11 were chosen with due consideration for the chemical forms of radionuclides involved in accident scenarios.

Section 9.1.4.6.3.A of the SRP recommends that the applicant use appropriate and verified assessment methods, computer codes, and literature values. Section 5.4.4.1.2, "Dose Evaluation," describes the assumptions for calculating bounding total effective dose equivalent to individuals exposed during accidents, including the use of Federal Guidance Report No. 11 as the source of dose conversion factors used in the analysis. In many cases, Federal Guidance Report No. 11 provides dose conversion factors for more than one chemical form (or solubility) of the radionuclides listed. These multiple forms are represented by the transportability classes D, W and Y, where, for plutonium, the more limiting dose conversion factors are generally associated with class W compounds (such as plutonium nitrate). The application does not contain a description in Section 5.4.4.1.2 of how the solubility of various chemical forms of plutonium and americium were considered in performing the dose assessments.

46. <u>Section 5.4.4.1.3. pp. 5.4-12 thru 5.4-13</u>

Provide the hourly meteorological data for the period from January 1, 1987 through December 31, 1996 that was collected from the H-area meteorological tower. Include the standard deviation of the horizontal wind direction fluctuations (sigma-theta), derived stability class, wind direction, wind speed and accumulated precipitation for each hour. Include a description of how stability classes are derived using sigma-a and sigma-theta.

Section 5.4.3.2.B.v of the SRP recommends that the applicant provide a scientifically correct and reasonable estimate of the consequences from analyzed accidents. Several radiological accident consequence models that NRC may use to verify the applicant’s dose calculations require hourly measurements of meteorological data. Therefore, the NRC staff must have the actual hourly data, rather than statistical summaries, to verify the correctness and reasonableness of the applicant’s estimates.

47. Section 5.5.1.1.1, p. 5.5-1; Table 5.5-2, pp. 5.5-60 thru 5.5-67

Explain why high enriched uranium (HEU) is not included in Table 5.5-2 of the application as a hazardous material ("Haz Mat").

Section 5.4.3.1.D of the SRP recommends that the applicant show that the hazard identification method provide a list of material or conditions that could result in hazardous situations. The HEU waste stream is described in several sections throughout the application. For example, Section 8.1.1.2.3 briefly describes the dilution of the HEU and subsequent storage in a vessel, but neither the HEU nor its storage vessel is explicitly described in Table 5.5-2 as a hazard.

48. Section 5.5.1.1.1, p. 5.5-1; Table 5.5-2, pp. 5.5-60 thru 5.5-67; and Table 1.2-1, p. 1.2-7

Resolve the discrepancy between the possession limit for uranium of any enrichment of 3 kg in Table 1.2-1 and that which would be expected to be in the facility based on the "Non-Polished Plutonium Sources" fraction of 0.019 gm uranium-235 per gm Pu+Am in the 70 year Final Isotopic Composition found in Table 9-3, and the possession limit of 9000 kg of plutonium as > 95 percent plutonium-239.

10 CFR 70.22(a)(4) requires that the applicant provide the name, amount and specification of the special nuclear material the applicant proposes to use. From Table 9-3, the 70 year Final Isotopic Composition in non-polished plutonium sources would be expected to include 0.019 gm uranium-235 per gram of plutonium plus americium. Given that the possession limit for plutonium as > 95 percent plutonium-239 is 9000 kilograms, this would amount to a potential maximum of 171 kilograms of uranium-235 in the form of >90% enriched uranium-235, not 3 kilograms as specified in Table 1.2-1.

49. Section 5.5.1.2, p. 5.5-3

Provide calculations and design bases to demonstrate that passive heat removal is adequate.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

On page 5.5-3, the application indicates that passive removal of decay heat is adequate for all areas except for the 3013 canister storage area. Calculations to justify that passive heat removal is adequate need to be provided before a safety determination can be made.

50. Section 5.5.2.1.6.1, pp. 5.5-5 and 5.5-6

Clarify the events and design bases for the electrolyzer. Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 5.5.2.1.6.1 describes a fire event involving the electrolyzer. The over-temperature results in the boiling of the electrolyzer contents and breach of the glovebox. Ultimately, solution containing unpolished plutonium is released into the C3b area. The application indicates a prevention-type strategy is used to protect the worker, based upon the process safety I&C system. The safety function involves shutting down the electrolyzer system and allowing passive convection cooling down to ambient temperature (i.e., no safety cooling system). Protection of the site worker and the public involve the filters on the C3 confinement system. However, no design basis information is provided to support these scenarios and proposed control approach. In addition, it is likely that there will be significant electrical currents and/or other energy input during an off-normal condition of the electrolyzer that metallic components could be heated significantly above ambient temperature. This could result in additional scenarios, such as hydrogen generation and metal combustion, that might not be addressed by the proposed control schemes. A determination of adequate assurances of safety cannot be made without this additional description and design basis information.

51. Section 5.5.2.3.6.3, pp. 5.5-22 thru 5.5-24

Clarify whether the 3013 canister is either a principal SSC or a defense-in-depth SSC for protection of the site worker from a load handling event.

Section 5.4.3.1.F of the SRP recommends that the applicant clearly describe the principal SSCs. Section 5.5.2.3.6.3 states that the 3013 canister is a both a principal SSC and defense-in-depth SSC for the site worker. This feature could be either a principal SSC or defense-in-depth SSC, but not both.

52. Section 5.5.2.3.6.3, pp. 5.5-22 thru 5.5-24

Clarify whether principal SSCs are applied to protect the site worker from a load handling event involving a MOX Fuel Transport Cask.

Section 5.4.3.1.F of the SRP recommends that the applicant clearly describe the principal SSCs. Section 5.5.2.3.6.3 does not mention whether or not principal SSCs are applied to mitigate the consequences to a site worker from a load handling event involving a MOX Fuel Transport Cask.

53. Section 5.5.2.4.6.2, p. 5.5-28; Table 5.5-19, p. 5.5-101

Resolve the discrepancy between Table 5.5-19, which shows that waste containers are principal SSCs for the protection of site workers only, and Section 5.5.2.4.6.2, which describes waste containers as principal SSCs for protection of the public, site worker and facility worker.

Section 5.4.3.1.F of the SRP recommends that the applicant clearly describe the principal SSCs. It is not clear whether the waste containers are principal SSCs solely for the protection of site workers or for the public, site workers and facility workers because the discussion in Section 5.5.2.4.6.2 appears to contradict the entry in Table 5.5-19 for this SSC.

54. Section 5.5.2.4.6.10, p. 5.5-31

Verify that the delivery of chemicals does not present additional hazards to the facility.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F of the SRP mention that design bases, process safety features, and Items Relied on for Safety (IROFS) should be included in the application.

Section 5.5.2.4.6.10 of the application briefly mentions outside explosions and mentions a mitigation strategy based upon maintaining the structure of the MOX fuel fabrication building and the emergency diesel generator building, and protecting the waste transfer line. However, the facility uses multiple chemical reagents that will require deliveries to replenish the supplies, and it is not clear if the explosion analyses have considered the potential hazards from deliveries. In particular, deliveries of hydrogen and fuel oil would seem to present predominantly explosion concerns, delivery of compressed gas cylinders might present primarily missile concerns, and deliveries of nitric acid and inert gases would present habitability concerns. In addition, events from operator activities during deliveries (e.g., overfilling) may also be of concern. The NRC would anticipate some analyses of these delivery situations, off-normal events, safe distances, their design bases and values, reliabilities, etc. In the absence of such information, it is not possible to make a safety determination.

55. Section 5.5.2.6, pp. 5.5-33 thru 5.5-38

Provide your philosophy/approach for combining independent (and dependent) natural phenomena events as well as natural events that are not "highly unlikely" with process events which are also not "highly unlikely." Parameters such as event duration and time to repair or mitigate may be taken into account to select credible combinations.

The regulatory acceptance criteria as provided in Section 5.4.3.1 (D)(ii)(a) of the MOX SRP states that the applicant's approach for the Process Hazard Analysis (PHA) should allow the applicant to examine selected accidents including natural phenomena and other types of bounding accidents. In the discussion of Natural Phenomena in Section 5.5.2.6, all events are listed as independent events.

56. <u>Section 5.5.2.6, pp. 5.5-34 thru 5.5-38</u>

Provide the rationale for choosing the widely varying annual exceedance probabilities for natural phenomena, for example, tornado ($2X10^{-6}$) and snow and ice events ($1\ X10^{-2}$). The explanation of rationale should include extreme local precipitation, snow and ice events, tornadoes, extreme winds, lightning, seismic events, external fires, and temperature extremes as listed in Section 5.5.2.6 of the application. Also provide a demonstration of how the selection of these various events for facility design will satisfy the performance requirements of 10 CFR 70.61. If design details are not yet available for such a demonstration, describe the approach or logic for incorporating future design information into such a demonstration.

The regulatory acceptance criteria as provided in Section 5.4.3.1 (D)(ii)(a) of the MOX SRP states that the applicant's approach for the PHA should allow the applicant to examine selected accidents including natural phenomena and other types of bounding accidents.

57. <u>Section 5.5.2.7.6.2, p. 5.5-40</u>

Provide the basis of the statement that the impacts of explosions in F area are bounded by the impacts accounted for in the MFFF structures for safeguards and security reasons, including expected explosion overpressures, the basis of these estimated overpressures, and the ability of the facility to withstand the estimated overpressures.

Section 5.4.3.1 (D)(ii)(b) of the MOX SRP states that the applicant's approach for the probabilistic hazard assessment should allow the applicant to examine selected accidents including natural phenomena and other events such as fires, explosions, criticalities, radiological (or hazardous chemical as applicable under 10 CFR Part 70) exposures, and loss of containment. In Section 5.5.2.7.6.2 of the application it is stated that the impacts of explosions in F area are bounded by the impacts accounted for in the MFFF structures for safeguards and security reasons.

58. <u>Section 5.5.3.2, pp. 5.5-46 thru 5.5-47</u>

Clarify the choice of $6x10^{-4}$ as the respirable release fraction (ARFxRF) for the bounding accident consequence assessment in Section 5.5.3.2.

SRP Section 9.1.4.6.3.A recommends that the applicant use appropriate and verified assessment methods, computer codes, and literature values. Section 5.5.3.2, "Internal Fire," describes a bounding consequence assessment in which the respirable release fraction (ARF x RF) is $6x10^{-4}$. However, the reference for this value (NUREG/CR-6410, Nuclear Fuel Cycle Facility Accident Analysis Handbook) cites an ARF = $6x10^{-3}$ and an RF = 0.01 for solid, noncombustible powders exposed to thermal stress (i.e., an ARFxRF = $6x10^{-5}$).

59. <u>Section 5.5.3.2, pp. 5.5-46 thru 5.5-47</u>

Justify the use of a leak path factor of 10^{-4} for two banks of HEPA filters under accident conditions.

Under 10 CFR 70.22(f), the application for a license for a plutonium fuel fabrication plant must provide a description and safety assessment of the design bases of the principal structure, systems, and components of the plant. In the application the ventilation filtration system is assumed to operate and mitigate releases of radioactive material following accidents. The application states that the leak path factor for two banks of HEPA filters is assumed to be 10^{-4} The basis for this assumption is not presented. NRC guidance in “Nuclear Fuel Cycle Facility Accident Analysis Handbook,” NUREG/CR-6410, recommends that removal efficiencies of 99 percent to 95 percent be used of a series of HEPA filters that are not protected by prefilters, sprinklers, and demisters under severe accident conditions.

60. Section 5.5.3.5, pp. 5.5-48 and 5.5-49

Describe the "Explosion Event" in more detail.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 5.5.3.5, "Explosion Event," discusses an internal explosion from either over-pressurization or due to potentially explosive mixtures. No energies, pressures, or other parameters are given. No reliability values are provided to demonstrate that the event would be highly unlikely. The application states the radioactive materials are filtered prior to their release, and uses a bounding leak path factor of 1E-04. However, HEPA filters are unlikely to survive an explosion of the magnitude implied by the text, and the leak path factor is likely to be orders of magnitude larger. In addition, there may be a substantial release of highly respirable material from the damaged or destroyed HEPA filters. More information and design bases are needed before a safety determination can be made.

61. Table 5.5-2, pp. 5.5-60 thru 5.5-67

Provide information to correlate specific events or compartments containing events as identified in Appendix 5A with the radioactive inventory as listed in Table 5.5-2. Location descriptions or identifiers should also be adequate to locate events on drawings showing fire barriers, ventilation zones and components, and other features affecting safety. For example, from an integrated safety perspective, the staff will need to evaluate events similar to FW-1 and FW-2 (Table 5.5-12), which pertain to fires involving more than one fire area and systems that cross fire areas, respectively.

Section 5.4.3.1 (E)(i) of the MOX SRP recommends that the applicant’s safety assessment of the design bases includes a hazards analysis that identifies the approximate location and quantities of Special Nuclear Material (SNM) and other hazardous materials. The staff will need to locate analyzed events and areas for potential events in order to evaluate the applicant’s analysis and to determine if there is any potential for additional consequences due to common mode failures, fire spread, or other effects that will need to be determined from an integrated assessment.

62. Table 5.5-9, p. 5.5-86; Table 5.5-12, p. 5.5-90; Table 5.5-15, p. 5.5-95; and 5.5-18, p. 5.5-100; Appendix 5A

Explain the difference between the events provided in the tables in Appendix 5A and those listed in Tables 5.5-9, 5.5-12, 5.5-15, and 5.5-18. Explain if the events listed in Tables 5.5-9, 5.5-12, 5.5-15, and 5.5-18 are a subset of those tables in Appendix 5A.

Section 5.4.3.1 (E) of the MOX SRP recommends that the applicant's safety assessment of the design basis shows that the design and design bases will result in a facility that will meet the performance requirements of 10 CFR 70.61 and the defense-in-depth requirements of 10 CFR 70.64(b). The SRP also recommends that the safety assessment of the design basis should include a hazards analysis. Clarification of the lists of events is necessary to understand the hazard analysis which is included to support the application.

63. Table 5.5-9, p. 5.5-86; Table 5.5-12, p. 5.5-90; Table 5.5-15, p. 5.5-95; and 5.5-18, p. 5.5-100;

Provide the calculated consequences for all hazard assessment events as listed in Tables 5.5-9, 5.5-12, 5.5-15, and 5.5-18. Also provide the parameters used in equations 5.4-1 and 5.4-2 to calculate the consequences.

Section 5.4.3.1 (D)(iv) of the MOX SRP recommends that the applicant's approach for assessing the consequences of accidents be consistent with the acceptance criteria in Section 5.4.3.2 (B)(v)(c). The consequences and parameters need to be provided for the staff to evaluate the approach.

64. Table 5.5-10, pp. 5.5-87 and 5.5-88; Table 5.5-13, pp. 5.5-91 and 5.5-92; Table 5.5-16, pp. 5.5-96 and 5.5-97

Provide a description of the training and procedures to be relied on as SSCs and provide estimates of the likelihood of these procedures to be incorrectly followed or to fail to provide the intended mitigation.

Section 5.4.3.1 (D)(iii) of the MOX SRP recommends that the applicant's approach for applying likelihoods to the accidents should show how each principal SSC acts to prevent or mitigate the accident. The staff will need to know the likelihood of events with consequences that could exceed regulatory limits to determine if the plant will meet the performance requirements of 10 CFR 70.61. Tables 5.5-10, 5.5-13, and 5.5-16 list principal SSCs for facility worker protection from various event categories. Some of the event groups within the categories contain training and procedures as their principal SSCs.

65. Table 5.5-10, pp. 5.5-87 and 5.5-88; Table 5.5-11, p. 5.5-89; Table 5.5-13, pp. 5.5-91 and 5.5-92; Table 5.5-14, pp. 5.5-93 and 5.5-94; Table 5.5-16, pp. 5.5-96 and 5.5-97; Table 5.5-17, pp. 5.5-98 and 5.5-99; Table 5.5-19, pp. 5.5-101 and 5.5-102

In addition to information provided in response to the comment above, provide failure or reliability estimates (ranges would be sufficient) for the principal SSCs as listed in Tables

5.5-10, 5.5-11, 5.5-13, 5.5-14, 5.5-16, 5.5-17, and 5.5-19. If a failure or reliability value can not be determined from the description of the SSC, then a target value for desired maximum failure probability or minimum reliability should be provided.

Section 5.4.3.1 (D)(iii) of the MOX SRP recommends that the applicant's approach for applying likelihoods to the accidents should show how each principal SSC acts to prevent or mitigate the accident. The staff will need to know the likelihood of events with consequences that could exceed regulatory limits to determine if the plant will meet the performance requirements of 10 CFR 70.61.

66. Table 5.6-1, pp. 5.6-5 thru 5.6-11

Describe the safety functions that are allocated directly or indirectly to software components.

Per Section 11.3 of the SRP, the Safety Analysis should address how potential failure modes are analyzed, including consideration of communication failures, common-mode failures, and human errors. Software is a potential common-mode and it is not clear from the table if it was considered. Software is frequently overlooked during system hazard analyses, but this should not occur in safety applications. Software hazard analysis controls software hazards and hazards related to interfaces between the software and the system interfaces between the software and the system (including hardware and human components.) It includes analyzing the requirements, design, implementation, user interfaces and changes. The description of methods, practices, or standards concerning the allocation of system hazards to software components and their inclusion in the requirements is missing in Table 5.6-1 of the application.

Per section 11.3 and 11.5.1 of the SRP, a determination should be made if the design basis adequately addresses the specific criteria of how potential failure modes are analyzed to include the effects of communication failures, common mode failures, and human errors. Information is needed in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

CHAPTER 6, NUCLEAR CRITICALITY ANALYSIS

67. Chapter 6, General

Explain the words "as practical" or "as needed" as used throughout this chapter. Provide explicit criteria explaining who makes the determination whether following a design principle is practical or necessary, and how the determination is made.

Explicit identification of how the design philosophy will be applied is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

68. Section 6.1, pp. 6-1 and 6-2

Describe the qualifications and duties of the Nuclear Criticality Safety (NCS) staff during the design phase.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and

components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.1.A recommends that the applicant describe positions, responsibilities, experience, and qualifications of persons responsible for NCS.

The NCS Organization and Administration is described for the operations phase, but not for the design phase except for the statement that the NCS function is within the "design engineering organization". Qualified staff are necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

69. <u>Section 6.1, pp. 6-1 and 6-2</u>

Revise the application (including pages 6-2 and 6-4) to provide the correct reference to the American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.1 standard.

Page 6-2 refers to ANSI/ANS-8.1-1983, when the correct reference should be ANSI/ANS-8.1-1983 (R1988).

70. <u>Section 6.1, pp. 6-1 and 6-2</u>

Justify the absence of a commitment to ANSI/ANS-8.19-1986, "Administrative Practices for Nuclear Criticality Safety", when describing the commitment to administrative practices in ANSI/ANS-8.1-1983 (R1988). Clarify what is being committed to with regard to administrative practices.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61 performance requirements. SRP Section 6.4.3.1.b recommends that ....

It appears that the applicant has explicitly chosen to commit to some standard administrative practices and implicitly commits to others. Clearly describing the criteria used in standards during the design is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

71. <u>Section 6.3.1, pp. 6-4 and 6-5</u>

State whether the Nuclear Criticality Safety Evaluations (NCSEs) will be completed and submitted to the NRC prior to construction. Justify your response.

Page 6-4 of the application states that, "The NCSEs are used to develop the design basis of the facility and to demonstrate compliance with the double contingency principle." Information used to develop the design basis should be submitted for review.

72. Section 6.3.1, pp. 6-4 and 6-5

On page 6-5, third bullet, define exactly what is meant by the statement, "Where practicable[. . .]," when referring to the preferred hierarchy of controls. State whether there is a specified procedure for making the determination of practicability.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.0 recommends that passive geometry control is preferred and justification should be provided for other controls.

Section 6.3.3 describes each type of control and its relative preference for use as a criticality control. The term "practicable" is rather loose in this context. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

73. Section 6.3.1, pp. 6-4 and 6-5

On page 6-5, fourth bullet, specify any additional facility management measures that may be used to flow down controlled parameters.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.D recommends that the applicant incorporate controls into facility management measures as required by 10 CFR 70.62(d).

If there are additional management measures that are relied on for safety, they should be identified here. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

74. Section 6.3.2, pp. 6-6 thru 6-8

Provide a list of those specific areas and/or operations for which an exemption is sought, with justification.

The basis for criticality accident alarm system (CAAS) exemptions is stated as follows: "CAAS coverage will be exempted from areas that are (1) limited to less than half of a minimum critical mass with no potential for double batching, and (2) used for storage of closed shipping containers." Under 10 CFR 70.24, an exemption must be approved by NRC. The CAAS is one of the principal SSCs of the facility mitigating the consequences of a criticality accident.

75. Section 6.3.2, pp. 6-6 thru 6-8

Describe whether CAAS detectors will be gamma or neutron detectors or whether they will provide dual alarm coverage of all non-exempt areas.

Dual alarm coverage is required under 10 CFR 70.24. This information does not appear to be provided in the application. The CAAS is one of the principal SSCs of the facility mitigating the consequences of a criticality accident.

76. Section 6.3.3.1, pp. 6-8 and 6-9

Clarify under what set of conditions in Section 6.3.3.1 neutron interaction is to be considered.

This section could be interpreted to mean that neutron interaction is only considered where single parameter limits are applied. This information is necessary to ensure that the process remains subcritical under both normal and credible abnormal conditions in accordance with 10 CFR 70.61(d).

77. Section 6.3.3.1, pp. 6-8 and 6-9

Explain the special status afforded to fixed neutron absorbers in Section 6.3.3.1 and state whether the use of other types of neutron absorbers are considered.

This section 6.3.3.1 singles out fixed neutron absorbers specifically in the section on general criticality control modes. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident as required by 10 CFR 70.61(d).

78. Section 6.3.3.2, pp. 6-10 and 6-18

In Section 6.3.3.2, "Available Method of Control", for all controlled parameters (especially mass, volume, and geometry), commit to consider the most reactive combinations of tolerances on the dimensions and material specifications.

SRP Section 6.4.3.3.2.9.A allows for the use of borosilicate glass raschig rings provided the applicant commits to ANSI/ANS 8.5-1996; soluble absorbers could also be used, but no mention of raschig rings or soluble absorbers is made. Section 6.3.3.2.1, "Geometry Control", states that "tolerances on nominal design dimensions are treated conservatively", but does not state that the most reactive combination of tolerances will be determined and used. This should also be generally true for other controlled parameters. This is necessary to ensure that the process remains subcritical under both normal and credible abnormal conditions in accordance with 10 CFR 70.61(d).

79. Section 6.3.3.2.4, p. 6-12; Section 6.3.3.2.5, p. 6-13

Provide a demonstration for the following assumptions: (1) the assumption that the presence of ^{241}Pu can be neglected, in Section 6.3.3.2.4; and (2) the assumption that 1-inch of water can be used to conservatively represent reflection, in Section 6.3.3.2.5.

Demonstration of these assumptions, used in designing the facility, is necessary to ensure that the process remains subcritical under both normal and credible abnormal conditions in accordance with 10 CFR 70.61(d).

80. Section 6.3.4, pp. 6-18 thru 6-33

Provide a commitment to the effect that two-parameter control is preferred over single-parameter control and show how this principle is applied in Tables 6-1 and 6-2.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.5.B recommends that two-parameter control should be preferred over one-parameter control. There does not appear to be a statement that reliance on controls on two independent parameters is preferable to two controls on one parameter. This should be part of the preferred design approach. Connected with this, several process units only appear to have a single controlled parameter defined. Knowledge of the design criteria to be used is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

81. Section 6.3.4, pp. 6-18 thru 6-30

For the Aqueous Polishing Process, for those Criticality Control Units (CCUs) where there is only one control defined, state the design approach to establishing double contingency protection, including whether there will be dual independent controls on the one parameter.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61 performance requirements. SRP Section 6.4.3.3.5.A recommends that the applicant commit to the double contingency principle as stated in ANSI/ANS 8.1-1983. Knowledge of the design philosophy is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

82. Section 6.3.4, pp. 6-18 thru 6-33

Explain whether the physicochemical forms discussed are controlled programmatically in the same manner as other criticality control modes. Describe why they have been separated out and how they are treated differently than other parameter limits, if any.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.D recommends that incorporating controls into facility management measures. Knowledge of the design philosophy to be used is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident. Whenever process controls are relied on for criticality safety, they should be programmatically controlled.

83. Section 6.3.4, pp. 6-18 thru 6-30

Several CCUs do not have any parameters identified. Describe the criticality safety design basis for all of these units in more detail.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describes controlled parameters for each process used as NCS controls. Knowledge of the dominant controlled parameters upon which the facility design will be based is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

84. Section 6.3.4, pp. 6-18 thru 6-30

Describe the design philosophy for excluding concentrated plutonium solution from these units.

Three CCUs–the Solvent Recovery Unit, Acid Recovery Unit, and Silver Recovery Unit–are expected to have low concentrations of plutonium under normal conditions. However, the process description refers to concentration mechanisms (*i.e.*, evaporators) that could result in a higher plutonium concentration. Knowledge of the design philosophy is necessary to ensure that the process remains subcritical under both normal and credible abnormal conditions in accordance with 10 CFR 70.61(d).

85. Section 6.3.4, pp. 6-18 thru 6-30

Describe at what point in the aqueous polishing process low concentrated waste will be transferred from favorable to unfavorable geometry, and describe the design philosophy for preventing its occurrence. (Section 11.3.2.13 describes a sampling system, but it is not clear whether this is credited for preventing this type of hazard or how it is used.)

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.B recommends that no single credible event or failure should result in a criticality that necessitates consideration of all credible failure mechanisms. At some point in the Aqueous Polishing Process, low concentrated waste will have to be transferred from favorable to unfavorable geometry. One of the most significant criticality hazards is the potential for transfer of concentrated plutonium solution to unfavorable geometry. Knowledge of the design philosophy is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

86. Section 6.3.4, 6-18 thru 6-30

For the Aqueous Polishing Process, where concentration control is credited for criticality safety, describe the design philosophy for ensuring that concentration measurements are representative.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.7.E recommends that particular attention be given to robustness of concentration controls where concentration is the only means of ensuring subcriticality in an unfavorable geometry. Knowledge of the design philosophy is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

87. Section 6.3.4.3.1.3, pp. 6-20 and 6-21

Provide the background calculations demonstrating the conclusion that, "the impact of a variation of these parameters on the calculated effective neutron multiplication factor (k_{eff}) is within the uncertainty of the criticality calculation," in Section 6.3.4.3.1.3.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description

and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.7.D recommends that dual independent sampling be used when sampling is used for concentration control, and that common-mode failures that include non-representativeness of the samples be considered. Assurance that validated calculational methods will be used is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

88. <u>Section 6.3.5.2, pp. 6-34 and 6-35</u>

Describe what statistical techniques will be used to benchmark the criticality codes for regions where there is little available experimental data.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.1.B recommends that the applicant demonstrate the adequacy of the subcriticality margin and the areas of applicability of the code. Section 6.3.5.2 states that validation tools exist (as referenced in NUREG/CR-6361 and NUREG/ CR-6655) that are useful for regions where there is little available experimental data, but does not describe what techniques will be used. Assurance that validated calculational methods will be used is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

89. <u>Section 6.3.5.3, pp. 6-35 and 6-36</u>

Describe the specific sets of benchmark experiments that will be used to validate criticality codes in the different neutron energy ranges, and especially, in the intermediate energy range.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.1.B recommends that the applicant demonstrate the adequacy of the subcriticality margin and the areas of applicability of the code. Section 6.3.5.3 states that "A wide range of experimental benchmark data is also available to help validate neutron cross-sections over thermal, intermediate, and fast neutron energy ranges." Assurance

that validated calculational methods will be used is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

90. Section 6.4, pp. 6-37 thru 6-39

Clarify exactly what ANSI standards and provisions of those standards are included in the commitments in the Application.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.2 lists several ANSI standards that have been endorsed by the NRC for criticality safety. The applicant refers to Regulatory Guide 3.71, but does not describe what ANSI standards and what provisions of those standards are being committed to (including "should" vs. "shall" statements). This information constitutes part of the design bases of the facility.

91. Section 6.4, pp. 6-37 thru 6-39

Define the term "administrative margin" as used in this section, and provide the basis for this margin.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.1.B recommends that the applicant demonstrate the adequacy of the subcriticality margin and the areas of applicability of the code. Section 6.4 describes an administrative k_{eff} margin of 0.05 for MFFF design applications, but does not provide a definition of this margin (such as whether the margin includes the bias or is applied in addition to the bias) or a technical justification. This information constitutes part of the design bases of the facility.

92. Section 6.4, pp. 6-37 thru 6-39

Explain the statement, "To the extent practical, process designs will incorporate sufficient features such that they can be demonstrated to be subcritical under both normal and credible accident conditions."

10 CFR 70.61(d) requires that processes remain subcritical under both normal and credible abnormal conditions and is not optional. This information constitutes part of the design bases of the facility.

93. Section 6.4, pp. 6-37 thru 6-39

On page 6-37 of the application, specify how any modifications to the design bases requirements applicable to the design and operation of criticality safety SSCs will be accomplished.

10 CFR 70.61(d) requires that processes remain subcritical under both normal and credible abnormal conditions. The NRC is reviewing the submitted design bases as is. Any change after the fact may affect reviewed design bases. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

94. Section 6.4, pp. 6-37 thru 6-39

Page 6-38, first paragraph, identify the approved margin of subcriticality that will be used to design nuclear processes.

10 CFR 70.61(d) requires that the applicant demonstrate subcriticality including the use of an approved margin of subcriticality. Since this facility has not been built yet, identifying the margin of subcriticality prior to construction allows for adequate implementation of the hierarchy of controls to rely more heavily on physical rather than administrative controls. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

95. Section 6.4, pp. 6-37 thru 6-39

Revise the included list of ANSI/ANS standards, and the several references on page 6-39, to provide the correct references.

For example, the reference to ANSI/ANS-8.1-1983 should be corrected to ANSI/ANS-8.1-1983 (R1988).

96. Section 6.4, pp. 6-37 thru 6-39

Update the references in this section to clarify the fact that ANSI/ANS-8.9-1987, "Nuclear Criticality Criteria for Steel-Pipe Intersections Containing Aqueous Solutions of Fissile Materials", has been withdrawn.

The use of the currently endorsed versions of the ANSI standards has been found to be generally acceptable to the staff. However, standards that have been withdrawn should not be used without an appropriate justification and consideration of the circumstances under which it was withdrawn.

97. Table 6-1, pp. 6-43 thru 6-48

Provide information on the principal criticality parameters in Table 6-1 for the Offgas Treatment Unit, the Liquid Waste Reception Unit, and the Sampling System.

10 CFR 70.61(d) requires that processes remain subcritical under both normal and credible abnormal conditions. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. Three process units described in Section 11.3 are not described in Table 6-1: the Offgas Treatment Unit, the Liquid Waste Reception Unit, and the

Sampling System. Knowledge of the dominant controlled parameters upon which the facility design will be based is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

98. Tables 6-1 and 6-2, pp. 6-43 thru 6-58

Revise Tables 6-1 and 6-2 to identify each parameter that is controlled for a given CCU, regardless of whether the control was implemented in an upstream process.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. The current convention does not make it clear where the control relied upon is found. This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

99. Tables 6-1 and 6-2, pp. 6-43 thru 6-58

Revise Tables 6-1 and 6-2 to correspond to the Process Description or otherwise provide a method for cross-referencing these data.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. The names and numbers of CCUs in Tables 6-1 and 6-2 do not correspond well to the list of process units in Chapter 11, making it difficult to cross-reference and reconcile the process description with the list of dominant controlled parameters. Knowledge of the dominant controlled parameters upon which the facility design will be based is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

100. Table 6-2, pp. 6-49 thru 6-58

Add information regarding the criticality control modes for the following areas:

a. PuO_2 Container Opening and Handling Unit (11.2.2.5)

b. Scrap Processing Unit (11.2.2.10)

c. Powder Auxiliary Unit (11.2.2.12)

d. Sintered Pellet Storage Unit (11.2.2.16)

e. Ground and Sorted Pellet Storage Unit (11.2.2.18)

f. Quality Control and Manual Sorting Unit (11.2.2.20)

g. Scrap Box Loading Unit (11.2.2.21)

h. Pellet Repackaging Unit (11.2.2.22)?

i. Pellet Handling Unit (11.2.2.24)

j. Rod Tray Loading Unit (11.2.2.26)?

k. Assembly Dry Cleaning Unit (11.2.2.35)

l. Assembly Packaging Unit (11.2.2.38)

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. The above process units appear not to be described in Table 6-2, in addition to Units 1 and 2 (non-fissile) and Unit 11 (identical design to another unit). This information is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

101. <u>Table 6-2, pp. 6-49 thru 6-58</u>

Explain the following footnotes in Table 6-2:

a. Parameter value ranges indicated are selected for use in criticality design calculations to encompass credible optimum conditions without reliance on process variable controls.

b. Reflection and interaction addressed by geometry control.

c. ...Clad characteristics guaranteed by supplied (Describe how this is confirmed.)

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety

assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. Knowledge of the design philosophy is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

102. <u>Tables 6-1 and 6-2, pp. 6-43 thru 6-58</u>

In Tables 6-1 and 6-2, describe what criticality control mode corresponds to reliance on the relative proportion of PuO_2 and UO_2 powder.

10 CFR 70.22(f) states, in part: "Each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant shall contain...a description and safety assessment of the design bases of the principal structures, systems, and components of the plant..." 10 CFR 70.62(a) states that each licensee or applicant shall establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. Nuclear criticality safety is an important area for the safety assessment of the design bases of the principal structures, systems, and components and for the safety program that demonstrates compliance with the 10 CFR 70.61performance requirements. SRP Section 6.4.3.3.2.E recommends that the applicant describe the controlled parameters for each process. Knowledge of the dominant controlled parameters upon which the facility design will be based is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

103. <u>Table 6-3, p. 6-59; Table 6-4, p. 6-60</u>

Provide the technical basis and/or references for the single-parameter limits in Tables 6-3 and 6-4.

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions. The single-parameter limits in Tables 6-3 and 6-4 are provided as possible subcritical values, but no demonstration of their adequacy is provided.

104. <u>Table 6-3, p. 6-59; Table 6-4, p. 6-60</u>

Clarify the conditions under which the mass limits in Tables 6-3 and 6-4 were determined (*e.g.*, fully or partially reflected).

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions. Knowledge of the conditions upon which the facility design will be based is necessary to ensure that the design bases will provide reasonable assurance of protection against a criticality accident.

<u>CHAPTER 7, FIRE PROTECTION</u>

105. <u>Chapter 7, General</u>

Clearly identify the types of equipment and/or processes in each fire area.

Under Appendix D4 of the SRP, process equipment and operations information should be provided to comprehensively assess fire safety. This chapter does not provide a detailed list of fire hazards that result from the use of equipment or processes. This information is necessary to comprehensively identify hazards and develop credible protection schemes.

106. Chapter 7, General

Include discussion of fire prevention features for the Secured Warehouse Building.

SRP Sections 7.4.3.2 (C) and (F) recommend that fire resistivity and combustibility details for radioactive waste or storage facilities be provided. Buildings other than the MOX Fuel Fabrication Building, which contain radioactive materials, should be analyzed for fire events.

107. Section 7.2.2.3.1

Discuss the reliability of the selection of pre-action over wet-pipe sprinkler systems where criticality is not a concern.

Per Appendix D5 of the SRP, the Fire Hazard Analysis (FHA) should evaluate the consequences of automatic fire protection system malfunction. This evaluation would demonstrate whether the selected protection scheme is appropriate for the hazard. Pre-action systems respond slower and are less reliable than wet-pipe systems.

108. Section 7.4, pp. 7-16 thru 7-20

Provide the analysis portion of the preliminary Fire Hazard Analysis

Section 7.3.D of the SRP recommends that the FHA evaluate anticipated consequences. Section 7.4 discusses the approach, assumptions, and the conclusions of the preliminary fire hazard analysis. A presentation of the preliminary analyses would help clarify key conclusions of the report. In particular, one of the key conclusions asserts that the use of polycarbonate/Plexiglas glovebox windows does not compromise fire safety. However, the preliminary FHA does not provide quantitative details on the fire model or data assumptions to support this conclusion.

109. Section 7.4, pp. 7-16 thru 7-20

Analyze the potential for fire spread between two fire areas.

Appendix D4 of the SRP identifies "potential for fire spread between two fire areas" as information needed to comprehensively assess fire safety. The fire hazard analysis confines the fire event to the area of fire origin. The analysis does not consider spread through interconnected glove boxes which could occur due to the heating of metal fire doors between glove boxes, an explosion, or room fire doors that are propped open.

110. Table 7-1, pp. 7-25 thru 7-36

Provide additional data in terms of the type, form and quantity of hazard.

MFFF Room Combustible Summary (Table 7-1) presents combustibility data in terms of equivalent fire load and estimated fire severity. Because materials burn differently, staff will be better able to assess postulated fire scenarios and protection schemes if the material form and quantity is provided per SRP Appendix D.10.

CHAPTER 8, CHEMICAL PROCESS SAFETY

111. Chapter 8, General

Provide additional information on chemical safety (general).

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete."

The application provides a qualitative description of the chemical process, potential hazards, and safety approaches and controls. Limited quantitative information is provided. Additional detailed information and quantification is needed in the following areas for the staff to adequately assess the safety implications and complete its review:

a. inventories
b. design bases and associated values, parameters, and ranges
c. system descriptions
d. general increase in quantification.

112. Chapter 8, General

Clarify the description of chemical process and chemical safety items.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete."

As currently written, the information on chemical process and safety is disjointed and split between several sections (e.g., Section 5, Section 8, Section 11.2, Section 11.3, Section 11.6, Section 11.8, and Section 11.9). Consequently, it is difficult to assess the information in an integrated manner and verify its completeness. It would be beneficial to have more of the information in one place and/or better cross-referenced.

113. Chapter 8, General

Verify that the chemical listing is complete.

SRP Section 8.4.3.1B recommends that chemical process details, such as chemical reactants and products, be provided in the application. SRP Section 8.4.3.1E recommends that chemical inventory information be provided with complete chemical and radionuclide inventories within the facility for routine and credible off-normal conditions. SRP Section 8.4.3.2 recommends that a list of hazardous chemicals and potential interactions be provided.

Table 8-1 lists many of the chemicals used or present in the MFFF. Sections 8.2 and 8.3 mention other chemicals that are not included in the listing, such as CO and azides (HN3), and imply more than trace quantities may be present. A complete listing is necessary to adequately understand the potential hazards and adequately assess the safety of proposed controls.

114. <u>Chapter 8, General</u>

Include mass and energy balances, and an estimate of daily usage of the chemicals and reagents, at least down to the individual unit level.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." Section 8.4.3.1 A and B include the recommendation for mass, energy, and radioactivity balances. Section 8.4.3.1.E recommends inventory information.

The application includes some inventory information and limited information on flow rates. Essentially no information is provided on enthalpies and energy sources, such as air lifts and pumps, that are capable of dispersing materials during an event. Source term information, including individual chemicals and radionuclides in process equipment and tanks, is limited. Some streams and components, such as americium and uranium, disappear in the limited information provided. Mass, energy, and radionuclide balance information, at a unit level, is needed for an adequate understanding of the processes and associated hazards, and appropriate measures to address potential safety concerns.

115. <u>Chapter 8, General</u>

Describe chemical storage and handling design bases and associated values, and principal SSCs/IROFSs.

SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Table 8-1 and the associated text list the chemicals, their state, and their concentrations. Section 11.9 provides some additional information. Section 11.9.5 is entitled "Design Basis for Principal SSCs" but consists of two short paragraphs and essentially provides no design basis information. Section 5.4.2.5 is also entitled "Design Bases of Principal SSCs" consists of one short paragraph which includes "... These design bases identify the safety functions and the specific values and ranges of values chosen for controlling parameters ..." However, design basis information and values are not clear for storage and handling of the chemicals. In particular, few bases and values are mentioned for the gases. This design basis information is needed to appropriately assess the potential hazards and any needed controls. For example, for gases, the handling of numerous high pressure cylinders presents different hazards as compared to a supply from a pressurized swing absorption (PSA) system. Hydrogen can be supplied by cylinders of various sizes, pipeline, cryogenic deliveries, ammonia dissociation, and natural gas reformation. This design basis information is needed to adequately assess the potential hazards, safety, and principal SSCs/IROFSs of the proposed facility.

116. Section 8.1.1.2.1.2, p. 8-3

Revise the last sentence of Section 8.1.1.2.1.2.

As written, the sentence refers to the use of silver as a catalyst for reduction. It appears the silver is used as a reagent for oxidation and dissolution of the plutonium as Pu(VI), and hydrogen peroxide is subsequently applied in a separate step to reduce the Pu(VI) to the more solvent extractable Pu(IV).

117. Section 8.1.1.2.1.3, p. 8-3

Describe the nitrous fume oxidation process in Section 8.1.1.2.1.3.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Sections 8.1.1.2.1.3 and 11.3.2.3.2 refer to a final plutonium valence adjustment from (III) to (IV) after purification by the use of "nitrous fumes." The process chemistry and sample reactions are not presented. "Nitrous fumes" are presumably nitrogen oxides and usually present hazards that may require safety controls. An adequate description and explanation of the use of "nitrous fumes" is needed before a safety determination can be made.

118. Section 8.7, pp. 8.22 and 8.23

Explain the chemical safety controls and provide a target reliability(ies).

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief paragraph on chemical safety controls. This indicates administrative controls for chemical makeup of reagents and to ensure segregation and separation of vessels and components from incompatible chemicals. No further information is provided. A description and design basis information are needed in order to make a safety determination. For example, the NRC would expect specific chemicals and systems associated with design basis events would be described and discussed, and reliabilities for prevention/mitigation presented. We would anticipate a description of the approach for administrative control(s) and target reliabilities.

119. Section 8.7, pp. 8.22 and 8.23

Describe and explain the administrative controls on hydrogen peroxide.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief sentence on chemical concentration controls. This indicates administrative controls will be used for ensuring the hydrogen peroxide concentration does not exceed 75 percent. No further information is provided. A description and design basis information are needed before a safety determination can be made. The NRC would expect a description of the approach for administrative controls and the systems/SSCs involved, including target reliabilities for prevention and mitigation aspects of these administrative controls.

120. Section 8.7, pp. 8.22 and 8.23

Describe and explain the administrative controls for hydrazine and the safety limits.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief sentence on chemical concentration controls. This indicates administrative controls will be used for ensuring the hydrazine concentration stays within safety limits. No further information is provided. A description and design basis information are needed before a safety determination can be made. The NRC would expect a description of the approach for administrative controls and the systems/SSCs involved, including target reliabilities for prevention and mitigation aspects of these administrative controls. The NRC would also expect the "safety limits" to be defined.

121. Section 8.7, pp. 8.22 and 8.23

Explain the design approach and design bases to avoid overpressurization of tanks, vessels, and piping.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief statement that principal SSCs include design vessels, tanks, and piping to prevent process deviations from creating overpressurization events. No additional information is provided. The reader is referred to Section 11.8 for details. Section 11.8 provides the general approach and codes and standards. Design basis functions and values are not included. Such information is needed before a safety determination can be made. For example, the NRC would expect a description of the design approach and design bases to address overpressurization concerns, including the identification of specific SSCs, design basis events, and values. Actual pressures, pressure ramps, and quantities would be included.

122. Section 8.7, pp. 8.22 and 8.23

Describe and explain the design basis functions and values for avoiding explosions using scavenging air flow.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief statement that principal SSCs include the Instrument Air Scavenging System that provides sufficient scavenging airflow to dilute the hydrogen produced by radiolysis such that an explosive condition does not occur. No further information is provided. The reader is referred to Section 11.9 for details. Section 11.9.1.9 discusses the service air system, Section 11.9.1.10 discusses the instrument air system, and Section 11.9.1.11 discusses the breathing air system. The instrument air system appears to be the source of the scavenging air - if this is correct, it should be clearly stated in Section 8.7. Normal dewpoints and pressures are mentioned in Section 11.9.1.10. However, additional design basis information is needed before a safety determination can be made. For example, the NRC would expect there to be a requirement for avoiding explosion limits of vapors, such as providing sufficient airflow to maintain all maximum credible explosive vapor and gas concentrations below 25 percent of their lower flammability limit (LFL) and a verification/monitoring/sampling requirement. Any potential safety controls and IROFS should be identified, along with their design basis and reliability information. For example, it might be anticipated that the step-down regulators or pressure controls for the glove box scavenging would have safety significance - too great a flow might overpressurize the gloveboxes and release plutonium/MOX powder, while too small a flow would not sweep the potentially explosive vapors and gases. Any safety categorizations for the compressed gas cylinder banks, service air system (which supplies the instrument air system), and other monitors (e.g., on the emergency banks) and equipment should also be noted. In addition, the NRC would anticipate more description and design basis information on the emergency conditions; what monitors/alarms/approaches notify the operator of the need to manually activate the emergency system, what response times and reliabilities are needed, what system reliabilities and performance are needed, etc.

123. Section 8.7, pp. 8.22 and 8.23

Describe and explain the process safety controls for evaporators containing tributyl phosphate (TBP).

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief statement that principal SSCs include the Process Safety Instrumentation and Control System to ensure that evaporator process temperature conditions do not exceed 275 F (135 C) in the presence of TBP. The reader is referred to Section 11.6 for details. Section 11.6 provides the general approach and codes and standards. Design basis functions and values are not included. Such information is needed before a safety determination can be made. For example, the NRC would anticipate that, in addition to temperature, there would be a design basis for determining the presence of TBP, design basis event(s), and a reliability requirement for the system (including the controllers and the sensors).

124. Section 8.7, pp. 8.22 and 8.23

Describe and explain the process safety controls for hydrogen and hydrogen/argon gas mixtures.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there are two brief statements that principal SSCs include the Process Safety Instrumentation and Control System to:

"Ensure that a non-explosive mixture of hydrogen/argon is introduced into the MOX Fuel Fabrication Building."

"Ensure that the flow of hydrogen is terminated prior to the attainment of explosive conditions."

The reader is referred to Section 11.6 for details. Section 11.6 provides the general approach and codes and standards for control systems. Design basis functions and values are not included. Such information is needed before a safety determination can be made. For example, the NRC would anticipate that there would be a design basis for determining the presence of hydrogen, the hydrogen ratio, presence/absence/quantity of flow, values and ranges, and reliability requirements (for sensors, controllers, and the system).

125. Section 8.7, pp. 8.22 and 8.23

Describe and explain the process safety controls for hydroxylamine nitrate (HAN)/hydrazine temperature and flow limits.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief statement that principal SSCs include the Process Safety Instrumentation and Control System to shut down the process prior to exceeding HAN/hydrazine temperature or flow limits. The reader is referred to Section

11.6 for details. Section 11.6 provides the codes and standards for control systems in general terms. Design basis functions and values are not included. Such information is needed before a safety determination can be made. For example, the NRC would anticipate that there would be a description and design basis for measuring HAN and hydrazine, temperatures, flows, ranges and limits, and reliabilities, supported by the hazard analysis and safety assessment. Design bases would include requirements (response time, reliabilities etc.) for the control system, including the sensors, the hardware, and the software.

126. Section 8.7, pp. 8-22 and 8-23

Describe and explain the process safety controls for solvent temperature limits.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there is a brief statement that principal SSCs include the Process Safety Instrumentation and Control System to shut down the process prior to exceeding solvent temperature limits. The reader is referred to Section 11.6 for details. Section 11.6 provides the codes and standards for control systems in general terms. Design basis functions and values are not included. Such information is needed before a safety determination can be made. For example, the NRC would anticipate that there would be a description and design basis for measuring solvent temperature(s), the approach/means/control elements to "shut down the process," ranges/limits, and reliabilities, supported by the hazard analysis and safety assessment. Design bases would include requirements (response time, reliabilities etc.) for the control system, including the sensors, the hardware, and the software.

127. Section 8.7, pp. 8-22 and 8-23

Provide the chemical process safety design basis for the offgas treatment unit.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 8.7, "Chemical Process Safety Design Basis," there are the following brief statements on the functions of the Offgas Treatment Unit:

> "Ensure venting of vessels/tanks to prevent over-pressurization conditions."
>
> "Provide exhaust to ensure that an explosive buildup of explosive vapors does not occur."
>
> "Provide exhaust to ensure that an explosive buildup of hydrogen does not occur."

The reader is referred to Section 11.4 for details. Section 11.4 discusses the heating, ventilating, and air conditioning (HVAC) system. Section 11.4.2.1 is one sentence and is entitled "Offgas Treatment Unit" - it refers the reader to Section 11.3.2.11, "Offgas Treatment Unit." This section provides total and nitric acid flow rates. Design basis functions and values are not included for over-pressurization, explosive vapors, and hydrogen. Such information is needed before a safety determination can be made. For example, the NRC would anticipate that there would be a description and design basis for detecting and measuring over pressure, explosive vapors, and hydrogen. There might be an action limit (say, 25 percent of the LFL). This would include the approach/means/control elements to prevent the situation from occurring and/or ameliorate the situation if it does occur. The design basis would include ranges/limits, minimum flow requirements for "important" vessels and situations, and reliabilities, supported by the hazard analysis and safety assessment. Design bases would include requirements (response time, response, reliabilities etc.) for the control system, including the sensors, the hardware, and the software.

128. Section 8.7, pp. 8-22 and 8-23

Explain the design bases and controls for asphyxiating gases, such as nitrogen and argon.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

The MFFF intends to use numerous gases, such as nitrogen, argon, hydrogen etc. that are not capable of supporting life. While quantities are not defined, they are implied to be significant. Undetected potential leaks and accumulation of such gases could result in the incapacitation or evacuation of operators and affect the safe handling of radioactive materials. Control of these asphyxiants may be necessary. More information, including design bases and values, is necessary before a determination of safety can be performed.

129. Table 8-2, p. 8-28

Provide complete chemical inventory information and verify that these are reasonably conservative values.

SRP Section 8.4.3.1B recommends that chemical process details, such as chemical reactants and products be included in the application. SRP Section 8.4.3.1E recommends that chemical inventory information be provided to include the complete chemical and radionuclide inventories within the facility for routine and credible off-normal conditions. SRP Section 8.4.3.2 recommends a list of hazardous chemicals and potential interactions.

Table 8-2 lists anticipated onsite inventories. From the associated discussion in Chapter 8, it is not clear if these are reasonably conservative values. In addition, several inventories are shown as "TBD" - to be determined; values are not given for argon, argon-methane mixture, azodicarbamide, helium, hydrogen, nitrogen, nitrogen tetraoxide, nitrous oxide, oxygen, and zinc stearate. Chemical and radiochemical inventories constitute fundamental contributors to the source terms in hazard analyses and their design basis functions and values are needed in order to make a determination regarding adequate assessment of safety.

CHAPTER 9, RADIATION SAFETY

130. Section 9.1.2.4.2, pp. 9-9 thru 9-10

Compare the quantitative values of the internal component of predicted occupational doses to values already provided for the external (direct) radiation component.

Section 9.1.4.2.3.C of the SRP recommends that the applicant's self-assessment of the submitted facility design, shielding, layout, traffic patterns, expected maintenance, and sources shows that both collective and individual doses from significant activities are within the limits of 10 CFR Part 20, As Low As Reasonably Achievable (ALARA), and meet facility design goals for routine and non-routine operations, including anticipated events. Preliminary quantitative estimates of direct radiation occupational doses are provided in section 9.1.2.4.1, "Dose Assessment Estimate." However, quantitative estimates of internal dose estimates are not provided in the following Section 9.1.2.4.2, "Internal Exposure," even though dates and International Nuclear Event Scale (INES) ratings are provided for actual MELOX events which may form such a basis.

131. Section 9.1.3.1, p. 9-16 thru 9-17; Table 9-3, p. 9-38

In Table 9-3, add the concentration of plutonium-241 in the column for 0 year "Radiological Isotopic Composition."

10 CFR 70.22(a)(4) requires that the applicant provide the name, amount and specification of the special nuclear material the applicant proposes to use.

132. Section 9.1.3.1, p. 9-16 thru 9-17; Table 9-3, p. 9-38

Explain why the concentration of plutonium-242 shown in Table 9-3 increases from 0.001 grams Pu/Pu+Am at 0 years to 0.01 grams Pu/Pu+Am at 40 years, then decreases to 0.001 grams Pu/Pu+Am at 70 years.

10 CFR 70.22(a)(4) requires that the applicant provide the name, amount and specification of the special nuclear material the applicant proposes to use.

133. Section 9.1.5, pp. 9-20 thru 9-23

Clarify the description of design goals provided in section 9.1.5, "Shielding Evaluations" (second full paragraph on p. 9-21)

Section 9.1.4.5.3.C of SRP recommends that the applicant derive permanent or temporary shielding requirements and specifications based on identified design objectives. The phrase "these are developed in the design," which appears to refer to design goals, is understood to mean that the 500 mrem design ALARA goal for workers, which is the goal defined in the ABAQUES method, is likely to change as design progresses. The last sentence, "The design goals are set based on this dose estimate" also suggests that design goals will be regularly reduced from an initial design goal of 500 mrem.

134. Table 9-2, p. 9-36

Update the MELOX Event INES Ratings described in Table 9-2 to include the most recent INES Level 1 event in March 2001.

Section 9.1.4.2.3.C of SRP recommends that the applicant's self-assessment of the submitted facility design, shielding, layout, traffic patterns, expected maintenance, and sources shows that both collective and individual doses from significant activities are within the limits of 10 CFR Part 20, ALARA, and meet facility design goals for routine and nonroutine operations, including anticipated events. Though quantitative estimates of internal dose estimates are not provided in the Section 9.1.2.4.2, "Internal Exposure," the dates and INES ratings are provided for actual MELOX events which may form such a basis. These events should be updated in the application to ensure that consideration is given to events which may affect the design of the MFFF.

CHAPTER 10, ENVIRONMENTAL PROTECTION

135. Figure 10-1, p. 10-21

Explain and describe the high alpha waste buffer storage.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Figure 10-1 depicts the liquid waste streams from aqueous polishing and has a box labeled "High Alpha Waste Buffer Storage." A description of this process area, its design bases, and design basis values could not be found in the associated text in Sections 8.1.1.2.3, 10.1.4, and 11.3.2.12. Such a description is necessary to understand the potential hazards associated with this system, safety issues, and any proposed principal SSCs and IROFSs.

CHAPTER 11, PLANT SYSTEMS

136. Section 11.1.2, pp. 11.1-1 and 11.1-2

Indicate the significance (in terms of fire) of the "membrane top" or "engineered fill material" atop the roof slab in the MFFF.

Appendix D7 of the SRP recommends that fire resistance ratings for barriers should be a minimum of two hours, subject to an evaluation of the hazards. Therefore, ratings of all barriers are necessary to evaluate their adequacy. The upper membrane is not discussed in terms of fire or seismic hazards. Section 7.2.3.1 does not indicate the combustibility or fire resistance of the outer security structures.

137. Section 11.3, General

Provide the design basis information, including reliabilities, for SSCs in the aqueous polishing area.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 11.3, the aqueous polishing process and equipment are discussed. Some of the SSCs will be in cells that are not normally accessible and may have to go for extended periods (potentially the life of the plant) without planned inspection and maintenance. Design basis information and/or management measures are needed to demonstrate this can be accomplished in a safe manner. In addition, pumps and fluid moving devices will be in this area. Design basis information is needed to address leakage, seal replacement, and other pump inspection and maintenance activities. In the absence of this information, it is not possible to make a safety determination.

138. Section 11.3, General

Check and revise as necessary the use of the word "analyte"

The word "analyte" is used in several places where electrolysis is discussed (e.g., first sentence page 11.3-5). "Analyte" is usually used to refer to samples for analysis. "Anolyte" is the term usually used in reference to the solution around the anode of an electrolytic cell. The use of anolyte would seem to be a better choice to avoid confusion.

139. Section 11.3.2, General

Provide more information on principal SSCs/IROFSs for chemical safety and the corresponding operating ranges and limits.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete."

Sections 11.3.2.2.7 on page 11.3-6, 11.3.2.3.7 on page 11.3-9, 11.3.2.4.7 on page 11.3-10, 11.3.2.5.7 on page 11.3-13, 11.3.2.6.7 on page 11.3-14, 11.3.2.7.7 on page 11.3-15, 11.3.2.8.7 on page 11.3-18, 11.3.2.9.7 on page 11.3-20, 11.3.2.10.7 on page 11.3-23, and 11.3.2.11.7 on page 11.3-25 contain the phrase:

"Normal operating parameters are described in Section 11.3.2.x.6. Principal SSCs are described in Chapter 5. Specific operating limits and the associated IROFSs will be provided in the ISA."

Additional information on chemical ranges and limits, and on IROFSs is needed before a determination of adequate safety can be made.

140. Section 11.3, General

Explain the flow path and disposition of the impurities (primarily americium, gallium, and uranium) in the plutonium.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

The aqueous polishing removes impurities (primarily americium, gallium, and uranium) from the plutonium. Tables 11.3-27 and 11.3-28 list some of the impurities, including values for maximum content and maximum exceptional content. It would be beneficial to have an explanation of the two terms "maximum content" and "maximum exceptional content." The flow path and intermediate accumulation locations of these impurities are not clear in Section 11.3, along with their disposition. A description of the flow path and disposition of these impurities, and their associated design bases and values, is needed before a safety determination can be made.

141. Section 11.3.2, pp. 11.3-1 thru 11.3-25

Explain the corrosion allowance and control in the electrolyzer and the dissolution unit.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.3.2 indicates that the process uses silver(II) as an oxidant to assist with the dissolution of the plutonium oxides, and the reagent is generated electrically. This reagent and stray currents from electrolysis can be very corrosive to normally corrosion resistant materials of construction, such as stainless steels. Portions of the dissolver circuit may have to be made out of different alloys and/or controls may be necessary to limit the silver(II) concentration going to lower alloy portions of the system. Design basis information on corrosion allowances (e.g., limit for mil/yr), cracking, allowable crack depth/through-wall percentages, online monitoring techniques, and inspection approaches (e.g., monthly, annually) are needed to adequately assess hazards associated with potential failures induced by corrosion and the need for any safety controls.

142. Section 11.3.2.11., pp. 11.3-23 thru 11.3-25

Provide a description of the aqueous processing system offgas filtration system referred to as the “filtering line.” Describe the relationship of the process vessel offgas system with the ventilation systems in Section 11.4. Describe how the offgas ventilation system is designed to withstand both routine and severe environmental conditions such as fires and explosions. Describe how HEPA filters in this system are tested to ensure performance.

The application describes how offgases from the aqueous polishing system are processed. The application does not provide a description of the filtration system, other than refer to it as a “filtering line” and say HEPA filtration will be used. It is unclear if the “filtering line” is the same as the filtration units described in Section 11.4.9. The application does not clearly describe the relationship to this ventilation system with the ventilation systems described in Section 11.4. The application does not describe how the offgas ventilation system is designed to withstand both routine and severe environmental conditions.

143. Section 11.3.2.12, p. 11.3-25

Explain and describe the liquid and LLW process units.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.3.2.12 mentions a "liquid waste reception unit." There is one sentence that reads, "The Liquid Waste Reception Unit will receive liquid waste from the AP process for temporary storage before sending it to SRS for treatment and processing." Figure 10-1 shows at least two liquid LLW buffer storage areas/units. A description of these areas, their design bases, and design basis values could not be found in the associated text in Sections 8.1.1.2.3, 10.1.4, and 11.3.2.12. Such a description is necessary to understand the potential hazards associated with this system, safety issues, and any proposed principal SSCs and IROFSs.

144. Section 11.4.1.2, pp. 11.4-1 thru 11.4-4

Provide a discussion of how the confinement system concepts in this section are applied to the sintering furnace. Provide justification for not enclosing the furnaces in gloveboxes to prevent releases to areas normally occupied by personnel.

Regulatory Guide 3.12, "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants," states that ventilation systems should confine radioactive materials and prevent uncontrolled releases into room and areas normally occupied by personnel. The sintering furnaces are presented as static barriers without being enclosed by gloveboxes. Since the sintering furnaces operate at a positive pressure to maintain the reducing environment needed for reliable operation, any release from the sintering furnace would be discharged directly to an area normally occupied by personnel.

145. Section 11.4.2.6.3, p. 11.4-14

In the list of components for the Supply Air System, clarify the type of filters used in the "filter bank."

SRP Section 11.4.5.2.D.iv indicates that information is needed to determine if ventilation systems are capable of controlling airborne particulate material (dust) accumulation. The application describes the components in the Supply Air System. One of the components listed is a "filter bank" without further discussion on the type of filters used.

146. Section 11.4.9, pp. 11.4-24 thru 11.4-26

Explain the philosophy of the fire protection of the final filtration units.

Appendix E of the SRP recommends the use of automatic suppression inside the final filter plenums. The application does not clearly describe the design features that prevent fire events from affecting the HEPA filters.

147. Section 11.4.9, pp. 11.4-24 thru 11.4-26

Describe the in-place testing provisions applicable to HEPA filters located at the glovebox interfaces and at C3 boundaries.

Regulatory Guide 3.12, "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants," states that HEPA filters should be tested after installation. Section 11.4.9.1 describes in-place testing provision designs for the final HEPA filter stages, but does not indicate that HEPA filters located at the glovebox interfaces and C3 boundaries are designed to accommodate in-place testing after installation. In-place testing is important to ensure that installation has been performed properly to ensure correct seating of HEPA filters and frames. Small seating defects can result in loss of design particulate removal efficiencies.

148. Section 11.4.9.2, pp. 11.4-25 thru 11.4.26

Provide the design soot loading analysis to support the functioning of the HEPA filter units during fire scenarios. Provide a basis for assuming that the ventilation system can withstand credible explosion events.

Regulatory Guide 3.12, “General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants,” states that ventilation systems should be designed to withstand any credible fire and explosion and continue to act as confinement barriers. In Section 11.4.9.2, the application provides a brief summary of the soot loading analysis used to show that HEPA filters can withstand the loadings from soot in internal fire scenarios. No discussion is provided on hypothetical explosion events.

149. Figure 11.4-11, p. 11.4-57

Clarify the design capacities for the High Depressurization Exhaust System.

Figure 11.4-11 indicates that for the High Depressurization Exhaust System there are two 100 percent capacity filtration trains each with 9 filtration units each having the capacity of about 6,000 CFM (2 by 3 cells, assuming each cell is rated for 1000 CFM, a standard HEPA filter size). The total capacity of each train would be 54,000 CFM. However, the figure also shows a design inlet capacity of 77,870 CFM. There appears, therefore, to be a discrepancy in the filtration train ratings and the total design airflow requirements. A similar discrepancy also exists for the Medium Depressurization Exhaust System, where the design flow into the filtration units is 116,870 CFM and the total capacity of the filtration units is 66,000 CFM, assuming standard 1000 CFM HEPAs are used. Section 11.4.2.5 of the application indicates that there is sufficient capacity in the filtration units to allow units to be shutdown for maintenance and still maintain design flow.

150. Section 11.5.2.3.1, p. 11.5-4

Provide justification for using only one 7-day fuel tank for the emergency diesel generators (EDGs) and why a larger tank size is not needed for the limiting design basis event. Also, explain why this decision is consistent with IEEE Std 308-1991, “IEEE Standard Criteria for Class 1E Power Systems for Nuclear Generating Stations.”

On page 11.5-14 of the application, DCS states that the fundamental design of the emergency Alternating Current power system is in accordance with IEEE Std 308-1991. In an April 25, 2001, meeting, DCS stated that redundant 7-day fuel tanks were being considered. On page 11.5-15, the application states, "The fuel oil supply tank provides sufficient storage capacity to allow one emergency diesel generator to operate continuously for seven days." This appears to be inconsistent with Section 6.2.5(5)(a) of IEEE Std 308-1991.

151. Section 11.5.2.4, p. 11.5-6

Provide a discussion for the MOX communication systems.

Although communication systems have been included as electrical systems in Section 11.5.2.4 of the application, there appears to be no separate, unique discussion in the application for communication systems related to information and acceptance criteria encompassed by Sections 11.3 and 11.4 of the SRP.

152. Sections 11.5.2.5, p. 11.5-7; Section 11.6.7, pp. 11.6-12 thru 11.6-14; and Section 15.3, pp. 15-12 thru 15-14

Discuss commitments to maintenance and periodic testing standards for electrical and Instrumentation and Control (I&C) SSCs.

Although there is a commitment to testing in Sections 11.5.2.5, 11.6.7, and 15.3 of the application; there appears to be no commitment (ignoring cross-referenced standards) to specific standards for maintenance and periodic testing for electrical and I&C SSCs (e.g. Institute of Electrical and Electronics Engineers (IEEE) Standard 450; "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications") as mentioned in Sections 11.3 and 11.4 of the SRP.

153. Sections 11.5.6 and 11.5.7, pp. 11.5-13 thru 11.5-16

Discuss DCS's lack of commitment to IEEE Standard 944-1986, "IEEE Recommended Practice for the Application and Testing of Uninterruptible Power Supplies for Power Generating Stations."

Section 11.3 of the SRP recommends that information be provided to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 944.

154. Sections 11.5.6 and 11.5.7, pp. 11.5-13 thru 11.5-16

Discuss DCS's lack of commitment to IEEE Standard 946-1985, "IEEE Recommended Practice for the Design of Safety-Related DC Auxiliary Power Systems for Nuclear Power Generating Stations."

Section 11.3 of the SRP recommends that information be provided to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 946.

155. Section 11.5.6.1, p.11.5-13

Discuss compliance with IEEE Standard 665-1987, "Guide for Generating Station Grounding." Discuss how the DCS commitment to IEEE Standard 1050-1996, "Guide for Instrumentation and Control Equipment Grounding in Generating Stations," meets the guidance provided in Regulatory Guide 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems."

DCS has committed to IEEE Standard 142-1991, "Recommended Practice for Grounding of Industrial and Commercial Power Systems," which is related to IEEE Standard 665-1987. DCS has also committed to IEEE Standard 1050-1996. The NRC staff, in Regulatory Guide 1.180, has endorsed IEEE Standard 1050-1996 with exceptions.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Sections 11.4.2.2 and 11.4.3.2 of the SRP, electrical and instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standards 665 and 1050 and RG 1.180.

156. Section 11.5.7.1, p. 11.5-14

Discuss any significant difference (applicable to MOX) between IEEE Standard 387-1995, "IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," and the 1984 version of this standard. Discuss how the DCS commitment to IEEE Standard 387-1995 meets the guidance provided in Revision 3 of Regulatory Guide (RG) 1.9, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electrical Power Systems at Nuclear Power Plants."

DCS has committed to IEEE Standard 387-1995. The NRC staff, in Revision 3 to Regulatory Guide 1.9, endorses IEEE Standard 387-1984. Some, but not all, of the Regulatory Guide 1.9, Revision 3, guidance has been incorporated in IEEE Standard 387-1995.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 387 and Regulatory Guide 1.9.

157. Section 11.5.7.1, p. 11.5-14

Discuss any significant difference (applicable to MOX) between IEEE Standard 308-1991, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Generating Stations," and the 1974 version of this standard. Discuss how the DCS commitment to IEEE Standard 308-1991 meets the guidance provided in Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants."

DCS has committed to IEEE Standard 308-1991. The NRC staff, in Regulatory Guide 1.32, has endorsed the 1974 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 308 and Regulatory Guide 1.32.

158. Section 11.5.7.1, p. 11.5-14

Discuss any significant difference (applicable to MOX) between IEEE Standard 323-1983, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," and the 1974 version of this standard.

DCS has committed to IEEE Standard 323-1983. The NRC staff, in Chapter 7 of NUREG-0800, has endorsed the 1974 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the

SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 323.

159. Section 11.5.7.1, p. 11.5-14

Discuss any significant difference (applicable to MOX) between IEEE Standard 344-1987, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Generating Stations," and the 1975 version of this standard. Discuss how the DCS commitment to IEEE Standard 344-1987 meets the guidance provided in Regulatory Guide 1.100, "Seismic Qualification of Electric Equipment for Nuclear Power Plants."

DCS has committed to IEEE Standard 344-1987. The NRC staff, in Regulatory Guide 1.100, has endorsed the 1975 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 344 and Regulatory Guide 1.100.

160. Section 11.5.7.1, p. 11.5-14

Discuss any significant difference (applicable to MOX) between IEEE Standard 379-1994, "IEEE Standard Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems," and the 1988 version of this standard.

DCS has committed to IEEE Standard 379-1994. The NRC staff, in Chapter 7 of NUREG-0800, has endorsed the 1988 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 379.

161. Sections 11.5.7.1 and 11.5.7.2, p. 11.5-14 and 11.5-15

Provide discussion/justification for deviations (applicable to MOX) from the minimum separation distances specified in Regulatory Guide 1.75, "Physical Independence of Electric Systems."

The NRC staff; in Regulatory Guide 1.75 endorses (with exceptions) IEEE Standard 384-1974, "Standard Criteria for Independence of Class 1E Equipment and Circuits." DCS has committed to IEEE Standard 384-1992.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 384 and RG 1.75.

162. Section 11.5.7.2, p. 11.5-15

Discuss DCS's lack of commitment to IEEE Standard 484-1975, "IEEE Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations."

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 484.

163. Section 11.5.7.2, p. 11.5-15

Discuss DCS's choice of IEEE Standard 485-1992, "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications," and discuss any significant difference (applicable to MOX) between this version and the 1997 version.

DCS has committed to IEEE Standard 485-1992. Staff review and participation in the standard's development indicate that IEEE Standard 485-1997 is much improved.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.2.2 of the SRP, electrical systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 485.

164. Sections 11.6.6 and 11.6.7, pp. 11.6-12 thru 11.6-14

Discuss specific design considerations used in the MOX facility to minimize the effects of smoke on digital instrumentation and control components.

Recently; in NUREG/CR-6597, "Results and Insights on the Impact of Smoke on Digital Instrumentation and Control," the NRC discussed the effects of smoke on digital, electronic components.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in NUREG/CR-6597.

165. <u>Section 11.6.7, pp. 11.6-12 thru 11.6-14</u>

Describe the method of data communications independence as related to isolation of the safety control circuits and other circuits.

Section 11.6.7 of the application states that the software programmable electronic systems used in safety control subsystems are designed using the methods and practices identified in IEEE 7-4.3.2 - 1993, "IEEE Standard for Digital Computers in Safety Systems of Nuclear Power Generating Stations." Section 5.6 of that standard entitled "Independence," states that data communications between safety channels or between safety and non-safety systems shall not inhibit the performance of the safety function.

Per SRP Section 11.4.3.2, information is recommended to determine if the design basis adequately addresses the maintenance of redundancy and independence. Data communications independence is a special case of independence for digital systems. The information submitted should include both the hardware and software basis of data communications independence.

166. <u>Section 11.6.7, pp. 11.6-12 thru 11.6-14</u>

Describe the planned degree of conformance with the specific criteria of IEEE Standard 4-7.4.3.2-1993, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," for the software programmable systems used in safety control subsystems.

In Section 11.6.7 of the application, the phrase "using the methods and practices" of the particular standard does not specifically identify the actual degree of conformance to the criteria of the standard.

Per Section 11.4.1, 11.5.1 of the SRP, information is recommended to determine if the design basis adequately addresses the specific criteria of the referenced standard in order to verify the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

167. <u>Section 11.6.7, pp. 11.6-12 thru 11.6-14</u>

Describe how the system hazards that the software components are expected to handle will be included in the requirements for the software components.

Software is frequently overlooked during system hazard analyses, but this should not occur in safety applications. Software hazard analysis controls software hazards and hazards related to interfaces between the software and the system (including hardware and human components.) It includes analyzing the requirements, design, implementation, user interfaces and changes. The description of methods, practices, or standards concerning the allocation of system hazards to software components and their inclusion in the requirements is missing in the application.

Per Section 11.3, 11.4.3.2, and 11.5.1 of the SRP, a determination should be made if the design basis adequately addresses the specific criteria of: a) the assurance measures, including applicable codes and standards; and b) the provisions so that I&C components fail in a safe manner. Information is needed in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

168. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Describe what methods, practices, or standard(s) that will be used for the software design documentation.

The description of methods, practices, or standards concerning the documentation of the software design is not described in the application. A consistent documentation method for the software is necessary for all the reviews, verification and validation, and other assurance measures.

Per Section 11.3 and 11.5.1 of the SRP, a determination should be made if the design basis adequately addresses the specific criteria of the assurance measures, including applicable codes and standards. Information is needed in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

169. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Describe the methods, practices or standard(s) under which previously developed software or purchased software involved in safety functions will be controlled, reviewed, verified and validated.

The assurance measures, including applicable codes and standards, for previously developed or purchased software that is used in safety functions is not described in this section of the application.

Per Section 11.3 and 11.5.1 of the SRP, a determination should be made if the design basis adequately addresses the specific criteria of the assurance measures, including applicable codes and standards. Information is needed in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

170. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Describe the methods, practices or standard(s) that will be used for the software programming language(s) involved in safety applications.

The assurance measures, including applicable codes and standards, for software programming languages that are planned to be used in safety functions is not described in this section of the application. The programming language can have effects on safety functions if certain features of the language are used. For information, the potential effects of programming languages are discussed in NUREG/ CR-6463, Revision 1, "Review Guidelines for Software Languages for Use in Nuclear Power Plant Safety Systems."

Per Section 11.3 and 11.5.1 of the SRP, a determination should be made if the design basis adequately addresses the specific criteria of the assurance measures, including applicable codes and standards. Information is needed in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

171. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Describe the planned application of IEEE 1074-1997 to the life cycle processes of the application software for the digital computers used in safety systems.

The application states that the application software life cycle will be developed, reviewed, and verified using the methods and practices identified in IEEE 1074-1997, "IEEE Guide for Developing Software Life Cycle Processes." The correct title of IEEE 1074-1997 is "IEEE Standard for Developing Software Life Cycle Processes."

In Section 11.6.7 of the application the phrase "using the methods and practices" of the particular standard does not specifically identify the actual degree of conformance to the detailed criteria of the referenced standard.

Per Section 11.4.1 and 11.5.1 of the SRP, information is required to determine if the design basis adequately addresses the specific criteria of the referenced standards in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria.

Note: Acceptance for software based equipment is based on the SRP and additional guidance in NUREG-0800, Chapter 7 (Instrumentation & Controls) for digital systems, software, real-time performance, data communications, and programmable logic controllers. In general, acceptance is based on the adequate confidence that the allocation of system hazards to software, the functional behavior that the software is to exhibit as specified in the requirements, and the characteristics of the software development process for the particular software life cycle, will result in a system that will meet the recommendations of SRP Section 11.4.1.

172. Section 11.6.7, p. 11.6-13

Clarify the degree of DCS's commitment to standards and codes.

Sections 11.4.1 and 11.5.1 of the SRP recommend that information be provided to determine if the design basis adequately addresses the specific criteria of the referenced standards in order to evaluate the applicant's commitment to provide plant systems that satisfy the acceptance criteria. The application states, "The following codes and standards, as applicable to fuel cycle facilities, are used in the design of I&C principal SSCs." This sentence does not provide a clear commitment to standard and codes. Also, the phrase, "using the methods and practices," does not specifically identify the actual degree of conformance to the detailed criteria of a referenced standard.

173. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 603-1998, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," and the 1991 version of this standard. Discuss how the DCS commitment to IEEE Standard 603-1998 meets the guidance provided in Regulatory Guide 1.153, "Criteria for Safety Systems."

DCS has committed to IEEE Standard 603-1998. The NRC staff, in Regulatory Guide 1.153, has endorsed the 1991 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 603 and Regulatory Guide 1.153.

174. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 828-1998, "IEEE Standard for Software Configuration Management Plans," and the 1990 version of this standard. Discuss how the DCS commitment to IEEE Standard 828-1998 meets the guidance provided in Regulatory Guide 1.169, "Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

DCS has committed to IEEE Standard 828-1998." The NRC staff, in Regulatory Guide 1.169, has endorsed the 1990 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 828 and Regulatory Guide 1.169.

175. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 830-1998, "IEEE Standard Recommended Practice for Software Requirements Specifications," and the 1993 version of this standard. Discuss how the DCS commitment to IEEE Standard 830-1998 meets the guidance provided in Regulatory Guide 1.172, "Software Requirements Specifications for Digital Computer Software Used in Safety systems of Nuclear Power Plants."

DCS has committed to IEEE Standard 830-1998. The NRC staff, in Regulatory Guide 1.172, has endorsed the 1993 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 830 and Regulatory Guide 1.172.

176. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 1012-1998, "IEEE Standard for the Software Verification and Validation," and the 1986 version of this standard. Discuss how the DCS commitment to IEEE Standard 1012-1998 meets the guidance provided in Regulatory Guide 1.168, "Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

DCS has committed to IEEE Standard 1012-1998. The NRC staff, in Regulatory Guide 1.168, has endorsed the 1986 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 1012 and RG 1.168.

177. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 1028-1997, "IEEE Standard for Software Reviews," and the 1988 version of this standard. Discuss how the DCS commitment to IEEE Standard 1028-1997 meets the guidance provided in Regulatory Guide 1.168.

DCS has committed to IEEE Standard 1028-1997. The NRC staff, in Regulatory Guide 1.168, has endorsed the 1988 version of this standard.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 1028 and RG 1.168.

178. Section 11.6.7, p. 11.6-13

Discuss any significant difference (applicable to MOX) between IEEE Standard 1074-1997, "IEEE Guide for Developing Software Life Cycle Processes," and the 1995 version of this standard. Discuss how the DCS commitment to IEEE Standard 1074-1997 meets the guidance provided in Regulatory Guide 1.173, "Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants." Discuss MOX computer software life cycle activities in light of the guidance contained in Branch Technical Position (BTP) HICB-14 contained in NUREG-0800.

DCS has committed to IEEE Standard 1074-1997. The NRC staff, in Regulatory Guide 1.173, has endorsed the 1995 version of this standard. Also, BTP HICB-14 in NUREG-0800 provides guidance on software life cycle activities for digital computer-based instrumentation and control systems.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in IEEE Standard 1074, RG 1.173, and BTP HICB-14.

179. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Discuss the use and qualification of isolation devices for the MOX facility in light of the guidance contained in BTP HICB-11 in NUREG-0800.

Branch Technical Position HICB-11 in NUREG-0800 provides guidance on isolation devices.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in BTP HICB-11.

180. Section 11.6.7, p. 11.6-14

Discuss how the DCS commitment to Instrument Society of America (ISA) 67.04.01-2000, "Setpoints for Nuclear Safety-Related Instrumentation," meets the guidance contained in BTP HICB-12 of NUREG-0800 and Regulatory Guide 1.105, "Instrument Setpoints for Safety-Related Systems."

DCS has committed to ISA 67.04.01-2000. Branch Technical Position HICB-12 in NUREG-0800 and Regulatory Guide 1.105 provide guidance on establishing and maintaining instrument setpoints.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and utilize specific design considerations such as those contained in ISA 67.04.01-2000, Regulatory Guide 1.105, and BTP HICB-12.

181. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Discuss the self-test and surveillance test provisions for MOX instrumentation and control systems in light of BTP HICB-17 contained in NUREG-0800.

BTP HICB-17 in NUREG-0800 provides guidance on self-test and surveillance test provision for digital computer-based instrumentation and control systems.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in BTP HICB-17.

182. Section 11.6.7, pp. 11.6-12 thru 11.6-14

Discuss the use of programmable logic controllers (PLCs) for MOX instrumentation and control systems in light of BTP HICB-18 contained in NUREG-0800.

BTP HICB-18 in NUREG-0800 provides guidance on the use of PLCs in digital computer-based instrumentation and control systems.

Per Section 11.3 of the SRP, information is recommended to determine if the design basis adequately addresses the functional requirements for the system. Per Section 11.4.3.2 of the SRP, instrumentation and control systems should be available and reliable and designed with specific considerations such as those contained in BTP HICB-18.

183. Section 11.7, pp. 11.7-1 thru 11.7-6

Provide a list of specific material handling equipment identified as principle structures, systems, or components (SSCs) and its location in the facility.

Section 11.4.7 of the SRP recommends that information be provided on material transport system design and operation to fulfill all of the functional requirements determined by the integrated safety assessment. The list of the specific subcomponents of the material handling equipment that may be principle SSCs are not provided. This information is needed to clarify the scope and extent of safety significance of the system.

184. Section 11.7, pp. 11.7-1 thru 11.7-6

Describe the capacity of the material handling equipment during normal operating and accident conditions.

Section 11.4.7.2.A of the SRP recommends that the applicant demonstrate that adequate capacity exists to handle the expected volume of radioactive material during normal operation and accident conditions. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. Information describing the capacity of the material handling equipment during normal operating and accident conditions was not provided in the application.

185. Section 11.7, pp. 11.7-1 thru 11.7-6

Other than the structural design of the system that would prevent failure of the material handling equipment during an event, clarify if other redundancy or diversity in material handling system components is provided to prevent a failure of the system that could lead to a confinement breach.

Section 11.4.7.2.B of the SRP recommends that the application describe equipment diversity or redundancy provided to prevent a system breach. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. The application does not address redundancy or diversity in design for the material handling equipment.

186. Section 11.7, pp. 11.7-1 thru 11.7-6

Describe the material handling equipment design bases intended to prevent breaches in the glovebox boundary as a result of the normal or off-normal operation of the system. Clarify the statement in Table 5.5-16 regarding the use of "engineered equipment" to prevent material handling equipment from impacting gloveboxes.

Section 11.4.7.2.B of the SRP recommends that information be provided to verify that states that there is redundancy or diversity of components required to prevent the release of radioactive materials to the environment or needed for safe operation of the material transport system. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. This information on the material handling equipment design bases intended to prevent breaches in the glovebox boundary as a result of the normal or off-normal operation of the system is either not addressed or is unclear as written in the application.

187. <u>Section 11.7, pp. 11.7-1 thru 11.7-6</u>

Identify and describe any material handling equipment that is provided with emergency power, if any.

Section 11.4.7.2.C of the SRP recommends that information be provided to should demonstrate provisions for emergency power are included for critical process components. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. The use of emergency power in the system is not described in the application.

188. <u>Section 11.7, pp. 11.7-1 thru 11.7-6</u>

Describe how the material handling equipment is designed to minimize buildup of plutonium, uranium, or MOX dust and debris in the transport systems.

Section 11.4.7.2.H of the SRP recommends that information be provided to demonstrate that the equipment is designed to minimize entrapment and buildup of solids in the system. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. The application does not describe system design to minimize dust and debris buildup.

189. <u>Section 11.7, pp. 11.7-1 thru 11.7-6</u>

Provide design basis decontamination characteristics for the material handling equipment.

Section 11.4.7.2.J of the SRP recommends that information be provided to verify that materials have surface finishes that have satisfactory decontamination characteristics. This section applies to the specific design considerations for the material handling equipment in general and to parts of the material handling equipment identified as principle SSCs, in particular. Decontamination characteristics for the material handling equipment are not discussed in the application.

190. <u>Section 11.8, pp. 11.8-1 thru 11.8-10</u>

Describe the design basis for the fluid transport systems. Provide the design pressures and capacities of the fluid transport systems.

Section 11.4.7.2.A of the SRP recommends that information be provided to verify that adequate capacity exists to handle normal operating and accident conditions. This section applies to the specific design considerations for the fluid transport systems in general and to parts of the fluid transport system equipment identified as principle SSCs, in particular. The NRC needs a clear description of systems, appropriate design bases and values, ranges, control information, needed reliabilities, and identification of any IROFS. The design basis for the fluid transport systems are not provided.

191. <u>Section 11.8, pp. 11.8-1 thru 11.8-10</u>

For all fluid transport systems, if a safety function is preventing back-flow into auxiliary systems, describe the applicable design criteria such as type and configuration of check valves. If isolation is safety function, describe the applicable design criteria, such as the type, capability and redundancy in isolation valves.

Section 11.4.7.2.B of the SRP applies to the specific design considerations for the fluid transport systems in general and to parts of the fluid transport system equipment identified as principle SSCs, in particular. No specific description of equipment used to prevent the release of radioactive materials to the environment or needed for safe operation of the system is provided.

192. Section 11.8, pp. 11.8-1 thru 11.8-10

Discuss the use of traps in the fluid transport system where buildup of solids could occur. If they exist, describe where they are located and what measures will be taken to minimize the buildup of solids in the system.

Basis: Section 11.4.7.2.H of the SRP recommends that the use of traps where solids can buildup be avoided. This section applies to the specific design considerations for the fluid transport systems in general and to parts of the fluid transport system equipment identified as principle SSCs, in particular. No discussion of the use of traps where buildup of solids could occur is included in the application.

193. Section 11.8, pp. 11.8-1 thru 11.8-10

List parts of fluid transport systems for wet processing operations that do not meet the recommendation that wet processing operations involving gram quantities of plutonium or 50 micrograms or more of respirable plutonium be conducted in a glovebox.

Section 11.4.7.2.I of the SRP states that the application should describe the need for hoods, gloveboxes, and shielding. This recommendation applies to the specific design considerations for the fluid transport systems in general and to parts of the fluid transport system equipment identified as principle SSCs, in particular. No specific discussion was provided for fluid systems that involve gram quantities of plutonium or 50 micrograms or more of respirable plutonium, but are not conducted in a glovebox.

194. Section 11.8, pp. 11.8-1 thru 11.8-10

Clarify where in the application decontamination characteristics are addressed.

Section 11.4.7.2.J of the SRP states that the application should demonstrate that surface finishes in the work areas are of materials that have satisfactory decontamination characteristics for their particular application. The fluid transport system section does not address decontamination characteristics of the equipment.

195. Section 11.8.6, pp. 11.8-5

Clarify the design bases for non-principal SSCs and any impact these might have upon principal SSCs/IROFSs

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application. Section 11.8.6, "Design Basis for Non-Principal SSCs," is simply a reference to Table 11.8-1. The section does not link specific codes and standards to specific SSCs and no design bases/values are provided. In addition, the distinction between non-safety SSCs and IROFSs is not clear. It is not clear how the linkage to an IROFS is addressed. More information is needed before a safety determination can be made.

196. Section 11.9, General

Provide information on the chemical double isolation valves and backflow prevention.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

In Section 11.9, double isolation valves are mentioned for many of the reagent systems, such as for hydrogen and nitric acid. Methods of actuation are not discussed. These valves would be activated by a seismic sensor system, which is not described further and no action limit is identified. Section 11.9.5.1 on page 11.9-51 is entitled, "Isolation Valves" in Section 11.9.5 entitled, "Design Basis for Principal SSCs." No design basis functions and values are identified for specific or general systems. Activation by other control systems in response to other stimuli/measurements (e.g., leak detectors) is not mentioned. In addition, breakpots are mentioned for some streams, but no further information could be found in the application. The description of these items implies some safety significance, but such significance is not identified in the application. However, at the public meeting of April 25, 2001, DCS stated the double isolation valves are principal SSCs/IROFSs. Sufficient information is not included in the report to address any potential hazards and safety functions associated with these SSCs. Design basis information and values, corrosion effect information, and an adequate system description are needed to assess the associated hazards and appropriateness of these valves and backflow preventers, and safety functions. For example, we would anticipate design basis information related to PFOD/reliability, leakage, aging/longevity requirements, activation methods/limits, IROFS/principal SSC status etc.

197. <u>Section 11.9, pp. 11.9-1 thru 11.9-116</u>

Regarding the process chilled water system, describe how in-leakage of contaminated coolant from intermediate heat exchangers would be detected. If no means of detection is provided, provide the basis for this design configuration.

Section 11.4.4.2.F of the SRP states that the application should describe that capacity and capability for detecting leaks and cross-contamination. The application does not provide specific information as to the detection of contaminated coolant.

198. <u>Section 11.9, pp. 11.9-1 thru 11.9-116</u>

Regarding the process condensate system and the plant water system and other similar systems, describe the potential for chemical/radiological contamination of piping and components. In the event of an isolation, describe what would prevent potentially contaminated water from migrating or back flowing to other equipment, the Savannah River Site, or the MOX MFFF drinking water supplies.

Section 11.4.4.2.F of the SRP states that the application should describe that capacity and capability for detecting leaks and cross-contamination in cooling water systems. The application does not provide specific information as to the detection of contaminated water.

199. <u>Section 11.9, pp. 11.9-1 thru 11.9-116</u>

Regarding the Emergency Diesel Generator (EDG) Fuel Oil System, explain if the exhaust system silencer/piping is an industry "standard design" rated for indoor use. Describe the industry standards. Describe the design basis criteria that the exhaust system meet to ensure the impact on operations or maintenance is minimal during EDG operation. Describe filtration of the diesel fuel oil. Describe how that is accomplished. Describe the criteria for the filters that will be used.

Standard Review Plan 11.4.2.2.C recommends, among other things, that the independent onsite power sources be designed to have no single failure vulnerability. Excessive noise and heat can be. Extreme noise in the EDG rooms could lead to operator fatigue and become a single failure vulnerability. The criteria and description of the industry standards and ratings for the EDG exhaust systems was not provided.

200. <u>Section 11.9, pp. 11.9-1 thru 11.9-116</u>

Regarding the Instrument Air System, explain the basis for the 7-day emergency scavenging air supply. Describe the basis for the sizes of the 10-minute and 1-hour receivers/buffer tanks.

10 CFR Part 70.22(a)(7) requires the application for a license contains a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property. 10 CFR Part 70.61(e) requires that controls or systems needed to meet performance requirements be designated as an item relied upon for safety. Section 11.4.3.2.G of the SRP recommends that systems have capability to maintain functionality when subjected to natural phenomena as established in the ISA. The basis for the 7-day emergency

scavenging air supply and the sizes of the 10-minute and 1-hour receiver/buffer tanks were not provided.

201. Section 11.9, pp. 11.9-1 thru 11.9-116

Regarding the Instrument Air System, identify any parts or functions of the system that are part of or support the "glovebox pressure controls." The system description discusses aqueous polishing glovebox scavenging and supporting miscellaneous equipment, however Figure 11.9-10 shows interfaces with MOX processing gloveboxes. Define the term "miscellaneous equipment." Section 11.9.1.10.5 of the application, “System Interfaces,” only lists the Service Air System and the Seismic Detectors as interfacing systems. The general description of gloveboxes in Section 11.4.7.1.5 does not list the Instrument Air System as an interface. Please clarify the functions and all interfaces of the Instrument Air System and clarify its safety function, if any, and whether any part of this system is a primary SSC or an item relied upon for safety. Provide the basis for the basis for your conclusions. Clarify the functions and interfaces of the scavenging air system.

10 CFR Part 70.22(a)(7) requires the application for a license contains a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property. The application does not clearly explain the interfaces and functions of the instrument air system.

202. Section 11.9, pp. 11.9-1 thru 11.9-116

Regarding the Radiation Monitoring Vacuum System (RMVS), describe how a failure in the RMVS be detected. Describe any alarms and where they would display if provided. Clarify if this system is relied on by the training program as an indicator to take emergency actions. Provide justification why this system should not be classified as a principle SSC.

10 CFR Part 70.22(a)(7) requires the application for a license contains a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property. The application does not provide sufficient information for a reviewer to find that the equipment is adequate to protect public health and safety and minimize danger to life and property.

203. Section 11.9, pp. 11.9-1 thru 11.9-116

Regarding the Nitric Acid System and all other applicable reagent systems in the MFFF, the descriptions of the tanks generally contain actions/contingencies for low tank level. Describe the design basis to protect against high tank level or overfill. Clarify how the release of tank contents from an overfill (of the nitric acid or nitrogen oxide tanks, for example) effect the adjacent MFFF. Describe the features that prevent escaping tank contents (liquids/gasses/vapors) from affecting workers in the MFFF or principle SSCs on the site.

10 CFR Part 70.22(a)(7) requires the application for a license contains a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property. No description of provisions or protection from tank overfill/release was given in the application. Supporting equipment must not interfere with the use or operation of IROFS.

204. Section 11.9, General

Discuss the potential hazards associated with gas cylinders and any needed safety controls.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application, or incorporated by reference, provided that these references are clear, specific, and essentially complete."

Section 11.9 indicates that high pressure gases and gas cylinders will be used within the facility. Little additional information is provided in the application. A compressed gas industry standard (CGA P-1) is mentioned on page 11.9-50. However, over a 10-20 year operating period for the facility, compressed gas cylinder incidents might be anticipated events if the usage rate is significant or have an unlikely likelihood if the usage rate is small (like a laboratory). Before a safety determination can be made, more information is needed to assess potential hazards such as regulator failures, dropped cylinders, and cylinder missiles; their potential impact upon the safe handling of any licensed radioactive materials; design bases and probabilities; and any safety controls.

205. <u>Section 11.9, pp. 11.9-1 thru 11.9-115</u>

Provide design basis information and commitments for the "Fluid Systems" presented in Section 11.9.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9 describes several fluid and reagent systems. Some design basis information is included, but it is generally inadequate to assess the potential safety of the proposed approach. The NRC would anticipate a clear communication of the system description, appropriate design bases and values, ranges, control information, needed reliabilities, and identification of any IROFSs. The NRC would expect any commitments to be clearly identified and stated, and, if the control concepts in Section 11.9.2.x.4 represent commitments, then they should be stated as such. In addition, these systems appear to rely heavily on operator actions and interactions, and, thus, human reliabilities should be included in the description and analyses.

206. <u>Section 11.9, pp. 11.9-1 thru 11.9-115</u>

Describe the integration of the different Fluid Systems presented in Section 11.9.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9 provides a limited description of the fluid systems at the proposed facility, including chemical reagent systems. It is not clear how the different systems are integrated and interlocked to avoid potentially hazardous situations. A clearer system description with the identification of design bases and controls is needed before a safety determination can be made. For example, oxidizers and reductants could be handled in the same area, at concentrations well above those used in the process. The wrong material could be inadvertently added to the wrong vessel or line. Other incompatibilities might be possible. Some of the reagents can also volatilize and affect operators, potentially affecting the safe handling of radioactive materials. During operations at the proposed facility, numerous interactions would occur between operating personnel, the control room, the control system, and local controls. The operators may even be called upon to activate safety systems or undertake safety-type actions (e.g., avoid overfilling of tanks and vessels. It is not clear how these operator interfaces would function and what indicators are available for these operators, what are the required response times, reliabilities etc. The NRC would expect this type of information to be included in the application.

207. <u>Section 11.9.2.1, pp. 11.9-23 thru 11.9-25</u>

Provide additional design basis information on the nitrogen system.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.2.1 describes the nitrogen system. Five primary and several backup functions are listed - it would be helpful to have the safety significance of these functions identified. The "Description" and "Major Components" sections appear contradictory and need clarification; the first part implies cryogenic storage as a backup while the second implies cryogenic supply is the primary storage means. Pressures, temperatures, quantities, purity, monitoring devices, control sensors and element design bases, interfaces for backup functions, and principal SSCs/IROFSs are not identified. This information is needed in order to make a determination regarding adequate safety.

208. <u>Section 11.9.2.2, pp. 11.9-25 thru 11.9-27</u>

Provide additional design basis and IROFS information on the argon/hydrogen system.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.2.2 describes the argon/hydrogen system. Some pressure information is provided for hydrogen and the argon/hydrogen mixture; no pressure information is provided for the argon itself. No flow rates or quantities are provided. IROFSs are not identified. However, redundant hydrogen monitors, regulators, flow control valves, seismic detectors, and backup systems would imply safety-related functions for these SSCs. Reliabilities for these SSCs are not mentioned. Without this additional design basis and safety information, it is not possible to make a safety determination regarding the proposed facility.

209. <u>Section 11.9.2.3, pp. 11.9-27 and 11.9-28</u>

Provide additional design basis and IROFS information on the helium system.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.2.3 describes the helium system. This system provides high pressure helium for rod pressurization and low pressure helium for welding, scavenging, and purging applications. Several components, such as the helium detectors, regulators, pressure switching system, and isolation valves imply a safety-related function, but IROFSs are not identified. Reliabilities are not mentioned. Without this additional design basis and safety information, it is not possible to make a safety determination regarding the proposed facility.

210. <u>Section 11.9.2.4, pp. 11.9-28 and 11.9-29</u>

Provide additional design basis information on the oxygen system.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.2.4 describes the oxygen system. Some of the components, such as regulators, pressure monitors, switch-over systems, and the isolation valves, would appear to have safety-like functions, but IROFSs are not identified. Reliabilities are not identified. Without this information, it is not possible to make a safety determination regarding the proposed facility.

211. Section 11.9.3.1, pp. 11.9-29 thru 11.9-32

Provide additional design basis and IROFS information on the nitric acid systems.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.3.1 describes the nitric acid system. Apart from concentrations, no quantitative information is given. Inventories, temperatures, supply pressures, etc. are not provided. Tank and pump information that could affect safety are not described. Potential IROFSs are not identified although the text hints that some are present. This system also requires considerable interfacing between the local operator, local controls and the control room operator. Thus, human errors become a significant concern. The NRC would anticipate some form of reliability requirement in the design basis. Without this information, it is not possible to make a safety determination.

212. Section 11.9.3.1.2, 11.9-30

Assess the potential safety concerns and any safety requirements that might be associated with the pressurized 6N nitric acid tank.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete."

Section 11.9.3.1.2 mentions that the 6N nitric acid tank is pressurized with air. No air pressure is specified. Figure 11.9-17 displays the system's flow diagram but does not show an air supply. It is unusual to pressurize a nitric acid tank and the impacts of the tank's rupture or unanticipated flow surges through lines and valves may impact the safe handling of radioactive materials. It is not possible to make a safety determination regarding this system until additional information is provided, including the design bases and values for the system and any controls.

213. Section 11.9.3.10.1, p. 11.9-44

Describe the mixing of concentrated hydrazine hydrate and nitric acid.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.3.10.1 mentions that the hydrazine system uses 35 percent hydrazine hydrate. The text indicates this is mixed directly with 13.6 M nitric acid in two reactors, each cooled with chilled water. These represent rather concentrated conditions for combining an oxidizing material with a fuel. Design basis information, such as enthalpy (heat) load, temperatures, potential IROFSs, etc. is needed before a safety determination can be made.

214. Section 11.9.4, pp. 11.9-49 thru 11.9-51

Clarify the design bases for non-principal SSCs and any impact these might have upon principal SSCs/IROFSs

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.4, "Design Basis for Non-Principal SSCs," is a listing of codes and standards. The section does not link specific codes and standards to specific SSCs and no design bases/values are provided. Some of the codes and standards overlap (e.g., on relief devices, pressure design). There is no discussion of the applicability of the codes in a nuclear facility. In addition, the distinction between non-safety SSCs and IROFSs is not clear. Some of the codes and standards would appear to also apply to potential IROFSs and non-safety SSCs might affect the function of IROFSs. For example, the plant uses compressed gas cylinders in several areas and as backup supplies for some functions (e.g., gas bottles for inerting, air scavenging). This section has several compressed gas standards that would seem to apply, but it is not clear how the linkage to an IROFS is addressed. More information is needed before a safety determination can be made.

215. Section 11.9.5, pp. 11.9-51 and 11.9-52

Explain the separation of incompatible chemicals.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.9.5 is entitled, "Design Basis for Principal SSCs," and consists of two short paragraphs. Portions of these paragraphs say:

> "Vessels/components are segregated/separated from incompatible chemicals ..."
>
> "Pressure vessels (e.g., gas storage bottles) are used in some utility systems. Principal SSCs are located away from these pressure vessels or otherwise protected such that failure of the pressure vessel will have no impact on the principal SSC."

Clear design bases, values, criteria, and descriptions (e.g., which components and pressure vessels) are needed before a safety determination can be made.

216. Section 11.10, pp. 11.10-1 thru 11.10-2

Verify that there are no unidentified heavy lift applications, other than in the fresh fuel cask shipping area, including any cranes or hoists used for maintenance activities in the facility or on the MFFF grounds.

Section 11.4.8.2.F of the SRP states that the application should describe the bases for cranes based on an analysis that considers the confinement of radioactive material under conditions of system failure or misoperation. The reviewer must verify that only one heavy lift crane exists in the MOX facility.

217. Section 11.10, pp. 11.10-1 thru 11.10-2

Discuss how heavy lift crane(s) are prevented by design, interlocks, or administrative controls, from moving over safety, confinement, and other principle SSCs.

Section 11.4.8.2.C of the SRP states that the application should describe the methods used to prevent a heavy load from moving over a safety or containment system. The design principles preventing movement over safety, confinement, and other principle SSCs are not provided in the application.

218. Section 11.10, pp. 11.10-1 thru 11.10-2

Assess the number of lifts of a fresh fuel cask container in any year and estimate the total percent of time during a lift a container could be above a principle SSC.

Section 11.4.8.2.E of the SRP recommends that information be provided to verify that the design and operation of heavy lift cranes fulfill all of the functional requirements of the integrated safety assessment. Information on handling fresh fuel cask containers is needed to assess the service conditions for the heavy lift crane in order to make a safety assessment of the unique application of this crane.

219. Section 11.10, pp. 11.10-1 thru 11.10-2

Discuss similar crane design and operating experience, including significant accidents, at La Hague and Melox facilities.

Section 11.4.8.2.F of the SRP recommends that information be provided to verify that heavy lift cranes have adequate reliability to perform their safety functions when needed. Information on crane failure rates, service conditions, and operating modes is needed to verify the design bases for heavy lift cranes.

220. Section 11.10, pp. 11.10-1 thru 11.10-2

Clarify the location of the fresh fuel cask shipping area crane and discuss whether it should comply with ANSI/National Fire Protection Association (NFPA)-780-1986 standard for lightning protection for cranes.

Section 11.4.8.2.G of the SRP recommends that information be provided to show that the heavy lift cranes are based on codes and standards that represent a level of capability to meet design requirements. The standard for lightning protection is not discussed in the application.

221. Section 11.10, pp. 11.10-1 thru 11.10-2

Evaluate the differences between the application-referenced design standards and those discussed in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," for the following standards:

a) Crane Manufacturers Association of America (CMAA)-70, "Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes," 1994 versus 1975 edition

b) American Society of Mechanical Engineers (ASME) B30.2, "Overhead and Gantry Cranes, " 1996 versus 1983 edition

c) ANSI N14.6, "Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 lbs or More," 1993 versus 1978 edition

d) ANSI/ASME B30.9, "Slings," 1996 versus 1971 edition.

NUREG-0612 references earlier standards. A change analysis for newer editions is needed. The reviewer must be able to find that these standards are an acceptable alternative to existing NRC guidance.

222. Section 11.10, pp. 11.10-1 thru 11.10-2

Clarify the statements regarding the drop of a heavy load in Table 5A-6 and Table 5A-7 for events RD-6 and AS-8, respectively. In these cases, provide the weight of the postulated dropped loads. Explain the basis for the related load handling equipment being excluded from the list of heavy list cranes.

Section 11.4.8.2.E of the SRP recommends that information be provided to verify that the design and operation of heavy lift cranes fulfill all of the functional requirements of the integrated safety assessment. The application does not clearly state the loads or the bases for equipment being excluded from the designation, "heavy lift crane." The application should describe all heavy lift cranes and why some cranes that are related to defense-in-depth are excluded.

223. Section 11.11, pp. 11.11-1 thru 11.11-23

Clarify the design basis for safety in the Laboratory.

Section 8.3 of the SRP states, "Information contained in the application should be of sufficient quality and detail to allow for an independent review, assessment, and verification by the reviewers. Some information may be referenced to other sections of the application , or incorporated by reference, provided that these references are clear, specific, and essentially complete." SRP Section 8.4.3.1 states that an application would be acceptable if it addresses the baseline design criteria for chemical safety and includes information on the chemicals, process, equipment, inventories, ranges, and limits. At the construction permit stage, this would be expected to include design bases and values for these items, with sufficient system description to allow verification of the design bases and values. Sections 8.4.3.5 B, C, D, and F recommend that design bases, process safety features, and IROFS be included in the application.

Section 11.11 discusses the laboratory. The laboratory plans on manual operations and pneumatic delivery of solid and liquid samples. The laboratory consists of several gloveboxes linked together, and includes analytical stations, instruments, and a MOX pellet test line. The test line reproduces the main steps of the fabrication process for adjustment of process parameters and characterization of pellet blends. Design basis information is not provided for the laboratory. For example, the NRC would anticipate communication of estimates of the number of samples, the operator actions with those samples, human and instrument errors, and required reliabilities. Inventory information would also be anticipated; Table 5.5-2 shows an entry for a laboratory inventory of 200 grams as plutonium dioxide powder. The laboratory would also have pellets and liquid samples containing plutonium. Each pellet weighs about 5 grams and contains about 0.25 grams of plutonium. In the absence of additional information, it is not possible to confirm the inventory estimate. The laboratory also has a liquid waste processing unit consisting of four small tanks (15.8 gallons each); the design basis and any concentration limits are not provided. This information is needed before a safety determination can be made.

CHAPTER 12, HUMAN FACTORS ENGINEERING FOR PERSONNEL ACTIVITIES

224. Section 12.1, pp. 12-1 thru 12-2

Discuss the human factors/human performance activities associated with maintenance of automated systems used in the MFFF, and identify any safety significant human-system maintenance interfaces.

Section 12.1 of the SRP defines "personnel activities" as activities identified as items relied on for safety (IROFS) and personnel activities that support safety such as maintenance.

225. Section 12.1, pp. 12-1 thru 12-2

Describe the criteria and basis used for determining that the protective control subsystem does not constitute a significant human-system interface. Define what "significant" means.

Regulatory Acceptance Criterion A of Chapter 12 of the SRP recommends that the applicant appropriately identify personnel activities so that the reviewer can understand the actions, the human-system interfaces involved and the consequences. It is, therefore, important to understand why the protective control subsystem does not constitute a significant human-system interface.

226. Section 12.1, pp. 12-1 thru 12-2

While the MFFF has a high level of automation with operators mainly monitoring the operation of systems and exercising supervisory control only when necessary, describe how staff are alerted to undesirable conditions at control stations that are not normally staffed, and what criteria are used to decide when appropriate operations staff need to be at these remote locations for appropriate and timely response.

Regulatory Acceptance Criterion F of Chapter 12 of the SRP requires the applicant to review the number and qualifications of personnel for each personnel activity during all plant operating conditions in a systematic manner. The criteria used to decide what staff need to be at these remote locations and when ensures appropriate staffing based on this systematic review.

227. Section 12.1, pp. 12-1 thru 12-2

The applicant states that "in general, omission of an operator action does not result in adverse conditions, and that errors in operator actions are generally expected to be bounded by other deterministic design basis accident assumptions." Clarify what is meant by "in general," and describe by example what the other deterministic design basis assumptions are.

This statement is confusing and provides little information about the deterministic design basis assumptions actually used.

228. Section 12.2.1, p. 12-2

Verify the commitment to use NUREG-0711 to guide their human factors design basis development work during construction and evaluate the revision to IEEE 1023.

IEEE 1023 (1988), "IEEE Guidelines for the Application of Human Factors Engineering to Systems and Equipment and Facilities of Nuclear Power Generating Facilities," will be used during construction, design and startup of the MFFF. This standard is being revised and should be issued in 2002. Also, Section 12.7 References, of Chapter 12 of the SRP, includes

NUREG-0711, "Human Factors Engineering Program Review Model." The applicant indicated in an April 25, 2001, meeting with NRC staff, that it would also use NUREG-0711 to guide their human factors design basis development work during construction and evaluate the revision to IEEE 1023.

229. Section 12.2.1, p. 12-2

Identify and describe what "facility baseline design" means, or cross-reference to other appropriate Chapter(s) of the application.

230. Section 12.2.1, p. 12-2

Identify and describe the aspects of the design that reduce the risk of errors or challenges to principal SSCs, and how these aspects are evaluated.

Section 12.3 "Areas of Review" of the SRP recommends that the applicant describe safety-significant personnel actions, the associated human systems interfaces, and the consequences of incorrectly performing or omitting actions for each personnel activity.

231. Sections 12.2.3, 12.2.3.1, and 12.2.3.2, pp. 12-3 thru 12-4

Describe, by example, how operating experience of the La Hague and MELOX facilities is incorporated in the MFFF design process. Provide lessons-learned evaluations that show how the MFFF as a next generation facility effectively incorporates this operating experience.

Regulatory Acceptance Criterion C of the SRP requires the applicant to identify safety-related human factors engineering events or potential events that have occurred in existing facilities that are similar to the MFFF.

232. Sections 12.2.3, 12.2.3.1, and 12.2.3.2, pp. 12-3 thru 12-4

The applicant indicated it will use the review criteria of NUREG-0700, Rev. 1, to evaluate the MFFF human-system interfaces. NRC staff plans to issue NUREG-0700, Rev. 2, in March 2002. This revision will include human factors engineering guidance to account for emerging technologies and increased automation, including digital systems and systems comprised of both analog and digital technology, e.g., hybrid control rooms. Also, the “Reference” section of Chapter 12 of the SRP includes five NUREG/CR reports (NUREG/CRs-6633-6637) that contain technical bases and guidance for risk-significant hybrid control room human performance issues. The applicant indicated in the April 25, 2001, meeting with the NRC staff, that it would use both NUREG-0700, Rev. 2, and the referenced NUREG/CR reports in both preliminary and final design. The applicant should verify this commitment.

233. Section 12.3, pp. 12-3 thru 12-5

Clarify what is meant by "no additional formal operating experience review is anticipated," for the MFFF based on the operational experience at the La Hague and MELOX facilities previously incorporated in the MFFF design. Lessons-learned from operating experience should be a continuing activity throughout construction, detailed design, and operation.

Regulatory Acceptance Criterion C of the SRP recommends that the applicant identify safety-related human factors engineering events or potential events that have occurred in existing facilities that are similar to the MFFF.

CHAPTER 15, MANAGEMENT MEASURES

234. Section 15.1, pp. 15-1 thru 15-5

Amplify the application and definitions of Quality Levels (QL) presented in the Section 15.1 of the application. Also, provide a full description of the methods for grading the application of quality assurance (QA) controls for various QLs.

SRP 15.1.4.3, Regulatory Acceptance Criteria, states that the applicant should describe, if used, the graded approach for application of QA. The methods for grading should be described, including how the QA program controls are applied or not. Amplify the discussion of the definitions of QL-1, QL-2 and QL-3. Discuss the relationship between the QL definitions and designations and the performance criteria of 10 CFR 70.61, and to what extent probability performance or failure rates are factored in the application of QLs and QA controls. Please explain the relationships and differences between the QL and applied QA controls and the engineering requirements and specifications for QL-1 and -2 SSCs.

Examples may be used for illustrative purposes. For example, specifically identify which Mixed Oxide Project Quality Assurance Plan (MPQAP) provisions will apply to criticality controls classified QL-1b. It would appear that most criticality safety controls would be graded QL-1b, on account of the double contingency principle. It is stated in the QAP that all MPQAP requirements pertain to controls graded QL-1a but, but not necessarily QL-1b. This information is necessary to ensure that the quality assurance program provides reasonable assurance of protection against a criticality accident. Identify the differences in the application of QA controls for SSCs that are produced routinely or to standard requirements such as thermocouples and those which may be customized such as electrolyzer controls.

235. Section 15.1, pp. 15-1 thru 15-5

Clarify what is meant in MPQAP Table 2-1 by "a condition compromising criticality safety", and explain the differences or discrepancies between this statement and the CAR Section 15.1.6.2 statement regarding SSCs whose single failure can directly result either in a criticality.

SRP Section 15.1.4.3, “Regulatory Acceptance Criteria,” states that the applicant should describe, if used, the graded approach for application of QA. Section 15.1.6.2 states that "SSCs whose single failure can directly result in...a criticality accident...are designated QL-1a." However, MPQAP Table 2-1 states that QL-1a controls are those which can cause "a condition compromising criticality safety." This information is necessary to ensure that the quality assurance program provides reasonable assurance of protection against a criticality accident.

236. Section 15.1, pp. 15-1 thru 15-5

Discuss the meaning and use of the QL-3/QL-1 boundary flags on drawings. Identify which components are QL-1 and which are QL-3 on drawings such as that in Figure 11.4-11 of the application.

SRP Section 15.1.4.3, “Regulatory Acceptance Criteria,” states that the applicant should describe, if used, the graded approach for application of QA. Note 2 to Figure 11.4-11 in the applications states that, "This drawing contains QL-1 IROFS & QL-3 components."

237. Section 15.1, pp. 15-1 thru 15-5

Provide justification for classification of the criticality monitoring and criticality alarms as QL-2 and not QL-1.

SRP Section 15.1.4.3, "Regulatory Acceptance Criteria," states that the applicant should describe, if used, the graded approach for application of QA. In processes dealing with liquids, it is possible to get a pulsating cycle between critical and non-critical conditions, and as such, criticality monitors and alarms could be considered to be mitigating IROFS. Please discuss the functions and/or importance of criticality monitors and alarms for prevention of or mitigation for a pulsating criticality.

238. <u>Section 15.1, pp. 15-1 thru 15-5</u>

Discuss the application and implementation of 10 CFR Part 21 requirements and procedures on the MOX project activities before operation, including MOX facility construction and design and MOX fuel design and qualification activities. Also explain why only IROFS SSCs and not QL-2 SSCs would be subject to Part 21 requirements.

SRP Section 15.4.3.D states that the requirements of 10 CFR Part 21 should be addressed by the applicant.

239. <u>Section 15.2, pp. 15-5 thru 15-12</u>

Discuss how the commitment to configuration management application during design and construction for establishing and controlling the design bases includes all SSCs, not just principal SSCs and IROFS. Describe how the configuration management process functions for documenting the baseline configuration and controlling all changes and provides adequate assurance during construction, including field changes, as-built documentation, and applicant, subcontractor and supplier non-conformances.

10 CFR Part 70.72 requires a configuration management system to evaluate, implement and track each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. The SRP Section 15.2.3.A states the construction authorization review should examine the applicant's establishment of a baseline configuration management policy applicable to all design and construction. The review should examine the applicant's establishment of a baseline configuration management policy applicable to all design and construction.

Section 15.2 of the application states that configuration management is applied to principal SSCs. The management commitments, policy directives and procedures for configuration management should be clearly specified.

REFERENCES

The following are the references cited in the RAIs for Chapters 1.3.6 and 1.3.7.

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