USEC
A Global Energy Company

March 9, 2005
AET 05-0006

Mr. Jack R. Strosnider
Director, Office of Nuclear Material Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

**American Centrifuge Plant**
**Docket Number 70-7004**
**Responses to Request for Additional Information Regarding the License Application (TAC Nos. L32306, L32307, and L32308)**

Dear Mr. Strosnider:

The purpose of this letter is to submit USEC Inc.'s (USEC) responses to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) regarding the license application for the American Centrifuge Plant.

In Reference 1, USEC submitted to the NRC, for their review and approval, a license application for the American Centrifuge Plant. After the initial technical reviews in the safety and safeguards areas, the NRC provided a Request for Additional Information (RAI) in Reference 2 for the license application.

As requested, USEC submits our 30-day response to the RAIs (Reference 2) as Enclosure 1 to this letter. This submittal provides Non-proprietary (Public) responses to the questions contained in Attachment 1 of Reference 2. Responses to the Proprietary questions contained in Attachment 2 of Reference 2 together with responses to Attachment 1 of Reference 2 that contain Proprietary Information, including information determined to be Proprietary in accordance with the December 21, 2004 NRC Review Criteria to Identify Sensitive Information in Fuel Cycle Documents, are being submitted under separate cover (AET 05-0007).

USEC looks forward to continued open, candid, and clear communications with the NRC as the technical review progresses. We will make ourselves available to the NRC staff to discuss our responses.

USEC will submit a revised license application and supporting documents that incorporate the proposed changes described in Enclosure 1 to the NRC by March 14, 2005. As specified in Enclosure 1, additional information regarding NRC Question LA-1 will be provided to the NRC by April 15, 2005.

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NMSS01

If there are any questions regarding this matter, please contact, Mr. Peter J. Miner, at (301) 564-3470.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Nuclear Regulatory Affairs

cc: B. Smith, NRC HQ
Y. Faraz, NRC HQ
J. Henson, NRC Region II

Enclosures: As Stated

References:

1. USEC Letter AET 04-0022, "Submittal of License Application for the American Centrifuge Plant," dated August 23, 2004.

2. NRC Letter from Y. H. Faraz (NRC) to S.A. Toelle (USEC), "Request for Additional Information Regarding the Application for the American Centrifuge Plant (TAC NOS. L32306, L32307, and L32308)," dated February 7, 2005.

**Enclosure 1 to AET 05-0006**

**Response to Request for Additional Information on the License Application (Non-Proprietary Information)**

**Enclosure 1 of AET 05-0006**
**Responses to NRC Request for Additional Information**
**for the American Centrifuge Plant (ACP) License Application**

<u>**Chapter 1 "General Information"**</u>

LA-1 As done for X-7725 in Figure 1.1-8 of Appendix B of the license application, provide building layout drawings/floor-plans depicting all process areas where significant quantities of hazardous material will be present including X-3001, X-3002, X-3012, X-3356, X-7746, and X3346. The drawings/maps/floor-plans should indicate the locations of operations involving significant quantities of radioactive material to assist Nuclear Regulatory Commission's (NRC's) licensing reviewers and inspectors in better understanding the process and locations of any associated hazards.

10 CFR 70.22(a)(7) requires submittal of a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life and property.

<u>**USEC Response**</u>

Drawings are being reviewed and will be provided to the NRC by April 15, 2005. The tentative list of drawings to be supplied include the following: DOE Reservation Plan; ACP Site Plan; Customer Service Building First Floor Plan; Feed Area of X-3346, X-7725S, and X-3346A; Customer Service Building Second Floor Plan; Customer Service Area of X-3346; Feed Area of X-3346; Product and Tails Withdrawal Building Layout Plant at Grade; Product and Tails Withdrawal Building Layout Plan at First Floor; R/A Building Level One Plan; Gas Test Flow Diagram; Feed System Process Flow Diagram; Tails Compression System Flow Diagram; Product Withdrawal System Process Flow Diagram; Cylinder Sampling and Product Transfer System Process Flow Diagram; Feed/CBS Evacuation/Vent System Process Flow Diagram; X-3356 Evacuation/Vent System Process Flow Diagram; R/A Gas Test Stand Process Flow Diagram; Process Building Feed/Product/Tails Process Flow Diagram; and Process Building PV/EV System Process Flow Diagram.

LA-2 Provide an official acknowledgment from the Department of Energy (DOE) or some other equivalent indication that DOE will provide sufficient indemnification for the American Centrifuge Plant (ACP) to meet the requirements of 10 CFR 140.13b. Coverage needs to be provided for the time periods involving construction, operation, and decommissioning.

10 CFR 140.13b requires each holder of a uranium enrichment facility license to have and maintain adequate liability insurance. Section 1.2.2, "Financial Qualifications," of the application states that, pursuant to Section 3107 of the United States Enrichment Corporation *Privatization Act*, the United States Enrichment Corporation is indemnified under Section 170d of the *Atomic Energy Act* for liability claims and that this indemnification is sufficient to meet the requirements of Section 193(d) of the *Atomic Energy Act* of 1954, as amended, and 10 CFR 140.13b. However, it is not clear to the NRC staff, based on the wording in Section 3107 of the *Privatization Act*, that it is applicable to gas centrifuge facilities.

USEC Response

USEC understands that 10 CFR 140.13b requires each holder of a uranium enrichment facility license to have and maintain adequate liability insurance to cover construction, operation, and decommissioning. As stated in Section 1.2.2, Financial Qualifications, of our license application, pursuant to Section 3107 of the United States Enrichment Corporation Privatization Act, the lease of the facilities located at the Portsmouth Gaseous Diffusion Plant is considered a contract under Section 170d of the *Atomic Energy Act* (AEA) and therefore, activities under the lease are indemnified for public liability claims. This indemnification under Section 170d of the AEA is sufficient to meet the requirements of Section 193(d) of the AEA of 1954, as amended, and 10 CFR 140.13b. This protection is applicable to the American Centrifuge Plant facilities in Piketon, Ohio. The particular details of indemnification are being defined in the Lease Agreement currently being discussed with the U.S. Department of Energy (DOE). Draft provisions for Price-Anderson indemnification coverage have been prepared and will be included in Amendment No. 1 to the Lease Agreement when executed by DOE and USEC. DOE has provided a letter to USEC confirming that Price-Anderson indemnification coverage is included in the lease. This DOE letter is USEC Proprietary Information and is being submitted under separate cover (USEC letter AET 05-0007, as Enclosure 3). We will provide the specific lease section dealing with Price-Anderson indemnification coverage to the NRC within 10 days of its execution by both DOE and USEC.

LA-3 Revise the specific possession limit amounts in Table 1.2-1 of the license application to amounts that the plant is anticipated to utilize/generate over its 30-year planned operation at full capacity. For example, the Decommissioning Funding Plan estimates the amount of tails to be generated over the ACP's 30-year planned operation to be about 11,920 metric tons of $UF_6$. However, Table 1.2-1 lists a much higher amount for source material. Also, it is not clear why an amount as large as that listed for special nuclear material (SNM) is warranted. Provide the bases in your response for requesting the specific amounts listed in Table 1.2-1.

10 CFR 70.22(a)(4) requires submittal of the amount of SNM an applicant proposes to use and produce.

USEC Response

**[USEC's response has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)]**

LA-4 In the second sentence of Section 1.0, add, "decommissioning" to the list of items covered by the license application.

10 CFR 70.22(a)(9) requires submittal of a decommissioning funding plan. NUREG-1727, "NMSS Decommissioning Standard Review Plan," defines regulatory guidance and appropriate acceptance criteria for decommissioning funding plans and decommissioning plans.

## USEC Response

Second sentence of Section 1.0, has been revised to reflect, "decommissioning" in the list of items covered by the license application. The sentence now reads, "It encompasses the construction, manufacturing, start-up, operations, maintenance, and decommissioning of a uranium enrichment facility using American Centrifuge technology that will produce approximately 3.5 million separative work units (SWU) annually."

## Chapter 1 (CAAS Exemption)

CA-1 Describe how the basis for your existing criticality accident alarm system (CAAS) exemption request relates to the cylinder storage yards for the ACP. Section 1.2.5 of the license application states that the exemption requested is "similar to the exemption granted for the GDP." The information in Section 1.2.5 of the license application is not sufficient, by itself, to support granting the exemption because it does not reduce the risk significantly below what is required to meet the performance requirements (i.e., "highly unlikely") with the alarms in place.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

## USEC Response

**[USEC's response has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)]**

CA-2 Explain why part of the justification for excluding CAAS from the cylinder yards is that maintaining and calibrating the CAAS would expose plant personnel to undue risk, when the administrative controls (e.g., cylinder surveillance) would also put plant personnel at risk in the same area. If maintaining and calibrating the CAAS would put workers at an undue net risk (factoring in the risk benefit to having the CAAS), then it would seem that requiring other surveillance in the same area (without the CAAS) would expose workers to an equal or greater risk. This information is needed to ensure that an exemption would not endanger life or property.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

USEC Response

Optimum placement for CAAS detectors in the $UF_6$ cylinder storage yards would require mounting the detectors 30 to 40 feet above the ground to obtain maximum coverage for the detectors. Given the high attenuation provided by the $UF_6$ in the cylinders and the requirement to maintain two separate detectors with the ability to sound an alarm, the expected range of a set of detectors is very limited. This will require a detector be mounted approximately every 50 feet. USEC estimates the number of detectors needed to be approximately 60.

The maintenance required on the detectors for periodic calibration or repair would unnecessarily expose personnel to fall hazards and increased radiation dose from the $UF_6$ cylinders. Mobile equipment in the cylinder yards to support the detector maintenance increases the likelihood of vehicle impact to the stored cylinders beyond that without the calibration and maintenance activities. Tall poles required providing the optimum coverage increases the likelihood of cylinder damage due to falling materials or missiles. None of these risks are present if the cylinder storage yards are not provided CAAS coverage.

CA-3 Describe how much water would be needed in a cylinder at the maximum assay to result in criticality. State the maximum assay of cylinders in the CAAS-exempt areas. Provide a summary of this analysis. Also, describe how much water would ingress from a 10-, 100-, and 1,000-year rainfall event relative to the minimum amount needed for criticality. This information is needed to ensure that an exemption would not endanger life or property.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

USEC Response

As discussed in USEC's response to NRC Question CA-1, the amount of water needed in a 10-ton $UF_6$ cylinder at 5 wt. percent $UF_6$ to result in a criticality is not limited because the entire void space could be filled and still remain in a subcritical configuration. Cylinders containing more than 5 wt. percent enriched $UF_6$ are not stored outdoors, so the amount of water that could ingress from a rainfall event does not apply. However, in a non-favorable geometry cylinder, the maximum amount of liquid water that could be admitted to a $UF_6$ cylinder containing 10 wt. percent enriched $UF_6$ during a breach event, and maintain subcriticality, is 13 liters.

CA-4 Describe the cylinder handling practices that ensure a low likelihood of breaching a solid $UF_6$ cylinder. This information is needed to ensure that an exemption would not endanger life or property.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. This information is needed to ensure that an exemption would not endanger life or property. However, 10 CFR 70.17 states that the NRC may "grant such exemptions

from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

USEC Response

Handling of $UF_6$ cylinders is performed with mobile equipment or overhead cranes. The mobile equipment ranges from dedicated straddle carriers and stackers to forklifts and transport dollies. The cylinders are only moved when the $UF_6$ is in the solid state. Cylinders containing liquid $UF_6$ are kept inside autoclaves until the $UF_6$ is solid. Cylinders containing $UF_6$ enriched above 5 wt. percent $^{235}U$ are stored inside facilities that are provided with CAAS coverage. Limits on speed, storage locations, and securing methods are imposed in all cylinder storage areas to maintain a sufficient margin of safety as described in operating procedures. Where necessary to ensure accident sequences involving cylinder handling are highly unlikely, these limits are controlled as IROFS. Given that $UF_6$ cylinders are very durable by design, cylinder handling operations are performed in accordance with approved procedures, and only trained operators can perform these functions; the likelihood is low that a cylinder could be damaged to the extent that a break would occur without notice.

CA-5 Justify why the risk of criticality is sufficiently low to permit exclusion of the CAAS from this area, given that the cumulative likelihood of a criticality (i.e., sum of likelihoods for the four accident sequences related to cylinder handling) is just barely highly unlikely ($1.2x10^{-5}$/yr). This information is needed to ensure that an exemption would not endanger life or property.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

USEC Response

As discussed in USEC's response to NRC Question CA-1, a critical configuration cannot occur in a 10-ton $UF_6$ cylinder containing up to 5 wt. percent enriched $^{235}U$ resulting from water infiltration from a cylinder breach. Therefore, CAAS is not needed in areas where cylinders containing 5 wt. percent-enriched $^{235}U$ or less are stored. USEC commits to storing cylinders containing $UF_6$ at enrichments above 5 wt. percent $^{235}U$ inside existing facilities provided with CAAS coverage.

## Chapter 9 "Environmental Protection"

EP-1 Regarding the X-7727H corridor, Section 9.2.1.2.1 of the license application provides a worst case bound for airborne uranium concentration in the corridor. Please provide a more realistic estimate (expected value) of the concentration. The addition of a more realistically conservative estimate (a quantitative or qualitative estimate together with the supporting rational for the estimate) likely would demonstrate an even greater margin of safety, thus

adding greater confidence that concentrations are insignificant.

Under 10 CFR Part 70, an applicant must provide a license application that shall contain, among other things, a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property and a description of proposed procedures to protect health and to minimize danger to life and property (10 CFR 70.22(a)(7) and (8)). The applicant must also satisfy the regulatory requirements found in 10 CFR Part 20, Subpart D, Radiation Dose Limits for Individual Members of the Public.

USEC Response

As described in Section 9.2.1.2.1 and Section 1.1 of the License Application, the only function of the X-7277H corridor is to provide a means of indoor transport for sealed cascade components (e.g., individual centrifuges) between X-7725 facility and the process buildings. Additionally, the corridor is isolated from these buildings except when transport is actually occurring. Consequently, the only anticipated source of airborne uranium in the corridor is air transfer between these buildings and the corridor during transport. The amount of transfer will obviously vary with the number of components being transported in any given time frame and may range from natural background concentrations (effectively non-detectable except with very high volume samples) to the same concentrations as in the process buildings and X-7725. Overall airborne uranium concentrations within these buildings is expected to vary from natural background to a level lower than ten percent of the environmental release limits in Table 2 of Appendix B to 10 CFR Part 20. Quantifying any of the average airborne concentrations within these ranges is speculative rather than realistic however.

The final paragraph in Section 9.2.1.2.1 under the subheading of "X-7725 Recycle/Assembly Facility; X-7726 Centrifuge Training and Test Facility; and X-7727H Interplant Transfer Corridor" has been revised to clarify that no operations that may generate airborne uranium are taking place in the X-7727H corridor. The text reads as follows: "As described in Section 1.1, the X-7727H corridor is used only to provide indoor transport for sealed components (e.g., individual centrifuges) between the X-7725 facility and the process buildings and is closed off from these buildings except when such transport actually occurring. Consequently, the X-7727H corridor is never directly exposed to a source of gaseous uranium although it does have some air ...."

EP-2 The description in Section 9.2.1.2.2 of the license application regarding the facility and equipment lacks specificity when stating that the TWC blowdown will be modified "at some point in the future."

Provide greater specificity as to what is meant by "at some point in the future," or under what circumstances, the TWC blowdown will likely be modified to bypass the RCW system. A simple extrapolation regarding capacity of the GDP RCW should be sufficient to provide a general time frame for any future changes and thus more accurately address NRC regulations.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or

property.

USEC Response

DOE is required to decommission and decontaminate the GDP at some point in the future. This is expected to include the GDP RCW system. No schedule has been set for this, other than it is expected to be later than the current DOE budget planning cycle and sooner than the end of the ACP operating lifetime. At whatever time the GDP RCW system ceases to operate, the ACP will have to have a bypass in place and operational. Until that point, the GDP RCW system can accept the TWC blowdown. The first paragraph of Section 9.2.1.2.2 has been revised, as shown below, to clarify.

"...suitable permitted discharge point. At some point in the future, DOE is expected to decommission and decontaminate the GDP, including the RCW system. By that time, the TWC blowdown will have to be modified to bypass the RCW system and discharge directly to the RCW discharge pipeline. The schedule for this has not been established. There should be no licensed material in the TWC blowdown."

EP-3 The current statement in Section 9.2.1.2.2 regarding the "ample" capacity of the GDP RCW to accept TWC effluent and modification of the TWC blowdown appears conclusive and insufficiently supported.

Provide an estimate (quantify) what is meant by "ample" (e.g., current capacity and usage, percentage to be used by TWC effluent). The information requested would provide the documentation for an independent review to support a determination that there is indeed ample capacity. The added information would provide sufficient detail to make the discussion of facilities and equipment in the application more transparent and defensible under 10 CFR 70.22(a)(7).

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property.

USEC Response

Based on the question, additional information on the RCW and TWC systems is needed in the License Application. New paragraphs 2 and 3 have been added to Section 9.2.1.2.2 to incorporate the additional information. These paragraphs read as follows:

"In the interim, the GDP RCW system has ample capacity to accept the TWC effluent without either physical modification or adjustment to its discharge limits. The GDP RCW system consists of three sequential loops, which have design capacities of 48,000 gallons per minute (X-626), 153,000 gallons per minute (X-630), and 489,000 gallons per minute (X-633). Current flow rates in these loops are only 8,000, 17,000, and 20,000 gallons per minute (17 percent, 11 percent, and 4 percent of design) and are not expected to increase. The TWC system is currently fitted with three 10,800 gallon per minute pumps and even assuming a conservative blowdown rate of ten percent, TWC

blowdown flow will be no more than 3,240 gallons per minute. Adding this to the current flows in the GDP RCW loops gives maximum flows that are only 23 percent, 13 percent, and 5 percent of the respective design capacities of the three loops.

Discharges from the RCW System are monitored by an automated sampler, which collects a weekly composite sample of the liquid effluent for radiological analysis as well as sample(s) for NPDES-mandated analyses. This data is available to the ACP as assurance that no unanticipated discharge of licensed material has occurred."

EP-4 The description of the integrity assurance plan in Section 9.2.1.2.2 of the license application lacks sufficient detail for an independent assessment regarding the integrity of the tanks. The current statement that the integrity assurance plan ensures that the tanks are not leaking as the ACP takes possession of them appears conclusive and insufficiently supported.

Provide a citation to, and briefly describe, the basic elements of the integrity assurance plan that assures the tanks are not leaking as the ACP takes possession of them. Provide a statement as to when the plan will be available. The information requested would provide the documentation for an independent review to support a determination that tanks are not leaking.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The added supporting information regarding procedures would also provide sufficient detail to make the discussion in the application more transparent and defensible under 10 CFR 70.22(a)(8).

USEC Response

A controlling document for LEC integrity has not been developed at this time. What is anticipated is commercial integrity testing such as is used to demonstrate tank integrity in new underground petroleum storage tanks during the turnover process from DOE to USEC Inc. along with sampling and analysis to verify there are no hazardous constituents in the tanks. After turnover, ongoing measurement and tracking of the volume of material similar to routine monitoring of gas station underground storage tanks would be used to ensure no leaks developed without being detected.

No change to the License Application is required.

EP-5 The current statement in Section 9.2.1.2.2 of the license application that the inspection and maintenance program ensures that no licensed material is released to the storage pads appears conclusive and insufficiently supported.

Provide a reference or citation, and briefly summarize, the procedures in the inspection and maintenance program for the $UF_6$ cylinders to assure that no licensed material is released to the storage pads. If the program has not been completed, state when it will likely be available. The information requested to clarify procedures would provide the documentation

for an independent review to support a determination that no licensed material is released.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The added supporting information would provide sufficient detail to make the discussion in the application more transparent and defensible under 10 CFR 70.22(a)(8).

USEC Response

The implementing procedures for the ACP storage pads have not been developed at this time. What is anticipated is a regular inspection program (at least annually) for product cylinders. All other cylinders will be inspected as required by ANSI N14.1, at a minimum. Timely repairs to cylinders will be made along with cleanup for any breaches found. The guiding document for this program is USEC-651, *Uranium Hexafluoride: A Manual of Good Handling Practices.*

The final paragraph in Section 9.2.1.2.2 has been revised to state, ".... The ACP conducts an inspection and maintenance program for its $UF_6$ cylinders to ensure that no licensed material is released to the storage pads in accordance with USEC-651, *Uranium Hexafluoride: A Manual of Good Handling Practices.* Stormwater runoff from the north pads drains to holding ponds in accordance with a service agreement. Holding pond effluents are currently continuously monitored with automated samplers in accordance with the NRC-certified GDP environmental protection plan (Chapter 5.1 of USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant, Safety Analysis Report). This data is provided to ACP environmental personnel as assurance that no unanticipated discharge occurred."

Also, USEC-651 has been added to the list of references for Chapter 9.0 of the License Application.

EP-6 The description of the procedure for monitoring stormwater runoff in Section 9.2.1.2.2 of the license application indicates that the stormwater runoff drains to holding ponds and is continuously monitored, and that the data from this monitoring is "available" to ACP environmental personnel as assurance that no unanticipated discharge occurred. As written, the mere availability of the data for review, without more, does not appear to contribute to the control of liquid effluents.

Please explain whether the review of this data is part of a written procedure to assure that the data is in fact reviewed.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property.

USEC Response

The northern holding pond effluents are currently monitored in accordance with the NRC-approved GDP environmental monitoring plan (Chapter 5.1 of USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant, Safety Analysis Report). The provision of this data to ACP environmental personnel will be part of the service agreement. See USEC's response to NRC Question EP-5 above for the appropriate revisions to Section 9.2.1.2.2 of the License Application.

EP-7 In the discussion of waste minimization in Section 9.2.1.4 of the license application, there is a general reference to waste generated being treated to the extent practical before storage or disposal.

Provide a reference or citation to, and briefly describe, such treatment.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

Other than the effluent treatment systems already described in the License Application, USEC Inc. is not planning any standing waste treatment facilities for the American Centrifuge Plant. Additional waste treatment within the American Centrifuge Plant will therefore be limited to such operations as batching materials to reduce volume and possibly simple pH adjustment (i.e., without precipitation of any constituents) in containers to eliminate corrosive waste.

No change to the License Application is required.

EP-8 The procedure for analyzing the four radionuclides anticipated to be present in liquid effluents described in Section 9.2.2 of the license application refers to providing routine analysis. This statement lacks sufficient specificity.

Define with greater specificity what is meant by the statement that the ACP will "routinely" analyze the four radionuclides anticipated to be present in liquid effluents.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

"Routine" was intended to mean each of the composite samples collected from the monitored vents and outfalls for radiological monitoring as described in Sections 9.2.2.1 and 9.2.2.2. Accordingly, the referenced text was intended to be a convenient summation of the specific monitoring programs described in 9.2.2.1 and 9.2.2.2. To clarify, the last sentence of Section 9.2.2 has been revised to state, "Consequently, ACP effluents will be analyzed for these four nuclides as described in the applicable sections below."

EP-9 The applicant describes a procedure in Section 9.2.2.1.2 of the license application in which it may supplement reservation meteorological data with data from the National Weather Service. In addition, it may also use such data in lieu of reservation meteorological data. However, there is no explanation of the circumstances under which data would be used in lieu of reservation data.

Describe under what circumstances data from the National Weather Service would be used in lieu of reservation meteorological data.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

Off-site meteorological data would be used by the ACP only when no reservation meteorological data is available. USEC has found from historical experience that lightning strikes on the on-site tower cannot be guaranteed to not disable it occasionally. More rarely, other types of incidents have also disabled the onsite tower (e.g., mold growing on circuit boards and electrical contacts inside weather-proof cabinets). The fourth paragraph of Section 9.2.2.1.2 has been revised to state, "... Data from the National Weather Service may be used in lieu of or to supplement reservation meteorological data in the event the onsite tower becomes inoperable. The reservation has ..."

EP-10 The term "where feasible" in Section 9.2.2.3.1 of the license application describing the procedure for collecting and packaging ACP-generated waste appears vague.

Explain what is meant by collecting and packaging ACP-generated waste "where feasible."

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

The word "generator" in this text refers to the individual worker actually generating the waste material. The sentence is intended to describe the ACP's preferred policy of packaging waste material as it is generated. This is usually, but not always, desirable in a maintenance situation. In the interest of minimizing radioactive waste generation, for instance, waste materials that are expected to be contamination-free need to be surveyed prior to being packaged. It is far more desirable to accumulate such wastes for surveying rather than package them immediately, then unpack them for surveying, then repackage them for disposal.

Section 9.2.2.3.1 has been revised to clarify the intended meaning and now states, "ACP generated wastes are preferably collected and packaged by the individual(s) generating the waste. However, this is not appropriate in cases where waste would have to be "double handled" (e.g., surveying wasted expected to be contamination-free). In this case, it is most appropriate to survey prior to packaging. ..."

EP-11 No reference is provided in Section 9.2.2.3.2 of the license application for the procedural requirements that will be followed.

Provide a reference or citation to the procedural requirements that will be followed for labeling containers known to have radioactive waste.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

Operating procedures for the ACP have not been developed at this time. When they are developed, they will be compliant with applicable NRC and EPA regulations. The procedures will be developed in accordance with the commitments in Section 11.4 of the License Application and 10 CFR Part 20.

Section 9.2.2.3.2 has been revised to state, " Containers known to contain radioactive waste, including packaging, are labeled in accordance with procedural requirements developed in accordance with the commitments in Section 11.4 of the this license application and 10 CFR Part 20."

EP-12 The term "appropriate wastes" in Section 9.2.2.3.2 of the license application is vague and needs clarification to support an independent review.

Clarify what is meant by "appropriate wastes."

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

<u>USEC Response</u>

Potentially fissile wastes may not be appropriate for overpacking with a larger container. Such materials would have to be repackaged in the same size containers instead of overpacks.

The final paragraph of Section 9.2.2.3.2 has been revised to state, "In addition, 85- and 110-gal overpacks may be used for damaged containers if the wastes are appropriate for these size containers."

EP-13 The description of the procedure for assessing the atmospheric impacts of ACP operations as described in Section 9.2.2.4.1 of the license application appears vague.

Define or provide examples of "other credible effluent information" that would be used to assess atmospheric impacts of ACP operations.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

<u>USEC Response</u>

Releases that pass through a monitored vent or outfall (which includes all planned releases that are not insignificant) would be quantified by the effluent monitoring. Some of the release scenarios identified in the ISA (e.g., a cylinder rupture on a storage pad); however, do not pass through any monitored discharge point. In this case, a mass balance around the involved cylinder would be the primary credible information available to quantify the release. Environmental sampling of contamination levels downwind or down stream of a release may also be used.

The second paragraph of Section 9.2.2.4.1 has been revised to state, "...professionals based on available credible information. Effluent monitoring will quantify routine gaseous effluents, but some accidental release scenarios may require information such as mass balances or measured environmental contamination to quantify an accidental release that did not pass through a monitored vent."

EP-14 The description of the DOE groundwater monitoring program in Section 9.2.2.4.5 of the license application does not identify the constituents of interest.

Identify the constituents of interest of the DOE groundwater monitoring program if other than technetium. Provide a citation to the DOE program.

10 CFR 70.22(a)(7) requires that the applicant describe equipment and facilities which will be used to protect health and minimize danger to life and property; 10 CFR 70.22(a)(8) requires that the applicant's procedures protect health and minimize danger to life or property. The supporting information would provide added detail to make the discussion in the application more defensible under 10 CFR 70.22(a)(8).

USEC Response

Information on the DOE groundwater program is found in DOE's Annual Environmental Report prepared for the reservation. References 3 and 4 of this chapter are the annual reports for 2000 and 2001, respectively. The second paragraph in Section 9.2.2.4.5 has been revised to reference the reports and include the radionuclides monitored by DOE. The text was revised to state, "...for the reservation. The ACP does not conduct a separate groundwater monitoring program. The current nuclides of interest in the DOE groundwater monitoring program are $^{99}Tc$, $^{234}U$, $^{235}U$, $^{236}U$, $^{238}U$, $^{237}Np$, $^{238}Pu$, $^{239}Pu$, $^{240}Pu$, and $^{241}Am$."

Decommissioning Funding Plan - (DFP)

DF-1 Include the cost of depleted uranium disposal in the total decommissioning cost estimate (DCE) presented in Table C3.18 of the DFP. Table C3.18 of the DFP presents a summary of total decommissioning costs, but does not include the cost of depleted uranium disposition including disposal. Specifically, the summary accounts only for $130 million (including 25% contingency) for decommissioning the facility, but does not include the $729 million (including 10% contingency, but see item DF-3 below) cost of depleted uranium disposition.

10 CFR 70.25(e) requires the DFP to include an estimate of the cost of decommissioning.

Conforming changes are necessary in the decommissioning cost summaries presented in Section 10.10 and Table 10.10-1.

USEC Response

USEC has revised the DFP and Chapter 10.0 of the License application to include the tails disposal costs, including the appropriate contingency, in Table C.3.18, Total Decommissioning Costs; License Application Table 10.10-1, Plant Decommissioning Cost Estimates and Expected Duration; and conforming sections of the License Application and DFP. Concurrent with this change to Table C3.18, USEC revised the total quantity of $UF_6$ tails generated over the 30 years of plant operation based on current project planning. The revision to the total quantity of $UF_6$ tails generated reflects a lower average tails assay of 0.35 weight percent and a reduced number of centrifuge machines

operating per year during the ramp up period to full capacity.

DF-2 Include a certification that financial assurance in the amount of the cost estimate has been provided. The DFP did not contain the required certification. An acceptable form of certification is illustrated in NUREG-1757, Vol. 3, Section A.2.4.

10 CFR 70.25(e) requires the DFP to contain a certification that financial assurance in the amount of the cost estimate has been provided.

<u>USEC Response</u>

USEC has provided an unexecuted Certification of Financial Assurance using the format illustrated in NUREG-1757, Volume 3, Section A2.4 as a guide in the DFP, Appendix A. In addition, see USEC's response to NRC Question DFP-10. USEC will provide an executed certificate in accordance with commitments contained in Section 10.10.4 of the License Application.

DF-3 Incorporate a 25% contingency factor into the disposal cost estimate for depleted uranium tails deposition or provide a more detailed justification as to why 10% is acceptable.

The DCE applies a 25% contingency factor to all decommissioning costs except those associated with tails disposition. A 10% contingency factor is applied to the tails disposition costs. A contingency factor helps ensure coverage for unexpected circumstances that could increase decommissioning costs and such circumstances are equally likely for tails dispositions, as well as decommissioning costs. NUREG-1757, Volume 3, Appendix A, page A-29, states the following:

"Because of the uncertainty in contamination levels, waste disposal costs, and other costs associated with decommissioning, the cost estimate should apply a contingency factor of 25 percent to the sum of all estimated decommissioning costs. The 25 percent contingency factor provides reasonable assurance for unforeseen circumstances that could increase decommissioning costs, and should not be reduced or eliminated simply because foreseeable costs are low."

"NRC's recommendation for the use of a 25 percent contingency factor is consistent with he analysis and guidance contained in NUREG/CR-6477, which applies a 25 percent contingency factor to all estimated costs associated with decommissioning various reference facilities."

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

<u>USEC Response</u>

As noted in the above quotation from NUREG -1757, the contingency factor helps ensure coverage for unexpected or unforeseen circumstances, which may increase decommissioning costs. In developing the estimated $UF_6$ tails unit cost for disposal, USEC has incorporated a number of factors

that reduce the uncertainty associated with the $UF_6$ tails generation and the associated liability and therefore, warrant a reduced contingency. These factors include 1) limiting the uncertainty associated with the quantity of $UF_6$ tails generated; 2) calculating the unit cost for $UF_6$ tails disposal based upon contracts and agreements with the U.S. Department of Energy (DOE) associated with $UF_6$ tails processing; and 3) reviewing, on a conservative schedule, and adjusting, as necessary, USEC's $UF_6$ tails generation and associated disposal cost liability. Each factor is described below in detail.

As noted in the Decommissioning Funding Plan (DFP), Section 3.0, USEC intends to provide financial assurance to incrementally fund the estimated cost for conversion and disposal of the $UF_6$ tails inventory generated during ACP operation. The estimated cost of conversion and disposal is based on the actual inventories of depleted uranium for prior periods of operation and a reliable forecast of the amount of depleted uranium to be generated for the upcoming period of operation. The forecast of the upcoming period of operation is adjusted, as necessary, in the subsequent period of operation to reflect the actual quantity of $UF_6$ tails generated. As such, the uncertainty associated with the quantity of $UF_6$ tails generated at the ACP is limited to the uncertainty associated with the estimate of tails generated for the upcoming period of operation as opposed to an uncertainty associated with an estimate covering the full 30 years of plant operation. Once full capacity is reached, USEC has committed to review and adjust the cost estimate no less frequently than annually.

As noted in Section 3.0 of the DFP, USEC also based the unit cost associated with $UF_6$ tails disposal upon an existing agreement with the DOE, and compared this unit cost to cost information derived from the DOE contract awarded to Uranium Disposition Services (UDS) for the DOE's $DUF_6$ conversion facilities as well as the American Conversion Services (ACS) proposal for this same $DUF_6$ conversion facility. USEC believes these documents provide the best available information to establish a reasonable unit cost for $UF_6$ disposition since the agreement and DOE contract provide actual DOE accepted values associated with disposition of depleted uranium, and in the case of the ACS proposal, an independent validation, from which a reasonable unit cost can be calculated. USEC recently received a copy of a letter from DOE to LES containing an estimate of costs to dispose of LES' tails. USEC is currently examining that estimate and its underlying assumptions to determine if any adjustment is necessary. If USEC determines that any adjustments are necessary, we will provide NRC with an updated response.

USEC has committed (see License Application Sections 1.2.5 and 10.10.2) to review and adjust, as necessary, the cost estimate for $UF_6$ tails disposal prior to operation of each additional increment of capacity on process gas and no less frequent than annually, once full capacity of the ACP is achieved. This commitment to review and adjust the $UF_6$ tails disposal cost estimate occurs on a much more frequent period than the not to exceed interval of three years required by 10 CFR 70.25(e). This annual frequency provides an opportunity to identify and include any unforeseen or unexpected circumstances associated with the $UF_6$ tails projections and cost estimate from the previous year's estimate and allows any needed corrections to occur on a much more frequent basis than required by regulation making cost uncertainty lower for tails disposition.

Furthermore, this annual frequency of reviewing and adjusting the $UF_6$ tails liability, to include the 10 percent contingency on the overall cost of tails disposition, has been successfully implemented at

the gaseous diffusion plants for a number of years.

Therefore, USEC considers the 10 percent contingency a reasonable value for the $UF_6$ tails disposal cost estimate.

No change to the License Application is required.

DF-4 Provide additional detail to support the decommissioning cost estimate.

In preparing the DCE, the applicant utilized the tables in NUREG-1757, Appendix A, but modified the suggested content. Specifically, the applicant has not included information about decontamination methods in Table C3.7. However, without additional detail on the decontamination methods, NRC cannot verify if appropriate unit costs and labor rates were used, or if disposal of wastes generated from these decontamination methods was included in the DCE.

In addition, in Tables C3.6 through C3.10, labor hours were provided for the five major tasks: (1) planning and preparation, (2) decontamination and/or dismantling of radioactive facility, (3) restoration of contaminated areas of facility grounds, (4) final radiation survey, and (5) site stabilization and long term surveillance. However, no breakdown of the major tasks to be accomplished under these headings was included. For example, under Table C3.10, total hours are given for site stabilization and long-term surveillance, but there is no explanation of what activities are anticipated, nor any justification for how those hour estimates were derived. Consequently, it is difficult to determine if the cost estimate adequately covers all tasks to be undertaken during decommissioning. The DCE should be revised to provide information on decontamination methods, as well as the types of activities likely to be undertaken in the five phases of decommissioning described above.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

The following paragraph describes various decontamination methods and those decontamination methods anticipated to be employed and accounted for in the DFP estimate. The DFP estimate Table C3.7 accounts for the labor to perform the decontamination and dismantling activities, Table C3.14 accounts for the disposal of waste material (i.e. in B-25 boxes), and Table C3.15 accounts for the purchase of B-25 boxes for waste disposal.

There are two methods of decontamination considered: dry and wet. Dry involves using an always safe vacuum cleaner (vacuuming), scooping up the material with a dust pan (low abrasive materials), sweeping material up with a brush or broom, or high abrasive (chipping or wire brush). Wet decontamination involves using films of cleaning solutions with mops, squeegees, rags, or dip tanks. For decontamination and decommissioning of the American Centrifuge Plant and establishing the associated funding, it is assumed that a dry decontamination process is utilized throughout. USEC anticipates low amounts and areas of actual contamination due to strict adherence to ALARA

principles throughout the plant's life. This is not to say that wet decontamination or a dry variation (i.e., dry ice blaster) decontamination method cannot be utilized, but this is not anticipated. The DFP estimate does consider scarifying (1/8 inch depth) the entire cylinder yard areas in their entirety as a conservative action. The amount of scarifying material expected is low and is assumed to fill the volume gap on our low-level waste disposal estimate in Table C3.14. The waste disposal estimate considers whole B-25 boxes as waste utilizing a volume unit cost waste factor and the boxes are anticipated to contain volume gaps, which can be filled to capacity. Any time surfaces are disturbed, there is a potential to produce airborne radioactivity. To mitigate these concerns, airborne monitoring for the personnel performing the work would be provided and these individuals would also be in the internal monitoring program (urinalysis), and if the conditions exist, respiratory protection may be required for sufficiently high levels. Furthermore, scarifying equipment may use a water spray to minimize dust, cool the cutting wheels, or use a limited amount of water as a media, but this is not considered to be a liquid waste as it is anticipated to evaporate to leave a dry debris for solid waste disposal.

The DFP estimate Tables C3.6 through C3.10 list the estimated productive labor to perform each decommissioning phase. Labor was considered for each task to be performed and was based upon Engineering experience and conservative judgment. Table C3.7 was further delineated to describe the disassembly effort in greater detail. The following is the anticipated task description that has been added to each respective phase Table described in the DFP estimate:

**Planning and Preparation Phase**

- Develop Project Execution Plan and Schedule (including organization and staffing plan and needed services)
- Develop Decommissioning Plan
- Develop/implement Site Characterization Plan
- Review/approve Site Decommissioning Plan by NRC; Regulatory/Licensing issues
- Develop Decommissioning Activity Procedures
- Design Decommissioning Service Area (DSA)
- Initial Project Support/Organization
- Initiate Plant Security

**Decontamination or Dismantling Components Phase**

- Erect Decontamination Facility (Minimal comparative effort)
- Decontamination of facilities - Internal
- Dismantle centrifuge machines; Waste segregation/staging
- Dismantle facilities/components
- Tails Cylinder movement/disposition (material title transfer DOE/UDS)
- Continued Project and Security Support

**Restoration of Contaminated Areas Phase**

- Decontamination of facilities – External/Outside; cylinder yards
- Perform HP surveys
- Remove fixed contamination; scarify cylinder storage yards surfaces
- Collect/dispose of yard debris

**Final Radiological Surveys Phase**

- Develop/implement survey plans
- Collect/analyze data
- Perform confirmatory surveys
- Develop final survey report
- Terminate License

**Site Stabilization/Long-Term Surveillance Phase**

- Site stabilization – not required
- Maintain maintenance/surveillances on IROFS equipment necessary until license terminated (approximately year six).

DFP Tables C3.6 through C3.10 have been revised to reflect the information noted above. In addition, corresponding changes have been made to Section 10.10.1 of the License Application.

DF-5 Revise the worker unit cost schedule to include an appropriate overhead rate on labor costs.

In the worker unit cost schedule in Table D3.12, the applicant does not include any labor overhead rate. Appendix A of NUREG/CR-6477 "Revised Analyses of Decommissioning Reference Non-Fuel-Cycle Facilities," Pacific Northwest National Laboratory, 1998), however, applies overhead rates of 50 to 70% for direct labor, and over 100% for subcontracted labor, based on NRC's decommissioning experience at reference facilities. The following factors, listed for the subcontracted rate, should be considered in determining appropriate overhead rate for an independent third-party contractor: overhead rates applied to direct staff labor are expected to be significantly higher for subcontracting organizations than for the facility operator because of the larger ratio of supervisory and support personnel to direct labor than usually exists in subcontracting organizations; having personnel in the field rather than in the home office also increases the overhead costs, because of travel and living expenses for some of the personnel. In view of these factors, an overhead rate on direct staff labor of 110%, plus 15% profit on labor and overheads, is assumed to be applicable to all subcontractor hours in this reevaluation study. (pages A.2-A.3) To ensure that the cost estimate accurately reflects all labor costs associated with decommissioning, the applicant should modify its worker unit cost schedule to include an appropriate overhead[1] rate on labor.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

[1] The term "overhead" typically includes costs that are not directly traceable to any particular product produced or project conducted by the firm. Thus, overhead typically includes "period" costs such as insurance, utilities, rent, supplies, property taxes, depreciation, and the costs of any wages, salaries, and benefits incurred as a result of the corporation's officers and "support staff" (e.g., accounting staff, legal staff, janitorial staff, security staff). To spread such costs across multiple products or projects fairly, firms usually calculate an "indirect" overhead rate that is applied to all direct labor hours (i.e., on those labor hours that are directly associated with particular products or projects). Licensees/applicants should provide justification for the overhead rates assumed in the cost estimate.

USEC Response

The ACP DFP cost estimate (Table D3.12) was revised to reflect labor rates, which are based on the local wage rates for each of the relevant labor classifications. To determine the appropriate overhead rate USEC specifically identified various indirect cost components that would be needed to support the projected level of effort as indicated in footnote 1 below. The cost associated with the indirect support is based on USEC experience at the Portsmouth Gaseous Diffusion Plant during calendar year 2004. Since the relevant cost of indirect support was specifically identified for each annual period, the overhead rate, as a percentage of direct cost, varies for each period. The DFP estimate Table C3.18 was modified to include additional information for indirect services, General and Administrative, and contractor profitability at a 15 percent rate. Additional information has been provided to justify the overhead rate methodology and indirect services development. **[This information has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)].**

DFP Tables D3.12 and C3.18 have been revised to reflect the changes noted above.

DF-6 Revise labor costs to include contractor profit and variations in labor rates.

The DCE does not appear to include profit on labor. Appendix A, NUREG-1757, recommends that decommissioning cost estimates assume work will be performed by an independent third party contractor. Appendix A, NUREG-1757, and Appendix A, NUREG/CR-6477, recommend that labor costs associated with all decommissioning tasks and activities include wages and benefits for contractor staff performing decommissioning-related tasks, overhead costs, and contractor profit. The base labor salaries shown in Table D3.12 of the DCE include only two labor categories (i.e., salary and hourly) although the cost estimate makes use of eleven labor groupings. To ensure the adequacy of the cost estimate, the applicant should revise the salaries in the cost estimate to account for the variation in labor rates and the addition of contractor profit.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

As indicated in USEC's response to the NRC Question DF-4, USEC compiled several additional tables that delineate the basis and buildup of the labor rates used in the proposal for each of the salary and hourly employee classifications. The labor costs associated with all decommissioning tasks and activities have been revised to include wages and benefits for third party contractor staff performing decommissioning-related tasks, overhead costs, and contractor profit. Profitability was added to this plan by applying 15 percent on all costs except NRC fees and lease payments.

DFP Table C3.18 has been revised to reflect the changes noted above.

DF-7 Include estimates for disposal of waste generated from decommissioning activities in the DCE.

The DCE does not appear to include waste disposal costs for any wastes generated by the decontamination process for the facility components or any wastes generated from restoration of facility grounds. The applicant should revise the cost estimate to include costs for disposal of wastes generated in decontaminating its individual facility components and restoring facility grounds.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

The decontamination method utilized determines the amount of waste generated. A more comprehensive response on the particular decontamination method is described and addressed in USEC's response to NRC Question DF-4. The amount of waste generated from the assumed "Dry" decontamination method activities is considered negligible compared to the amount of other waste considered for disposal. The accumulated waste from scarifying the cylinder yards (approximately 60 B-25 boxes) will be added as fill material to the B-25 boxes generated from the disassembly of the centrifuge machines and associated piping (approximately 19,865 B-25 boxes). This additional waste material can fill the volume gaps on the low-level waste disposal estimated in DFP estimate Table C3.14. The waste disposal estimate considers whole B-25 boxes as waste utilizing a volume-based unit cost waste factor (see Table C3.14) versus the previous weight-based unit cost waste factor. A note was also added to Table C3.14 to describe using the material to fill volume gaps.

DFP Table C3.14 has been revised to reflect the changes noted above.

DF-8 Justify the costs of packaging, shipping, and disposal of radioactive wastes in the DCE.

The DCE provides several unit costs for packaging, shipping, and disposal of wastes. Specifically, in Table C3.14, the DCE indicates unit costs of \$28/ft3 for compacted equipment waste disposal, and \$4.47/lb for classified waste disposal. Further, the heading on Table C3.14 implies that labor costs were not included (i.e., Table C3.14 "Packaging, Shipping, and Disposal of Radioactive Wastes (Excluding Labor Costs)"). The cost of labor for packaging, shipping and disposal of waste must be accounted for. The DCE should be revised to include labor costs to package, ship, and dispose of the waste.

Further, because the unit cost for compacted equipment waste does not break out the transportation costs, NRC cannot verify that adequate transportation costs or distances were used. The applicant should revise or justify the disposal unit costs so that these costs can be verified.

Table C3.19 indicates a tails disposal cost of \$3/kg U, with no explanation of where the tails will be processed or how this unit cost was derived. No other costs are included for tails

disposal, such as transportation or loading. Because the ultimate disposition of the tails is not known at this point, it is not clear whether the tails would need to be transported (e.g., the tails might be processed by DOE at its co-located facility). The applicant should justify this unit cost and clarify whether it includes anything beyond the actual waste disposal and/or conversion costs.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

**[USEC's response has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)]**

DF-9 Revise or justify estimates for non-labor costs in the DCE.

The DCE does not provide justification for the laboratory costs included in Table C3.16. Specifically, no information is included to indicate the number of samples and locations, or the derivation of the $105/sample unit cost. The applicant should provide a justification of the laboratory costs.

The miscellaneous costs listed in Table C3.17 do not include license fees, insurance, or taxes. The applicant should revise the cost estimate to include these costs.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

**[USEC's response has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)]**

DF-10 Provide an unexecuted copy of a broker/agent's power of attorney, as recommended in NUREG-1757, Volume 3, pages 4-24 and A-90. Note that pursuant to 10 CFR 70.25(e), the DFP does not meet regulatory requirements until the originally signed financial instruments have been received by the NRC.

10 CFR 70.25 requires that decommissioning funding plans include a certification that financial assurance has been provided in the amount of the site-specific cost estimate. The applicant supplied an unexecuted copy of a surety bond and standby trust agreement proposed to be used as the mechanism for decommissioning financial assurance. The unexecuted copies of the surety bond and standby trust agreement are consistent with the

recommended wording in NUREG-1757, Volume 3, Appendix A.2. However the applicant did not submit an unexecuted copy of the broker/agent's power of attorney,3 as recommended by NUREG-1757, Volume 3, pages 4-24 and A-90. An unexecuted copy of the broker/agent's power of attorney authorizing the broker/agent to issue bonds on behalf of the issuing company will ensure that the surety bond is enforceable. Although a model power of attorney is not included in NUREG-1757, it is a commonly-used legal document.

10 CFR 70.25 requires the applicant to provide a decommissioning funding plan that contains a cost estimate and a description of the method for assuring funds for decommissioning.

USEC Response

USEC has included an unexecuted, commonly used, broker/agent's power of attorney in Appendix A of the DFP.

USEC does not plan to transfer licensed material into the ACP until plant startup. Since decommissioning funds are principally used for radioactive decontamination and disposal of radioactive waste, executed copies of decommissioning financial assurance instruments are not necessary until the introduction of licensed material is planned. USEC recognizes the requirements noted in 10 CFR 70.25(e) and has committed, in Section 4.0 of the DFP, to supplement the Application to include the signed, executed financial documentation to NRC. Consistent with the approach for the American Centrifuge Lead Cascade License, USEC suggests that the license be conditioned as follow:

> "The licensee shall not introduce licensed material into the American Centrifuge Plant until the decommissioning funding mechanism has been executed by the licensee and accepted by the NRC."

DF-11 Please attest to whether the cost of security is included in the cost estimate or not. If it was not included, revise the cost estimate to include the cost of security. The decommissioning cost estimate does not specify whether the cost estimate included the cost of maintaining the security of the facility and licensed material for the duration of the decommissioning period.

10 CFR 70.25(e) requires the DFP to include an estimate of the cost of decommissioning. Appendix A of NUREG-1757 states that the estimate should adequately cover all decommissioning costs. Part of these costs include providing security for the facility and license material.

[2] NRC recognizes that the amount of the surety bond is contingent upon the cost estimate and assumes that the amount and surety organization will be inserted into the surety bond at the appropriate time in the NRC licensing process.

[3] NRC recognizes that a power of attorney cannot be executed until the surety is chosen and a valid instrument is created; however inclusion of an unexecuted copy in the application package demonstrates the applicant's understanding that the instrument is part of the recommended application package.

USEC Response

The ACP DFP estimate did consider security throughout, but this question and the change in philosophy between utilizing company operational support and an independent third party contractor to perform the decommissioning activities prompted a reevaluation on the amount of security needed for decommissioning. The amount of direct security support was increased on ACP DFP Tables C3.6 and C3.7. Secondly, plant wide security support is further addressed and accounted for in the overhead rate discussed earlier and included in the indirect services provided.

DFP Tables C3.6 and C3.7 have been revised to reflect the changes noted above.

**Financial Qualifications (Chapter 1.0, Section 1.2.2, and Appendix C, Table C-1, Deployment Costs for American Centrifuge Plant [ACP])**

FQ-1 Submit a detailed estimate of the cost to construct and operate the ACP, including the supporting basis for each cost item. The level of detail should generally be consistent with that provided in the decommissioning cost estimate. Further, construction costs should be provided by building/area, and include details such as identification of major construction activities (e.g., site preparation, construction of new building, refurbishment of interior of existing building), size of the area to undergo construction, and type and amount of construction materials to be used. Provide costs for construction materials, principal systems and equipment, engineering, construction labor, and any other major costs associated with each building/area.

The license application (in Section 1.2.2 and Appendix C, Table C-1) provides summary text and tables of the costs to build and operate the ACP, but did not provide the supporting basis for the staff to determine if the cost information reasonably represents the costs to build and operate the ACP facility. To determine the financial qualifications of the applicant, the staff must evaluate the cost estimates to construct and operate the facility.

10 CFR 70.23(a)(5) requires financial qualifications of the applicant "Where the nature of the proposed activities is such as to require consideration by the Commission, that the applicant appears to be financially qualified to engage in the proposed activities in accordance with the regulation in this part."

USEC Response

**[USEC's response has been withheld pursuant to 10 CFR 2.390 and is being submitted under separate cover (AET 05-0007)]**

## Chemical Process Safety (NUREG 1520, Chapter 6)

CP-1 Clarify the scope and extent of human factors reviews applied to IROFS and initial conditions. Section 6.2.2.9, page 6-7, "Human Factors," states that "human factors design responsibility for plant and system design in the ACP is assigned to engineering, with specific technical assistance from Industrial Safety personnel. Human factors reviews address the interface of people with processes and its impact on system operation."

This information is needed to determine compliance with 10 CFR 70.62(c)(vi) which states that the integrated safety analysis should identify "each item relied on for safety; the characteristics of its preventive, mitigative, or other safety function; and the assumptions under each item is relied on to support compliance with performance requirements of 10 CFR Part 70.61."

### USEC Response

The ACP design has been developed with a preference for engineered controls over administrative controls to increase overall reliability and a preference for features that enhance safety by reducing challenges to the items relied on for safety. This includes human factors reviews to ensure that accident initiators resulting from human/machine interfaces are minimized and ensure that human response for accident prevention or mitigation is appropriate. This was described in Section 2.6 of the ISA Summary.

CP-2 Describe how human factors reviews are considered within the design control/change process. Section 6.2.2.9, page 6-7, "Human Factors," states that "human factors design responsibility for plant and system design in the ACP is assigned to engineering, with specific technical assistance from Industrial Safety personnel. Human factors reviews address the interface of people with processes and its impact on system operation."

This information is needed to determine compliance with 10 CFR 70.62(b) which states that "each licensee or applicant shall maintain process safety information to enable the performance and maintenance of an integrated safety analysis."

### USEC Response

As described in Section 11.1.4.1, Control of Changes to the Physical Plant, human factors is a consideration in evaluating modifications to the facility. Modifications (permanent and temporary) are evaluated, as appropriate, for any required changes or additions to the plant's procedures, personnel training, testing programs, or the ISA Summary in accordance with the requirements in 10 CFR 70.72. See also USEC's response to NRC Question CP-1.

CP-3 Describe the graded approach to quality for performing tests and inspections. Section 6.2.2.3.3, "Preventive Maintenance and Quality Considerations," page 6-5 of the license application, states that the "ACP personnel perform inspection and testing based on the graded approach to quality."

This information is needed to determine compliance with 10 CFR 70.62(a) which states that "the safety program may be graded such that management measures applied are graded commensurate with the reduction of risk attributable to that item."

<u>USEC Response</u>

ACP personnel perform inspection and testing in accordance with the CM Program, described in Section 11.1 of this License Application, and the Maintenance Program, described in Section 11.2. The CM Program provides for a graded application of resources taking into consideration the elements listed in Section 11.1.1.1.

CP-4 Clarify whether the Material Safety Data Sheet (MSDS) records and any other information about hazardous and toxic materials that is brought on site by contractors are readily accessible. Section 6.2.2.11.1, "Identification and Inventory Control," page 6-8 of the license application, states that "when work is to be performed by contractors, a review of the contractors' Safety and Health Plan is conducted to identify the presence of hazardous and toxic materials to be brought on site by a contractor. The contractor provides MSDSs for these chemicals and the list of chemicals is forwarded to Industrial Hygiene and appropriate supervision."

This information is needed to determine compliance with 10 CFR 70.22(i)(3)(xiii) which states that the applicant must meet its responsibilities under the Emergency Planning and *Community Right-to-Know Act* of 1986, Title III, if applicable to the applicant's activities at the proposed place of use of special nuclear material.

<u>USEC Response</u>

Material Safety Data Sheets (MSDSs) are maintained in a central location and are available at all times to plant employees, including emergency response and fire department personnel, and to off-site organizations that respond to an emergency on the reservation. The contractor provides the latest revision of MSDSs for chemicals brought on site. Hard copies are maintained by the contractor at the job site, by Industrial Hygiene in a central location, and by Facility Custodians.

CP-5 Commit to maintaining MSDSs on-site and sharing these with off-site organizations that may be expected to respond to an emergency. Also, identify the locations from where the MSDSs could readily be retrieved on-site. Page 58 of Section 10.0 in the Emergency Plan, "Compliance with Community Right-to-Know Act," states that "MSDSs are maintained in several areas throughout the DOE reservation."

This information is needed to determine compliance with 10 CFR 70.22(i)(3)(xiii) which states that the applicant must meet its responsibilities under the Emergency Planning and *Community Right-to-Know Act* of 1986, Title III, if applicable to the applicant's activities at the proposed place of use of special nuclear material.

USEC Response

USEC commits to maintaining MSDSs on-site and sharing these with off-site organizations that may be expected to respond to an emergency. See also USEC's response to NRC Question CP-4.

CP-6 Commit to reporting chemical releases that could cause NRC's regulatory limits to be exceeded.

This information is required to determine compliance with 10 CFR 70.50, which states that the licensee "should notify the NRC as soon as possible...release that could exceed regulatory limits (e.g., toxic gas releases)."

USEC Response

USEC has committed to comply with the reporting requirements of 10 CFR 70.50 in Section 11.6 of the License Application. The ACP satisfies the requirements of 10 CFR 70.50 by following administrative procedures relating to incident identification and reporting. These procedures work together to ensure that abnormal events and conditions occurring at the ACP are promptly reported to appropriate personnel, assessed, and when required, reported to the NRC Operations Center or designated NRC office. Accordingly, USEC will report chemical releases that cause NRC's regulatory limits to be exceeded in accordance with the requirements in 10 CFR 70.50.

No change to the License Application is required.

CP-7a Commit to retaining records to ensure compliance with the NRC's chemical process safety requirements. Section 11.7.1.5, "Retention and Disposition," page 11-50 of the license application, states that "record retention times are specified in a retention schedule, developed by the manager of the organization that originates the record, or the designee. The process for disposition of records that have reached the end of their retention lifetime is specified by procedures and conforms to applicable requirements."

The Standard Review Plan (NUREG-1520), Section 6.3(8), mentions that the NRC's review should cover "the applicant's commitment to retain records for chemical process safety compliance and reporting commitments for chemical releases."

USEC Response

USEC commits to retaining records to ensure compliance with the NRC's chemical process safety requirements. Added final sentence to Section 6.3 as to state, "Records of chemical releases and documentation relating to chemical process safety are retained in accordance with Records Management and Document Control (RMDC) requirements described in Section 11.7.1.5 of this License Application to ensure compliance with NRC's chemical process safety requirements."

CP-8a Explain how USEC will provide oversight of contractors' qualification and training programs to ensure that guidance followed by the contractors fulfill the training requirements of the ACP. Also indicate which program/position is responsible for ensuring that this task will be performed adequately. Section 11.2.2, "Personnel Qualification and Training," page 11-13, states that "a member of the ACP organization provides oversight of contractor activities."

This information is required to determine compliance with 10 CFR Part 70.62(d) which states that "each applicant or licensee shall establish management measures to ensure compliance with the performance requirements of 10 CFR part 70.61."

USEC Response

As described in Section 6.2.2.2 of this License Application, the Production Support Manager has overall responsibility for employee training. Contractor (typically construction, maintenance, and service) personnel receive access training and plant-specific safety training prior to starting work. The contractor or the contractor-designated Safety and Health Officer has the contractual responsibility for internal contractor employee training. USEC also approves the contractor's Safety and Health Plan. The Site Technical Representative is the liaison between the contractor and USEC.

No change to the License Application is required.

Management Measures (NUREG 1520, Chapter 11)

MM-1 Describe the application of quality assurance (QA) controls to nuclear criticality safety controls.

This information is needed to determine compliance with 10 CFR 70.61(d), which states that "the risk of nuclear criticality accidents must be limited by assuring that under normal and credible abnormal conditions, all nuclear processes are subcritical... preventive controls and measures must be the primary means of protection against nuclear criticality accidents."

USEC Response

Quality assurance requirements will be applied to IROFS as described in the QAPD for QL-1 and QL-2 items. NCS controls that are not IROFS will have QA applied in a manner commensurate with their hazard and risk in accordance with the graded approach to configuration management and quality assurance.

No change to the License Application is required.

MM-2 Confirm that modifications to the process, design, system documentation, and drawing specifications are also evaluated, as appropriate, for potential chemical exposure. Section 11.1.4.1, "Control Change of the Physical Plant," of the license application states that "modifications are also evaluated as appropriate, for potential radiation exposure, nuclear criticality safety (NCS), and worker safety requirements and/or restrictions."

This information is needed to determine compliance with 10 CFR 70.72(a)(6) which states "...the impacts or modifications to the ISA Summary, or other safety program information...[must be addressed prior to implementing any change]."

<u>USEC Response</u>

"Potential chemical exposures" is a criterion that should be included as a consideration during evaluation of modifications. Accordingly, Section 11.1.4.1 has been revised to incorporate the evaluation of "potential chemical exposures" for modifications to the process, design, system documentation and drawing specifications.

Specifically, the third bullet, second sentence of Section 11.1.4.1 was revised to state, "Modifications are also evaluated, as appropriate, for potential radiation exposure, potential chemical exposure, nuclear criticality safety (NCS), and worker safety requirements and/or restrictions."

MM-3 Confirm that ACP oversight of contractor qualification and training programs for activities that could affect IROFS are commensurate with the Quality Assurance Program (QAP) requirements. Section 11.2.2, "Personnel Qualification and Training," of the license application states that "contractors that work on or are performing activities that could affect IROFS follow the same maintenance guidelines as maintenance personnel. In addition, a member of the ACP organization provides oversight of contractor activities."

This information is needed to determine compliance with 10 CFR 70.62(d), "Management Measures," which states that "management measures shall ensure that ...items relied on for safety ...are maintained, as necessary, to ensure they are available and reliable to perform their safety function when needed..."

<u>USEC Response</u>

ACP oversight of contractor qualification and training programs for activities that could affect IROFS are commensurate with the Quality Assurance Program Description (QAPD) requirements, consistent with the requirements imposed on ACP employees.

No change to the QAPD is required.

MM-4 Clarify whether QL-3 items are considered to be IROFS.

This information is needed to determine compliance with 10 CFR 70.62(d), "Management Measures," which states that "management measures shall ensure that ...items relied on for safety ...are maintained, as necessary, to ensure they are available and reliable to perform their safety function when needed..."

<u>USEC Response</u>

IROFS are either QL-1 or QL-2. QL-3 items are not IROFS. The definition of QL-2 has been changed, as follows to ensure clarity:

QL-2 Two or more IROFS that prevent or mitigate a high consequence event; or one or more IROFS that prevents or mitigates an intermediate consequence event.

MM-5 Confirm that safe work practices to control processes and operations with radioactive and special nuclear material, IROFS, and/or hazardous chemicals incident to the processing of licensed material are covered by appropriate procedures. Section 11.4.2.1, "Identification," of the license application identifies the minimum tasks that require procedures. Those tasks are limited to IROFS and those management measures supporting IROFS operation, and actions to prevent or mitigate the consequences of accidents described in the ISA Summary.

This information is needed to determine compliance with 10 CFR 70.23(a)(4), which states that the applicant shall "propose procedures to protect health and minimize danger to life or property."

<u>USEC Response</u>

Section 11.4.2.1 has been revised by adding a bullet that confirms the inclusion of the requested elements, as follows: "Safe work practices to control processes and operations with special nuclear material, IROFS, and/or hazardous chemicals incident to the processing of licensed material."

<u>Chapter 5, "Nuclear Criticality Safety"</u>

NC-1 Clarify whether all controls and/or barriers relied on to meet the double contingency principle (DCP) will be classified as IROFS. If not, provide appropriate justification. Clarify the difference between controls and barriers.

10 CFR 70.61(e) requires that each control relied on to meet performance requirements be designated an IROFS. In addition, 10 CFR 70.64(a)(9) requires compliance with the DCP. Section 5.1.1of the license application states that "Controls and/or barriers that are relied on to prevent inadvertent criticalities are designated as items relied on for safety (IROFS) in the Integrated Safety Analysis (ISA)." However, during the on-site licensing review, it became apparent that not all controls relied on to meet the DCP were identified as IROFS in the ISA Summary. This information is needed to determine whether controls relied on to meet the DCP will be sufficiently robust that changes in process conditions will be "unlikely."

## USEC Response

Not all double contingency controls are necessary to show each event sequence is highly unlikely. Only those double contingency controls necessary to show a specific event sequence is highly unlikely are designated as an IROFS. There is no difference between barriers and controls.

NC-2 Clarify whether the criteria for fissile material operations (1wt% $^{235}U$ and 100g $^{235}U$) apply to normal operating conditions only or to credible abnormal conditions as well. If applied to normal conditions only, justify why abnormal conditions can be assured to be subcritical. If applied to abnormal conditions, explain how all abnormal conditions will be identified (given that nuclear criticality safety (NCS) evaluation is not required for non-fissile material operations).

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. 10 CFR 70.61(e) requires that each control relied on to meet the performance requirements be designated an IROFS. It is conceivable that processes not meeting the criteria for fissile material operations under normal plant conditions could exceed these criteria under certain upsets; in this case, controls would be needed under 10 CFR 70.61(d) to maintain subcriticality of the upset condition.

## USEC Response

The criteria for fissile material operations apply to normal and credible abnormal conditions. All abnormal conditions will be identified through a documented process that describes the subject operation and imposes controls, as necessary, to ensure inadvertent accumulation of 100 grams $^{235}U$ or more of 1 wt. percent $^{235}U$ enriched material does not occur. These controls are not double contingency controls and they are not IROFS because accumulations of only 100 grams $^{235}U$ cannot credibly form a critical configuration under any circumstances. USEC chose this threshold because it is more than a factor of 10 below the minimum critical mass required at 10 wt. percent $^{235}U$ enrichment and provides an adequate safety margin. USEC also chose this threshold to allow the plant, the regulator, and the management measures programs to focus on the safety significant operations, while also providing reasonable controls over de minimus quantities of licensed material. USEC understands that failure to implement this program correctly would result in the inadvertent performance of an unanalyzed fissile material operation.

NC-3 Describe what "equivalent technical experience" is considered an acceptable substitution for the educational requirements for the NCS manager (see Section 5.2.1 of the license application). Also, clarify whether the four years of "nuclear experience" means experience in NCS.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.2(6), states that the applicant should commit to describe the experience and qualifications of personnel responsible for NCS. Whereas NCS Engineers and Senior NCS Engineers are required to have a bachelor's degree in engineering, mathematics, or

related science, the NCS Manager is only required to have either a bachelor's degree or equivalent technical experience, but this equivalent experience is not described. This information is needed to ensure the NCS Manager has sufficient education to perform the necessary duties of this position.

USEC Response

The NCS Manager's position is primarily administrative. Unless the NCS manager is also a qualified NCS engineer or Senior NCS Engineer, the NCS manager will have no ability to make technical decisions. "Equivalent technical experience" may involve many years of experience in the nuclear safety profession combined with an associate's degree and a proven ability to handle the administrative complexities of managing an engineering group. Because the qualifications of an NCS engineer requires a bachelor's degree in engineering, mathematics, or related science, and only NCS engineers or senior NCS engineers have the authority to establish NCS controls, serve on the Plant Safety Review Committee (PSRC), serve on the emergency response cadre, and perform other safety related tasks, the administrative duties of the manager can be performed by personnel who are not also burdened with the more demanding duties of an NCS engineer. The four years of "nuclear experience" is not specific to NCS, but rather may encompass technical work at a nuclear facility, such as a nuclear power plant, fuel fabricator, or other nuclear facility.

NC-4 Justify why one year as a qualified NCS Engineer is sufficient for qualification as a Senior NCS Engineer, given the duties incumbent on the position.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.2(6), states that the applicant should commit to describe the experience and qualifications of personnel responsible for NCS. The duties of a Senior NCS Engineer involve performing technical reviews and overseeing more junior NCS engineers. However, only one additional year's experience is stated as being needed to qualify as a Senior NCS Engineer. Historically, three additional years experience have been required at other fuel facilities.

USEC Response

The one-year requirement is just one part of the qualification process for an NCS engineer. The other components of the qualification process ensure the candidate has sufficient knowledge to independently address expected NCS related issues that may be encountered in operating the ACP.

NC-5 State whether USEC commits to follow American National Standards Institute/American Nuclear Society (ANSI/ANS) 8.19-1996 and ANSI/ANS-8.20-1991 as they relate to training, procedures, and audits and assessments. If committing to follow these standards, clarify which provisions of the standards USEC will follow in implementing these management measures.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-

1520, Section 5.4, states that "if an applicant intends to conduct activities to which a standard applies and the standard has been endorsed by an NRC Regulatory Guide, then a commitment to comply with all the requirements (i.e., "shalls") is necessary but may not be sufficient to meet the acceptance criteria." NUREG-1520, Section 5.4.3.3, states that the applicant should commit to follow these standards with the aforementioned items.

<u>USEC Response</u>

Section 1.4.1 (page 1-103) of the License Application provides USEC's commitment to ANSI/ANS-8.19-1996 and ANSI/ANS-8.20-1991 and provides the extent to which USEC satisfies each code or standard.

No change to the License Application is required.

NC-6 Describe the procedure control and work control processes. Describe any differences between the approval and change control processes for procedures and work packages.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.4.7(2), states that the applicant should commit to perform NCS determinations to evaluate changes to processes, operating procedures, IROFS, and management measures. Section 5.3.1 draws a distinction between procedures and work packages but does not explain this difference. This information is needed to ensure that any process changes (including changes to both procedures and work packages) receive appropriate NCS review.

<u>USEC Response</u>

License Application Section 11.2.3 describes the design/work control process and Section 11.4 describes the procedure control program. As described in Section 11.2.3, maintenance of ACP equipment is performed in a manner that maintains the documented configuration of plant systems. Prior to modification of systems, it is necessary to complete actions required by Section 11.1 of this License Application, which would include a facility change evaluation to ensure compliance with the requirements in 10 CFR 70.72. A work control process establishes the necessary control, review, and approval process to maintain the documented configuration of ACP systems. A facility change evaluation is not required for maintenance work packages, since modifications to the design or function of a system are not undertaken. Rather, the QL of an item requiring maintenance establishes the level of planning, extent of reviews, and approval required to perform the maintenance task. A work package is developed to direct and document maintenance activities involving QL-1 and QL-2 items. Work packages contain, as a minimum, a task description, approved work instructions or procedure, post-maintenance tests and equipment history documentation. The package contents may also include equipment drawings, vendor manuals, and safety permits.

A facility change evaluation is conducted for new procedures and changes to procedures.

NC-7 In Section 5.3.2, clarify whether postings and/or labels are required for administrative controls in all operations without an "in-hand" operating procedure.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.2(4), states that the applicant should commit to provide NCS postings in areas, operations, work stations, and storage locations. Section 5.3.2 states that postings and/or labels "may not be required for administrative controls when those limits and controls are included in 'in-hand operating procedures'." However, it is not clear whether the postings and/or labels are required whenever such "in-hand" procedures do not exist. This information is necessary to ensure that administrative controls relied on for NCS are sufficiently available and reliable to perform their safety functions.

<u>USEC Response</u>

Postings and/or labels are not required when an in-hand procedure is used. However, postings and/or labels may still be used to ensure adequate dissemination of NCS requirements to all personnel.

NC-8 Clarify what is meant by an "appropriate size" for the writing on postings and what is meant by "conspicuous locations" for posting placement.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.2(4), states that the applicant should commit to provide NCS postings in areas, operations, work stations, and storage locations. It is necessary that these postings be visible to be effective in ensuring compliance with administrative controls. However, the terms in Section 5.3.2 of the license application are ambiguous.

<u>USEC Response</u>

When the operation is specific to a fixed workstation or piece of equipment, the size and location of postings will be within conspicuous view of the operator who is performing the task or an operator in a typeface of sufficient size and simplicity that is readily legible to the operator. When the operation takes place within an operating area or room, the size and location of postings will be within conspicuous view of personnel entering the area in a typeface of sufficient size and simplicity that it is readily legible to personnel entering.

NC-9 In Section 5.3.3 of the license application, state whether the NCS organization reviews all fissile material operation changes, or only those involving an NCS-related IROFS.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.4.7(2), states that the applicant should commit to perform NCS determinations to evaluate changes to processes, operating procedures, IROFS, and management measures. However, there may be instances in which an NCS-related IROFS is

not directly being changed, but the change may adversely affect the capability of the IROFS to perform its safety function (or an item relied on to meet the DCP, if these items are not all IROFS). This information is needed to ensure that IROFS are sufficiently available and reliable to perform their safety functions.

USEC Response

Through the configuration management program, NCS reviews all operations and changes to operations that have the potential to impact fissile material operations. These reviews can occur at many levels including the initial request for change, the development of the change, the approval of the change, and the implementation of the change. As a member of the ISA review team and PSRC, NCS is involved in all changes that could impact the safety basis of the ACP.

NC-10 Justify why annual walkthroughs of fissile material operations are acceptable (see Section 5.3.4).

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.3(3)(b), states that such walkthroughs should review all process areas at least every two weeks. This information is necessary to provide assurance that controls relied on for NCS are in fact present in plant operations.

USEC Response

Annual NCS walk-throughs are sufficient due to the training and knowledge of the ACP front line supervision. Front line supervision provides real-time assessments of fissile material operations within their operating area to ensure NCS requirements are being adequately implemented and operating conditions have not been altered to adversely affect NCS.

NC-11 State how often NCS Program audits will be performed.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4.3.3(3)(c) states that NCS audits should be performed at least quarterly. This information is necessary to provide assurance that controls relied on for NCS are in fact present in plant operations.

USEC Response

Section 11.5 of the License Application describes specific details related to audits and assessments. Audits and assessments are conducted for the area of NCS in accordance with written procedures or checklists by qualified auditors and in accordance with Section 18.0 of the QAPD.

The system of audits and assessments is designed to ensure comprehensive program oversight at least once every three years. The three-year cycle provides for flexibility to maximize effectiveness of quality assurance resources by targeting areas of weakness using supplemental assessments verses

using resources auditing areas that are known to be functioning adequately. The proper mix of audit and assessment will provide an effective and comprehensive quality assurance oversight program.

No change to the License Application is required.

NC-12 Clarify the meaning of "if necessary" with regard to when a Nuclear Criticality Safety Evaluation (NCSE) is needed.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.3.1, states that the objectives of an NCS Program include "conducting NCS evaluations to assure that under normal and credible abnormal conditions, all nuclear processes [are] remain subcritical." Section 5.4.2 of the license application provides three criteria for not performing an NCSE in the sentence prior to this one (request is inadequately detailed, the change is bounded by a current analysis, or the process does not meet the criteria for a fissile material operation). It is unclear whether these cases are to be considered all-inclusive or whether there are other reasons an NCSE may not be needed. This information is needed to ensure that all nuclear processes will be subcritical under normal and credible abnormal conditions.

USEC Response

The request to evaluate an operation for NCS may not result in the need to write an NCSE for a variety of reasons, including:

- The operation is obviously non-fissile (like the sanitary sewer system)
- The operation or change has not been funded
- The operation or change is already included in the scope of an existing NCSE
- The operation is a non-fissile operation due to limited inventory or enrichment
- The operation or change cannot be shown to be doubly contingent and/or highly unlikely

NC-13 When relying on the natural and credible course of events for criticality control, describe how the natural and credible course of events is maintained, in Section 5.4.2. Also, describe what "other means" may be used than those described.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. 10 CFR 70.61(e) requires that each control relied on to meet the performance requirements be designated an IROFS. Section 5.4.2 states that controls include engineered features, administrative controls, reliance on the natural and credible course of events, and other means. No information is provided on how the natural and credible course of events will be maintained, or what other means may be used. This information is necessary to ensure that sufficient controls are present to ensure nuclear processes are subcritical under normal and credible abnormal conditions.

USEC Response

Natural and credible course of events are relied on because implementing an explicit NCS control over certain inherent characteristics of a fissile material operation is unnecessary, impractical, or overly prescriptive. In order to qualify as a natural and credible course of events, no controls will be necessary to maintain them. The natural and credible course of events is inherent to certain operations and do not require additional passive, active, or administrative controls to maintain them. Justification for crediting the natural and credible course of events in the absence of supporting controls is included in NCSEs when used to support the double contingency principle and in the ISA summary when used to support the conclusion of "Highly Unlikely."

NC-14 Describe the process and/or criteria that will be used to ascertain whether a change in process conditions is sufficiently "unlikely" to meet the DCP, in Section 5.4.2.

10 CFR 70.64(a)(9) states that new processes and facilities must comply with the DCP. The DCP states that the changes in process conditions leading to criticality must be "unlikely." Section 5.4.2 states that "The NCSE will document the basis for the conclusion that a change in a process or parameter is 'unlikely.'" However the means of making this determination are not described. This information is needed to ensure that the DCP will be met.

USEC Response

The ACP NCS Program meets the double contingency principle by implementing at least one control on each of two different parameters or implementing at least two controls on one parameter. Controls include passive engineered barriers (e.g., structures, vessels, piping, etc.); active engineered features (e.g., valves, thermocouples, flow meters, etc.); reliance on the natural or credible course of events (e.g., relying on the nature of a process to keep the density of uranyl fluoride less than a specified fraction of theoretical); and administrative controls that require performance of human actions in accordance with approved procedures or work instructions, or by other means that limit parameters within specified values. The criteria used to determine whether a proposed control is sufficiently unlikely to meet the DCP is engineering judgment, combined with a peer reviewer and the rest of the NCSE approval process. The NCSE will document the basis for the conclusion that a change in a process or parameter is "unlikely." The basis may be an engineered feature, administrative control, the natural or credible course of events, or any combination of these or other means necessary to ensure the change is unlikely to occur. The parameters or conditions relied on and the limits must be specified in the NCSE and controlled.

NC-15 Clarify the meaning of the second full paragraph on page 5-9 of the license application. In particular, address the following:

a) Define "items related to NCS" and describe how they are programmatically controlled. State whether they are IROFS and, if not, how plant management measures are applied to them.

b) Clarify how Section 11.1 relates to establishing credit for control availability and reliability. Section 11.1 pertains to configuration management, and it is not apparent

how it relates to this topic.

c) Clarify the apparent inconsistency in the last sentence of this paragraph. This sentence states that "where the NCS-credited controls do not provide adequate assurance of availability or reliability...specific NCS controls are established..." It would appear that these would then become "NCS-credited controls," so the meaning of this is unclear.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. 10 CFR 70.61(e) requires that each control relied on to meet the performance requirements be designated an IROFS. Section 5.4.2 states that controls include engineered features, administrative controls, reliance on the natural and credible course of events, and other means. However, the details of what will be done when relying on the natural and credible course of events is not clear. This information is needed to ensure that nuclear processes are subcritical under normal and credible abnormal conditions.

<u>USEC Response</u>

a) "Items related to NCS" are those items described in the NCSE as being credited with preventing or helping prevent a change to a process condition relied on for nuclear criticality safety. As described in the referenced section of Chapter 5.0, the natural and credible course of events can be those items that are maintained by non-NCS programs like the Health Physics program, the Industrial Safety program or other management measures. In some cases, these other management measures are IROFS, however this is not required. For certain specific NCS scenarios, it is possible to justify that a particular chain of events that might lead to a change to a process condition is inherently unlikely without any specific NCS control on it. For example, a change to a process condition that requires the simultaneous misoperation of five separate valves in a manner contrary to established operating procedures could be credited as a single double contingency control without the establishment of an explicit administrative, passive, or active engineered control. Similarly, a change to a process condition that would require the operator to risk imminent death or injury can be relied upon as being unlikely without the establishment of an explicit administrative, passive, or active engineered control.

b) Configuration management as described in Section 11.1 is the management measure that establishes the surveillance frequencies, inspection criteria, and other controls to ensure the availability and reliability of passive and active engineered controls. The NCS program identifies those structures, systems, and components needed to ensure an operation meets the double contingency principle. Once these SSCs are identified in an NCSE, the configuration management program takes over to ensure those SSCs are maintained available and reliable.

c) In this context "NCS-credited controls" refers to those non-NCS program controls that might be relied upon to provide double contingency control. Despite the level of control some other non-NCS program may apply to a system condition, it may not be adequate to ensure the control is sufficiently unlikely, independent, available, or reliable to meet the needs of the NCS program. For example, the site's waste management compliance program cannot be relied upon to ensure

fissile waste is placed into the properly sized containers to maintain geometry control. Only an explicit NCS control would work. However, the waste management program can be relied upon to ensure fissile waste is not carelessly dumped into an open culvert without an explicit NCS control forbidding the practice.

NC-16 State whether the NCSE approval process includes review by the Plant Safety Review Committee (PSRC). Section 5.2.1 of the license application states that one of the duties of NCS Engineers is to provide support to the PSRC. However, the process described in Section 5.4.2 (top of page 5-10) of the license application does not discuss this.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.3.1 states that the objectives of an NCS Program include "conducting NCS evaluations to assure that under normal and credible abnormal conditions, all nuclear processes [are] remain subcritical." The information regarding the process for approving such evaluations is unclear. This information is needed to ensure that nuclear processes are subcritical under normal and credible abnormal conditions.

<u>USEC Response</u>

NCSEs require PSRC approval for the initial approval and for changes that impact the ISA summary. If a change to an NCSE does not impact the ISA summary as determined by a facility change evaluation, then the NCSE change does not require PSRC approval.

NC-17 Remove the following statement in Section 5.4.2.1 of the license application: "Controls are sometimes applied to a non-fissile material operation to ensure it does not inadvertently involve fissile material. These controls can be either engineered or administrative and may be incorporated into applicable operating procedures or work instructions at the discretion of the responsible line manager."

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. 10 CFR 70.61(e) requires that each control relied on to meet the performance requirements be designated an IROFS. The controls needed to ensure a process remains a non-fissile material operation must be reliable and available to perform their intended safety functions, and subject to the same kinds of management measures as controls in fissile material operations.

<u>USEC Response</u>

As stated in USEC's response to NRC Question NC-2, the criteria for fissile material operations apply to normal and credible abnormal conditions. All abnormal conditions will be identified through a documented process that describes the subject operation and imposes controls, as necessary, to ensure inadvertent accumulation of 100 grams $^{235}U$ or more of 1 wt. percent $^{235}U$ enriched material does not occur. These controls are not double contingency controls and they are not IROFS because accumulations of only 100 grams $^{235}U$ cannot credibly form a critical configuration under any circumstances. Likewise, for non-fissile material operations USEC plans to apply controls that are not IROFS to help ensure accumulation of 100 grams $^{235}U$ or more of 1 wt.

percent $^{235}U$ enriched material does not occur. Given the small quantity of enriched uranium involved, these non-fissile operations are not sufficiently hazardous to merit the full rigor of NCS controls required for double contingency or IROFS. Thus, USEC has not deleted the sentences as requested.

NC-18 Revise your commitment to the preferred design philosophy in Section 5.4.3 of the license application (or justify not doing so), to indicate that passive engineered controls are preferred over active engineered controls, and enhanced administrative over simple administrative controls. Revise your commitment to indicate that two-parameter control is preferred over two controls on one parameter.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(3), states that the applicant's order of preference should be "(a) passive engineered; (b) active engineered; (c) augmented administrative; and (d) simple administrative." Also, NUREG-1520, Section 5.4.3.4.4(7)(a) states that "The first method [two-parameter control] is the preferred approach [over single-parameter control] because of the difficulty of preventing common-mode failure when controlling only one parameter." This information is needed to ensure that controls are chosen so as to ensure that criticality is made highly unlikely.

USEC Response

Section 5.4.3 of the License Application indicates a preferred design approach that is equivalent. The preferred design approach is the philosophy that NCS controls should be engineered into an operation with a preference for passive design controls, active engineered controls, and administrative controls, in that order. This philosophy is a guide that is left to the judgment of the NCS engineer, peer reviewer, design engineer, and other engineering disciplines to determine the extent with which to apply the philosophy. Due to the need to ensure criticality related event sequences are highly unlikely, the preferred design approach is automatically a part of the decision making process when developing criticality controls for fissile material operations because passive design controls have a lower failure frequency than active engineered controls, which have a lower failure frequency than administrative controls. To help minimize complexity and reduce errors, it is desired to establish and maintain only those minimum set of controls needed to meet the DCP and maintain criticality accident sequences "highly unlikely." Therefore, the passive design philosophy is an inherent part of the development process for safety controls and there is not need to explicitly state it.

USEC recognizes the preference to maintain a diverse set of controls over fissile material operations by distributing NCS controls over many different parameters. However, given that a preponderance of NCS controls at the ACP focus on maintaining moderation control of the $UF_6$, it is not possible to state a preference for two-parameter control over two controls on one parameter.

No change to the License Application is required.

NC-19 Clarify whether the justification for taking exception in certain instances to the preferred design philosophy in Section 5.4.3 of the license application will be documented in plant NCSEs.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(3), states that, in addition to the preferred hierarchy of passive over active and engineered over administrative controls, "when using a control, the choice of the type and manner should be justified." This is necessary to ensure that the preferred design philosophy is adhered to the greatest extent practicable.

USEC Response

The preferred design approach is a guiding philosophy instilled in all engineers, engineering management, the ISA Team, and the PSRC. The application of the preferred design approach is made based on the judgment of qualified personnel throughout the NCSE development and approval process. There will be no requirement to justify utilizing the particular control (passive, active, or administrative) over another control. It is not necessary to document in the NCSE.

NC-20 Revise the commitment to ANSI/ANS-8.3 to indicate which version of the standard USEC is committing, and that USEC is committing to the standard as modified by Regulatory Guide 3.71.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. NUREG-1520, Section 5.4 states that "if an applicant intends to conduct activities to which a standard applies and the standard has been endorsed by an NRC Regulatory Guide (R.G.), then a commitment to comply with all the requirements (i.e., "shalls") is necessary but may not be sufficient to meet the acceptance criteria." NUREG-1520, Section 5.4.3.4.3(2), states that the applicant should commit to ANSI/ANS-8.3-1997, as modified by RG 3.71. Section 5.4.4 of the license application contains a commitment to the standard, but does not state to which version of the standard the applicant commits, and does not qualify that it is committing to those portions of the standard that have been endorsed in RG 3.71 (i.e., which are consistent with 10 CFR 70.24).

USEC Response

USEC is committing to the 1997 version to the standard as modified by Regulatory Guide 3.71. At it applies to the ACP, Regulatory Guide 3.71 simply points out several cases where the requirements of 10 CFR 70.24 are more rigorous than ANSI/ANS-8.3 regarding criticality accident alarm systems (CAAS). Specifically, Part 70 requires CAAS coverage to be applied to areas where special nuclear material in excess of 700 grams $^{235}U$ is handled, used, or stored while ANSI-8.3 only requires the need for CAAS to be evaluated. Also, Part 70 requires each area to be covered by two detectors, while ANSI-8.3 requires only one. The detection criterion for the CAAS is the same for both ANSI-8.3 and Regulatory Guide 3.71 at 20 rad/min at 2 meters from the source. Because USEC has committed to Part 70 regarding the implementation of CAAS, there was no need to separately commit to Regulatory Guide 3.71.

NC-21 Remove the following statement from Section 5.4.4 of the license application with regard to when a CAAS exemption is appropriate: "Other exceptions to CAAS coverage are documented in NCS evaluations and are based on a conclusion in the NCSE that a criticality accident is non-credible in an area where the fissile material operation is ongoing."

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." In addition to the specific exemption request for the cylinder storage yards, the above general language is contained in the license application. The statement in Section 5.4.4 appears to imply that review and approval of CAAS exemptions by NRC is not required if the applicant determines that criticality is incredible. This is not consistent with the requirements to 10 CFR Part 70.

<u>USEC Response</u>

10 CFR 70.24 requires that "each licensee authorized to possess special nuclear material in a quantity exceeding 700 grams of contained $^{235}U$...shall maintain in each area in which such licensed...material is handled...a monitoring system...." Since USEC will be authorized to possess quantities of SNM exceeding 700 grams, it must have a monitoring system at the ACP. However, the regulation provides that the monitoring system must be provided only "in each area in which such" material is handled. The language quoted by the NRC in the ACP application is consistent with the regulation and simply makes clear that USEC will use formal NCSEs to ensure that areas where coverage is not provided do not contain quantities of $^{235}U$ greater than 700 grams.

The statement immediately following the above statement reads: "Conclusions of non-credibility require at a minimum that the inventory of $^{235}U$ in the area is less than 700 grams, less than 50 grams per square meter, or less than 5 grams in any 10 liter volume." These criteria represent the same mass limit as listed in 10 CFR 70.24, the same areal density limit as listed in ANS/ANSI-8.3, and the concentration limit for exempt nuclear material from 10 CFR 71.53. Therefore, CAAS coverage need only be established for those areas where a criticality accident is credible. USEC utilizes the NCSE to determine when CAAS coverage is not required under Parts 70 and 71 and ANSI standards.

NC-22 Provide justification for the criteria for CAAS exemption due to incredibility in Section 5.4.4 of the license application (i.e., less than 700g $^{235}U$, less than 50g $^{235}U/m2$, less than 5g $^{235}U$ in any 10-liter volume). State whether these criteria are applied only to normal or credible abnormal conditions as well.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. However, 10 CFR 70.17 states that the NRC may "grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." In addition to the specific exemption request for the cylinder storage

yards, the above general language is contained in the license application. More information is needed for NRC to make a determination that an exemption in these select cases will not endanger life and property.

USEC Response

See USEC's response to NRC Question NC-21. These criteria apply to credible abnormal conditions.

NC-23 Clarify whether dual criticality alarm coverage will exist in all areas meeting the criteria in 10 CFR 70.24(a) that are not subject to an NRC-approved exemption. In the event that dual coverage is not maintained, clarify whether there are any other compensatory measures that may be used besides those listed in Section 5.4.4, and if so, what they are.

10 CFR 70.24(a)(1) requires that "coverage of all areas [in which CAAS is required] shall be provided by two detectors." Section 5.4.4 states that each area requiring CAAS coverage will have "at least two independent detection units", but also states that "this arrangement allows for one detection unit to be temporarily out of service with fissile operations continuing under the coverage of the other detection unit." Thus, it is not clear whether dual-alarm coverage meeting 10 CFR 70.24(a)(1) will be maintained at all times. In the event coverage is not maintained, Section 5.4.4 states that "plant procedures provide for compensatory actions, which may include...", but does not provide a comprehensive list of what the compensatory measures are. NUREG-1520, Section 5.4.3.4.3(7), states that "the applicant should commit to compensatory measures (e.g., limit access, halt SNM movement) when the CAAS system is not functional." Knowledge of what these compensatory measures are is needed to ensure safety to the workers.

USEC Response

The CAAS is required to provide dual coverage at all times. USEC does not intend to routinely suspend CAAS coverage for any area where it is required. In the unlikely event the CAAS system is non-functional in whole or in part, appropriate compensatory actions will be imposed until CAAS coverage is restored.

NC-24 Provide the technical basis for limiting the installation of evacuation horns and radiation warning lights to facilities within 200 feet of buildings or facilities requiring CAAS coverage.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. NUREG-1520, Section 5.4.3.4.3(6), states that the applicant should commit to having a CAAS alarm that is clearly audible in areas that must be evacuated. Knowledge of the distance at which plant personnel are at risk from the consequences of a criticality is necessary to determine the area requiring an audible alarm.

## USEC Response

The 200 ft evacuation zone is sufficient to ensure personnel are removed from the location of the criticality such that the dose in free air is below regulatory limits. However, a wider evacuation zone has a higher risk of causing personnel to evacuate in the direction of the criticality instead of away from the criticality.

NC-25 Clarify whether the "credible abnormal events" that the CAAS system is required to survive include natural phenomena or external events, including seismic events, fire, explosion, or corrosive atmosphere.

10 CFR 70.24 states that a CAAS is required for operations containing greater than 700 g of contained $^{235}U$. NUREG-1520, Section 5.4.3.4.3(4), states that the CAAS should be designed to remain operational during a seismic shock equivalent to the site-specific design basis earthquake or the equivalent value specified by the Uniform Building Code. NUREG-1520, Section 5.4.3.4.3(5), states that the CAAS should be designed to remain operational during credible events such as a fire, explosion, corrosive atmosphere, and other credible conditions. Such conditions could be coincident with a criticality accident.

## USEC Response

As a permanently installed fixture in a facility, the CAAS can withstand the same abnormal events as the structure of the building.

NC-26 In Section 5.4.4.1 of the license application, justify use of the plant public address (PA) system to warn plant personnel within 200 feet of a portable CAAS unit in the event of a criticality accident. Describe the range in which the portable unit's alarm will be audible. Explain why the time delay for notifying at-risk personnel using the PA system is acceptable.

10 CFR 70.24(a) requires a "monitoring system meeting the requirements of either paragraph (a)(1) or (a)(2), as appropriate...which will energize clearly audible alarm signals if accidental criticality occurs" for operations containing greater than 700g of contained $^{235}U$. The applicant has committed to follow ANSI/ANS-8.3-1997 in this regard. However, use of a portable CAAS in conjunction with a PA system does not meet the requirement that the monitoring system will energize a clearly audible alarm and does not meet all the provisions of the standard. Therefore, this information is needed to ensure that use of a portable CAAS in conjunction with a PA system will be an acceptable alternative, in that plant personnel will be notified in a sufficiently timely manner to protect them from the consequences of a criticality accident.

## USEC Response

When portable CAAS is used, the portable system will have an installed audible device to alert personnel in the immediate area (25 ft) to evacuate. However, there may be personnel within the 200 ft evacuation zone that are in buildings, vehicles or otherwise shielded from adequate audibility of the installed device. The only method to alert these personnel is to use the plant Pubic Address

(PA) system. The use of the plant PA system is adequate for the following reasons: (1) a portable CAAS is not anticipated to be used frequently; (2) the immediate area will be evacuated due to the installed device; (3) personnel beyond the immediate area will not receive a life-threatening radiation dose because of the same structures that limit audibility will provide some radiation shielding and the distance from the source will decrease the dose rate to survivable levels; and (4) the response time of personnel initiating a message over the plant PA (a few minutes) will ensure personnel beyond the immediate area evacuate with sufficient promptness to avoid radiation doses in excess of the regulatory limits.

NC-27 Clarify the statement in Section 5.4.5.1 of the license application under "Moderation" that "water is considered to be the most efficient moderator commonly found in the ACP." State that you will evaluate whether moderators more efficient than water (e.g., oil, under certain conditions) are present, on a case-by-case basis, or justify not doing so.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. Calculational methods assuming that water is the most reactive moderator present could yield non-conservative results if other materials present could be more reactive. Evaluating potentially more reactive moderators is necessary to provide assurance that processes will be subcritical under normal and credible abnormal conditions.

USEC Response

The ACP does not intend to have any fissile material operations that involve hydrocarbon oils and uranium compounds in mixtures or solutions under either normal or abnormal conditions. Some small vacuum pumps used in various instrumentation or sampling operations are likely to contain hydrocarbon oils, but the oil volume in these applications will be too small to accumulate more than 100 grams $^{235}U$. Therefore, for planned operating and maintenance related evolutions, water is the most likely available and most efficient moderator available.

NC-28 Clarify the commitment to limit the use of moderating material for firefighting in areas where greater-than-safe masses of uranium are handled, processed, or stored, and moderation controls are applied. Clarify whether this means that moderating material for firefighting will be entirely excluded, or the amounts of such materials will be limited based on analysis in NCSEs.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(12)(f), states that "when developing firefighting procedures for use in a moderation controlled area, restrictions are placed on the use of moderator material." The statement in Section 5.4.5.1 of the license application that use of moderator materials are "limited" in such cases is ambiguous and clarification is needed.

USEC Response

Limitations on the use of moderating material during fire fighting is provided in the training of qualified fire fighting personnel that will support ACP operations. This guidance is only guidance and is not intended to be as rigorous as a double contingency control or items relied on for safety because the ACP design does not present any unsafe conditions regarding NCS. The specific guidance is primarily applicable to fire fighting in and around gaseous diffusion plant equipment. It involves some guidelines to avoid spraying water directly into process gas openings, the desire to use fogging nozzles rather than stream nozzles on fire hoses, and the recommendation to maintain more than 15 ft of spacing between the fire fighters and any equipment where a criticality could occur.

The justification for this is that fire fighters must be allowed to combat a large fire using all available techniques, without concern for whether double contingency is maintained. USEC considers the possibility of a large $UF_6$ release and its associated off-site impact to the public to be a greater hazard than the potential of violating double contingency or even having an accidental criticality as a result of a fighting a fire to prevent the large $UF_6$ release. USEC has analyzed all operations involving uranium in quantities greater than safe mass to include the possibility of a large fire. Those operations will remain sub-critical when subject to the moderation conditions that could be credibly experienced resulting from fighting a large fire.

NC-29 Commit that when moderator control is used and process variables can affect moderation, they will be identified as IROFS, or justify not doing so.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(12)(b), states that "when process variables can affect the moderation, the process variables are shown in the ISA Summary to be controlled by IROFS." This is needed to ensure moderator controls are available and reliable when needed.

USEC Response

When moderation control is used and those controls are necessary to ensure the criticality accident sequence is highly unlikely, those controls are IROFS. The commitment to identify controls that maintain high consequence accident sequences highly unlikely as IROFS is contained in the ISA Summary.

NC-30 State whether USEC commits to ANSI/ANS-8.22-1997 with regard to moderator control, and if so, clarify to which provisions in the standard USEC is committing.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2, states "when using moderation, the applicant commits to ANSI/ANS-8.22-1997."

## USEC Response

USEC has not committed to ANSI-8.22 since moderation control provided by the standard is unnecessary when applied to equipment containing $UF_6$. By design, all equipment containing $UF_6$ is leak-tight. The presence of water on the exterior surfaces of this equipment will not adversely impact nuclear criticality safety. Moderation control of the $UF_6$ is incorporated into the process by design with any significant deviations readily apparent as operational difficulties long before it could adversely impact nuclear criticality safety. The analysis of breaches of $UF_6$ processing equipment is included in NCS evaluations as appropriate with the result of those breaches resulting, at worst, in a loss of double contingency. Fire fighting issues are discussed above in USEC's response to NRC Question NC-28.

NC-31 Describe the safety factor that will be used when basing safe geometry dimensions on established standards.

10 CFR 70.61(d) states that processes should be assured to be subcritical "including use of an approved margin of subcriticality for safety." NUREG-1520, Section 5.4.3.4.2(8)(b), states that when using large single units as a single parameter control from experimental data, the applicant should use 90% of the minimum critical cylinder diameter, 85% of the minimum critical slab thickness, and 75% of the minimum critical sphere volume, as margins of safety.

## USEC Response

When safe parameter limits from handbooks are used in the ACP, they are supported by operation-specific reactivity calculations to ensure credible abnormal events are adequately subcritical.

NC-32 Clarify what other management measures than pre-operational verification will be used, as appropriate, when relying on geometry for criticality control. If geometry control can be lost by bulging, corrosion, leakage, or other mechanisms, means should be provided to prevent its loss.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. Section 5.4.5.1 discusses pre-operational verification of geometry controlled items, but does not discuss other management measures that may be needed to ensure subcriticality under certain abnormal conditions.

## USEC Response

The specific NCS controls necessary to assure geometry controls are available and reliable vary based on the specific operation analyzed. In general, however, geometry controls are assured for permanently installed equipment by a pre-operational implementation verification walk-down and for portable equipment by a pre-use verification prior to each operation. Permanently installed equipment may also have periodic surveillances performed if the equipment may credibly degrade.

NC-33 Clarify that when relying on factors such as geometry, enrichment, or composition, in the setting of mass limits, these controls in conjunction with mass will only be credited as one control for meeting the DCP, or justify not doing so. Commit that when these items are not identified as IROFS, all other parameters will be evaluated at their most reactive credible values (e.g., spherical geometry, optimum moderation, most reactive reflection).

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(10)(a), states that "NCS safety limits...and limits on NCS controlled parameters will be established assuming credible optimum conditions... unless specified controls are implemented to control the limit to a certain range of values." Therefore, if mass is relied on alone to ensure subcriticality, all other system parameters are uncontrolled and should be at their most reactive credible values. Section 5.4.5.1 of the license application states, however, that safe mass values are determined in conjunction with other controls. This appears to be contradictory.

<u>USEC Response</u>

When geometry, enrichment, or composition is used as the primary control, the uranium material subject to that control is analyzed at the highest credible moderation or optimum moderation. The mass of the uranium is based on those parameters.

NC-34 Describe the safety margin that will be applied to mass limits (a) when double batching is credible, and (b) when double batching is not credible.

10 CFR 70.61(d) states that processes should be assured to be subcritical "including use of an approved margin of subcriticality for safety." NUREG-1520, Section 5.4.3.4.2(7)(d), states that when double batching is possible, the mass should be no more than 45% of the minimum spherical critical mass. NUREG-1520, Section 5.4.3.4.2(7)(e), states that when double batching is not possible, the mass should be no more than 75% of the minimum spherical critical mass.

<u>USEC Response</u>

Typically, mass limits are established at "safe mass" values which are not more than half the minimum critical mass. However, lower "safe mass" values are required to ensure the "highly unlikely" criterion is also met. USEC does not intend to perform any fissile material batching at the ACP. Therefore, mass is never the only parameter being controlled in a fissile material operation.

NC-35 State what means are provided to segregate materials of different enrichment when enrichment is used for criticality control.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(10)(a), states that a method of segregating different enrichments should be used to ensure they will not be interchanged, or else the most limiting enrichment will be applied to all materials.

USEC Response

Enrichment controls for the ACP are inherent to the design of the centrifuge equipment and are limited to 10 wt. percent $^{235}U$. Enrichment limits are only assumed for certain operations where compliance with ANSI standards for cylinder size is required. Those operations are limited to 5 wt. percent $^{235}U$; however, the presence of $UF_6$ cylinders at a maximum enrichment of 10 wt. percent will be subcritical. Therefore, there are no operations for which a credible violation of an enrichment control could cause a criticality.

NC-36 Justify the use of homogeneous safe mass at up to 10 wt% $^{235}U$. Demonstrate that the difference between heterogeneous and homogeneous systems at up to 10 wt% $^{235}U$ are sufficiently close, with the chosen margin of subcriticality, that the difference can be ignored.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2, states that heterogeneous effects should be considered, especially for low-enriched systems. Section 5.4.5.1 of the license application states that "Using the homogeneous safe mass of 10 wt. percent $^{235}U$ is also safe for heterogeneous 10 wt. percent $^{235}U$ because, at this enrichment, the homogeneous and heterogeneous minimum critical masses are close in value." However, this statement is not justified and it is not apparent what "close in value" means. This information is needed to ensure that processes are subcritical under normal and credible abnormal conditions.

USEC Response

USEC has committed to considering heterogeneous configurations for those operations that involve small fissile material and moderator regions. These configurations may be present when analyzing sample containers in arrays subject to interstitial moderation. However, these complicated configurations would be explicitly modeled in bounding configurations using reactivity computer codes rather than handbook values.

For systems based on safe mass, USEC uses less than 50 percent of the minimum critical mass as shown in the attached chart from LA-10860, "*Critical Dimensions of Systems Containing $^{235}U$, $^{239}Pu$, and $^{233}U$.*" In many cases, the need to show the operation is also "highly unlikely" has also required the adoption of additional margin so that the actual mass limit imposed on the operation is approximately 25 percent of the minimum critical mass. The extrapolated value for the minimum heterogeneous mass of $^{235}U$ required for criticality in a spherical geometry is approximately 100 grams $^{235}U$ lower than the experimental result for the homogeneous case. USEC believes this difference is not significant for the following reasons:

- Systems, which are known to be heterogeneous, are analyzed as such.
- The form of fissile material in the ACP is $UF_6$, which converts to $UO_2F_2$ when exposed to water and $UO_2F_2$ dissolves readily in water creating a homogeneous solution.
- The conditions necessary for the small mass difference to become significant cannot credibly occur by chance. These conditions include: optimum fuel moderation, full

water interstitial moderation, spherical geometry, and optimum spacing of individual fissile units.

Therefore, the difference between the heterogeneous safe mass and homogeneous safe mass is not significant for ACP operations.

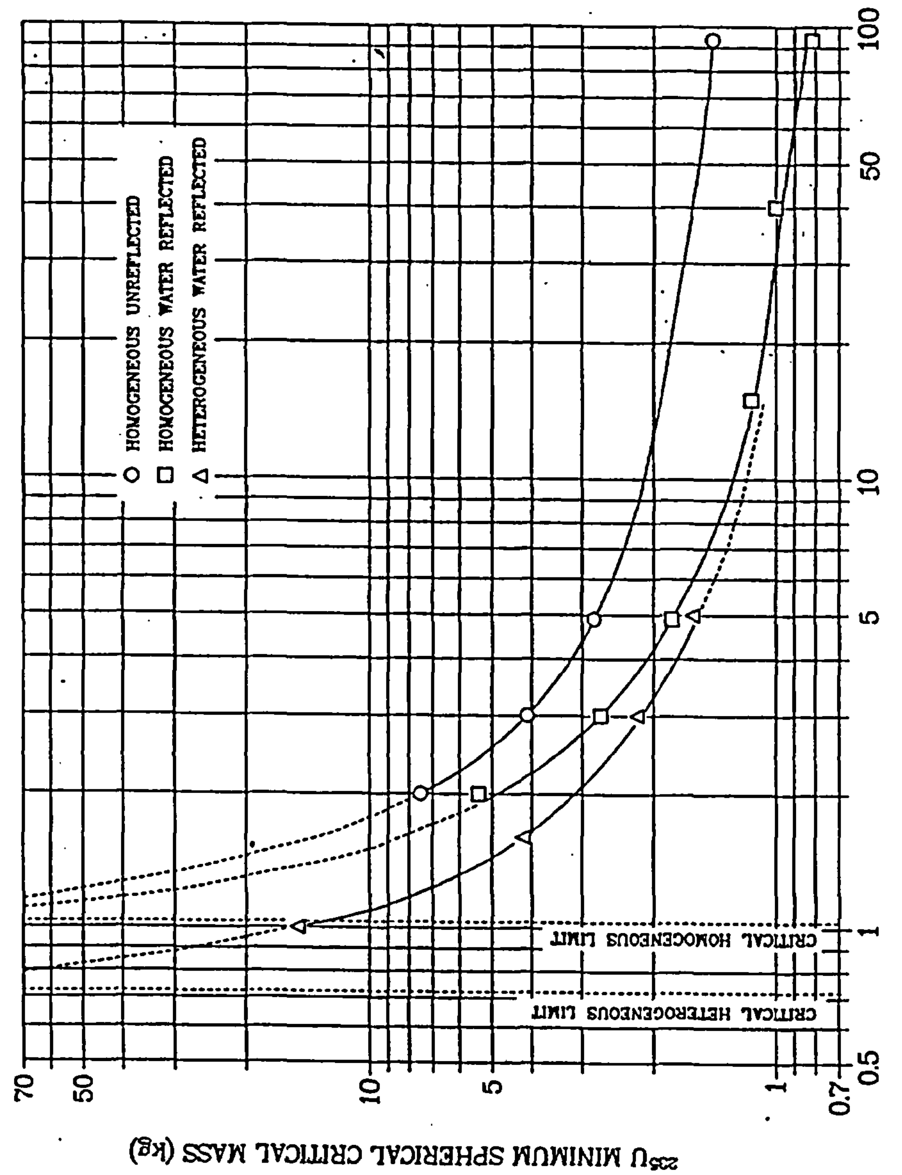


*Fig. 22. Minimum spherical critical masses as functions of $^{235}U$ enrichment in homogeneous and heterogeneous hydrogen-moderated systems.*

NC-37 Clarify whether the use of concentration control requires dual independent sampling. In particular, clarify whether drawing and analyzing the samples must be done by two different individuals or using different instrumentation.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(13)(d), states that "When concentration needs to be sampled, dual independent sampling methods are used." Section 5.4.5.1 of the license application states that, when relying on concentration, "the medium is sampled twice, the samples are verified to be properly taken by a second individual, and the two samples are independently analyzed." However, it is not made clear whether the dual sampling and analysis is completely independent, especially during taking of the sample.

USEC Response

There are no fissile material operations planned for the ACP that involve concentration control.

NC-38 Commit that when process variables can affect concentration, they are identified as IROFS, or justify not doing so.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(13)(a), states that "When process variables can affect the concentration, the process variables are shown in the ISA Summary to be controlled by IROFS." This is necessary to ensure that concentration controls are available and reliable to perform their safety functions.

USEC Response

There are no fissile material operations planned for the ACP that involve concentration control.

NC-39 Describe whether there is a minimum reflection condition to account for the presence of nearby structural or transient materials (e.g., 1-inch tight fitting reflector). If this is not used, justify why the models are adequately bounding.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(10)(a), states that "NCS safety limits...and limits on NCS controlled parameters will be established assuming credible optimum conditions... unless specified controls are implemented to control the limit to a certain range of values." Since there will always be some materials at some distance from the fissile system, unless specific controls are established to preclude them, criticality calculations must take them into account. This information is needed to ensure that processes are subcritical under normal and credible abnormal conditions.

USEC Response

The minimum reflection condition is established in each individual evaluation of each fissile material operation for each component, item, or equipment. This condition is described and justified in the specific evaluation and subject to the approval process described in Chapter 5.0 of the License Application. For operations involving the routine presence of personnel at the operating floor level, full water reflection may be used or interstitial moderation, combined with one or more full density blocks of water to simulate personnel, may be used. However, for operations that involve equipment installed overhead and the routine presence of personnel is not credible, full water reflection is not credible and is not considered.

NC-40 State whether the full range of interstitial moderation is considered in evaluating normal and abnormal conditions.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(10)(a), states that "NCS safety limits...and limits on NCS controlled parameters will be established assuming credible optimum conditions... unless specified controls are implemented to control the limit to a certain range of values." Section 5.4.5.1 states that "the possibility of full water reflection is considered when performing analyses." However, there may be instances (e.g., strongly coupled arrays) in which full flooding is not the most reactive case. In this event, the full range must be considered to ensure that processes are subcritical under normal and credible abnormal conditions.

USEC Response

The level of interstitial moderation considered is established in each individual evaluation of each fissile material operation for each component or array of components. Due to the height of the ACP above any flood plain, it is non-credible to experience a fully flooded condition for an array of components. Additionally, there are no rooms or other confined areas that could credibly collect and hold sufficient water during an abnormal event to create a fully flooded condition. Therefore, interstitial moderation is limited to the presence of a thin film of water and a low water density between components to simulate a sprinkler actuation over the array. This interstitial moderation, combined with one or more full density blocks of water to simulate personnel is adequate to bound any credible interstitial water conditions.

NC-41 State whether you commit to the use of ANSI/ANS-8.21-1995 in the use of fixed neutron absorbers.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.2(15)(a) states that the applicant should commit to ANSI/ANS-8.21-1995.

USEC Response

ANS/ANSI-8.21 applies to the use of fixed neutron absorbers as criticality controls. The ACP does not currently have any fissile material operations that rely on the presence of fixed neutron absorbers. However, in the event USEC develops an operation that relies on fixed neutron absorbers, USEC has committed to ANSI/ANS-8.21-1995 in Section 5.4.5.1 of the License Application.

NC-42 State whether raschig rings and/or soluble absorbers are used in the facility, and if so, whether you commit to ANSI/ANS-8.5-1996.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4, states that □if an applicant intends to conduct activities to which a standard applies and the standard has been endorsed by an NRC Regulatory Guide, then a commitment to comply with all the requirements (i.e., "shalls") is necessary but may not be sufficient to meet the acceptance criteria. RG 3.71 has endorsed ANSI/ANS-8.5-1996 for use of borosilicate glass raschig rings. In addition, soluble absorber controls may be used, but these are not mentioned in the application.

USEC Response

ANS/ANSI-8.5 applies to the use of borosilicate glass Raschig rings used as criticality controls. The ACP does not have any fissile material operations that rely on Raschig rings. Therefore, commitment to ANSI-8.5 is not necessary.

NC-43 Clarify the assertion in Section 5.4.5.2 of the license application that "the generic nature of the experimental data does not address the variables present in the different operations." Explain whether this means that the selected benchmark experiments do not cover the range of parameters (area of applicability) needed for ACP operations.

10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(7)(c) states that the applicant should commit to "apply the methodology only in the area or areas of applicability or provide justifications for applying the methodology outside the area or areas of applicability." The aforementioned quote could be interpreted as contradicting this.

USEC Response

The quoted passage is simply stating that use of the experimental criticality results alone, without the use of computer codes, does not provide sufficient information to allow for the evaluation of the operations at the ACP. This section is used as a lead-in for further discussion on the other methods of reactivity calculation USEC may employ. This statement was not intended to address the area of applicability of the benchmark experiments in any validation report.

NC-44 When using handbooks to derive subcritical limits, describe the amount of margin used (e.g., 90% of the minimum critical diameter). Describe how the handbooks are validated for use in setting subcritical limits.

> 10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(7), states that the applicant should validate each methodology used for NCS, including "experimental data, reference books, hand calculations, deterministic computer codes, probabilistic computer codes, consensus standards." This is necessary to ensure that processes are subcritical under normal and credible abnormal conditions.

<u>USEC Response</u>

Handbooks are used to provide a starting point for establishing NCS limits. The limits derived from the handbooks must be reviewed with respect to the credible upset conditions involved, the materials of composition of both the fissile fuel and the surrounding reflectors, moderators, and interstitial moderators, and level of heterogeneity of the fuel. Based on that review the limits may be either used as written, incorporated into an operation specific reactivity calculation, or applied in a reduced fashion based on the credible upset conditions.

Handbook values are either the direct result of critical experiments or are a calculational study that examines a particular nuclear parameter to provide a ready reference for future work. In the first case, critical experiments require no validation. In the second case, a calculational study is subject to the same requirements of validation as any other reactivity calculation. Those validation requirements will be confirmed to be met during the NCSE development and review process, or additional calculations will be performed to ensure they are met.

NC-45 Describe how hand calculations are validated for use in setting subcritical limits.

> 10 CFR 70.61(d) requires that all nuclear processes must be assured to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(7), states that the applicant should validate each methodology used for NCS, including "experimental data, reference books, hand calculations, deterministic computer codes, probabilistic computer codes, consensus standards." This is necessary to ensure that processes are subcritical under normal and credible abnormal conditions.

<u>USEC Response</u>

Five different kinds of hand calculations are described in Chapter 5.0 of the License Application. Each type of hand calculation will be discussed to address this question.

Modified two-group diffusion equation – This method is applicable to a small subset of cases that are not particularly representative of the kinds of fissile material operations expected at the ACP. To perform this kind of calculation, it is necessary to limit the fuel mixture to just fuel and moderator (water or graphite). No fast fissions are allowed. Only one fissile unit can be included and that unit must be spherical, cylindrical, or a cube. Finally, the system has to be sufficiently large to be

considered infinite or the reflector around the system must be considered infinite. The parameters used to perform the calculations are obtained from nuclear engineering texts and are experimentally derived values. Between the conservatisms inherent in the calculation and the use of experimentally derived values, no validation of this method is necessary.

Buckling conversion – A buckling conversion is a simple mathematical transformation to convert from one geometry to another. It is applicable to all materials and enrichments and does not require a validation.

Comparative analysis – This kind of analysis is described in the previous question regarding the use of handbooks.

Solid Angle Method – Several additional requirements are imposed for this kind of calculation as described in Chapter 5.0. Most significantly, the maximum allowed $k_{eff}$ of any single unit is 0.80. With this limitation and the other limitations described in Chapter 5.0, the range of applicability is very constrained, and the margin of subcriticality is large. No additional validation is required.

Surface Density Method – This method uses the reactivity of a single unit and applies it to an array to determine the necessary spacing. The reactivity of the single unit is determined either through handbooks as previously described or through reactivity calculations that are validated as described in Chapter 5.0.

NC-46 Expand on your statement in Section 5.4.5.1 that "Computer codes are validated using experimental data from benchmark experiments that, ideally, have geometries and material compositions similar to the systems being modeled." Indicate what course of action will be followed when benchmark experiments with geometry and material composition similar to the systems being modeled are not used.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4, states that "if an applicant intends to conduct activities to which a standard applies and the standard has been endorsed by an NRC Regulatory Guide, then a commitment to comply with all the requirements (i.e., "shalls") is necessary but may not be sufficient to meet the acceptance criteria." ANSI/ANS-8.1-1998 applies to validation and includes the requirement to use experiments similar in composition and geometry. NUREG-1520, Section 5.4.3.4.1(7)(g), states that the applicant should use "plant-specific benchmark experiments." Inclusion of the term "ideally" appears to indicate this is not always the case. In the event this is not the case, knowledge of what other methods will be followed is necessary to ensure processes are subcritical under normal and credible abnormal conditions.

<u>USEC Response</u>

The use of the word "ideally" is to acknowledge that, in a perfect world, there would be sufficient benchmark experiments to exactly represent all the potential geometries and material compositions to be found in the ACP. Of course, there are limited benchmark experiments available and a validation is used to describe the area of applicability and establish the upper safety limit for

reactivity calculations performed with a specific computational platform. The geometries represented in the benchmark experiments are sufficiently diverse that no limit has been placed on the kinds of geometries that can be modeled.

When materials of construction are used that are not represented in the area of applicability, the NCS engineer has several options available to address that situation. First, the specific material can be left out of the model. Second, a different material can be substituted that is within the AOA and provides a similar (or more conservative) amount of neutron moderation, multiplication, or reflection. Third, the material can be included based on a review of its neutron cross sections that conclude no significant impact can occur from that material. Fourth, the material can be included but with an adjustment in its density so that any unknown affect is minimized. Fifth, the material can be included with a reduction to the upper safety limit to account for the additional uncertainty. Lastly, additional benchmark experiments can be added to the validation to specifically include the material. These options are understood by qualified NCS personnel who exercise their engineering judgment to determine the correct course of action. The peer review process provides a second check to ensure any analysis is correct.

NC-47 Justify the use of a minimum margin of subcriticality of 0.02 for ACP operations. Show that this provides adequate assurance of subcriticality.

10 CFR 70.61(d) requires that processes be assured to be subcritical "including the use of an approved margin of subcriticality for safety." This information is required to ensure that a sufficient margin of subcriticality for safety will be used.

USEC Response

The 0.02 margin of subcriticality is an arbitrary margin based partly on historical use, engineering judgment, and the low risk of an accidental criticality associated with the ACP.

Historically, 0.02 has been the margin of safety applied to the Paducah Gaseous Diffusion Plant, the Portsmouth Gaseous Diffusion Plant, and the Lead Cascade. The derivation of the upper safety limit for reactivity calculations includes this arbitrary margin of subcriticality as an additional safety margin to account for potential unknown uncertainties in the validation method. These uncertainties could stem from errors in the benchmark experiment descriptions, errors in the modeling of the benchmark experiments, or errors in the isotopic neutron cross sections used in the neutron transport calculations to determine system reactivity in the computer codes. None of these sources of error in the validation method is expected to be anywhere near the magnitude of 0.02 due to the inherent nature of performing validations. Any significant errors in the description of the benchmark experiments would result in a calculated reactivity very different from 1.00. Similarly, any significant errors in the modeling of the experiments would also result in a calculated reactivity very different from 1.00. Lastly, the neutron cross-section libraries have been developed over the last 50 years by the world's leading nuclear research facilities. The experiments and their models do not include any exotic materials of construction that has not already been validated many times throughout the world. There are dozens of facilities in the United States alone that use the cross section libraries to perform a variety of neutron transport calculations. Any significant deviation of the cross sections from reality would manifest itself in calculational results significantly different

than experimental results. As a registered user of the reactivity code, any errors discovered in the cross section libraries would be quickly disseminated throughout the user community, which includes USEC.

Using engineering judgment USEC concludes that calculated errors in the reactivity calculation are small compared to 0.02. Modern computing platforms allow for the calculated error to be lower than 0.005 and even lower than 0.002 depending on the user parameters selected within the code. With the calculated error at least a factor of four and up to a factor of ten (and possibly more) lower than the arbitrary margin of subcriticality, there is no potential for the calculated error in the reactivity code to jeopardize the margin of subcriticality.

Lastly, the risk of an accidental criticality resulting from ACP operations is inherently low. There are no planned operations involving uranium solutions as a normal case. There are no planned operations involving more than a safe mass of uranium outside the centrifuge processing equipment. Therefore, because virtually all the enriched uranium is stored, handled, and processed within airtight equipment, the inherent risk of a criticality is low and a 0.02 margin of subcriticality is adequate.

NC-48 Provide in the license application a summary description of your validation report for ACP operations (or justify not doing so), for all methods used to determine subcritical limits, including:

a) A summary of the theory of the methodology that is sufficiently detailed and clear to allow understanding of the methodology.
b) A summary of the area or areas to which the validation report applies.
c) A commitment to apply the methodology only in the area or areas of applicability or provide justification for applying the methodology outside the area or areas of applicability.
d) A commitment to use pertinent computer codes, assumptions, and techniques in the methodology.
e) A commitment to properly perform the mathematical operations in the methodology.
f) A commitment to use data based upon reliable and reproducible experimental measurements.
g) A commitment to use plant-specific benchmark experiments and data derived there from to validate the methodology.
h) A commitment to determine the bias, the uncertainty in the bias, the uncertainty in the methodology, the uncertainty in the data, the uncertainty in the benchmark experiments, and the margin of subcriticality for safety, when using the methodology.
i) A commitment to use controlled software and hardware, when using the methodology.
j) A commitment to use a verification process when using the methodology.

10 CFR 70.61(d) requires that all processes be shown to be subcritical under normal and credible abnormal conditions. NUREG-1520, Section 5.4.3.4.1(7)(a)-(j), states that the aforementioned information should be included in the applicant's summary description of its

validation report.

USEC Response

USEC may use the results of reactivity calculations from a variety of sources based on a variety of validation reports subject to the requirements of Chapter 5.0 of the License Application regarding the margin of subcriticality and the confidence interval in the future. The specific validation report used to perform the reactivity calculations for the ISA summary is included as a reference and is available for review at USEC facilities at any time.

The area of applicability is described in the specific validation document supporting a specific reactivity calculation. USEC may modify the referenced validation document in the future subject to the commitments in Chapter 5.0 of the License Application on method and margin of safety and after performance of a facility change evaluation to ensure compliance with the requirements of 10 CFR 70.72. In addition, USEC may use the results of reactivity calculations performed on other operating platforms, hardware platforms, software versions or cross section libraries as long as the validations of those other codes were performed in accordance with the commitments in Chapter 5.0. Due to the large scope of possible reactivity calculations at USEC's disposal, including the area of applicability from a single validation document would not enhance safety or assurance of safety because reactivity calculation results may come from other computational platforms with a unique validation and area of applicability. The safety basis of the reactivity calculations are based on the method of performing the validation described in Chapter 5.0 including the margin of subcriticality and the confidence interval. Therefore, the details associated with a specific validation used to support a specific reactivity result are not sufficiently fixed and unchanging to provide the specific description.

NC-49 Explain your statement in Section 5.4.5.2 of the license application that "scoping and analysis calculations may be performed utilizing various unvalidated computer codes; however, computer calculations of $k_{eff}$ used as the basis for NCS evaluations are confirmed by, or performed using, configuration-controlled codes and cross section libraries for which documented validations are performed..." Clarify whether all calculations used to set subcritical limits are either confirmed by or performed using validated methods (i.e., if not performed using validated methods, is there 100% confirmation using validated methods?).

10 CFR 70.61(d) requires that processes be assured to be subcritical "including the use of an approved margin of subcriticality for safety." NUREG-1520, Section 5.4.3.4.1(3) states that "Methods used to develop NCS limits will be validated..." Knowledge that the limits are based on validated methods is needed to ensure that processes are subcritical under normal and credible abnormal conditions.

USEC Response

Scoping calculations are reactivity calculations that are performed on non-validated computing platforms. These scoping calculations are used by NCS engineers to quickly perform informal reactivity calculations during the development of NCS limits. Any calculations performed on a non-validated computing platform must be repeated on a validated platform to be the basis of any NCS limit, double contingency control, or IROFS.

NC-50 Clarify to which of the currently NRC-endorsed ANSI/ANS-8 series standards USEC is committing, and to which provisions of those standards it is committing.

10 CFR 70.62(a) requires the applicant to establish and maintain a safety program demonstrating compliance with the performance requirements of 10 CFR 70.61. NUREG-1520, Section 5.4, states that "if an applicant intends to conduct activities to which a standard applies and the standard has been endorsed by an NRC Regulatory Guide, then a commitment to comply with all the requirements (i.e., "shalls") is necessary but may not be sufficient to meet the acceptance criteria." In addition, "Any variations from the requirements of the standard should be identified and justified in the application." There are a large number of industry standards that are endorsed in RG 3.71, but which are not discussed in the license application.

USEC Response

Section 1.4 of the License Application lists the various industry codes, standards, and regulatory guidance documents that have been referenced in the license application. The extent to which USEC satisfies each code, standard, and guidance document is identified.

No change to the License Application is required.