Enclosure 3 to AET 05-0085

Submittal of Changed Pages for the License Application and Supporting Documents (Non-Proprietary Information)

Remove and Insert Instructions
Enclosure 3 of AET 05-0085

Remove and Properly Destroy	Insert
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Cover Page – Revision 9	Cover Page – Revision 10
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ULOEP-1 through ULOEP-4	ULOEP-1 through ULOEP-4
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LA-3605-0001

License Application

for the American Centrifuge Plant

in Piketon, Ohio

The American Centrifuge™

USEC's Advanced Uranium Enrichment Technology

Revision 10

Docket No. 70-7004

November 2005

Information contained within
does not contain
Export Controlled Information

Reviewer: D. Hupp
Date: 11/04/05

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LA-3605-0001

LICENSE APPLICATION

for the American Centrifuge Plant in Piketon, Ohio

Docket No. 70-7004

Revision 10

Information contained within does not contain Export Controlled Information

Reviewer: D. Hupp
Date: 11/04/05

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UPDATED LIST OF EFFECTIVE PAGES

Revision 0 – 10 CFR 1045 review completed by L. Sparks on 07/29/04 and the Export Controlled Information review completed by R. Coriell on 07/30/04.

Revision 1 – 10 CFR 1045 review completed by L. Sparks on 03/04/05 and the Export Controlled Information review completed by R. Coriell on 03/10/05.

Revision 2 – 10 CFR 1045 review completed by J. Weidner on 04/29/05 and the Export Controlled Information review completed by R. Coriell on 04/29/05.

Revision 3 – 10 CFR 1045 review completed by J. Weidner on 05/23/05 and the Export Controlled Information review completed by R. Coriell on 05/23/05.

Revision 4 – 10 CFR 1045 review completed by R. Coriell on 06/16/05 and the Export Controlled Information review completed by D. Hupp on 06/16/05.

Revision 5 – 10 CFR 1045 review completed by J. Weidner on 06/21/05 and the Export Controlled Information review completed by D. Hupp on 06/21/05.

Revision 6 – 10 CFR 1045 review completed by J. Weidner on 08/30/05 and the Export Controlled Information review completed by D. Hupp on 08/30/05.

Revision 7 – 10 CFR 1045 review completed by J. Weidner on 09/02/05 and the Export Controlled Information review completed by R. Coriell on 09/02/05.

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Revision 10 – 10 CFR 1045 review completed by J. Weidner on 11/04/05 and the Export Controlled Information review completed by D. Hupp on 11/04/05.

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simultaneously withdrawing two uranium assays. The compression train consists of centrifugal compressors arranged in series with coolers and with recycle capability. Tails withdrawal is used for emergency inventory removal.

The major components that support the withdrawal operations are withdrawal (compression) trains, cold boxes, cold traps, assay spectrometers, and vents.

1.1.5.5.5 Sampling and Transfer Operations

UF_6 sampling and transfer operations for UF_6 product material is carried out in the Customer Services Area of the X-3346 building, also known as the Sampling and Transfer Area. In addition, some sampling of feed and tails cylinders is done to support Nuclear Material Control and Accountability requirements. The area can also be used to blend UF_6 to the proper assay by transferring the appropriate amount of two or more assays to a daughter cylinder.

Since the American Society for Testing and Materials (ASTM) sampling standards necessitate that sampling must be from homogenized UF_6, the design involves liquid UF_6 material in the cylinders and the transfer operations (References 19 and 20). Autoclaves with heating and cooling capability are used to liquefy UF_6 in the cylinders to facilitate sampling and transfer into customer cylinders and then solidification of the UF_6 in the cylinders at the end of the operations. The autoclaves are pressure vessels and are designed to contain a UF_6 release. Electrically heated hot air is the heating medium and cold air is used for cooling.

The major components that comprise the sampling and transfer operations are autoclaves, cold traps, and vents.

1.1.5.5.6 Shipping Operations

The X-3346A building is also the shipping point for emptied cylinders leaving the ACP as well as UF_6 cylinders shipped to fulfill customer product orders (including Russian LEU), and UF_6 cylinders containing feed or depleted material. Any approved UF_6 cylinder may be shipped from this facility. See Figure 1.1-4 (located in Appendix B) for a schematic of the Feed, Withdrawal, and Product Operations.

Filled customer product cylinders, emptied feed cylinders, and other UF_6 cylinders will be prepared for shipment and shipped in accordance with U.S. Nuclear Regulatory Commission (NRC) and DOT regulatory requirements from the X-3346A.

1.1.5.5.7 Waste Handling Operations

Depleted UF_6 tails material is considered a resource material with the ultimate disposition to be determined and is not considered a waste. USEC intends to evaluate possible commercial uses for depleted UF_6. Depleted UF_6 is stored in steel cylinders within cylinder storage yards until this material can be processed in accordance with the disposition strategy established by USEC. Depending upon technological developments and the existence of facilities available prior to the ACP shutdown, the depleted UF_6 may have commercial value and may be marketable for further enrichment or other processes.

Waste generated by the ACP is collected, handled, packaged, segregated, stored, and shipped for off-site treatment/disposal in a safe and environmentally acceptable manner in accordance with applicable state and federal regulations, and plant procedures. Waste accumulation areas are established throughout the ACP as necessary to meet these regulatory requirements.

The ACP obtains waste management services from a qualified provider licensed/certified by the NRC or an agreement state. Waste may be further sampled/measured to assist in determining the proper waste characterization and proper disposal/treatment method.

Potential waste streams generated include Low-Level Radioactive Waste, LLMW, RCRA Hazardous Waste, Sanitary/Industrial Waste, Recyclable Waste, and Classified/Sensitive Waste.

Waste generating activities are evaluated for waste minimization opportunities to reduce the volume and toxicity of waste generated to the degree determined to be economically practicable.

A further description of the transportation impacts can be found in Section 4.2 and the waste impacts can be found in Section 4.13 of the Environmental Report for the American Centrifuge Plant.

1.1.5.5.8 Liquid and Air Waste Discharge Points

Waste discharge points are categorized by either liquid (water) or air.

For liquid, wastewater discharges are handled by different means depending upon the originating source: process, sanitary, or storm water.

No process wastewater is intentionally discharged from the liquid effluent tanks. Accumulated water in these tanks are sampled and managed according to analytical results. Trained professionals using approved spill response protocols and spill response equipment will promptly contain liquid spills within the process buildings. Spill materials will be collected, sampled, analyzed, and managed in accordance with applicable federal and state laws. The only intentional process wastewater discharge resulting from plant operations is the blow down from the TWC (Tower Cooling Water) system. This cooling water system is not interconnected with the MCW (Machine Cooling Water) system located in the process buildings. The MCW system is a closed-loop system, which requires minimal makeup water, but does not have blow down discharges.

Sanitary wastewater (e.g., showers, toilets, etc.) located within the area discharge to the plant sanitary sewer system and ultimately to the X-6619 Sewage Treatment Plant. Treated sanitary wastewaters are discharged from X-6619 directly to the Scioto River via an underground pipeline via a permitted NPDES outfall.

Storm water runoff from the ACP area, along with some once-through cooling water (sanitary water), drain to a pair of holding ponds (X-2230N West Holding Pond and X-2230M

1.2 Institutional Information

USEC Inc. is the applicant for the ACP license.

1.2.1 Corporate Identity

USEC is a global energy company and its subsidiary, the United States Enrichment Corporation, is the world's leading supplier of enriched uranium fuel for commercial nuclear power plants. USEC, including its wholly owned subsidiaries, was organized under Delaware law in connection with the privatization of the United States Enrichment Corporation.

USEC is responsible for the design, manufacturing, assembling, installation, operation, maintenance, modification, and testing of the ACP in Piketon, Ohio.

USEC's principal office is located at 6903 Rockledge Drive, Bethesda, MD 20817. USEC is listed on the New York Stock Exchange under the ticker symbol USU. Private and institutional investors own the outstanding shares of USEC. The principal officers of USEC are listed below and are citizens of the United States.

John K. Welch, President and Chief Executive Officer

Philip G. Sewell, Senior Vice President
Robert Van Namen, Senior Vice President
Ellen C. Wolf, Senior Vice President and Chief Financial Officer
W. Lance Wright, Senior Vice President

The mailing address for the ACP is:

USEC Inc.
American Centrifuge Plant
P. O. Box 628
Piketon, Ohio 45661

The NRC has issued Certificates of Compliance to the United States Enrichment Corporation, a wholly owned subsidiary of USEC, to operate the Paducah and Portsmouth GDPs (Docket Numbers 70-7001 and 70-7002, respectively). Consistent with the requirements in 10 CFR 76.22 and in connection with the issuance of these Certificates, the NRC has determined that USEC is neither owned, controlled, nor dominated by an alien, a foreign corporation, or a foreign government. Issuance of a license to USEC would be consistent with the requirements of 10 CFR 40.38 and 70.40, since the NRC concluded that USEC has satisfied similar requirements in 10 CFR 76.22. Furthermore, more recently the NRC has issued a license to USEC to operate the Lead Cascade Demonstration Facility (Docket No. 70-7003) pursuant to 10 CFR Part 70. There have been no changes in ownership or control that would invalidate the NRC's previous findings.

Further, issuance of a license would not be inimical to the common defense and security of the United States or to the maintenance of a reliable and economical domestic source of enrichment services. To the contrary, issuance will support those important goals. Commercial deployment of American Centrifuge technology by USEC will help ensure the United States will continue to maintain a reliable and economic, domestic source of enriched uranium. Deployment of the ACP is in furtherance of the goals of the June 17, 2002, DOE-USEC Agreement to "facilitate the deployment of new, cost effective advanced enrichment technology in the United States on a rapid schedule." It will enable USEC to deploy a modern, efficient and reliable enrichment plant to supplement and replace its current 50+ year-old GDPs.

1.2.1.1 Site Location

The ACP is located on the DOE reservation. The reservation is located at latitude 39°00'30" north and longitude 83°00'00" west measured at the center of the reservation on approximately 3,700-acres of federally owned land in Pike County, Ohio, one of the state's lesser populated counties. The largest cities within an approximate 50-mile radius are Portsmouth, Ohio, located approximately 27 miles to the south, and Chillicothe, Ohio, located approximately 27 miles to the north. The reservation occupies approximately 750 security-fenced acres and is located about one and one half miles east of U.S. Route 23 and two miles south of U.S. Route 32, and two miles east of the Scioto River.

USEC, through its subsidiary the United States Enrichment Corporation, leases a significant portion of the DOE reservation from the DOE. The ACP is within the space leased by the United States Enrichment Corporation and occupies approximately 200 acres of the southwest quadrant of the CAA. USEC and its agents will conduct USEC activities within the ACP buildings/facilities and access and egress thereto, in accordance with this license application.

1.2.1.2 Other Reservation Activities

The United States Enrichment Corporation operates the GDP in accordance with a NRC Certificate of Compliance issued pursuant to 10 CFR Part 76 requirements. These operations include:

- Maintaining the GDP in Cold Standby status under a contract with the DOE;
- Performing uranium deposit removal activities in the cascade facilities; and
- Removing technetium-99 (^{99}Tc) from potentially contaminated uranium feed in accordance with the June 17, 2002 agreement between DOE and the United States Enrichment Corporation.

The United States Enrichment Corporation also possesses a license for radioactive material operations from the State of Ohio for the conduct of laboratory and associated support activities. This license encompasses laboratory analyses, in-field analyses for radioactive material deposits, health physics survey, and characterization activities.

- ASME N509-1989, *Nuclear Power Plant Air-Cleaning Units and Components*

  New and existing fixed HEPA filter systems needed to ensure compliance with release limits or to control worker radiation exposure satisfy the provisions of this standard with the following exceptions/clarifications:

  Section 5.2 - Do not satisfy; No credit is taken for absorbers

  Section 5.5 - Do not satisfy requirements for air heaters

  Section 8.0 - Quality assurance requirements for applicable systems are identified in the QAPD

  Appendix A - Do not sample adsorbents

  Appendix B - Do not use allowable leakage guidance

  Appendix C – This appendix is used as guidance only

  Appendix D - The manifold qualification program uses this appendix as guidance only

  For the reference to this standard, see Section 4.6.1 of this license application.

- ASME N510-1989, *Testing of Nuclear Air-Treatment Systems*

  New and existing fixed HEPA filter systems that satisfy the requirements of ASME N509 and are needed to ensure compliance with release limits or to control worker radiation exposure satisfy the provisions of this standard with the following exceptions/clarifications:

  Section 6.0 - Only satisfy this section for new seal-welded duct systems or for connections to a system where this section has been previously applied

  Section 7.0 - Do not use guidance for monitoring frame pressure leak tests

  Existing fixed HEPA filter systems that do not satisfy the requirements of ASME N509 are tested using the requirements of this standard or another industry accepted standard as guidance only

  For the reference to this standard, see Section 4.6.1 of this license application.

1.4.5 American Society for Testing and Materials

- ASTM C787, *Standard Specification for Uranium Hexafluoride for Enrichment*, 1996

  USEC will satisfy the provisions of this standard. All other uranium that does not meet the requirements of ASTM - C787 for reprocessed UF_6 may be accepted for storage and subsequent dispositioning, but will not be introduced to the enrichment

process, with the exception of small amounts (e.g., 50 pounds UF_6) associated with sampling, sub-sampling, and analyses required to establish receiver's values.

For the reference to this standard, see Tables 1.2-1 and 1.2-2 of this license application.

- ASTM C996, *Standard Specification for Uranium Hexafluoride Enriched to Less than 5 Percent U-235*, 1996

  USEC will satisfy the provisions of this standard. All other uranium that does not meet the requirements of ASTM – C996 for reprocessed UF_6 may be accepted for storage and subsequent dispositioning, but will not be introduced to the enrichment process, with the exception of small amounts (e.g., 50 pounds UF_6) associated with sampling, sub-sampling, and analyses required to establish receiver's values.

  For the reference to this standard, see Tables 1.2-1 and 1.2-2 of this license application.

- ASTM C1052, *Standard Practice for Bulk Sampling of Liquid Uranium Hexafluoride*, 1996

  USEC will satisfy the provisions of this standard.

  For the reference to this standard, see Section 1.1.5.5.5 of this license application and Section 3.5.5 of the ISA Summary.

1.4.6 National Fire Protection Association

- NFPA 10-2002, *Standard for Portable Fire Extinguishers*

  USEC satisfies the provisions of this standard with the following exceptions/clarification:

  The provisions of this standard were used as guidance in determining the size, selection, and distribution of portable fire extinguishers. USEC will satisfy the provisions of this standard for modifications to the facility except as documented and justified by the Authority Having Jurisdiction (AHJ).

  For references to this standard, see Section 7.4.3 of this license application.

- NFPA 13-2002, *Standard for the Installation of Sprinkler Systems*

  USEC satisfies the provisions of this standard with the following exceptions/clarification:

The provisions of this standard were used as guidance for the design and installation of wet and dry pipe automatic sprinkler systems. In addition, the Process Building meets the definition of Ordinary Hazard Occupancies (Group 2) as stated in this standard and the fire protection system exceeds the sprinkler discharge requirement for this type of occupancy. USEC will satisfy the provisions of this standard for modifications to the facility except as documented and justified by the AHJ.

For the reference to this standard, see Section 7.3.1 of this license application.

- NFPA 15-2001, *Standard for Water Spray Fixed Systems for Fire Protection*

  USEC will satisfy the provisions of this standard for modifications to the facility except as documented and justified by the AHJ.

  For the reference to this standard, see Section 7.3.1 of this license application.

- NFPA 25-2004, *Standard for Inspection, Testing, and Maintenance of Water-Based Protection*

  USEC will satisfy the provisions of this standard except as documented and justified by the AHJ.

  For the reference to this standard, see Section 7.1.2 of this license application.

- NFPA 30-2003, *Flammable and Combustible Liquids Code*

  USEC satisfies the requirements of this standard with the following exceptions/clarification:

  Above ground storage tanks were installed using the provisions of this standard for guidance only. USEC will satisfy the provisions of this standard for modifications to the facility except as documented and justified by the AHJ.

  For references to this standard, see Section 7.3 of this license application.

- NFPA 51B-2003, *Standard for Fire Prevention During Welding, Cutting, and Other Hotwork*

  USEC uses the provisions of this standard as guidance for the review of hot work permitting.

  For the reference to this standard, see Section 7.1.1 of this license application.

- NFPA 70-2005, *National Electrical Code*

  This NFPA standard was used as guidance for the installation of the electrical systems.

  For the reference to this standard, see Section 7.3 of this license application.

- NFPA 72-2002, *National Fire Alarm Code*

  This NFPA standard was used as guidance for the installation of the fire alarm systems.

  For the reference to this standard, see Section 7.3.2 of this license application.

- NFPA 75-2003, *Standard for the Protection of Electronic Computer/Data Processing Equipment*

  This NFPA standard was used as guidance for the protection of the computer systems.

  For the reference to this standard, see Section 7.0, Table 7.1-1 of this license application.

- NFPA 80-1999, *Standard for Fire Doors and Fire Windows*

  USEC will satisfy the provisions of this standard except as documented and justified by the AHJ.

  For the reference to this standard, see Section 7.0, Table 7.1-1 of this license application.

- NFPA 101-2003, *Life Safety Code*

  USEC uses the provisions of this standard as guidance for the review of emergency egress paths.

  For the reference to this standard, see Section 7.3 of this license application.

- NFPA 220-1999, *Standard on Types of Building Construction*

  USEC uses the provisions of this standard as guidance for the review of building construction.

  For the reference to this standard, see Section 7.0 Table 7.1-1 of this license application.

- NFPA 232-2000, *Standard for the Protection of Records*

  USEC satisfies the provisions of this standard with the following exceptions/clarification:

  > As described in Section 11.7.1.8 of the licensing application, there are several acceptable methods for the storage of permanent records. If the NFPA 232 method of storage in 2-hour-rated containers is used, any exceptions to this standard will be documented and justified by the AHJ.

  For the reference to this standard, see Section 11.7.1.8 of this license application.

- NFPA 241-2000, *Standard Safeguarding Construction, Alteration, and Demolition Operations*

  USEC uses the provisions of this standard as guidance for the review of construction activities.

  For the reference to this standard, see Section 7.1.1 of this license application.

- NFPA 801-2003, *Standard for Fire Protection for Facilities Handling Radioactive Material*

  USEC will utilize this standard for any future modifications to the fire protection program as stated in Section 7.1.1 of this license application.

  For the reference to this standard, see Section 7.1.1 of this license application.

1.4.7 Nuclear Regulatory Commission Guidance

- Regulatory Guide 1.59, Revision 2, *Design Basis Floods for Nuclear Power Plants*

  USEC satisfies the provisions of this Regulatory Guide (RG) to the extent applicable to a Part 70 licensee.

  For references to this standard, see Sections 1.3.4.3 and 1.3.4.3.2 of this license application.

- Regulatory Guide 3.67, Revision 0, *Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities*

  USEC utilized the provisions of this RG as guidance for DOE reservation Emergency Plan.

  For references to this RG, see Sections 8.1 and 8.2 of this license application.

- Regulatory Guide 3.71, Revision 0, *Nuclear Criticality Safety Standards for Fuels and Material Facilities*

  This RG endorses ANSI/ANS-8 standards. USEC commits to ANSI/ANS-8.1-1983, ANSI/ANS-8.19-1996, and ANSI/ANS-8.20-1991 as described above.

  For the reference to this RG, see Section 5.5 of this license application.

- Regulatory Guide 8.13, Revision 2, *Instructions Concerning Prenatal Radiation Exposure*

  USEC satisfies the provisions of this RG.

  For the reference to this RG, see Section 4.1.1 of this license application.

- Regulatory Guide 1.109, Revision 1, *Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I*

  USEC satisfies the provisions of this RG to the extent applicable to Part 70 licensee.

  For references to this RG, see Sections 9.2.2.1.2 and 9.2.2.2.2 of this license application.

- NUREG-1065, *Acceptable Standard Format and Content for the Fundamental Nuclear Material Control Plan Required for Low Enriched Uranium Facilities*

  This NUREG was used for general reference purposes in structuring the FNMCP for the ACP.

  For references to this NUREG, see Section 15.0 of the FNMCP for the ACP.

- NUREG-1513, *Integrated Safety Analysis Guidance Document*

  This NUREG was used as a general reference and guidance document during the development of the ISA and ISA Summary.

  For references to this NUREG, see Sections 3.1.2, 3.2, 3.3, 5.5, 6.4, 7.2.2, 7.6, 8.2, 9.2.3, and 9.4 of this license application.

- NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, March 2002*

  This NUREG was used as a general reference and guidance document during the development of the license application. This license application follows the format and guidelines of the NUREG.

For references to this NUREG, see Sections 1.0, 1.4, 3.2, 5.5, 6.4, 7.6, 8.2, 9.2.3, 9.4, 10.11, and 11.9 of this license application.

- NUREG-1601, *Chemical Process Safety at Fuel Cycle Facilities*

  This NUREG was used as a general reference and guidance document during the development of the license application.

  For the references to this NUREG, see Section 6.14 of this license application.

- NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*

  This NUREG was used as a general reference and guidance document during the development of the license application.

  For the references to this NUREG, see the Environmental Report for the ACP.

- NUREG-1757, *Consolidated NMSS Decommissioning Guidance, Volumes 1, 2, and 3, Final Report, September 2003*

  This NUREG was used as a general reference and guidance document during the development of the decommissioning section of the license application.

  For the references to this NUREG, see Section 10.10.1 of this license application.

- NUREG/BR-0006, *Instructions for Completing Nuclear Material Transfer Reports*

  This NUREG describes the requirements for reporting nuclear material transactions to the national database. 10 CFR 74.15 requires that instructions in this NUREG be followed.

  USEC satisfies the provision of this NUREG.

  For the reference to completion of Nuclear Material Transaction Reports, see Section 10 of the FNMCP for the ACP.

- NUREG/BR-0007, *Instructions for the Preparation and Distribution of Material Status Reports*

  This NUREG describes the requirements for submitting material status reports to the national database. 10 CFR 74.13 requires that instructions in this NUREG be followed.

USEC satisfies the provisions of this NUREG to the extent possible for uranium enrichment facilities.

For the reference to this NUREG, see Section 8.7 of the FNMCP for the ACP.

- NUREG/BR-0096, *Instruction and Guidance for Completing Physical Inventory Summary Reports, NRC Form 327*

  This NUREG provides line-by-line instructions for preparing NRC Form 327, Special Nuclear Material and Source Material Physical Inventory Summary Reports.

  USEC satisfies the provisions of this NUREG.

  For the reference to this NUREG, see Section 12.4 of the FNMCP for the ACP.

- NUREG/CR-4604, *Statistical Methods for Nuclear Material Management*

  This NUREG contains techniques and formulas used to estimate random and systematic error variances associated with nuclear material measurement methods.

  For the reference to this NUREG, see Section 9.1.1 of the FNMCP for the ACP.

- NUREG/CR-5734, *Standard Format and Content for the Fundamental Nuclear Material Control Plan Required for Low Enriched Uranium Enrichment Facilities*

  This NUREG is used to establish the Detection Quantity for evaluation of nuclear material inventory differences.

  For the reference to this NUREG, see Section 9.4 of the FNMCP for the ACP.

- NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook*

  Portions of this NUREG were used as a general reference and guidance document in the development of the accident analyses in the ISA.

  For the reference to this NUREG, see Section 3.3 of the ISA Summary for the ACP.

- NRC Information Notice No. 88-100: *Memorandum of Understanding between NRC and OSHA Relating to NRC-Licensed Facilities (53 FR 43950, October 31, 1988)*, December 23, 1988

  USEC has reviewed the information contained in this Information Notice.

  For the reference to this IN, see Section 6.4 of this license application.

1.4.8 Institute of Electrical and Electronics Engineers

Several of the Institute of Electrical and Electronics Engineers (IEEE) standards identified in this section include the term "Class 1E." USEC is taking exception to utilizing the term "Class 1E." The term utilized by USEC for items relied on for safety (IROFS), per 10 CFR Part 70, is "IROFS." IROFS quality levels (i.e., QL-1 or QL-2) are established and defined in Section 2.0 of the QAPD. The IROFS, including their quality class, are based on the analyzed, credible conditions identified in the ISA. IROFS (and non-IROFS that may directly affect the safety function of an IROFS) will be designed, procured, maintained and documented in accordance with the requirements of the "Configuration Management Program" included in Chapter 11.0 of this license application.

- ANSI/IEEE 336-1985, *ANSI/IEEE Standard Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities*

  USEC commits to periodic inspections and testing of items relied on for safety will be in accordance with Clause 7.

- For the reference to this standard see Sections 2.6.4 and 2.6.8 of the ISA Summary for the ACP.

- IEEE 338-1987 *Standard Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems*

  USEC commits to utilizing IEEE 338 Sections 1 (Scope), 2 (Definitions), 4 (Basis), and 5 (Design Requirements); and portions of Sections 3 (References) and 6 (Testing Program Requirements).

  USEC takes exception to portions of the contents of IEEE 338 Sections 3 and 6 and Annex A for the following reasons:

  Section 3 — The ACP operations procedures will govern plant operations in lieu of ANSI/ANS 3.2-1982.

  Section 3 — In Section 3 (References) USEC commits to only the applicable portions of the IEEE Standards 7-4.3.2 and IEEE 603.

  Section 6.1 (11) The ACP operations procedures will govern plant operations in lieu of ANSI/ANS 3.2-1982.

  Note - Annex A provides only "informative" references.

  For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 7-4.3.2-1993, *Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations*

  USEC commits to utilizing IEEE 7-4.3.2 Clauses 1 (Scope), 3 (Definitions) and 7 (Execute Features) and portions of Clauses 5 (Safety System Criteria), 6 (Sense and Command Features), and 8 (Power Source Requirements).

  USEC takes exception to IEEE 7-4.3.2 Clauses 2 (References), 4 (Safety System Design Basis), and Annexes A through H. These areas are not considered to be applicable or necessary due to their nuclear reactor content and redundancy with other IEEE standards and USEC's ISA. Annexes A through H provide only "informative" details and references. USEC also takes exception to the contents of IEEE 7-4.3.2 Clause 5 for the following reasons:

Sections 5.3 and 5.3.1	USEC commits to ASME NQA-1-1994 Part II, Subpart 2.7, Basic Requirement 11 as defined in Section 1.4.3 of this license application.
Section 5.3.2	USEC does not intend to qualify existing commercial computers.
Section 5.15	Reliability analysis methods and calculations are as specified in the ISA for the ACP.

  For the reference to this standard see Section 2.6.4 of the ISA Summary for the ACP.

- IEEE 308-2001, *Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations*

  USEC commits to utilizing IEEE 308 Section 3 (Definitions) and portions of Sections 1 (Overview), 4 (Principle Design Criteria), 5 (Supplemental Design Criteria), 6 (Surveillance and Test Requirements), and 8 (Documentation).

  USEC takes exception to IEEE 308 Sections 2 (References), and portions of Sections 1 (Overview), 4 (Principle Design Criteria), 5 (Supplemental Design Criteria), 6 (Surveillance and Test Requirements), and 8 (Documentation) for the following reasons:

Section 1	Figure 1 is not applicable to the ACP. USEC will provide reliable electrical power to all IROFS that require electrical power to function during postulated events analyzed in the ISA. Back-up power is required only as needed to provide the reliability of the IROFS as credited in the ISA. Note that IROFS that fail safe on loss of power do not require back-up power systems.
Section 2	The ACP does not commit to all of the standards listed in this section.

Section 4.2	Figure 3 is not applicable to the ACP. USEC will provide reliable electrical power to all IROFS that require electrical power to function during postulated events analyzed in the ISA. Back-up power is required only as needed to provide the reliability of the IROFS as credited in the ISA. Note that IROFS that fail safe on loss of power do not require back-up power systems.
Section 4.7	Documents will be identified and controlled in accordance with Sections 6.0 and 17.0 of the QAPD and plant procedures.
Sections 4.10 and 5.2.1	These Sections are not applicable to the ACP as written and are modified as follows: A back-up power supply may be utilized to provide reliable power to an IROFS that requires electrical power to function during postulated events analyzed in the ISA. The power circuits from the back-up power supply to the IROFS will be independent and redundant if necessary to provide the reliability of the IROFS as credited in the ISA. The control circuits from the control room to the IROFS will also be independent and redundant if necessary to provide the reliability of the IROFS as credited in the ISA.
Section 4.11	A non-IROFS load that needs reliable standby power may be connected to an IROFS power system in accordance with portions of Figure 3 and IEEE 384.
Sections 5.2.4 and 5.3.1	These Sections are not applicable to the ACP. The ACP will follow applicable portions of IEEE 446 for guidance related to standby power supplies and DC power systems.
Section 5.3.3.6	Battery systems for IROFS that are not failsafe will be tested in accordance with approved ACP maintenance procedures.
Section 6.1	The "illustrative" continuous monitoring surveillance methods listed in Table 3 are optional (i.e., surveillance monitoring by a computer is not mandatory).
Section 7	This section does not apply to a uranium enrichment facility.
Section 8.1	The ACP does not commit to performing the studies listed as Items a through g; applicable studies will be conducted and documented.

The ACP electrical IROFS systems will utilize commercial-grade equipment approved or rated by nationally-recognized industry standards and reputable organizations such as IEEE, Underwriters Laboratory Inc. (UL), Factory Mutual

(FM), NFPA, and National Electrical Manufacturers Association (NEMA). Procurement and installation will be in accordance with the QAPD.

For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 323-2003, *Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations*

USEC commits to IEEE 323 Clauses 1 (Scope), 3 (Definitions), 4 (Principles), and 7 (Documentation).

USEC takes exception to IEEE 323 Clause 2 (References), 5 (Methods), 6 (Program), and Annex A. Annex A provides only "informative" references (37), whereas, only certain portions of two IEEE standards (7-4.3.2 and 603) listed in Clause 2 (References) are applicable to the ACP.

For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

Per Section 4.1, "For equipment located in a mild environment for meeting its functional requirements during normal environmental conditions and anticipated operational occurrences, the requirements shall be specified in the design/purchase specifications. A qualified life is not required for equipment located in a mild environment and which has no significant aging mechanisms." For purposes of the ACP, the equipment will be located in a mild environment in which no significant radiation exposure or aging mechanisms are identified or expected. The accident conditions anticipated at the ACP are mild in nature. The worst conditions are due to fire scenarios which can produce high temperature, subsequent water spray exposure from the fire suppression system, and exposure to UF_6 due to a release.

Therefore, USEC will not classify any equipment as Class 1E in accordance with Sections 5 and 6, but will include the other applicable requirements identified in the IEEE standards, i.e., design control (additional design package rigor, equipment specifications, critical design characteristics, QC inspection criteria, vendor testing requirements, special equipment storage and handling requirements), quality control, post maintenance testing, preventive maintenance/testing, surveillances and documentation control/retention.

The primary equipment that is required to fulfill the IROFS function, including necessary support system components back to the point of redundancy, is considered to be part of the IROFS boundary. All IROFS boundary components will be designed, installed and maintained to the applicable IEEE requirements identified and committed to above and in accordance with the QAPD. In addition to meeting the above requirements, the ACP electrical IROFS systems will utilize commercial-grade

equipment approved or rated by nationally recognized industry standards and reputable organizations such as IEEE, UL, FM, NFPA, and NEMA.

- IEEE 379-2000, *Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*

  USEC commits to utilizing IEEE 379 Sections 1 (Overview), 3 (Definitions), 5 (Requirements), and 6 (Design Analysis), and portions of Section 4 (Single-Failure Criterion). Applicable portions of IEEE 379 will be used as a guideline for the design of IROFS systems since this standard supplements IEEE 603 by providing guidance in the application of the single-failure criterion for safety systems in nuclear power stations.

  USEC takes exception to the contents of IEEE 379 Sections 2 and 4 and Annex A. The exceptions that USEC takes to the contents of IEEE 379 are:

Section 2	The ACP does not commit to all of the standards listed in this section.
Section 4	These Sections are not applicable to the ACP as written and are modified as follows: a back-up power system may be utilized to provide reliable power to an IROFS that requires electrical power to function during postulated events analyzed in the ISA. The power circuits from the back-up power system to the IROFS will be independent and redundant if necessary to provide the reliability of the IROFS as credited in the ISA. The control circuits from the control room to the IROFS will also be independent and redundant if necessary to provide the reliability of the IROFS as credited in the ISA.

  Annex A provides only "informative" references.

  For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 384-1992, *Standard Criteria for Independence of Class 1E Equipment and Circuits*

  USEC commits to utilizing IEEE 384 Clauses 1 (Scope), 2 (Purpose), 4 (Definitions), 5 (Independence Criteria), 6 (Separation Criteria), and 7 (Specific Isolation Criteria). Applicable portions of IEEE 384 will be used as a guideline for the design of IROFS systems since this standard supplements IEEE 603 by providing guidance criteria for implementation of the independence requirements for Class 1E systems.

  USEC takes exception to the contents of IEEE 384 Clause 3 and Annex A. USEC does not commit to all the standards listed in Clause 3. Annex A provides only "informative" references.

The ACP electrical IROFS systems will utilize commercial-grade equipment approved or rated by nationally recognized industry standards and reputable organizations such as IEEE, UL, FM, NFPA, and NEMA. Procurement and installation will be in accordance with the QAPD.

For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 446-1995, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*

USEC commits to utilizing IEEE 446 Clauses 1 (Scope) and 2 (Definitions) and portions of Clauses 6 (Protection), 7 (Grounding), 8 (Maintenance), and 10 (Reliability).

USEC takes exception to the contents of IEEE 446 Clauses 3, 4, 5, and 9. These clauses are not considered to be applicable or necessary due to their content and/or redundancy with other IEEE standards and NFPA 70 *National Electrical Code*. In addition, USEC takes exception to portions of IEEE 446 Clauses 6, 7, 8, and 10 for the following reasons:

Section 6.11	USEC does not commit to all of the standards listed in this section.
Section 7.14	USEC does not commit to all of the standards listed in this section.
Section 8.1.3	Maintenance personnel will receive training on-site, not at the manufacturer's location. It is anticipated that ACP supervisory personnel will receive factory training and then develop an on-site training program to be utilized for on-site training of ACP maintenance personnel; additional on-site training provided by the manufacturer may be an option if deemed appropriate.
Section 8.4.3.a) 1)	Battery charging system inspections are anticipated to be monthly in accordance with Table 8-1, not weekly.
Section 8.4.3.a) 2)	The diesel-generator (D-G) system testing will not consist of full-load, weekly testing. A plant procedure for periodic testing of the D-G set will be developed in accordance with existing plant D-G testing practices based upon nearly 50 years operating experience and the D-G manufacturer's recommendations.
Section 8.5.2	Daily inspections of uninterruptible power supply (UPS) systems will not be required; inspections are anticipated to be monthly in accordance with Section 8.5.2.b.

Section 8.5.2.a) The listed UPS "weekly inspection" items are anticipated to be monthly and included in the routine inspections listed in Section 8.5.2.b).

Section 8.6.1 A battery system maintenance procedure will be developed in accordance with existing plant battery system practices based upon nearly 50 years operating experience and the battery system manufacturer's recommendations. It is anticipated that general battery system inspections will be performed monthly in accordance with Table 8-1.

Section 8.9 USEC does not commit to all of the standards listed in this section.

Sections 10.4 a.) thru c.) The UPS final factory testing steps will be based upon the capacity (size) of the system, the precise type of batteries, the system configuration, and the intended function of the installed system.

Section 10.9 USEC does not commit to all of the standards listed in this section.

For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 603-1998, *Standard Criteria for Safety Systems for Nuclear Power Generating Stations*

USEC commits to utilizing IEEE 603 Clauses 1 (Scope), 3 (Definitions) and 7 (Execute Features) and portions of Clauses 5 (Safety System Criteria), 6 (Sense and Command Features), and 8 (Power Source Requirements).

USEC takes exception to the contents of IEEE 603 Clauses 2 (References), 4 (Safety System Design Basis), and Annexes A, B, and C. These clauses are not considered to be applicable or necessary due to their nuclear reactor content and redundancy with other IEEE standards and USEC's ISA. Annexes A, B, and C provide only "informative" details and references. In addition, USEC takes exception to portions of contents in IEEE 603 Clauses 5, 6, and 8 for the following reasons:

Sections 5 and 5.1 Single-failure criterion will be applied only where needed to provide the reliability of the IROFS credited in the ISA.

Sections 5.3 and 5.3.1 USEC commits to ASME NQA-1-1994 Part II, Subpart 2.7, Basic Requirement 11 as defined in Section 1.4.3 of this license application.

Section 5.4	Qualification - Use and qualification of equipment is specified in USEC's IEEE 323 commitment above.
Sections 5.6.1 and 5.6.2	USEC's goal is to design any safety system that might not survive all design basis events such that it is electrically failsafe (i.e., does not require electrical power to perform its intended safety function).
Section 5.15	Reliability analysis methods and calculations are as specified in the ACP ISA. The ACP condition notice system will be monitored and evaluated.
Section 6.2	Manual control requirements may not be applicable to all IROFS; the need will be evaluated during the final design phase.
Section 8.1	Safety systems that are failsafe upon loss of electrical power will not require redundant power sources.

For the reference to this standard see Sections 2.6.4 and 2.6.7 of the ISA Summary for the ACP.

- IEEE 1023-2004, *IEEE Recommended Practice for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations and Other Nuclear Facilities*

  USEC will satisfy the provisions of this standard.

  For the reference to this standard see Section 2.6 of the ISA Summary for the ACP.

- IEEE 1050-1996, *Guide for Instrumentation and Control Equipment Grounding in Generating Stations*

  USEC commits to utilizing IEEE 1050 Clauses 1 (Overview), 3 (Definitions), 4 (Design), 5 (System Grounding), 6 (Shield Grounding), and 7 (Testing).

  USEC takes exception to the contents of IEEE 1050 Clause 2 and Annexes A and B. USEC does not commit to all of the standards listed in Clause 2. Annexes A and B provide only "informative" references.

  For the reference to this standard see Section 2.6.4 of the ISA Summary for the ACP.

1.4.9 Other Codes, Standards, and Guidance

- ASCE 7-2002, *Minimum Design Loads for Buildings and Other Structures*

  USEC will satisfy the provisions of this standard.

For the reference to this standard, see Sections 1.3.3.1 and 1.3.3.3 of this License Application.

- Federal Guidance Report No. 11, "*Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*

  The data contained in Tables 2-1 and 2-2 of this document used to calculate dose conversion factors for radionuclides of concern. This data is also used to calculate the Derived Air Concentrations (DACs) listed in Table 4.7-4.

  For the reference to this guidance document, see Section 4.7.4 of this license application.

- American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A, June 1980 Edition

  USEC satisfies the provisions of this recommended practice.

  For the reference to this recommended practice, see Section 2.0 of the QAPD for the ACP.

- IAEA Safeguards Technical Manual, Part F, Volume 3

  The method used to establish sample sizes for item monitoring activities was obtained from this manual.

  For the reference to this recommended practice, see Section 7.4 of the FNMCP for the ACP.

- ANSI/ISA 67.04.01-2000 *Setpoints for Nuclear Safety-Related Instrumentation*

  The IROFS related setpoints are determined utilizing methodologies in accordance with this standard. USEC commits to utilizing ISA 67.04.01 Clause 1 (Purpose), 2 (Scope), 3 (Definitions), 4 (Establishment of Setpoints), 5 (Documentation), and 6 Maintenance of Safety-Related Setpoints).

  USEC takes exceptions to the contents of ISA 67.04.01 Clauses 7 (References) and 8 (Informative References). USEC does not commit to all the standards listed in Clauses 7 and 8.

  For the reference to this standard see Section 2.6.10 of the ISA Summary for the ACP.

1.5 References

1. NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*

2. DOE/EIS-0360, Draft Environmental Impact Statement (DEIS) for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site, December 2003

3. USEC 2003 Annual Report

4. U.S. Bureau of the Census, 2000, "Profiles of General Demographic Characteristics: 2000 Census of Population and Housing, Ohio", U.S. Department of Commerce, accessed on February 24, 2004, Website: http://www.census.gov/prod/cen2000/dp1/2kh39.pdf

5. USEC-2004-SP, USEC Inc. e-mail correspondence entitled "Data on Surrounding Areas," dated February 9, 2004

6. LA-3605-0002, Environmental Report for the American Centrifuge Plant

7. USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant, Safety Analysis Report

8. United States National Oceanic and Atmospheric Administration, National Environmental Satellite Data, and Information Service, National Climactic Data Center, Asheville, NC, Climatology of the United States, No. 81, 33 Ohio, Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000, February 2002, [NOAA 2003b]

9. Huff, Floyd A. and Angel, James R., Rainfall Frequency Atlas of the Midwest, Bulletin 71 (MCC Research Report 92-03) Midwestern Climate Center, Climate Analysis Center, National Weather Service, National Oceanic and Atmospheric Administration, Illinois State Water Survey, A Division of the Illinois Department of Energy and Natural Resources [NOAA 2003c]

10. Ohio Department of Natural Resources, Website accessed February 24, 2004, http://www.dnr.state.oh.us/parks/parks/lkwhite.htm

11. U.S. Department of the Interior, U.S. Geological Survey, Reston, VA, and Website: http://www.usgs.gov/index.html

12. Tetra Tech, Inc. correspondence, "Methodology for the 5-mile Population Grids," November 2002

13. United States Oceanic and Atmospheric Administration, National Climactic Data Center, Asheville, NC, Waverly and Piketon Ohio Weather Stations data from 1930 through 2002, and Website: (http://nndc.noaa.gov/onlinstore.html) [NOAA 2003a]

14. Regulatory Guide 1.59, Revision 2, *Design Basis Floods for Nuclear Power Plants*

15. ORO-EP-123, "Preliminary Safety Analysis Report for the Gas Centrifuge Enrichment Plant," Portsmouth, OH, U.S. Department of Energy Oak Ridge Operations Office, July 1980

16. ORO-EP-120, "Seismic Design Criteria for the Gas Centrifuge Enrichment Plant – GCEP," U.S. Department of Energy Oak Ridge Operations Office, Office of the Deputy Manager for Enrichment Expansion Projects, Oak Ridge, Tennessee, December 1978

17. Beavers, J. E., Manrod, W. E., and Stoddart, W. C., K/BD-1025/R1, "Recommended Seismic Hazards Levels for Oak Ridge, Tennessee; Paducah, Kentucky; Fernald, Ohio; and Portsmouth, Ohio," U.S. Department of Energy Reservations, Union Carbide Corporation – Nuclear Division, Oak Ridge, TN, 37830, December 1982

18. "Gas Centrifuge Enrichment Plant, Portsmouth, Ohio, Geotechnical Investigation," Law Engineering Testing Company, Project MK7502, Contract No. EY-77-C-05-5614, April 1978

19. USEC-651, "The UF_6 Manual – Good Handling Practices for Uranium Hexafluoride," Revision 8, January 1999

20. ASTM C1052, *Standard Practice for Bulk Sampling of Liquid Uranium Hexafluoride*, 1996

21. Reference Deleted

22. Nuclear Regulatory Commission, Environmental Assessment of the USEC American Centrifuge Lead Cascade Facility, January 2004

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2.1.1 Senior Vice President

The Senior Vice President, located at headquarters, reports to the President and Chief Executive Officer. The Senior Vice President has overall responsibility for safe operation of the ACP and has shutdown and stop work authority for the ACP. If such authority is exercised, the Senior Vice President must concur with restart of shutdown operations.

The Senior Vice President has, as a minimum, a bachelor's degree in engineering or the physical sciences or equivalent technical experience, six years nuclear experience, and ten years of management experience, which may be concurrent with the nuclear experience.

The USEC Board of Directors appoints the Senior Vice President.

2.1.2 Director, Regulatory and Quality Assurance

The Director, Regulatory and Quality Assurance, located at headquarters, reports to the Senior Vice President.

This position has responsibility for the management of regulatory and quality assurance functions and the ACP policy system. This individual is the primary day-to-day interface with the NRC and has overall responsibility for management of activities related to license requirements for the ACP. Although this individual works closely with the Director, American Centrifuge Plant and key plant personnel, he/she is independent from production, plant operating cost, and production schedule concerns, and has the authority to stop work if there is a failure to adhere to regulatory requirements. If such authority is exercised, the Director, Regulatory and Quality Assurance must concur with restart of shutdown operations.

This position has, as a minimum, a bachelor's degree in engineering or physical sciences or equivalent technical experience, and six years of nuclear experience, and six years of management experience, which may be concurrent with the nuclear experience.

The Senior Vice President appoints the Director, Regulatory and Quality Assurance.

2.1.2.1 Regulatory Manager

The Regulatory Manager, located at the ACP, reports to the Director, Regulatory and Quality Assurance.

The Regulatory Manager is responsible for regulatory oversight functions, environmental compliance, and commitment management. The Regulatory Manager, as delegated by the Director, Regulatory and Quality Assurance, and Director, American Centrifuge Plant, maintains the day-to-day interface with NRC representatives on matters of regulatory compliance. The individual has responsibility for managing the plant change process and ensuring the plant

change reporting requirements are met. The Regulatory Manager is also responsible for implementing the Corrective Action Program; ensuring incident investigations are performed; and providing management with data to assure that corrective actions and commitments are properly addressed and managed to facilitate compliance with implementing policies and procedures.

The Regulatory Manager has shutdown and stop work authority in any part of the ACP where activities are not being conducted in accordance with applicable regulatory requirements. If such authority is exercised, the Regulatory Manager must concur with restart of shutdown operations.

The Regulatory Manager has, as a minimum, a bachelor's degree in engineering or the physical sciences or equivalent technical experience, and four years of nuclear experience.

The Director, Regulatory and Quality Assurance appoints the Regulatory Manager, with concurrence from the Director, American Centrifuge Plant.

2.1.2.2 Quality Assurance Manager

The QA Manager, located at the ACP, reports to the Director, Regulatory and Quality Assurance.

The QA Manager has the responsibility to exercise oversight of procurement, refurbishment, construction, start-up, and plant operations to ensure that the health and safety of the public and workers are adequately protected; to ensure compliance with safety, safeguards, and quality requirements; and to ensure implementation of the Quality Assurance Program Description (QAPD) for the ACP, policies, procedures, and management expectations.

The QA Manager has direct access to the Senior Vice President for quality assurance matters and has shutdown and stop work authority, when necessary, to ensure protection of public and worker health and safety; provide for common defense and security; and to ensure regulatory and quality compliance. If such authority is exercised, the QA Manager must concur with restart of shutdown operations. The QA Manager has access to information at the plant related to safety, safeguards, and quality. This manager interacts directly with the Director, American Centrifuge Plant, other managers, and key ACP personnel, and participates (as desired) in any evaluations or discussions related to safety, safeguards, and quality. The QA Manager informs the Director, American Centrifuge Plant and the Director, Regulatory and Quality Assurance about safety, safeguards, and quality issues and compliance.

The QA Manager provides independent oversight and assessment to ensure that the health and safety of the public and workers are adequately protected; to ensure compliance with safety, safeguards, and quality requirements; and to ensure implementation of policies, procedures and management expectations.

dissemination of information regarding plant activities to the incident commander during emergencies, and making notification of events to regulatory agencies.

The Operations Supervisors are responsible for providing operational support of centrifuge machine assembly, transport, installation, pump down, integrated system testing, start-up, operation, and repair. The Operations Supervisors also direct the operation of systems within the facilities necessary to support enrichment operation. Operations Supervisors authorize the restart of equipment that has been shutdown in a routine fashion when the prerequisites and limitations of the associated operating procedure are met.

Operations Supervisors have, as a minimum, a high school diploma or satisfactory completion of the General Educational Development test, and three years of industrial/chemical/nuclear plant operations, maintenance, or engineering experience. Operations Supervisors must have one year of supervisory experience or completion of a supervisory training course.

The Operations Manager appoints Operations Supervisors, with the concurrence of the Manager, Enrichment Operations.

2.1.3.3.3 Maintenance Manager

The Maintenance Manager reports to the Manager, Enrichment Operations.

The Maintenance Manager is responsible for the safe and reliable performance of preventive and corrective maintenance and support services on facilities and equipment with the exception of centrifuge machines. This includes troubleshooting; maintenance of logs and records; work planning/control to initiate, screen, evaluate, and prioritize maintenance work; and coordinating shop maintenance. The Maintenance Manager is also responsible for integrated planning and scheduling. This includes managing daily work control activities, developing an integrated work schedule, and coordinating development of work control guidelines.

In the absence of the Manager, Enrichment Operations, the Maintenance Manager may be delegated the responsibilities and authorities of the Manager, Enrichment Operations. The Maintenance Manager has shutdown and stop work authority in any part of the operation for which he/she has responsibility. If such authority is exercised, the Maintenance Manager must concur with restart of shutdown operations.

The Maintenance Manager has, as a minimum, a bachelor's degree in engineering or the physical sciences or equivalent technical experience, and four years of nuclear experience.

The Maintenance Manager is appointed by the Manager, Enrichment Operations, with concurrence from the Director, American Centrifuge Plant.

2.1.3.3.3.1 Maintenance Supervisors

Maintenance Supervisors report to the Maintenance Manager.

Maintenance Supervisors are responsible for supervising the maintenance of electrical equipment; electronic and pneumatic instrumentation and controls; and computers and programmable controllers. Maintenance Supervisors are also responsible for supervising mechanical maintenance (i.e., valve, pump, and mechanical repair and replacement). In addition, these supervisors are responsible for supervising other maintenance activities (i.e., painting, carpentry, sheet metal, and machinist activities). The Maintenance Supervisors have shutdown and stop work authority in any part of the operation for which they have responsibility.

Maintenance Supervisors have, as a minimum, a high school diploma or satisfactory completion of the General Educational Development test, and three years of industrial/chemical/nuclear plant operations, maintenance, or engineering experience. Maintenance Supervisors must have one year of supervisory experience or completion of a supervisory training course.

The Maintenance Manager appoints Maintenance Supervisors.

2.1.3.3.4 Shift Crew Composition

The minimum operating shift crew consists of an Operations Supervisor, a Radiation Protection/Industrial Hygiene technician, and one operations technician per process building. Other personnel, such as NCS, will be available on an as needed basis.

2.1.4 Corporate Security Director

The Corporate Security Director, located at headquarters, reports to the Senior Vice President, Human Resources and Administration.

The Corporate Security Director is responsible for the strategic direction of security operations and programs, including physical, personnel, and information security. The Corporate Security Director has shutdown and stop work authority for activities not being conducted in accordance with applicable security requirements. If such authority is exercised, the Corporate Security Director must concur with restart of shutdown operations.

The Corporate Security Director has, as a minimum, a bachelor's degree or equivalent technical experience, six years security experience, and six years of management experience, which may be concurrent with the security experience.

The Senior Vice President, Human Resources and Administration appoints the Corporate Security Director.

2.1.4.1 Security Manager

The Security Manager, located at the ACP, reports to the office of the Corporate Security Director.

The Security Manager is responsible for the ACP safeguards and security services. The Security Manager has direct access to the Director, American Centrifuge Plant concerning security matters and has shutdown and stop work authority for activities not being conducted in accordance with applicable security requirements. If such authority is exercised, the Security Manager must concur with restart of shutdown operations.

The Security Manager has, as a minimum, a bachelor's degree or equivalent technical experience, and four years security experience.

The Corporate Security Director appoints the Security Manager, with the concurrence of the Director, American Centrifuge Plant.

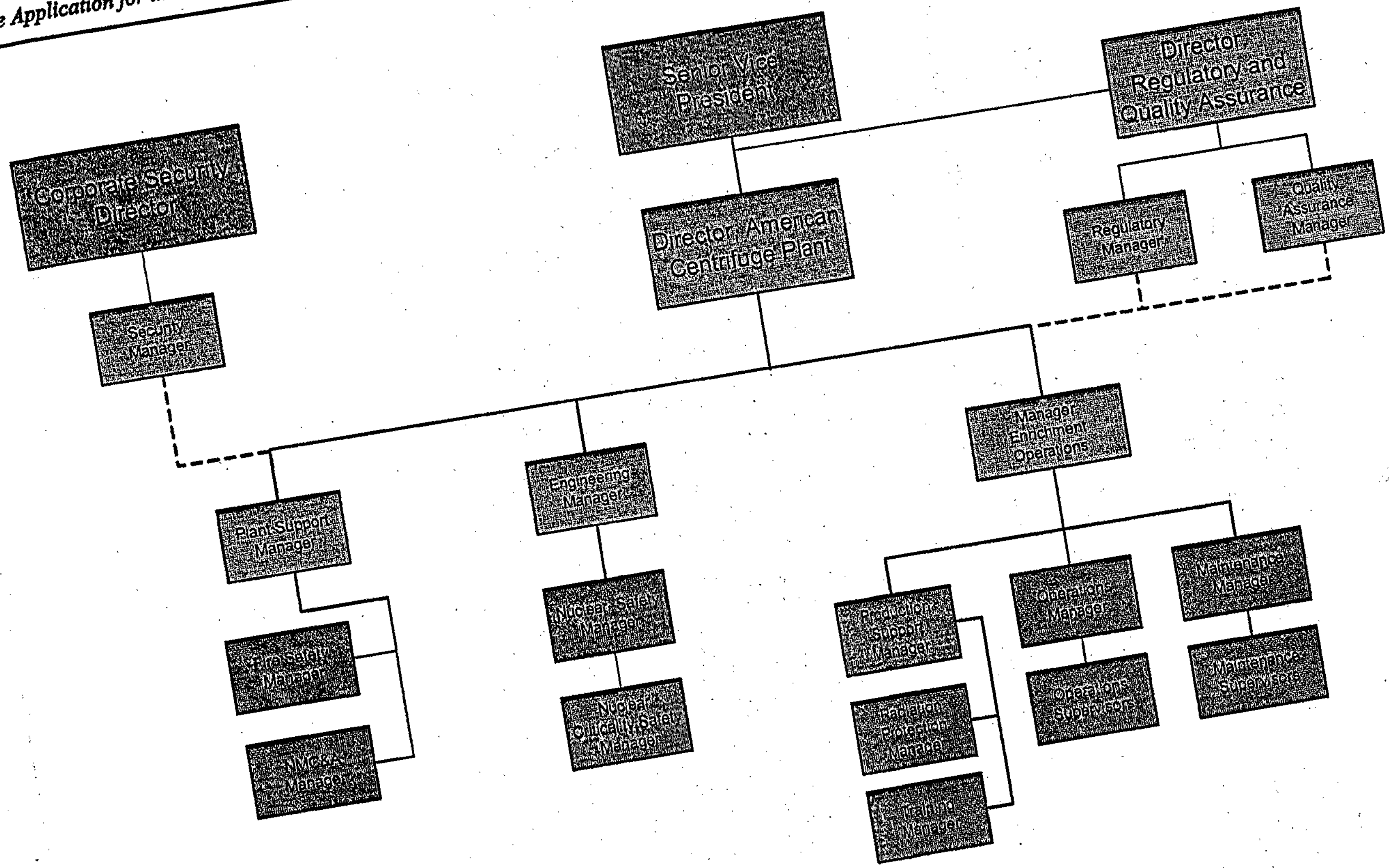

Figure 2.1-1
American Centrifuge Plant Organization Chart

the postulation of a release resulting from an event with an unreasonable event frequency (e.g., a release from a 50-year return period seismic tremor). ICs become a part of the list of IROFS.

Initial conditions that are associated with a specific or a limited number of events are identified in the event description of those events in bold type font followed by IROFS numbers. Initial conditions that apply to many events, such as the 10 weight percent ^{235}U assay limit, are not repeated in the event description of each event.

3.1.2.3.2.2 Unmitigated Hazard Evaluation

Information related to Unmitigated HE is collected and organized in "Hazard Evaluation Tables." These tables are useful as a guide for performing HE, and they provide an effective format for documenting both unmitigated and mitigated HE results. HE Tables are generated to address the non-screened hazards associated with the systems and areas identified during the hazard identification process. The HE Tables may be based on facility sections, systems, activities, or areas, and generally include the following information:

- Event Number and Category;
- Event Description (including location, release mechanism, material at risk, initial conditions specific to the event, and hazard source);
- Cause(s);
- Unprevented Event Frequency Level;
- Unmitigated Consequence Level (categorized as Low, Intermediate or High); and
- Unprevented/Unmitigated Risk Bin (categorized as A or B).

For an unmitigated analysis, estimated values are provided in the columns pertaining to Unprevented Event Frequency and Unmitigated Consequences. Additionally, any preventive and mitigative controls that may be available within the facility are listed in their respective HE Table columns as provided in Appendix C of the ISA Summary. However, no credit is taken for the available controls during the unmitigated hazard analysis (unless the control is listed as an Initial Condition).

3.1.2.3.2.2.1 Event Number and Category

In the HE Tables, events are identified by a unique sequential reference. The first two letters typically represent the facility section (i.e., "PB" for ACP Process Building) as indicated in Section 3.1.2.3.1.1 above, the first number represents the event category as described below, and the second number (following the hyphen) represents the event sequential number.

Events are categorized according to the nature of the postulated release mechanism. Table A-3 in Appendix A of the ISA Summary provides some additional information regarding

event categories and associated hazardous material and energy sources. The categories are as follows:

- Fire (Category 1)
- Explosion (Category 2)
- Loss of Containment/Confinement (Category 3)
- Direct Radiological/Chemical Exposure (Category 4)
- Nuclear Criticality (Category 5)
- External Hazards (Category 6)
- Natural Phenomena (Category 7)

3.1.2.3.2.2.2 Event Description

A brief description of a postulated event is given in this column of the HE Tables. The event description defines the nature of the event and includes the event type, location, release mechanism, Material-at-Risk (MAR), initial conditions (if applicable), and hazard source. Using the results of the Hazard Identification process as a basis, the HA team develops event scenarios for each facility system or area where a potential exists for a release of hazardous energy and/or material. The scenarios cover a broad spectrum of credible events for a given hazard; from low consequence events, for which procedures or equipment may be credited in providing adequate protection, to credible high consequence events. Events typically progress to and result in a release of hazardous material.

3.1.2.3.2.2.3 Cause

The event cause specifically states the failure, error, operational, and/or environmental condition that initiates the progression of occurrences that leads to a release of hazardous material (the event). The cause(s) need to be clearly identified in order to support event release frequency estimates. The cause(s) listed typically identify the major contributors and do not necessarily provide an exhaustive list of every possible cause. The Hazard Identification Tables (Appendix B of the ISA Summary) are used as a guide in developing specific causes for release events. When multiple causes are apparent, they are separately numbered in the HE Table Cause column for the event.

3.1.2.3.2.2.4 Unprevented Frequency Level

3.1.2.3.2.2.4.1 Internal and External Initiated Events

Unprevented (sometimes termed "Unmitigated") frequency level evaluation is a predominantly qualitative (or semi-quantitative) process that involves assigning a frequency

level to each event (event is defined as the progression of occurrences necessary to release hazardous material, i.e., from initiator, through to the point of release) in the HE Tables. The term "unprevented" is used to designate a release event frequency derived during the unmitigated HE before preventive features are credited to reduce the event frequency. Frequency levels with numerical descriptions, which are based on NUREG-1520, Section 3.4.3.2 (9) Quantitative Definitions of Likelihood (Reference 3) are summarized in Table A-4, Frequency Evaluation Levels in Appendix A of the ISA Summary. Specifically, a "Highly Unlikely" event is defined as an event with a frequency less than 10^{-5} occurrences per year, while an "Unlikely" event is defined as an event with frequency range greater than or equal to 10^{-5} and less than 10^{-4} occurrences per year. An event considered to be "Not Unlikely" is defined as an event with a frequency range of greater than 10^{-4} occurrences per year. Table A-4 in Appendix A of the ISA Summary provides a summation of the frequency evaluation levels used in the hazard evaluation tables.

All credible events should be included in the HE Tables. A "Credible" event is considered to be an event that could occur at a frequency greater than or equal to 10^{-6} occurrences per year. Less frequent events may also be included, but are not required.

Sources of event frequency could include generic initiator database information and failure rate data from other sites (of which portions may be evaluated as applicable to ACP operations), centrifuge event history, natural phenomena frequency levels, engineering calculations, analyst judgment, and enrichment process expert opinion. The frequency level is recorded in the HE Tables in Appendix C of the ISA Summary according to the Table A-4 lettering scheme. Uncertainties in frequency levels are accommodated by erring in the conservative direction from best-estimate value. This practice is particularly important when an event frequency is just below the next highest frequency level. For example, the HA team considers the sources of frequency-related information, the methods used to evaluate that information, and the uncertainty associated with the evaluation process. With this information, the team might collectively decide to designate an event "Unlikely" if the event has been estimated to have an event release frequency at the high (more frequent) end of the "Highly Unlikely" frequency level.

The basis for each Unprevented Event Frequency Level listed in the HE Tables is provided in Appendix E of the ISA Summary. In general, to arrive at the unprevented frequency level for an event, a frequency for the initiator is determined through engineering judgment or by using existing applicable data when available. Then given the initiator frequency, conditional probabilities for each step in the progression to a release are estimated and combined with the initiator frequency to yield an event (release) frequency in terms of occurrences/year. During the unmitigated phase of the HA, a control is not credited for its preventive properties when estimating the unprevented event frequency (unless the control is credited as a preventive Initial Condition in the determination of the initial unprevented frequency). If an event has multiple causes, an event frequency is developed for each cause and the cumulative event frequency is used as the overall event frequency listed in the Unprevented Frequency Level column of the table.

3.1.2.3.2.2.4.2 Natural Phenomena Hazards

For Natural Phenomena Hazard (NPH) events the severity of the design basis event (DBE) and its associated return period establish the design basis for the facility. The frequency ranges provided in Appendix A of the ISA Summary, Table A-4, are used to determine the unprevented frequency level. By design, there will be no adverse consequences to the workers or the public from a DBE. A less frequent (and more severe) event is not postulated, consistent with the philosophy that the facilities are designed to withstand the DBE. The DBE frequency for the major NPH events is provided in Table A-10 in Appendix A of the ISA Summary.

3.1.2.3.2.2.5 Unmitigated Consequence Level

Event consequences are documented by specifying the impact on the receptors. For unmitigated HA purposes, consequences are defined as the dose or exposure at specified receptor locations based upon unmitigated release of hazardous material. Consequences are a function of the type and characteristics of the hazard, the quantity of hazardous material released, the release mechanism, relative location of the release, and any relevant transport characteristics. Consequences are determined from (1) simple source term calculations, (2) existing safety documentation, and/or (3) qualitative assessment. The HA team utilizes its discretion, expertise, and knowledge of facility hazards to select one or more of the above methods appropriate for consequence determination. As in frequency evaluation, the consequence errs in the conservative direction, especially for those events with consequences at the high end of a given level. During unmitigated consequence determination, a Structure, System, and Component (SSC) or administrative control is not credited for its mitigative properties (except in those cases where the control is being credited as a mitigative IC in the determination of the initial unmitigated consequences).

Consequences are evaluated at various receptor locations to assess health effects associated with the postulated event. Table A-5 in Appendix A of the ISA Summary gives the consequence levels for radiological releases and Table A-6 provides the consequence levels for chemical releases, along with their relationship to specified receptor locations, using the maximally exposed individual at each receptor location. Appendix I of the ISA Summary presents the environmental consequences to comply with the Performance Requirements presented in 10 CFR 70.61(c)(3). The consequences presented in Tables A-5 and A-6 comply with the Performance Requirements presented in 10 CFR 70.61(b)(1-4) and 10 CFR 70.61(c)(1-4). Receptors and their locations are as follows:

Off-site Off-site receptors are the public or everyone outside the site boundary or Controlled Area. Off-site doses or chemical exposures are conservatively estimated (semi-quantitatively) for the public at a distance from the point of release to the nearest site boundary as follows:

Facility	Off-site Receptor Distance in meters (ft)
Feed and Customer Service Building, X-3346	500 (1,640)
Feed and Product Shipping and Receiving Building, X-3346A	500 (1,640)
Interconnecting Process Piping, X-2232C	500 (1,640)
Cylinder Storage Areas – X-745G, X-745H, X-745G-2, X-7746E, X-7746N, X-7746W, X-7746S, and X-7756S	500 (1,640)
Transportation Routes	500 (1,640)
Process Buildings, X-3001 and X-3002 (also includes Process Support Building, X-3012)	700 (2,297)
Recycle/Assembly Facility, X-7725	700 (2,297)
Centrifuge Training and Test Facility, X-7726	700 (2,297)
Interplant Transfer Corridor, X-7727H	700 (2,297)
Product and Tails Withdrawal Building, X-3356	800 (2,624)

WCA Workers in the Controlled Area are workers typically outside the restricted area, but within the controlled area of the site boundary. For evaluation purposes, these workers are located outside the last possible barrier from the hazard and at the worst possible location. Doses or chemical exposures are estimated (semi-quantitatively) for the WCA receptor at a distance of 100 meters (m). Typically, this would represent a point near to the exterior walls of the analyzed facility, but far enough outside that releases could have the potential to reach ground level.

WRA Workers in the Restricted Area are workers inside the facility. This category of receptors includes those workers in the immediate area of the hazard, and those workers in the same room or building who would quickly become aware of the hazardous condition and evacuate immediately. Doses or chemical exposures for the WRA are estimated qualitatively, but in all cases it is assumed that the WRA receives a dose at least as significant as the dose received by the WCA.

The Unmitigated Consequence Level column of the HE Tables indicate the estimated unmitigated impact of the release event on each of the three receptors in terms of the consequence bins of "High," "Intermediate," and "Low" as described in Table A-5 for radiological consequences and Table A-6 for chemical consequences in Appendix A of the ISA Summary.

Consequences are estimated from simple source term calculations, and/or qualitative assessment. Prior to determining the consequences of an airborne release of radionuclides, the Source Term (ST) for the radionuclides must be determined under the assumed conditions. Using the ST as input, the dose to each receptor is then determined.

3.1.2.3.2.2.5.1 Source Term Derivation

Radiological Consequences

In order to have conservative estimates of consequences from the accidental release of the UF_6 and UO_2F_2 inventory relating to the ACP operations, source term estimates are performed. For the type of inventory in the ACP process systems, the airborne pathway of released UF_6 and UO_2F_2 is of primary concern. The airborne source term is typically estimated by the following five-component linear equation taken from DOE-HDBK-3010-94 (Reference 7) as suggested in the *Nuclear Fuel Cycle Facility Accident Analysis Handbook*, NUREG/CR-6410 (Reference 8).

Source Term (ST) = MAR x DR x ARF x RF x LPF

where:

MAR = Material-at Risk: amount of hazardous material available to be acted upon by a given physical stress,

DR = Damage Ratio: fraction of MAR actually impacted by the accident,

ARF = Airborne Release Fraction: the coefficient used to estimate the amount of material suspended in air as an aerosol, vapor or gas and thus available for airborne transport due to physical stress from a given accident,

RF = Respirable Fraction: fraction of airborne radionuclides or chemical aerosols that can be transported through air and inhaled into the human respiratory system, and

LPF = Leak Path Factor: fraction of radionuclides or chemical aerosols in the air transported through some confinement, deposition or filtration mechanism.

The product of the MAR x DR was conservatively determined in the unmitigated analysis on an event by event basis to estimate that quantity of the available material which could be acted upon by the event, taking into consideration the nature of the event, and the distribution of

the material in the vicinity of the event. The combination of ARF and RF is selected from DOE-HDBK-3010-94 (Reference 7) based on conservative assumptions regarding the physical form of the material and the available energy during an event. The ARF/RF values depend on the event type (e.g., fire, explosion, impact, loss of confinement) and the form of the hazardous material released (e.g., predominantly UF_6 and HF gas, uranium bearing solution, and UO_2F_2 particulate). These tabulated values may be modified by calculations based on physical properties of the materials involved and the system being evaluated. A conservative value of 1.0 is typically used for the LPF in the unmitigated analysis.

The ARFs and RFs used for the consequence determination are categorized by the release mechanism and material form. The release mechanisms used are as follows:

- Fire
  - Events where the hazardous material confinement mechanism is breached by fire or is impacted by the fire.

- Explosion
  - External Explosion – Events caused by ignition of fuels or explosive gas, e.g., hydrogen generation, vehicle fuel tanks, etc.
  - Internal Explosion – Generation of explosive concentrations of flammable gases in a steel container (centrifuge casing) as a result of decomposition of contained materials due to heat, friction, etc. triggered by heat, static charge, or spark.
  - Pressurized release – Material is vented out of a container due to built up pressure.

- Loss of Containment/Confinement
  - Ambient release – Breach events with resulting release of material (e.g., leaks, etc.)
  - External Impacts/Fall – Mishandling and dropping events, impacts from external sources.

The material form during a release is:

- Predominantly Gas – UF_6, and HF from the reaction of UF_6 with moist air.

- Particulate – UO_2F_2 from the reaction of UF_6 with moist air, and UO_2F_2 stored in B-25 boxes.

- Liquid – waste containing uranium bearing solution stored in the Satellite Accumulation Areas throughout the ACP facilities.

The ARFs and RFs listed in Table 4.4-1 of the ISA Summary were taken from the DOE Handbook on Airborne Release Fractions, DOE-HDBK-3010-94 (Reference 7). The bounding release fractions were selected.

Once doses for the Public and WCA receptors are determined, these consequences are assigned as "High," "Intermediate," and "Low" according to Table A-5 in Appendix A of the ISA Summary using the radiological consequence levels for each specified receptor. The indicated consequence level bin (High, Intermediate, Low) for the WRA receptor, however, is selected qualitatively by identifying the calculated 100 m (WCA) receptor dose for each event as an initial baseline reference point. For release events, the WRA would be aware of a nearby release, as UF_6 releases are readily identified by sight, unpleasant odor, and physical discomfort if inhaled. Thus, it was assumed that the WRA would promptly relocate to avoid the release. For these events, the WRA consequence level was assumed to be equal to the WCA receptor, who is assumed to be unaware of the release.

WRA exposure equivalent to the WCA exposure is explained by using a simple expanding gas hemisphere as a release model in most cases. Assuming that the gas hemisphere radius expands at a rate of 1 m/s and the receptor walks away from the release point at 1 m/s within the cloud, it can be shown that the airborne chemical concentration levels drop off by approximately a factor of 100 within a radius of approximately 40-50 m. Workers in restricted areas could evacuate at a faster rate, putting themselves ahead of the leading edge of the expanding cloud or minimizing exposure during evacuation even if they evacuate in the direction of the plume.

For criticality events, since the consequences only take place in a localized area (well under 100 meter distance), the dose received by the WRA is assumed to be "High" and the dose expected for the WCA and the Off-site public is assumed to be "Low."

<u>Chemical Consequences and Chemical Consequence Standards</u>

Exposure levels resulting from the accidental release of UF_6/HF were semi-quantitatively, or in the case of the WRA, qualitatively, assessed to determine airborne concentrations at each receptor. Each chemical release consequence is evaluated using the source term equation above, incorporating the same DR, ARF x RF values that were applied in the radiological consequence analysis in order to conservatively estimate the amount of UF_6/HF that becomes airborne (source term) as a result of the event. In general, the maximum off-site and on-site concentrations are then calculated by multiplying the source term by an appropriate dispersion factor (χ/Q) for the respective locations (WCA: 100 m, and Off-site: 500 m, 700 m or 800 m). Similar to the radiological case above, downwind airborne concentration values for UF_6/HF releases are estimated using a χ/Q spreadsheet that calculates straight-line Gaussian plume dispersion for the receptors of interest. For the WCA, χ/Q is evaluated with a wind speed of 4.5 m/s and D atmospheric stability class. For the off-site public, χ/Q is evaluated with a wind speed of 1.0 m/s and F atmospheric stability class. Release duration depends on the nature of the event. Explosion, fire, and impact/leak events are assumed to have a 3-minute, 20-minute and 8 hour release duration, respectively. For fire events that do not involve any cylinders, the release will be assumed to occur over 20 minutes to account for the time to involve sources and breach of containment. When a cylinder is subject to fire, the internal pressure of the cylinder will build up to the rupture pressure resulting in a sudden release. In the ISA, the fire induced cylinder rupture is treated as explosion with a 3-minute release duration. The 8-hour time for impact/leak events reflects the expected conditions for low-energy steady-state releases resulting

from simple breach of containment events. Although release rates varied, once the material was released from its confinement, LPFs from the building were assumed to be 1.0 for events in the unmitigated consequence analysis.

In the ISA Summary, two simple diffusion models were developed as source term input into the straight-line Gaussian plume model spreadsheet based on a calculation for molecular diffusion from breaches in the UF_6 confinement in which no heating is involved. For releases not resulting from fire, the pre- and post-processing steps to account for plume rise and heavy gas behavior become less critical to the evaluation. The HGSYSTEM code, which is a refined Gaussian model, is not necessary to achieve the appropriate level of accuracy in this situation. Even for releases from cylinders containing liquid UF_6, the key is the size of the release relative to the surrounding atmosphere. For the liquid cylinder drop event, a flash model is developed for the evaluation of the source term. The ISA does not attempt to develop a cylinder fire model but instead uses the results from the simulation analysis used in the Cylinder Yard SAR. For additional detail with regard to chemical consequence determination for specific events and groups of similar events, refer to Appendix D, Event Consequence Development, of the ISA Summary.

The calculated airborne concentrations from the release and dispersion models estimated at the receptors of interest are then compared to the chemical consequence limits selected by the ISA team. The chemical consequence limits selected are the Emergency Response Planning Guidelines (ERPGs) given in Table A-6 of Appendix A of the ISA Summary. The ERPGs are airborne concentration limits used for emergency response personnel, below which are believed that nearly all individuals could be exposed for up to one hour without experiencing certain health effects. The ERPG-1, ERPG-2, and ERPG-3 values for UF_6 are 5 mg/m^3, 15 mg/m^3, and 30 mg/m^3, respectively. Since UF_6 can readily react with the moisture in the air forming uranium compounds and HF, the chemical effects of HF have to be considered also. The ERPG-1, ERPG-2, and ERPG-3 values for HF are 1.5 mg/m^3, 16.4 mg/m^3, and 41 mg/m^3, respectively. Special ERPG values for 10-minute exposures are also used for HF, with the ERPG-1, ERPG-2, and ERPG-3 values being 1.5 mg/m^3, 41 mg/m^3, and 139 mg/m^3, respectively (Reference 9). Instead of using the ERPG values for uranium compounds, the ISA uses the uranium intakes of 10 mg, 30 mg, and 40 mg as the equivalency for ERPG-1, ERPG-2, and ERPG-3, respectively (Reference 10). From Table A.1-1 (Reference 11), the 50 percent lethality limit of soluble uranium compounds uptake is 1.63 mg U/kg body weight. With a 50 percent retention, it can be shown that the 50 percent uranium lethal intake is 228 mg for a person of 70 kg (154.4 lb). As a result, the ISA uses a 40 mg intake, which is approximately half of the 50 percent lethal intake as the equivalency of the ERPG-3. Comparison of the calculated chemical airborne concentrations at the receptor to the appropriate ERPG values (or uranium intake values) allows the assignment of a chemical consequence level of High, Intermediate, or Low to each receptor as outlined in Table A-6. Unless otherwise stated, exposures are assumed to be for one hour for all receptors and the one-hour ERPG values will be used.

High consequences for the Off-site receptor are generally based on airborne concentrations exceeding the ERPG-2 value (or 30 mg uranium intake), while Intermediate consequences to the Off-site receptor are based on exceeding the ERPG-1 value (or 10 mg uranium intake). High consequences to the WCA and WRA receptors are based on airborne concentrations exceeding the ERPG-3 value (or 40 mg uranium intake), while intermediate consequences to the WCA and WRA receptors are based on concentrations exceeding the ERPG-2 value (or 30 mg uranium intake). For those events that involve only the release of UF_6 from cylinders or pipes in the absence of fire, the rate of diffusion of UF_6 is generally very low such that the UF_6 has sufficient time to react with air and the product UO_2F_2 has time to deposit or plate out. Only the peak HF concentrations are used to compare with the ERPG values for both on-site and off-site receptors during these events. The consequence classification for HF is based upon the peak HF concentration at any time during the event.

Environmental Consequences

Environmental consequences were addressed by the ISA Team when considering the credible accident scenarios where release quantities exceeded the levels established by the Performance Requirements of 10 CFR 70.61(c)(3). The methods used and results are provided in Appendix I of the ISA Summary.

3.1.2.3.2.2.6 Unmitigated Risk Level

Using event frequency and consequence levels, the events are "binned" in frequency-consequence space to assess relative risk in accordance with 10 CFR 70.61. A risk rank for each receptor is individually determined for both radiological consequences and chemical consequences. The objective of risk binning is to focus attention on those events that pose the greatest risk to the public and workers. Higher risk events are candidates for additional analysis and/or selection of IROFS to reduce the risk.

Tables A-7, A-8, and A-9 of the ISA Summary are risk binning matrices for the three receptor locations considered in the ISA [i.e., WRA (close-in), WCA (100 m), and Off-site (500 m, 700 m, or 800 m)]. Table A-7 is the risk binning matrix for the Worker in the Restricted Area, who is typically located anywhere inside the facility with the hazardous release or hazardous condition. Table A-8 is the risk binning matrix for the Worker in the Controlled Area (100 m receptor) located outside the facility. Table A-9 is the risk binning matrix for off-site receptors (Public).

In each of these tables, a rectangular matrix defines bins in frequency-consequence space. Each bin that is lettered with the letter "A" indicates that 10 CFR 70.61 Performance Requirements are exceeded, in which case IROFS must be implemented to reduce the risk. Alternately, bins designated with the letter "B" indicates that 10 CFR 70.61 Performance Requirements are met, and no IROFS are required.

Accidents that are considered not to be "Credible" (i.e., events having a frequency less than 10^{-6}/year) are generally not shown, but would have a risk rank of "B." Accidents that have Low consequences have a risk rank of "B." In either case, the risk rank of "B" requires no

further analysis or designation of IROFS to control risk (unless the control is an IC, in which case the control would be designated as an IROFS).

The HE Tables in Appendix C of the ISA Summary provide a bin letter in the unmitigated risk level column for both radiological and chemical consequences, representing risk for each receptor location for each of the postulated release events.

3.1.2.3.2.3 Available Preventive and Mitigative Controls

3.1.2.3.2.3.1 Preventive Controls

A preventive control is any feature that may be relied upon to reduce the frequency of a hazardous release event (up to the point of release). The selection of preventive controls is made without regard to any possible pedigree of the feature such as procurement level or current classification. Preventive controls might include engineered features (e.g., SSCs), administrative controls (e.g., operator actions), natural forces or physical phenomena (e.g., ambient conditions, buoyancy, gravity), or inherent features (e.g., physical or chemical properties, location, elevation) operating individually or in combination. Controls that could serve preventive functions are listed in the Preventive Controls column of the HE Tables, and are sub-divided into administrative and engineered (design) controls for each event. It is from this list that the controls needed to prevent hazardous events are selected. Team analysts and engineers utilize this list to select and subsequently credit preventive controls as IROFS to reduce the frequency of the postulated release events. The prevented event controls as given for a particular event takes into account any credited (bolded) preventive controls (preventive IROFS) in the HE Tables which act to reduce the frequency of the event (i.e., to reduce the frequency of the initiator and/or to reduce the frequency of the progression of occurrences which ultimately lead to the release).

3.1.2.3.2.3.2 Mitigative Controls

Mitigative controls are any features that could reduce the consequences associated with the release of hazardous material. The identification of such controls is made without regard to any possible pedigree of the feature such as procurement level or current classification. Mitigative controls are those that are assumed to be operable during an event or post event, and are not required to be operating prior to the event initiation. Therefore, mitigative controls must be capable of withstanding the environment of the event. These might include engineered features (e.g., SSCs, detection systems), administrative controls (e.g., operator actions), natural forces or physical phenomena (e.g., ambient conditions, buoyancy, gravity), or inherent features (e.g., physical or chemical properties, location, elevation) operating individually or in combination. Controls that could serve mitigative functions are listed in the Mitigative Controls column of the HE Tables, and are sub-divided into administrative and engineered (design) controls for each event. It is from this list that the controls needed to mitigate hazardous events are selected. Team analysts and engineers utilize this list to select and subsequently credit mitigative controls (mitigative IROFS) to either reduce the material released once a release occurs, or reduce the consequences of the release event to the receptors of interest.

3.1.2.3.2.3.3 Subdivision of Preventive and Mitigative Controls

Preventive and mitigative controls can be subdivided into active engineered controls, passive engineered controls, and administrative controls. Active engineered controls are physical devices that use active sensors, electrical components, or moving parts to maintain safe process conditions without any required human action. Passive engineered controls are devices that use only fixed physical design features to maintain safe process conditions without any required human action. Administrative controls are procedurally required or prohibited actions, combined with or without a physical device that alerts the operator that the action is needed to maintain safe process conditions, or otherwise adds substantial assurance of the required human performance.

3.1.2.3.2.4 Control Selection and Mitigated Hazard Evaluation Development

Following the Unmitigated Hazards Evaluation step, controls were identified using the methodology given in NUREG-1520 (Reference 3) for designation as IROFS. The controls selected as IROFS are necessary to bring the risk of unprevented and unmitigated accidents to within the Performance Requirements of 10 CFR 70.61, or to capture Initial Conditions that were established in the unmitigated Hazards Analysis as safety basis controls. Controls include engineered controls such as SSCs and also administrative controls or programs that provide a safety function. Defense in Depth (DID) concepts utilizing non-credited controls were also incorporated into the control strategy for a postulated event whenever possible.

3.1.2.3.2.4.1 Control Selection Method

First, candidate non-credited controls for each postulated event are listed in the Preventive Controls Column and Mitigative Controls Column of the HE Tables in Appendix C. The candidate controls for each event can then be either: 1) credited as IROFS, if necessary, to prevent or mitigate a release event, or 2) remain non-credited controls, which are available to provide DID, but which require no control "pedigree." For those events in which the unmitigated risk exceeds Performance Requirements of 10 CFR 70.61, appropriate controls are required to be selected from the candidate controls and credited as IROFS in preventing and/or mitigating the subject event until the mitigated risk is within the Performance Requirements. Other controls which exist but which are not selected and designated as IROFS, provide a DID function.

The unprevented frequency and unmitigated consequences of each event are compared with the 10 CFR 70.61 Performance Requirements for each receptor. These Performance Requirements for each of the three receptors (WRA, WCA, and Off-site) are presented in Tables A-7, A-8, and A-9 in Appendix A of the ISA Summary. Those unmitigated events whose risk exceeded the 10 CFR 70.61 Performance Requirements were marked for control selection to reduce the event frequency or mitigate the event consequences to within the Performance Requirements. Preventive controls that were credited for reducing the frequency in the Mitigated HA columns are set in bold font type followed by IROFS numbers in the HE Tables Preventive Controls column and are also provided in the List of IROFS in Section 7.2 of the ISA Summary. The prevented event frequency given for a particular event takes into account any credited

(bolded) preventive controls in the HE Tables, which act to reduce the frequency of the event. Preventive controls not explicitly credited in this way to reduce frequency provide DID. Similarly, mitigative controls that were credited in mitigating consequences are set in bold font type followed by IROFS numbers in the HE Tables Mitigative Controls column and are also provided in the List of IROFS in Section 7.2 of the ISA Summary. The mitigated consequences estimated for a particular event takes into account any credited (bolded) mitigative controls in the HE Tables which act to reduce the severity, material released, or dose (or chemical exposure) due to the event.

In a series of ISA Team meetings hazard analysts and system experts proceeded with control selection to bring the mitigated risk of the subject events to within 10 CFR 70.61 performance requirements. Table F-1 in Appendix F of the ISA Summary, a control selection table for risk reduction, was developed by the team for each unmitigated event with risk exceeding the established Performance Requirements to record the process of selecting controls that would reduce the frequency of, and/or lessen the severity of, each applicable event to within the Performance Requirements. The table presents the credited risk reduction to the applicable receptors for each credited control (i.e., IROFS). Estimated frequency reduction values for each credited preventive IROFS were given to arrive at a "prevented" event frequency for each event cause. Similarly, estimated consequence (dose or chemical exposure) reduction values for each credited mitigative IROFS were presented to arrive at a mitigated consequence for each receptor.

3.1.2.3.2.4.2 Control Selection Preference

In general, controls were selected using an order of preference. The first controls credited were the "see and flee" controls, which include Emergency Response Actions; Alert, Notification, and Protective Actions; and Trained Operator Actions. These controls are credited with reducing potential radiological and chemical consequences to all receptors. These controls were applied first, as crediting receptors with minimizing their exposure to a hazardous chemical release is a control of very high reliability. Then, additional controls were applied, as necessary, with preference given to certain types of controls over other types of controls. In general, available preventive controls were generally selected before additional mitigative controls so as to prevent or reduce the frequency of the event rather than attempt to mitigate the event consequences after the release has occurred. If available, engineered or designed controls were selected before administrative controls to utilize the inherent reliability advantage of designed systems or components over that of required human action compliance. In the case of engineered controls, where possible, passive engineered controls were generally selected before active engineered controls due to the increased reliability of a passive engineered feature. Factors such as reliability, durability, life cycle cost, facility operating life, applicability to multiple events, etc. were also considered during control selection and had some influence on the preferred selection strategy.

3.1.2.3.2.4.3 Preventive or Mitigative Value of Control

While it is often difficult to estimate the value of a specific control in providing event frequency reduction or consequence mitigation, several general guidelines were used to assist in control value estimation, in the absence of more detailed information.

3.1.2.3.2.4.3.1 Preventive Control Value

With regard to preventive controls, a passive engineered control (such as a nozzle or orifice in limiting flow, or a concrete jersey barrier for limiting vehicle access or impacts) would typically be credited as providing a frequency reduction of three orders of magnitude (frequency may be reduced by 1×10^{-3}). An active engineered control (such as negative pressure ventilation system, an automatic valve or an automatic fire suppression system) would be credited as providing a frequency reduction of two orders of magnitude (frequency may be reduced by 1×10^{-2}). An administrative control (such as operator actions) would typically be credited as providing a frequency reduction of only one order of magnitude (reduced by 1×10^{-1}) due to the potential for human error. These values are supported by, and are generally more conservative than the example control values outlined in Table A-10 of Appendix A of the ISA Summary as compared to Chapter 3 of NUREG-1520 (Reference 3). It should be noted that these are general preventive control values that the ISA Team considered as a starting point. Any vulnerabilities or strengths in a particular control could be reason for the team to vary the general value of these types of controls for the specific situations involved in a particular event.

3.1.2.3.2.4.3.2 Mitigative Control Value

Mitigative controls reduce either the amount of material released, or the potential dose or airborne chemical concentration to a receptor attributed to the release. The value of the mitigative control varies with the effectiveness of the control with relation to the nature and energy of the release event. For instance, the value of certain mitigative controls (e.g., HEPA filtration) may be fairly easy to quantify. As a general example, HEPA filtration incorporates an engineered efficiency of approximately 99.9 percent, and therefore may be confidently considered to reduce the dose to an external receptor by three orders of magnitude (dose reduction by approximately 1,000) due to the efficiency of the filtration mechanism (given that the released hazardous material, in fact, follows the filtered release path and the filter survives the event intact). In some events, a mitigative control such as a centrifuge casing was credited with sufficient confinement capability relative to the nature of the event, so as to limit the subsequent doses to receptors.

However, the determination of the mitigative value of an administrative control such as worker evacuation from the immediate scene of an unfiltered radiological or chemical release is more subjective and difficult to quantify. The ACP utilizes a "See and Flee" policy to protect the health and safety of workers who may encounter a release of UF_6 or other hazardous material. The policy is for employees to promptly move to a safe location away from the immediate release area. The "See and Flee" policy has been utilized effectively at the gaseous diffusion plants for numerous years, in conjunction with other plant programs/controls, in limiting exposures to plant workers to safe levels (thousands of hours of operation with hundreds of thousands of pounds of in-process UF_6 at pressures much greater than the pressures in the ACP). The results have been minimal exposure to workers, even from a sizable release. In addition, experience indicates that workers can readily recognize even incidental releases of UF_6 and take appropriate actions to evacuate the area of the release. "See and Flee" is credited with mitigative values on a case-by-case basis, with appropriate consideration that the worker in the vicinity of

the release has the ability to evacuate due to the conditions likely to be present during the postulated accident scenarios. In general for this analysis, the worker's ability to recognize a radiological or chemical upset condition and immediately evacuate the area was qualitatively estimated to reduce the dose to the worker by a range of approximately two to three orders (1/100 to 1/1,000) of magnitude. This value is subjective and may vary on a case-by-case basis depending on the nature and rapidity of the event, worker awareness, available egress routes, and the ability and time to take protective action (evacuation). In general, the ISA Team considered that WCA protective actions were also worth approximately two orders of magnitude (1/100) consequence reduction, again subject to specific event conditions. For the Off-site Public, the mitigative control of alert/notification and sheltering/evacuation was deemed by the ISA Team to result in a conservative consequence reduction of only one order of magnitude (1/10), in that the response of the public is considered to be less reliable than that of trained site workers. Refer to Table F and the associated text in Appendix F of the ISA Summary for the values assigned to each credited preventive and mitigative IROFS for each event cause and receptor.

Controls were required to be credited in all events for which the unmitigated risk exceeded 10 CFR 70.61 performance requirements. In addition, for certain events (including events whose unmitigated risk did not exceed performance requirements), Initial Conditions may have been credited inherently in the unprevented frequency and unmitigated consequences for certain events, by initially limiting the frequency or consequences of the event. For example, for the massive river flooding event, the location and elevation of the site well above the Maximum Probable Flood crest level was credited as an initial condition in establishing the unprevented frequency for the event in the "Highly Unlikely" frequency level. The team would look for and capture these types of Initial Conditions as an inherent credited control (an IROFS) for that event, regardless as to whether the unmitigated risk associated with the event exceeded Performance Requirements.

3.1.2.3.2.4.4 Control Selection Results

The credited controls identified for each event were grouped and consolidated, and are presented in Table 7.2-1 of the ISA Summary, including controls credited as initial conditions. Table 7.2-1 presents grouped controls under an appropriate Control Strategy heading, whether the control constitutes a design feature, or an administrative control, and the applicable event(s) from the HE Tables in Appendix C of the ISA Summary to which the control applies. A description of each credited control (i.e., IROFS) is also given in Chapter 7.0 of the ISA Summary including the safety function and credited attributes of the control. IROFS are also denoted by controls listed in bold type followed by IROFS numbers in the Preventive and Mitigative Controls column of the HE Tables in Appendix C of the ISA Summary. As previously noted, the preventive and mitigative reduction values of these IROFS are presented in Table F-1 of Appendix F of the ISA Summary for each event.

3.1.2.3.2.4.5 Implementation of Controls

Procedural IROFS listed in Table 7.2-1 of the ISA Summary and IROFS which involve operation of equipment to perform the safety function, also require associated training conducted to familiarize Workers with the procedure and/or equipment. In addition, for each SSC credited as an IROFS, periodic surveillances (inspections) and preventive maintenance should be developed for the SSC during implementation, as validation of the operability of the SSC. Other general programmatic controls such as facility configuration control and inventory control are not specifically identified or credited as an IROFS for each event, although implementation of these controls is assumed to maintain the continuing validity of the IROFS.

3.1.2.3.2.5 Mitigated Risk Level

Once the prevented event frequency and mitigated consequence levels are determined from the crediting of IROFS, the events are risk-binned again in frequency-consequence space to assess the mitigated risk relative to 10 CFR 70.61 performance requirements. Similar to the unmitigated analysis, Tables A-7, A-8, and A-9 are also used as the risk binning matrices for the mitigated risk comparison for each receptor (WRA, WCA, and Off-site, respectively). Following the crediting of IROFS, the mitigated risk for the event is expected to fall in a bin designated "B," indicating the Performance Requirements have been met. If the mitigated risk bin remains within the "A" designation indicating the Performance Requirements are still exceeded, then either additional analysis must be performed, or additional IROFS must be identified and credited. While not preferred, in the event that no additional IROFS are available or no more refinement is to be gained from any additional analysis that might confirm a reduced risk when compared to that previously estimated in the unmitigated Hazard Evaluation, then the NRC may at their discretion, consider acceptance of a "Residual Risk" from the event to Workers or to the Public.

3.1.2.3.2.6 Evaluation of Mitigative IROFS Failure

A consideration in the identification of mitigative IROFS is the possibility that these controls could fail to perform their safety functions. Given this possibility, events for which mitigative controls were credited were evaluated to examine the residual risk associated with the postulated failure upon demand of each mitigative IROFS. The approach used in this evaluation develops a series of sub-events designed to demonstrate that the risk of the event following failure of one or more of the credited mitigative controls is still within the 10 CFR 70.61 performance requirements. This evaluation is summarized in Appendix K of the ISA Summary.

The sub-events involve postulating the simultaneous occurrence of the primary event AND the failure upon demand of one or more of the mitigative IROFS. The frequency of failure upon demand of mitigative IROFS was developed in a manner similar to that for assigning preventive values to IROFS described in Section 3.1.2.3.2.4.3.1. Each sub-event is then evaluated in the same manner as that described in Sections 3.1.2.3.2.2, 3.1.2.3.2.3, and 3.1.2.3.2.4. In some cases, the likelihood of the combination of the primary event and the failure of mitigative IROFS fall in the Highly Unlikely frequency range. In these cases, no further evaluation is necessary. In other cases in which the resulting frequency of the primary event in combination with the failure of a mitigative IROFS falls in either the Not Unlikely or the Unlikely frequency range, the consequences of those "combination events" must be shown to be sufficiently low such that the final risk still falls in the "B" risk bin.

3.1.3 Management Measures

ACP IROFS are identified in the ISA Summary. Management measures are utilized to maintain the IROFS so that they are available and reliable to perform their safety functions when needed. Management measures are the principal mechanism by which the reliability and availability of each IROFS is ensured. Management Measures are described in Chapter 11.0 of this license application. Any IROFS deficiencies are addressed in accordance with the Corrective Action Program.

3.2 Integrated Safety Analysis Summary

An ISA Summary for the ACP (Reference 1) meeting the requirements of 10 CFR 70.65(b) was prepared in accordance with the guidance contained in Chapter 3.0 of NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* and NUREG-1513, *Integrated Safety Analysis Guidance Document.* The ISA Summary is being submitted for review (separate from this license application).

3.3 Items Relied on For Safety Boundary Definition

In order to ensure IROFS are available and reliable, their boundaries must be clearly established. The IROFS boundary determination process relies upon the ISA to identify and define the IROFS and their functions. The boundary determination process then uses the ISA and ACP design documentation to establish and identify what structures, systems, components, and actions are required to fulfill the IROFS functions. IROFS boundaries are defined using CMP-3601-0001, "IROFS Boundary Determination Plan."

3.4 Seismic Specifications

Seismic specifications for the ACP design are based on the risks and potential consequences from seismic events involving the primary facilities. This approach results in two criteria being applied depending upon whether or not the normal operations therein involve

liquid UF_6. Facilities where liquid UF_6 operations occur are required to withstand the forces resulting from a 10,000-year return period seismic event. All other facilities are required to withstand the forces resulting from a 1,000-year return period seismic event because UF_6 operations therein involve UF_6 in either gas or solid form.

The X-3346 Feed and Customer Services Building Customer Services Area is designed to withstand a 10,000-year return period seismic event for the Piketon, Ohio area. This correlates to a conservative assumption of 0.32 gravity Peak Ground Acceleration (PGA) (Reference 12). The corresponding vertical earthquake ground motion is two-thirds of the horizontal ground motion or 0.21 gravity PGA.

The X-2232C Interconnecting Process Piping; X-3001 and X-3002 Process Buildings; X-3012 Process Support Building; X-3346 Feed and Customer Services Building Feed Area; X-3346A Feed and Product Shipping and Receiving Building; X-3356 Product and Tails Withdrawal Building; X-7725 Recycle/Assembly Facility; X-7726 Centrifuge Training and Test Facility; and X-7727H Interplant Transfer Corridor are designed to withstand a 1,000-year return period seismic event for the Piketon, Ohio area. This correlates to a conservative assumption of 0.15 gravity PGA (Reference 12). The corresponding vertical earthquake ground motion is 0.1 gravity PGA.

IROFS structures, systems, and components required to function in response to seismic events are constructed and/or installed to withstand the forces stated above. Non-IROFS structures, systems, and components are constructed and/or installed, as necessary, to ensure they cannot adversely affect IROFS structures, systems, and components.

3.5 References

1. LA-3605-0003, Integrated Safety Analysis Summary for the American Centrifuge Plant

2. NUREG-1513, *Integrated Safety Analysis Guidance Document*, U. S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC, May 2001

3. NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*, U. S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC, January 2002

4. 40 CFR Part 68, *Risk Management Programs for Chemical Accidental Release Prevention*, U. S. Environmental Protection Agency, Washington, DC

5. 29 CFR 1910.119, *Process Safety Management (PSM) of Highly Hazardous Chemicals*, Occupational Safety and Health Administration, Washington, DC, 1991

6. 40 CFR 355, *Emergency Planning and Notification*, U. S. Environmental Protection Agency, Washington, DC

7. DOE-HDBK-3010-94, *Airborne Release Fractions and Respirable Fractions for Use with DOE Non-Reactor Nuclear Facilities*, U. S. Department of Energy, Washington, DC, 1994

8. NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook*, U. S. Nuclear Regulatory Commission, Washington DC, March 1998

9. Current AIHA ERPGs (2004), http://www.aiha.org/Committees/documents/erpglevels.pdf

10. USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant, Safety Analysis Report, Volume 2, Section 4.2

11. R. A. Just, "Report on Toxicological Studies Concerning Exposures to UF_6 and UF_6 Hydrolysis Products," K/D-5573, Rev. 1, Martin Marietta Energy Systems, Inc., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, TN, July 1984

12. ORO-EP-120, *Seismic Design Criteria for the Gas Centrifuge Enrichment Plant – GCEP*, Department of Energy, Oak Ridge Operations Office, Office of the Deputy Manager for Enrichment Expansion Projects, Oak Ridge, TN, December 1978

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7.1.1.2 Hot Work Permits

Hot work is controlled by procedure complying with NFPA 51B-2003 and applicable Occupational Safety and Health Administration (OSHA) requirements per 10 CFR Part 1910. The permit system ensures that cutting, welding, and other hot work conducted in plant areas not normally used for such purposes will be conducted utilizing a permit system/process and performed in a manner that is consistent with industry fire prevention practices. This includes pre-job inspection, stationing a fire watch during the hot work as required, and post-job fire watch to prevent delayed ignition of any combustibles.

Selected managers and supervisors are trained and authorized to write hot work permits. Personnel performing fire watches receive additional training. The Fire Safety Manager, or designee, is notified by the line manager prior to the initial use of a hot work permit. The permits are logged and a field surveillance of work is conducted during routine building inspections and when concerns or unusual circumstances exist.

7.1.2 Inspection, Testing, and Maintenance

Fire protection equipment is inspected and tested upon installation in accordance with NFPA 25-2004. Periodic inspection and testing of fire protection equipment are performed by or overseen by trained personnel to help ensure that fire safety related IROFS are available and reliable. The testing and inspection of equipment is performed in accordance with procedures that include test frequencies as defined by the Fire Safety Manager. The major elements of the plant inspection program are identified as follows.

- Flow test sprinkler systems
- Test manual fire alarms (pull stations)
- Test sprinkler water flow alarms
- Test supervisory alarm devices including control valves, low air pressure, low temperature, and loss of power
- Operate sprinkler system control valves
- Test special fire alarm indicators, such as heat and smoke detection systems
- Inspect major buildings to evaluate housekeeping, check fire emergency equipment, and exit pathways
- Inspect sprinkler systems risers
- Inspect portable fire extinguishers

7.1.3 Emergency Response Organization Qualifications, Drills, and Training

The ACP relies upon a qualified provider to perform emergency response to fire and other types of accident scenarios occurring at the ACP. Employees receive initial and biennial fire safety training as part of General Employee Training (GET) on emergency preparedness. This includes emergency reporting, building/facility evacuation, and fire extinguisher familiarization. GET is described in Section 11.3.1.1 of this license application.

A qualified supplier provides fire department response to an emergency. This supplier is staffed, trained, and equipped adequately to meet the needs of the ACP and the commitments contained in this license application. The qualified provider will have adequate resources to meet the needs of the ACP. This requires appropriately trained and qualified fire fighting personnel, available 24-hours per day, as well as a minimum complement of equipment. There will be a minimum of four qualified fire fighters and one supervisor available to respond per shift. These four fire fighters cover entry and backup (two each). Equipment requirements include one pumper truck with a minimum capacity of 1,000 gpm, one ambulance, and one HAZMAT truck with radiological and rescue equipment. The time to apply water onto a fire will not exceed 20 minutes, 90 percent of the time. This is assured through assessments performed in accordance with Section 11.5 of this license application that confirms that the level of service is consistent with performance requirements specified in a letter of agreement.

Firefighter training is equivalent to the state certified firefighter training curriculum. Emergency medial response personnel meet requirements for state certification as emergency medial technicians and are usually also firefighters.

Qualified instructors provide a range of classroom and hands-on training to maintain standards of performance for all response personnel. Training needs are reviewed annually and the training program modified to meet identified needs. Training records are kept of the training activities. Training is based on national standard emergency response methodology with plant-specific training on issues unique to the plant. Specific training activities include firefighting, hazardous material response, confined space rescue, emergency medical response, radiological emergencies, and rescue. Drills are conducted as part of the plant emergency plan.

7.1.4 Pre-Fire Planning

Pre-fire plans are developed as part of the building emergency packet for the following buildings and areas; X-3001 Process Building; X-3002 Process Building; X-3012 Process Support Building; X-3346 Feed and Customer Services Building; X-3346A Feed and Product Shipping and Receiving Building; X-3356 Product and Tails Withdrawal Building; X-7725 Recycle/Assembly Facility; X-7726 Centrifuge Training and Test Facility; X-7727H Interplant Transfer Corridor; and the Cylinder Storage Yards (X-745G-2, X-745H, X-7746N, X-7746S, X-7746E, X-7746W, and X-7756S).

UF_6 is the primary hazardous material in the ACP and the ISA provides an evaluation of accidents that involve the release of UF_6, including both radiological and toxicological hazards. The HF, which evolves from a UF_6 release, is considered as one of the toxicological hazards from a UF_6 release and is also addressed in the ISA.

7.2.3 Building Surveys

The building surveys are conducted, in accordance with written procedures on a periodic basis, to ensure the buildings/facilities, systems, and operations continue to meet the codes and standards to which they were built and operated, and do not violate any safety bases that were established in the ISA for the credible accident scenarios. The building surveys also ensure no new credible fire scenarios have been created.

7.3 Building/Facility Design

There are fire hazards related to the enrichment process. Fire hazards are typical industrial hazards, including maintenance; incidental use of chemicals and flammable liquids; and energized electrical equipment in the buildings. Accident potentials are discussed in the FHAs and ISA.

The ACP buildings/facilities are large and spread across the DOE reservation, which minimizes the effects that a fire or explosion could have on adjacent buildings and operations. Ventilation supply and exhaust locations are considered with regard to contamination potential and smoke control. Floor surfaces are finished to support contamination control.

The primary ACP buildings/facilities are X-3001, X-3002, X-3012, X-3346, X-3346A, X-3356, X-7725, X-7726 buildings/facilities, and X-7727H corridor. The X-3001, X-3002, X-3012, X-3346, X-3346A, X-3356, X-7725, X-7726 buildings/facilities, and X-7727H corridor are constructed of heavy unprotected steel frame, concrete floors, insulated metal panel exterior walls, and a built up roofing material on a metal deck. Each building is considered a single fire area with exception of the X-3346, X-7725, X-7726 buildings/facilities, and X-7727H corridor. Sprinkler coverage is provided in each building/facility. The sprinkler and water systems are described below. There are no water-exclusion areas in the ACP. Combustible loading is typically low and the fire hazards are limited to normal industrial activities. Exceptions are identified in the building survey report or by the building/facility manager. These include such things as electrical switchgear and transformers, and maintenance activities.

Use of firewater and potential firewater accumulation has been reviewed in each of the buildings/facilities to assure no unsafe accumulations can occur with regard to criticality, equipment loss, or spontaneous combustion. Criticality concerns were identified in the X-3346 Customer Service Area and X-3356 such that floors are required to have no diking or areas where ponding can occur.

Firewater runoff to the environment is controlled by the presence of holding ponds that can reduce or terminate releases as necessary to minimize environmental impact. There are no credible accident scenarios that could result in a criticality event in the holding ponds.

As indicated previously, the X-3001, X-3002, X-3012, X-3346A, X-3356, X-745G-2, X-7746N, X-7746S, X-7746E, X-7746W, and X-7756S are each considered single fire areas, but the X-7725 and X-7726 facilities, and X-7727H corridor are considered as a single fire area and the X-3346 building is considered as two fire areas (Feed Area and Sampling and Transfer Area). Fire areas are considered to be any location bounded by fire rated construction with a minimum rating of two hours and equivalently fire rated doors, dampers, or penetration seals. Building and area separation is used as a method of limiting fire spread. The X-7725 facility and X-3001 building are, connected by the X-7727H corridor, of the same construction. Each are protected by automatic sprinkler system, and have acceptable amounts of combustibles.

Review of the emergency egress paths for the existing buildings/facilities is accomplished using NFPA 101-2003, *Life Safety Code,* as guidance. Some buildings do not comply with the travel distances due to their size. Exit arrangements are adequate because of the low occupancy levels, low combustible loading, large number of exits, and fixed fire suppression systems in the buildings.

Combustible storage in the buildings is considered as part of the hazard evaluation described in Section 7.2 of this chapter. There are no significant quantities of flammable liquids used in the enrichment process; however, centrifuge component manufacturing may be performed in the X-7725 and involve significant quantities of flammable liquids. The use of these liquids is controlled in accordance with NFPA 30-2003, *Flammable and Combustible Liquids Code.*

Electrical systems are installed in accordance with NFPA 70-2005, *National Electric Code.*

ACP building/facility design elements include fire protection lighting and fire barriers to ensure personnel safety in accordance with the applicable NFPA identified in Table 7.1-1.

Security provisions to maintain control of classified material during fire events are addressed in the Security Program for the American Centrifuge Plant.

New buildings/facilities are designed, constructed, and operated to meet the codes and standards applicable at the time of design development.

The Cylinder Storage Yards (X-745G-2, X-745H, X-7746N, X-7746S, X-7746E, X-7746W, and X-7756S) have fire hydrants equipped with monitor nozzles. Workers are trained to initiate the nozzles should a fire occur within the yards.

Cylinder handling equipment for handling 2.5-ton cylinders or larger are equipped with fire suppresser systems for the engine compartments.

7.3.1 Fire Suppression Systems

Fire suppression for the X-3001, X-3002, X-3012, X-3346, X-3346A, X-3356, X-7725, X-7726 buildings/facilities, and X-7727H corridor is provided by sprinkler systems. The systems are hydraulically designed to exceed the NFPA recommended sprinkler density for

Ordinary Hazard Group 1 occupancies of 0.12 gallon per minute for 3,000 square feet. The systems consist of sprinklers located at the ceilings/roof level and in other areas where needed. The sprinkler heads are supplied by piping fed from a riser connected to the firewater distribution system. This design is sufficient to ensure that credible fire related accident scenarios can be controlled given the building designs, equipment layout, and anticipated combustible loadings.

Existing suppression systems are maintained in accordance with the applicable codes and standards enforced at the time of construction and installation. New suppression systems will meet NFPA 13-2002, *Standard for the Installation of Sprinkler Systems* and NFPA 15-2001, *Standard for Water Spray Fixed Systems for Fire Protection*. When modifying existing buildings/facilities, the safety benefit from applying current codes and standards will be evaluated to determine if the change is justified. The evaluation and decision made will be documented.

7.3.2 Fire Alarms

The sprinkler systems are connected to the Fire Alarm system. This system meets the requirements of NFPA 72-2002, *National Fire Alarm Code*. The system alarms include sprinkler water flow alarms from the sprinkler systems and manual pull stations located in the X-3001, X-3002, X-3012, X-3346, X-3346A, X-3356, X-7725, X-7726 buildings/facilities, and X-7727H corridor. Alarms are received in the X-1020 Emergency Operations Center and the X-1007 Fire Station. Alarm announcement is not local, but a building evacuation system can be manually initiated from the X-1020 Emergency Operations Center, from the X-3012 building, or locally in some areas.

7.4 Process Fire Safety

The ACP has addressed process fire safety through the design of the buildings and operations such that consideration is taken for fire hazards that may be present in order to protect the workforce and public. Hazardous areas are identified to ensure the workforce is cognizant of hazardous material and operations. The ISA has been performed to identify the credible accident scenarios and establish the necessary IROFS to ensure the health and safety of the workforce and public.

The ACP buildings/facilities are designed in accordance with the codes and standards as identified in Section 7.1 above. The ACP hazardous areas are identified as part of the pre-fire plans required in Section 7.1.4 above. The ACP ISA is discussed in Section 7.2.2 of this chapter and Chapter 3.0 of this license application.

The ISA determines the likelihood of occurrence for the explosion and fire scenarios and resulting consequences associated with the release of UF_6 and its airborne release reaction product, HF assuming the accident is unmitigated. The ISA identifies IROFS and related management measures necessary to prevent the accident and/or mitigate the consequences in accordance with the performance criteria in 10 CFR 70.61. The IROFS identified by the ISA to prevent or mitigate explosion and fire related scenarios are grouped in the following three categories.

- Combustible Material Control
- Fire Suppression and Response
- Fire/Explosion Prevention

UF_6 is the primary hazardous material in the ACP. In the presence of moist air, UF_6 reacts to form HF gas and UO_2F_2. The ISA considers U for radiological and toxicological hazards and HF for toxicological hazards. Other chemicals evaluated are activated alumina pellets used in the alumina traps to filter UF_6 gas, compressed gases (e.g., nitrogen, acetylene), perfluorocarbon fluid used in the equipment brine heating/cooling system, other refrigerants used in the various process refrigeration systems, janitorial supplies, fire extinguishing agents, and non-flammable oils used within the centrifuge upper and lower support assemblies. These other chemicals are not considered to have a significant hazardous interaction capability.

If centrifuge component manufacturing is performed within the ACP, additional materials are required for the process that will present fire safety and health concerns. These additional materials include carbon fibers, resin systems (resins, hardeners, and modifiers), prepregs (fibers/resin system) and for cleaning chemicals such as acetone, alcohols, carbon dioxide, ethanol, and Freon 134.

7.5 Fire Protection and Emergency Response

The design and operation of the buildings/facilities are evaluated on a periodic basis to ensure fire hazards are controlled. Fire protection systems are present to further reduce the risk of fires that could result in a release of hazardous material. Emergency response is provided to add defense-in-depth to the fire protection systems and respond to areas where fire protection systems do not exist.

7.5.1 Fire Protection Engineering

Fire protection engineering support is available to evaluate fire hazards; review changes to maintenance and process systems; and provide in-house consultation under the direction of the Fire Safety Manager. They also perform the building surveys as described in Section 7.2.3 of this chapter.