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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	**Docket No. 70-7004-ML**
USEC INC.	)	**ASLBP No. 05-838-01-ML**
(American Centrifuge Plant)	)	**March 12, 2007**

APPLICANT'S PRE-FILED TESTIMONY CONCERNING HEARING ISSUE HTS-12 (ISA AND ISA SUMMARY: SUFFICIENCY OF REVIEW OF INFORMATION)

Q1. Please state your name, current position, and by whom you are employed.

A1. My name is Robert M. Bernero ("RMB"). I am currently employed as an independent nuclear safety consultant by USEC Inc. ("USEC" or "Applicant") and others. I serve on USEC's Plant Performance Review Committee for the Gaseous Diffusion Plants ("GDPs") at Piketon, Ohio and Paducah, Kentucky. In addition, I have been retained by USEC to independently review the American Centrifuge Plant ("ACP") License Application and Integrated Safety Analysis ("ISA") Summary.

A1. My name is Peter J. Miner ("PJM"). My current position is Director, Regulatory and Quality Assurance for the ACP.

Q2. Please describe your professional qualifications.

A2. (RMB) I hold a Bachelor of Arts (1952), Bachelor of Science (1959) and Master of Science (1961) in Chemical Engineering. I have more than 47 years of experience in nuclear technology, including 23 years of service with the U.S. Atomic Energy

Commission Regulatory Staff and the U.S. Nuclear Regulatory Commission ("NRC") Staff. For six years, I served as the NRC's Director of the Office of Nuclear Material Safety and Safeguards. In that position, I was the senior NRC Staff official responsible for licensing of all NRC-licensed facilities other than nuclear reactors. I retired from the NRC in 1995. As a member of the NRC Staff, I also participated in the safety reviews of the designs of several nuclear reactors conducted for purposes of determining whether licenses should be issued for construction or operation of those reactors. A statement of my professional qualifications is provided in USEC Exhibit 1.

A2. (PJM) I hold a Master of Science degree in Environmental, Safety and Health Management from the University of Findlay, and a Bachelor of Science Degree in Mathematics from the University of Massachusetts. A statement of my professional qualifications is provided in USEC Exhibit 1.

Q3. On whose behalf are you testifying?

A3. (RMB, PJM) I am testifying on behalf of the Applicant, USEC.

Q4. Please describe your involvement in the ACP License Application.

A4. (RMB) I had no involvement in the preparation and submittal of the ACP License Application. However, subsequent to the submittal of that application, USEC requested me to make an independent evaluation, as an experienced former NRC regulator, of the ACP License Application and its supporting documents (including the ISA Summary) to determine whether USEC had provided sufficient information in accordance with the applicable regulations.

A4. (PJM) I am USEC's Director of Regulatory and Quality Assurance for the ACP. I served as the Project Manager for the development of the ACP License Application, ISA,

Environmental Report, and supporting documents. I have provided coordination and oversight of development activities for technical subjects, drafted inputs to various technical areas, and reviewed and edited the documents. I also coordinated responses to requests for additional information with the NRC Staff.

Q5. Please describe the purpose of your testimony.

A5. (RMB, PJM) The purpose of our testimony is to address certain topics upon which the Atomic Safety and Licensing Board ("ASLB") requested information in its February 6, 2007 Order (Establishing a Modified Case Schedule; Issuing Questions and Identifying Hearing Topics) and in its March 2, 2007 Memorandum and Order (Issuing Additional Questions and Hearing Topics). Specifically, in its February 6, 2007 Order, the ASLB requested information regarding sufficiency of the information in USEC's License Application for the ACP and the adequacy of the NRC Staff's review relating to the ISA performed for the ACP (ASLB Question S2-1). Information in response to this question was subsequently provided to the ASLB by the NRC Staff on February 20, 2007; by four individual NRC staff members on February 26, 2007; and by USEC on March 5, 2007.

Q6. (RMB, PJM) Have you reviewed the information provided to the ASLB in response to Question S2-1 by the NRC Staff and USEC?

A6. (RMB, PJM) Yes. I have reviewed the information in response to Question S2-1 provided by the NRC Staff on February 20, 2007 and by USEC on March 5, 2007, and agree with that information.

Q7. In addition, in its March 2, 2007 Memorandum and Order, the ASLB requested further information and clarification regarding the answers to Question S2-1 included in the NRC Staff's February 20, 2007 response. The ASLB designated this further request as

Hearing Issue HTS-12, and stated its expectation that the parties would address these issues orally at hearing. However, the Board also noted that the parties might file written presentations if they believed that a written submission would materially aid the Board's understanding of these issues. Does your testimony address Hearing Issue HTS-12?

A7. (RMB, PJM) Yes. In particular, our testimony addresses Section B of HTS-12. It also addresses Section C.1 of HTS-12 by providing a description of the bases for assurance that USEC's final design and construction of the ACP will comply with the description of the facility provided in the License Application and the ISA Summary.

Q8. In HTS-12 B., the ASLB requests information regarding the level of detail reviewed by the NRC Staff regarding USEC's ISA Summary for the ACP. Please describe the NRC requirements regarding the level of information that 10 CFR Part 70 requires license applicants to provide about facility design for a uranium enrichment facility.

A8. (RMB, PJM) The regulations in 10 CFR Part 70 Subpart H (10 CFR 70.60 through 70.76), which apply to facilities (such as a uranium enrichment facility) at which a licensee is authorized to possess a critical mass of special nuclear material, contain specific requirements regarding the types and level of information required to support the granting of a license. Under Subpart H, the applicant must conduct an ISA that identifies various hazards potentially associated with the facility and the Items Relied on for Safety ("IROFS") that will be established or installed to address these hazards, including: (1) radiological hazards; (2) chemical hazards; (3) facility hazards; (4) potential accident sequences; (5) the consequence and likelihood of each potential accident sequence; and (6) IROFS relied upon to address these hazards. *See* 10 CFR 70.62(c)(1). For purposes

of facility licensing, an applicant must submit to the NRC Staff a summary of its ISA so that the Staff can make a determination whether the ISA is acceptable.

The contents of the ISA Summary, and its level of detail, are prescribed in 10 CFR 70.65, "Additional Content of Applications." 10 CFR 70.65(b) states that "[t]he integrated safety analysis summary must contain:

(1) A general description of the site with emphasis on those factors that could affect safety (*i.e.*, meteorology, seismology);

(2) A general description of the facility with emphasis on those areas that could affect safety, including an identification of the controlled area boundaries;

(3) A description of each process (defined as a single reasonably simple integrated unit operation within an overall production line) analyzed in the integrated safety analysis in sufficient detail to understand the theory of operation; and for each process, the hazards that were identified in the integrated safety analysis pursuant to §70.62(c)(1)(i)-(iii) and a general description of the types of accident sequences;

(4) Information that demonstrates the licensee's compliance with the performance requirements of §70.61, including a description of the management measures; the requirements for criticality monitoring and alarms in §70.24; and, if applicable, the requirements of §70.64;

(5) A description of the team, qualifications, and the methods used to perform the integrated safety analysis;

(6) A list briefly describing each item relied upon for safety [IROFS] which is identified pursuant to §70.61(e) in sufficient detail to understand their functions in relation to the performance requirements of §70.61;

(7) A description of the proposed quantitative standards used to assess the consequences to an individual from acute chemical exposure to licensed material or chemicals produced from licensed materials which are on-site, or expected to be on-site as described in §70.61(b)(4) and (c)(4);

(8) A descriptive list that identifies all items relied on for safety that are the sole item preventing or mitigating an accident sequence that exceeds the performance requirements or §70.61; and

(9) A description of the definitions of unlikely, highly unlikely, and credible as used in the evaluations in the integrated safety analysis."

10 CFR 70.65(b) (emphasis added).

In sum, the regulations explicitly require general descriptions of processes, equipment and design parameters sufficient so that their functions and theory of operations can be understood. The Staff uses this ISA Summary as the primary basis for determining whether the applicant has complied with 10 CFR 70.61-70.65.

The conclusion that general information, not detailed final information, is required by 10 CFR 70.65 is supported by a review of the history of the adoption of Part 70 by the Commission. The paper prepared by the NRC Staff (SECY-00-0111), which transmitted the Staff's recommendation to approve the current Part 70 to the Commission, and was before the Commission at the time it voted to adopt the rule, contained an example of a sample IROFS list that sheds light on the appropriate level of detail for an ISA Summary. The sample IROFS list is as follows:

Items Relied On For Safety (IROFS)	Safety Function
Bulk chemical storage tanks # 12, 13, 14, & 15 in Building A.	Storage tanks are made of chemically resistant materials.
Bulk chem transfer piping for tanks # 12, 13, 14, & 15 in Building A.	Transfer materials are made of chemically resistant materials.
Bulk Chem Operator sight gauge at station X in building A.	During loading and unloading the operator watches fill gauge.
Operator checks level in tank and will not take load unless tank level is less than 64" (4500 gal).	To ensure that the tank is not overfilled.
Fire sprinkler system in building A.	To extinguish a fire by providing suppression.

See Rulemaking Issue Affirmation, SECY-00-0111 (May 19, 2000) at Att. 6 Annex at 5. Note that the IROFS and associated safety functions are written in broad language, and do not contain any quantitative analyses or detailed design information. While only an example, this sample indicates that the original drafters of the current Part 70 believed that such an IROFS list contained sufficient detail on which the NRC Staff could base their licensing review and understand the functions of the IROFS.

Q9. Do the regulations in 10 CFR Part 70 require that details of the design of the facility be finalized prior to preparation of the ISA and ISA Summary?

A9. (RMB, PJM) No. Nowhere in 10 CFR Part 70, including Subpart H, is it required that the design be fully detailed or final prior to preparation of the ISA or ISA Summary. Instead, the design need only contain enough detail to identify and describe credible accident sequences and IROFS. In essence, the License Application and the ISA Summary describe, at the level of detail prescribed by 10 CFR 70.65(b), the parameters within which the applicant commits to build the facility. The Staff then makes a determination whether a facility so described complies with the applicable regulations in Part 70, including 10 CFR 70.61 and 70.62. It is then the responsibility of the licensee to finish the details of the design and build the facility in compliance with these descriptions, ensuring that the lists and descriptions of credible accident sequences and IROFS included in the ISA Summary remain valid and that the facility otherwise complies with the terms of the license. As USEC has committed in its License Application for the ACP, "As the final design is developed for the ACP, the management system and design approach will require that the final designs be reviewed against the ISA to ensure the ISA accurately reflects the ACP design and operations, identifies the

credible accident sequences and appropriate assumptions, and credits the IROFS necessary to meet the performance requirements of 10 CFR 70.61." ACP License Application §3.1.2. The bases for assurance that USEC will establish the details of the ACP design and complete construction of the ACP in conformity with the License Application, the ISA Summary, and the license are described in response to Questions 13 through 17 below.

Q10. Does the ISA Summary that USEC provided for the ACP contain the information required by 10 CFR Part 70 for a uranium enrichment facility?

A10. (RMB, PJM) Yes. USEC's ISA Summary complies with the requirements specified in 10 CFR Part 70. As required by 10 CFR 70.62(c)(1), USEC has identified the radiological hazards, chemical hazards, facility hazards, and potential accident sequences for the facility. USEC has also described the consequence and likelihood of each potential accident sequence and identified and described the IROFS relied upon to address these hazards. Similarly, the ISA Summary submitted by USEC and reviewed by the NRC Staff provided all of the information required by 10 CFR 70.65.

In particular, the ISA Summary contains all credible accident sequences for the ACP facility that could exceed performance requirements in 10 CFR 70.61, and lists and describes all the IROFS that will be relied upon to prevent, mitigate, or otherwise address those credible accident sequences. As noted in the NRC Staff Safety Evaluation Report ("SER") for the ACP, the ISA Summary submitted by USEC supplies this information. The facility's processes were described in sufficient detail to permit an understanding of the theory of operation of each process, and this description was sufficient to permit the identification of credible accident sequences. The IROFS were described in sufficient

detail to understand their functions in relation to the performance requirements of 10 CFR 70.61, and to permit the Staff to reasonably conclude that if they were installed and functioned as described, they would perform their intended safety functions. A table summarizing those portions of the ISA Summary which supply the required information is presented as an Exhibit to this testimony. See USEC Exhibit #12.

Q11. In your experience, is the level of detail regarding the ACP design that USEC provided sufficient for the NRC Staff to evaluate compliance with the NRC's regulations in 10 CFR Part 70?

A11. (RMB) Yes. During my tenure at the NRC, I participated in the licensing review of many reactors, several nuclear fuel reprocessing plants, and three uranium enrichment plants (the two GDPs and LES-1). At the time, these utilization and production facilities were treated under 10 CFR Part 50, following the two-step Construction Permit/Operating License model, or (in the case of the GDPs and LES-1) were subject to alternative forms of licensing or certification. Pursuant to subsequent legislation and rulemaking, the NRC has replaced the previous two-step model with a one-step approach under 10 CFR Part 70, including Subpart H. As described in response to Question 8 above, the rules in Subpart H specify the types of information that the licensee must provide regarding facility design and safety analysis in order to provide the NRC Staff with a sound basis for a licensing decision before all details of the design have been finalized. I have assessed the level of detail provided by USEC in the License Application and the ISA Summary regarding the ACP design, and consider it sufficient to enable the NRC Staff to evaluate whether the licensing requirements of 10 CFR Part 70 have been met.

Q12. What evidence did you see in your assessment of the information supplied by USEC in its License Application and ISA Summary for the ACP that led you to the conclusion that it provides sufficient information for the NRC Staff to make a licensing decision?

A12. (RMB) I reviewed the License Application and the ISA Summary, and noted the safety focus in those documents reflects the risk profile of a gas centrifuge uranium enrichment plant. Because of the low operating pressures and low masses of gas involved, the cascade is not the dominant source of risk in a gas centrifuge uranium enrichment facility. Instead, the comparatively greater risks are associated with the UF_6 feed and withdrawal and Customer Service areas where relatively large quantities of UF_6 are present. I found that the ISA Summary focused on these areas, and included information on the specific features established to ensure their safety. I found descriptions of enhanced safety measures for these comparatively higher-risk areas.

I also reviewed the methodology and structure of the ISA Summary, as well as examples of the accident sequences and equipment described within it, and found it to be thorough and comprehensive, resulting in safety systems that provide ample margins of safety, and substantial margins of protection from "true failure," as recommended by NUREG-1520 at 3-21.

Q13. In response to Question 9 above, you noted that the License Application and the ISA Summary establish the parameters within which the design and construction of the ACP must be completed. What assurances are there that the applicant will in fact finish the design and construction of the facility as contemplated by the ISA Summary, the License Application, and the license?

A13. (RMB, PJM) There are at least four bases for assurance that an applicant will finalize the design and construction of a facility in compliance with the ISA Summary, the License Application, and the license. These include: (1) "programmatic" features and programs which the applicant commits to apply during the completion of facility design and construction (as well as during subsequent operation of the facility); (2) requirements for updating of the ISA Summary as the design and construction of the facility proceed; (3) requirements that any changes to the facility meet the criteria of 10 CFR 70.72; and (4) NRC inspections and reviews of design and construction prior to commencement of operation.

Q14. Please describe the "programmatic" features and programs that provide assurance that the applicant's final design and construction of the facility will comply with the ISA Summary and the license.

A14. (RMB, PJM) "Programmatic" features and programs include a Quality Assurance program, a Configuration Management program, a training program, a preoperational test program, management qualifications, and other programs that will be implemented during design and construction, or prior to facility operation. These programs and features provide assurance that the facility will comply with the descriptions provided in the License Application and the ISA Summary. For example, USEC is implementing design controls to ensure that the design of the facility is compliant with applicable requirements, codes and standards, including the description of the facility in the ISA Summary. *See* ACP License Application §§1.4, 11.0, 11.1. Similarly, prior to operation, ACP equipment will be subject to a preoperational test program to verify that the equipment will perform its design functions as intended. *See* ACP License Application

§2.3. Note that these programs and features are not a substitute for identification and description of credible accident sequences and IROFS required by 10 CFR 70.65(b). Instead, these programs and features ensure that the descriptions of those accident sequences and IROFS, and other facility features, provided in the License Application and ISA Summary are met by the final as-built design. These programs also provide assurance that, once construction is complete, the facility will be operated as contemplated in the ISA Summary and the License Application.

Q15. Please describe the requirements for updating the ISA Summary as the design and construction of the facility proceed.

A15. (RMB, PJM) 10 CFR 70.72(a) requires that licensees establish a configuration management system to evaluate, implement, and track each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. Any changes that affect the ISA Summary (even if the licensee is authorized to make the changes without prior NRC approval in accordance with 10 CFR 70.72) must be recorded in revised pages to the ISA Summary and those pages must be submitted to the NRC annually within 30 days after the end of the calendar year in which the changes occurred. See 10 CFR 70.72(d)(3). In addition, for the ACP, USEC has committed to provide an updated ISA Summary that incorporates all changes that have occurred since issuance of the license to the NRC for review 180 days prior to operation of the ACP. See ACP License Application at §3.1.2. Accordingly, in the event that ongoing design efforts were to result in changes that would affect the ISA, the NRC would be specifically notified of and be able to evaluate those changes well in advance of operation of the ACP. Also, as noted in response to Question 16 below, if a change were to have a

significant impact on credible accident sequences or IROFS described in the ISA Summary, that change would require NRC approval via a license amendment.

Q16. Please explain the requirements under 10 CFR 70.72 regarding the need for prior Commission approval for changes that significantly affect information contained in the ISA Summary.

A16. (RMB, PJM) As noted in response to Question 15 above, pursuant to 10 CFR 70.72(a) licensees must evaluate each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. Furthermore, 10 CFR 70.72 requires the licensee to evaluate such changes to determine whether, among other things, the change (1) creates a new type of accident sequence that would exceed the performance requirements of 10 CFR 70.61 that has not been previously described in the ISA Summary for the facility; (2) removes, without at least an equivalent replacement of safety function, an IROFS listed in the ISA Summary; or (3) alters any IROFS that is listed in the ISA Summary as the sole item preventing or mitigating an accident sequence that exceeds the performance requirements of 10 CFR 70.61. If the change would cause any of these conditions, the change cannot be made without prior NRC approval through an amendment to the facility's license. See 10 CFR 70.72(d). Accordingly, these requirements provide assurance that the facility will be completed such that it conforms to the lists and descriptions of credible accident sequences and IROFS contained in the ISA Summary.

Q17. Please describe NRC inspections and reviews of design and construction prior to commencement of operation.

A17. (RMB, PJM) Under 10 CFR 40.41(g) and 70.32(k), operation of a uranium enrichment facility may commence only after operational readiness review inspections in which the NRC "verifies through inspection that the facility has been constructed in accordance with the requirements of the license." These NRC inspections occur throughout the period of design completion and construction, and confirm that the commitments included in the License Application and ISA Summary have been met. See the NRC Staff Response to ASLB Order of February 6, 2007 (February 20, 2007) at pp. 32-33, 35-36. They therefore provide additional assurance, prior to operation, that the facility has been completed in conformance to the license, the ISA Summary, and applicable NRC regulations.

Q18. In the ISA Summary for the ACP, did USEC rely on "programmatic" information or commitments as a substitute for the required level of information regarding credible accident sequences and IROFS?

A18. (RMB, PJM) No. As described in response to Question 10 above, the ISA Summary provides information on accident sequences and IROFS as required by 10 CFR 70.65. USEC did not rely on "programmatic" information or commitments as a substitute for technical or design information about facilities and equipment required by 10 CFR Part 70. However, as noted in response to Question 14 the programmatic information and commitments supplied by USEC (including such programmatic features as the Quality Assurance program, the Configuration Management program, the training program, preoperational testing, and management and personnel qualifications) provide assurance that the design and construction of the ACP (including IROFS) will be completed in

compliance with the License Application, the information in the ISA Summary, and the license for the facility.

In accordance with 28 U.S.C. §1746, I state under penalty of perjury that the foregoing is true and correct:

Robert M. Bernero — 3/12/07

Robert M. Bernero — Date

Peter J. Miner — 03/12/07

Peter J. Miner — Date