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Department of Energy
Washington, DC 20585
March 24, 2000

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Chief, Rules and Directives Branch
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sir/Madam:

The U.S. Department of Energy's Fissile Materials Disposition Program (recently incorporated into the National Nuclear Security Agency) is pleased to submit comments (see enclosure) on NUREG-1718, *Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility* (DRAFT), which the Nuclear Regulatory Commission (NRC) released for public comment in late January 2000.

NUREG-1718 builds upon the information previously provided in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (DRAFT), and, like NUREG-1520, addresses the proposed revisions to 10 CFR 70, *Domestic Licensing of Special Nuclear Material*. The document implements a risk-informed, performance-based regulatory approach and distinguishes between the license application requirements for facility construction and materials possession (i.e., operation). The draft report has also enhanced our understanding of the regulatory requirements that NRC may use to evaluate the applications to be submitted by Duke Cogema Stone & Webster (DCS) for construction and operation of the MOX Fuel Fabrication Facility (MFFF) at the Savannah River site.

Our review of draft NUREG-1718 has identified some general areas of concern. The guidance in the draft NUREG is unnecessarily prescriptive in several key areas and appears to endorse a significant number of industry codes and standards as "minimum" regulatory requirements rather than establish regulatory performance requirements to be addressed by the applicant. Some of the NUREG chapters (for example, Chapters 11 and 12 on plant systems and human factors engineering, respectively) provide regulatory guidance intended for commercial nuclear power plants. In addition, it is not clear that the guidance to the NRC reviewer places sufficient emphasis or priority on the results of the ISA in his evaluation of the license application.

Please note that the comments provided in the enclosure were developed with the understanding that NUREG-1718 would apply only to the planned MFFF at Savannah River. If it is the NRC's intent to make the document applicable for use in evaluating license applications for MOX facilities other than the MFFF, some additional revisions to the report verbiage will be needed.

DOE appreciates the opportunity to review this draft document, and we look forward to further involvement with the NRC staff in developing the final version of the NUREG. If you have any questions on this letter or the enclosure, please contact me at (202) 586-5960 (Email: James.V.Johnson@hq.doe.gov).

Sincerely,

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Enclosure

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ENCLOSURE to March 24, 2000 Letter
Comments on NUREG-1718
Department of Energy – Fissile Materials Disposition Program

Glossary

1. A definition of the term "design basis" should be added since the two major licensing actions for the MOX facility (construction authorization and possession license) are based on the NRC's evaluation of the applicant's description, safety assessment, and implementation of the facility design basis.

2. The definition of "uncontrolled outcome" and "unmitigated consequences" are essentially the same. The "uncontrolled outcome" definition should be deleted to avoid confusion.

Introduction

1. Page xxiv, "Application for Construction Approval," second paragraph – The paragraph states that the applicant should demonstrate (emphasis added) how it determined that the design basis will provide adequate assurance of protection against natural phenomena and the consequences of potential accidents. The "demonstration" of design basis adequacy will come in the next phase of the project when the detailed accident analyses are performed. Therefore, the phrase "demonstrate how the applicant determined that" should be changed to "describe how."

2. Page xxvii, Section 4, "Acceptance Criteria," second paragraph (An applicant for license renewal or an amendment for an existing facility...) – The reference in NUREG-1718 to existing facilities should be reconsidered since there are no existing MOX facilities. The SRP should focus on the needs of the MOX facility and minimize references to existing or new processes at existing facilities.

Chapter 2, Financial Qualifications

The only potential MOX facility for the foreseeable future will be owned by the U.S. government and built at the Savannah River site. The government will also finance the design and construction of this facility. However, the operation of the facility will be financed by a private contractor (the licensee). Therefore, only the financial qualifications of the private contractor for operating the facility should be reviewed by NRC.

Chapter 5, Integrated Safety Analysis (ISA)

1. Page 5.0-1, section 5.1.A, second paragraph – The last sentence states, "Therefore, the areas of review and acceptance criteria described for the safety assessment of the design basis draw upon the acceptance criteria for the ISA for the license application." This does not consider the design phase of the facility.

The request for construction authorization will be based on preliminary design of the MOX facility. Judging the design basis information at this stage based on the ISA acceptance criteria at the license application stage is too restrictive and inconsistent with a risk-informed, performance-based regulatory approach. The NRC's review and acceptance criteria should focus on the adequacy of the design basis established by the applicant for the facility and the applicant's description of how the design basis, when implemented, provides adequate assurance to protect against the consequences of natural phenomena and other potential accidents.

2. Page 5.0-4, section 5.3.1.E., requires the NRC staff to review how the applicant defines the terms "likely," "unlikely," "highly unlikely," and "credible" in their safety assessment of the design basis for the facility's principal structures, systems, and components (SSCs). These same terms are used inconsistently throughout the document. Clarification is needed to prevent inconsistent usage of the terms by both the applicant in their safety assessment/ISA and the NRC reviewers in their evaluation of the license application documentation.

3. Page 5.0-26, section 5.4.3.2, part viii – The last paragraph states, "The quantitative consequences categories defined in proposed 70.61 are broad, especially the 'high consequence' category, which is open ended. For this reason, the meaning of 'highly unlikely' for an individual accident should be graded in inverse proportion to the magnitude of consequences when the consequences are significantly greater than the lower limits defining high consequences in proposed 70.61." The NRC should (a) describe how this logic is reflected in the development of the likelihood values, and (b) provide their (NRC) basis for adopting this logic and how the logic provides a true perspective on risk.

4. Page 5.0-27, section 5.4.3.2, part viii – The last paragraph states, "Subject to this guidance, the applicant's definition of the terms likely, unlikely, highly unlikely, ... show compliance with proposed 10 CFR 70.61 if they are reasonably consistent with the following quantitative guidelines on a per accident basis." The discussion continues on page 5.0-28, stating that for "unlikely," the value 'Ni' is assumed to be less than 100 events of intermediate consequence, and for "highly unlikely," the value 'Nh' is assumed to be 1000 events of high consequence. Based on worldwide operational experience with this type of fuel cycle facility, the opposite is true, i.e., more events of intermediate consequence are expected than those events of high consequence. The NRC's technical basis and guidance should be revised accordingly.

5. NUREG-1718 builds on the guidance provided in NUREG-1520 and discusses the acceptance criteria for the MOX facility licensing actions. The acceptance criteria being proposed in NUREG-1718 are linked to the two performance safety measures (no inadvertent criticality and no increase in reportable radiation releases) established in the draft NRC Strategic Plan (NUREG-1614) and represent an attempt by the NRC Staff to quantify the Commission's performance safety measures as they relate to nuclear material safety. However, the bases for

the quantified safety measures (i.e., the acceptance criteria in NUREG-1718) are not supported by sufficient technical data and, as such, may call into question the validity of the applicant's safety assessment as described in their ISA. The following observations are provided in support of this comment:

5.1 Quantitative and non-quantitative determination of likelihood of accidents

The quantitative determination of event likelihood is dependent on several factors, such as equipment failure rate; operator error rate; and surveillance, inspection, maintenance, and testing intervals. These factors must be known to determine the frequency of occurrence of an event. Otherwise, the non-quantitative determination of likelihood can impose design requirements such as redundancy and independence and assurance measures for reliability and availability for SSCs identified by the applicant as items relied on for safety that may not be necessary.

The likelihood index, which is a summation of preventive and mitigation control failures, does not consider the interdependency of these controls nor does it reflect the actual performance of the controls under the expected operating conditions. For example, the integration of failure rates over a range of potential failures for controls that are independent and the summation of failure rates for interdependent controls would be more likely to represent the actual performance and likelihood of failure of these controls.

In summary, the acceptance criteria for these evaluations are subjective and open to interpretation by a reviewer. Consequently, the risk for potential disagreement on appropriate assigned accident likelihood, duration index, and failure rates is extremely high and could render the results of the ISA invalid. The NRC's technical basis and guidance should be revised accordingly.

5.2 Failure rate of components credited for prevention and mitigation of accidents and reduction of risk and/or likelihood

The use of failure data for specific equipment without consideration of the total systems integration failure (i.e., system interactions, support system failures, etc.) may not reflect the effectiveness of the engineered features in mitigating the risk from potential hazards. The ISA process attempts to implement the performance-based, risk-informed approach to hazards analysis/mitigation. However, without comprehensive and valid equipment failure data, the approach cannot be implemented in a meaningful fashion. Therefore, the use of qualitative assessment of equipment failure should be permitted by NRC when failure data are not available.

5.3 Summation of frequencies of all accident sequences

The summation of frequencies of all accidents and comparison of the result to a set of quantitative goals may or may not reflect the actual risk from the facility because these goals are set without sufficient basis or adequate data. The data used to set the safety performance goal numbers are insufficient and statistically insignificant. In addition, the

number of operating facilities should not be considered as a significant factor in determining the safety performance goal. The 10 percent of the average reportable increase in radiation exposure is an arbitrary number. NRC should provide justification for the use of 10 percent of the average reportable increase in radiation exposures and explain why 10 percent is a more representative value than other values (such as 5 percent or 20 percent).

5.4 Risk index evaluation

The risk index evaluation includes factors such as frequency of the initiating event, duration of vulnerability, and frequency of the preceding system/control failure. Unfortunately, the bases for duration index numbers appear to have been selected without technical justification. The duration of a control/system failure is important in determining the overall risk index; however, these numbers should be based on credible data and properly factored in the index. The data and the methodology for assigning a duration index number should be referenced, and bases for the assigning of index numbers also should be provided.

For example, in Table 6 of the ISA (see Appendix A of the SRP), a duration index is assigned to the duration of the vulnerable state. A duration index of -2 is assigned for an average failure of a few days and a duration in years of 0.01. In addition, a -5 duration index is assigned for a 5-minutes average failure and an E-5 duration in years. It is not clear what the term "a few days" means to NRC (i.e., 2 days, 4 days, less than one week, etc.). Also, it is not clear how a 5-minute average failure results in an index value of –5. Clarification on these issues is requested from the NRC.

5.5 ISA process

The ISA process should be tailored to accommodate the complexity and uniqueness of the operation to be analyzed and simple enough that it can be easily understood and applied. As currently described, the ISA process includes the use of several tables to assess the risk from potential accidents and the acceptability of an item relied on for safety to prevent or mitigate the consequences of an accident. This approach has made the process very complex and hard to follow. Consequently, a logic diagram or procedure should be included in NUREG-1718 to describe the process better.

Appendix A, Risk Evaluation

1. Page A-5, section A3, likelihood category assignment – The likelihood presented is somewhat different than what is stated in Chapter 5 and in NUREG-1520. The frequency for the likelihood category should be consistent in both NUREG-1520 and NUREG-1718.

2. Page A6, top of page – The assumption in the example is not representative of the actual accident categories that could be found in fuel fabrication facilities. It is anticipated to have more events in the intermediate consequence category than in

the high consequence category. Justification to support the assumption as stated in the SRP should be provided by NRC.

3. Tables A-3 & A-6 and Tables A-4 & A-5 – The two sets of tables use two different frequency numbers (1E-05 in A-3/A-5; 1E-06 in A-4/A-5). NRC should justify the use of different frequencies and their impact on the risk results.

Chapter 11, Plant Systems

In this chapter, priority is placed by NRC on the use of acceptance criteria derived from the SRP for commercial nuclear power plants (NUREG-0800), which reflects reactor safety imperatives embodied in the General Design Criteria (Appendix A of 10CFR50). Not only are these criteria not applicable (by law) to the MOX facility, but they were developed under an entirely different regulatory framework. For the MOX facility, acceptance criteria should be based on 10CFR70. The ISA will identify the SSCs and establish their safety functions that must be performed during normal, abnormal and accident conditions. As such, the ISA should be given more emphasis in the regulatory guidance.
DOE recommends that the NRC reviewers should find the applicant's system design and safety bases acceptable if they satisfy the criteria listed in Section 11.4.1 of NUREG-1718 (refers to 70.22, 70.23, etc.). Specifically, the reviewer(s) should focus his/her review on the adequacy of the SSCs designated as items relied on for safety (based on the applicant's ISA) to provide reasonable assurance that the level of protection satisfies the performance requirements in 70.61 and the design, construction and operation of these SSCs incorporate the baseline design criteria in 70.64. Use of partial or limited implementation of criteria is acceptable provided appropriate justification is provided which is supported by the ISA results.

In addition, the following specific comment are provided:

1. Page11.0-4, section 11.4.2, lists the regulatory guidance and associated industry standards for implementing and satisfying the regulatory requirements and acceptance criteria for electrical systems. The complexity of electrical systems at reactors warrants the use of the guidance. However, the MOX process is a batch process that lacks the integration and complexity of the reactor systems and, as such, does not warrant the restrictive acceptance criteria listed. The risk associated with operating the MOX facility is not equivalent to the risk associated with operating a nuclear reactor. The acceptance criteria should be set based on the consequences and the risk. NUREG-0800, Chapter 8 acceptance criteria are too restrictive and would not be commensurate with the risk associated with the MOX facility.

   DOE recommends that NRC develop specific acceptance criteria for electrical systems commensurate with risk associated with the MOX facility. The NRC Staff has done an excellent job in developing the baseline design criteria in 10CFR70.64. Similar efforts would result in developing balanced and focused

acceptance criteria commensurate with the risk associated with operation of the MOX facility.

2. Page 11.0-5, section 11.4.3, instrumentation and control (I&C) – NUREG-0800, Chapter 7 acceptance criteria are too restrictive and are not commensurate with the degree of complexity (as compared to a reactor) of the MOX I&C systems. DOE recommends that NRC develop specific acceptance criteria for I&C systems commensurate with the systems' complexity/integration and associated risk.

3. Page 11.0-6, Item G requires establishment of a QA program for design, construction, operation, and maintenance for all SSCs identified as items relied on for safety. However, the chapter sections for electrical, I&C, and ventilation systems did not include a requirement to establish a QA program for items relied on for safety. DOE recommends that QA requirements should be identified for each process system that has SSCs designated as items relied on for safety per the ISA results. The SRP should have a consistent treatment of QA from one section to the next within the same chapter.

4. Page 11.0-7, section 11.4.5.1 – The acceptance criteria for reactor HVAC systems in NUREG-0800 and Regulatory Guides 1.78, 1.95, and 1.140 are too restrictive for the MOX facility. Acceptance criteria should be based on NRC Regulatory Guide 3.12, "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants."

5. Page 11.0-16, section 11.4.7.1 – NRC Regulatory Guides 1.13 and 1.26 are too restrictive for the MOX facility. Invoking ASME Section III for piping and valves for the MOX facility is unduly restrictive, not commensurate with the risk associated with the systems, and inconsistent with a risk-informed, performance-based regulatory approach. Acceptance criteria should endorse ANSI B31.1 for piping/valves and ASME Section VIII for pressurized tanks.

Chapter 12, Human Factor Engineering (HFE)

DOE agrees that some level of HFE is required for the MOX process, but it should not be to the same level as for a reactor. As an example, the acceptance criteria in this chapter appear to be based on NUREG-0700, Guidelines for Control Room Reviews, and NUREG/CR-3331, Methodology for Allocating Nuclear Power Plant Control Functions to Human or Automatic Control. The criteria in those documents are reactor-specific and not appropriate for the MOX facility because of lack of integration and complexity of the I&C systems. HFE should be based on a graded approach and commensurate with the complexity and integration and operation of the control systems.