[redacted]

August 15, 2005

Ms. B. Marie Moore, Vice President
Safety and Regulatory
Nuclear Fuel Services, Inc.
P.O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: NUCLEAR FUEL SERVICES, INC., REQUEST FOR ADDITIONAL INFORMATION-NUCLEAR FUEL SERVICES, SITE-WIDE INTEGRATED SAFETY ANALYSIS SUMMARY (TAC L31852)

Dear Ms. Moore:

This refers to your submittals providing Nuclear Fuel Services,(NFS) site-wide Integrated Safety Analysis (ISA) summaries. Our review has identified that additional information is needed before your request can be approved. The additional information, specified in the enclosure, should be provided within 60 days of the date of this letter. Please reference the above TAC No. in future correspondence related to this request.

If you have any questions concerning this letter, please contact me at (301) 415-8139 or via e-mail to mxl2@nrc.gov.

[redacted]

[redacted]

[redacted]

[redacted]

Sincerely,

/RA/

Michael A. Lamastra, Project Manager
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-143
License No.: SNM-124

Enclosure: Request for Additional Information

[redacted]

[redacted]

[redacted]

Sincerely,

/RA/

Michael A. Lamastra, Project Manager
Fuel Cycle Facilities Branch
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Request for Additional Information
Nuclear Fuel Services, Inc. Site-wide
Integrated Safety Analysis

E1. Discuss how management measures are applied to an individual item relied on for safety (IROFS) when the IROFS is designated (in the integrated safety analysis (ISA)) as a type that is different than its actual type. For example, a passive engineered control is designated an administrative control. Include this discussion in Section 4.4 of the Nuclear Fuel Services, Inc. (NFS) Site ISA Summary.

During the staff's on-site review, discussions with the licensee indicated that, as an example, an enhanced administrative control could be designated (for indexing purposes) as an administrative control. Because of this practice, the staff is concerned that just applying management measures per Table 4-1 based on a control's designated type and not its actual type would not be adequate since (for the example) calibration is required for an enhanced administration control but not for a purely administrative control per Table 4-1.

Because the same or higher index (less risk reduction credit) is always used when changing designations, the licensee's position is that designating an IROFS differently than its actual type represents a conservative approach to the ISA. Although this may be true with regard to the chosen index, this does not consider the need to apply adequate management measures.

In Section 4.4 of the NFS Site ISA Summary, the licensee states that:

> The applicable management measures identified in Table 4-1 are applied based on the type of control to ensure that the credited IROFS failure index meets the risk index specified or the design basis thresholds for events associated with natural phenomena. Information to justify a deviation from a management measure contained in Table 4-1 associated with a specific IROFS will be documented.

The licensee needs to ensure the application of appropriate management measures when the actual type of IROFS is different than its designated type in the ISA Summary or document deviations to the assignment of appropriate management measures (per Section 4.4 of the ISA Summary).

10 CFR 70.62(d) requires the licensee to establish management measures to ensure that IROFS are designed, implemented and maintained such that they are available and reliable to perform their function when needed. Section 3.4.3.2(6)b of NUREG-1520,

[redacted]

[redacted]

"Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," states that the description of each IROFS within an ISA Summary should identify what management measures are applied to the IROFS.

E2. Discuss how availability and reliability are ensured for actual [redacted] IROFS (e.g., piping) that are erroneously described as management measures (e.g., piping integrity plan) in IROFS tables.

During the staff's on-site review, the practice of designating management measures as IROFS was discussed. The regulations clearly differentiate between IROFS and management measures. The former are structures, systems, equipment, components, or operator actions that control the accidents of concern. The latter are the programmatic controls put in place to provide assurance of the reliability and availability of IROFS. The staff will be unable to approve an ISA methodology that does not clearly recognize the difference.

10 CFR 70.4 defines IROFS to be structures, systems, equipment, components, and activities of personnel that are relied on to prevent potential accidents at a facility that could exceed the performance requirements in 10 CFR 70.61 or to mitigate their potential consequences. Also, 10 CFR 70.62(d) requires the licensee to establish management measures to ensure that IROFS are designed, implemented and maintained to ensure they are available and reliable to perform their function when needed. Section 3.4.3.2(6)b of NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," states that the description of each IROFS within an ISA Summary should identify what management measures are applied to the IROFS.

E3. Provide an example that shows how the facility's ISA methodology will be utilized to determine if a new IROFS is equivalent to the one it replaced.

The staff believes that if the licensee uses an ISA methodology (involving practices such as those discussed in E1 and E2 above) that is not consistent and repeatable in the designation and definition of IROFS as discussed in E1 and E2 above and cannot be understood by all stakeholders, then the equivalency of IROFS replacement cannot be determined and agreed to by all concerned parties. The licensee's safety and regulatory review guidance that states: "merely replacing an IROFS with another type of control that provides equivalent control does not require a license amendment" does not alleviate this concern.

10 CFR 70.72(c)(2) allows a licensee to remove from the facility an IROFS listed in the ISA Summary if there is an equivalent replacement of the safety function without prior staff approval.

[redacted]

[redacted]

E4. Discuss how adequate set points are provided for active engineered controls when set point analyses do not account for instrument errors [redacted].

During the staff's on-site review, several set point calculations were reviewed for active engineered controls (IROFS). Although reference accuracy (repeatability) was always accounted for, the calculations did not include other common errors (or did not justify not accounting for them) such as those typically associated with instrumentation channels (drift, etc. - see ANSI/ISA-67.04.01-2000). The staff believes that not accounting for all known errors leads to non-conservative set points and active engineered controls, credited as IROFS, not adequately performing their required safety functions. This becomes very significant when the licensee includes no margin in the set point calculations.

10 CFR 70.62(d) requires each licensee to establish management measures to ensure that IROFS are designed, implemented and maintained, as necessary, to ensure they *are available and reliable to perform their function when needed.*

N1. Justify the application of a duration index to the final IROFS in an accident sequence [redacted]

During the staff's on-site review, the staff noted an instance in which a duration index was applied to the final IROFS credited in the above accident sequence. [redacted] and thus it does not appear that any credit should be given for the failure duration of the final IROFS.

10 CFR 70.61(b) requires that all high consequence events must be ensured to be highly unlikely. Section A.5 of NUREG-1520 states that the use of duration indices is appropriate when the accident sequence requires that two (or more) IROFS must simultaneously be in a failed state, and that it is necessary to consider the duration following failure of the first IROFS in which the system is vulnerable to failure of a second IROFS. However, this does not apply to cases in which there is no subsequent failure.

N2. Describe the methodology for choosing the IROFS credited in the ISA Summary [redacted]

During the staff's on-site review, the staff noted that the IROFS in [redacted] did not realistically reflect the actual design features and operator actions relied on to prevent criticality. While the IROFS chosen were consistent with controls credited for meeting double contingency in the nuclear criticality safety evaluation (NCSE), it was evident to the staff that what ensures safety of the operation is the margin [redacted] needed before criticality is possible, rather than [redacted] as credited in the ISA Summary.

[redacted]

[redacted]

10 CFR 70.61(d) requires that, under normal and credible abnormal conditions, all nuclear processes are subcritical. As indicated in Chapter 4 of its license application, the licensee has chosen to meet this requirement by means of the double contingency principle (consistent with ANSI/ANS-8.1-1998). 10 CFR 70.61(e) requires that each engineered or administrative control necessary to comply with paragraphs (b), (c), or (d) of this section shall be designated as an IROFS. In addition, FCSS ISG-03 states that meeting 10 CFR 70.61(d) through use of the double contingency principle is acceptable provided that double contingency controls are designated as IROFS in accordance with § 70.61(e).

N3. Describe the relationship between IROFS credited in the ISA Summary and the controls credited for double contingency in the NCSE [redacted]

During the staff's on-site review, the staff noted that the IROFS in [redacted] did not realistically reflect the actual design features and operator actions relied on to prevent criticality. [redacted] The double contingency controls in the NCSE credit both devices and a visual inspection of both devices. It is apparent these redundant devices were put in place for the express purpose of protecting against this scenario. However, the IROFS credited in the ISA Summary consist of: (1) the second such device [redacted] and (2) a visual inspection [redacted] of this device. It is not clear that the visual inspection of the device is truly independent from the operator action to set the device, and this appears to give a false impression of what is being relied on for safety.

10 CFR 70.61(b) requires that high-consequence events be shown to be highly unlikely. Chapter 4 of the license application commits the licensee to follow the double contingency principle (consistent with ANSI/ANS-8.1-1998). This is an important part of the licensee's safety program. An accurate understanding of the ISA process requires an understanding of how these program elements are related.

N4. Explain how IROFS are chosen in performing the ISA, for criticality accident sequences [redacted]

During the staff's on-site review, the staff identified several criticality accident sequences with sole IROFS, even though the affected processes are required to meet the double contingency principle. It is apparent that in such cases that either: (1) all controls relied on for criticality safety have not been designated as IROFS; or (2) one of the controls relied on for criticality safety is being treated as an initiating event.

10 CFR 70.61(b) requires that high-consequence events be shown to be highly unlikely. Chapter 4 of the license application commits the licensee to follow the double contingency principle (consistent with ANSI/ANS-8.1-1998). This is an important part of the licensee's safety program. An accurate understanding of the ISA process requires an understanding of how these program elements are related.

[redacted]

N5. Describe how administrative controls consisting of rare unplanned actions versus routine actions are distinguished, for the purpose of assigning indices [redacted]

During the staff's on-site review, the staff noted that [redacted] was assigned a failure probability index of [redacted]. NFS's ISA methodology presumes a failure probability index of [redacted] for administrative IROFS involving routine planned operations, and an index of [redacted] for those involving rare unplanned events. The administrative action [redacted] credited in this sequence was assigned an index of [redacted], even though the actions are only taken in response to an upset that operating experience has shown is rare. Therefore, it is not apparent that assignment of this index is justified.

10 CFR 70.61(b) requires that all high consequence events must be ensured to be highly unlikely. Demonstration that a criticality accident is highly unlikely is done in accordance with the licensee's ISA methodology, in which assignment of likelihood indices is done consistent with tables in Appendix A of NUREG-1520.

N6. Describe how human performance factors such as task complexity, rarity, and response time are factored into assignment of indices to administrative controls [redacted]

During the staff's on-site review, the staff noted that [redacted] was assigned a failure probability index of [redacted]. NFS's ISA methodology presumes a failure probability index of [redacted] for administrative IROFS involving routine planned operations, and an index of [redacted] for those involving rare unplanned events. The administrative action [redacted] credited in this sequence was assigned an index of [redacted] even though the action is complex [redacted], and even though the actions are only taken in response to an upset that operating experience has shown is rare. In addition, it has not been shown that there is sufficient response time for the operator to complete the required actions. Therefore, it is not apparent that assignment of this index is justified.

10 CFR 70.61(b) requires that all high consequence events must be ensured to be highly unlikely. Demonstration that a criticality accident is highly unlikely is done in accordance with the licensee's ISA methodology, in which assignment of likelihood indices is done consistent with tables in Appendix A of NUREG-1520.

N7. Justify using a lower (more negative) index for active engineered controls that consist of mechanical devices than for those consisting of electrical or electronic devices. Explain how it is determined that an index for a general type of control is applicable to a specific type of equipment [redacted].

During the staff's on-site review, the staff noted that a lower (more negative) index was assigned to [redacted] than would be typical for this type of control, without any apparent justification. NFS's ISA methodology presumes a failure probability index of [redacted] for a single active engineered IROFS. The licensee stated during the on-site review that the basis for assigning a [redacted] index was that the active control was mechanical, rather than

[redacted]

electrical or electronic, in nature. However, it is not apparent that this is sufficient justification for assigning a lower (more negative) index. Given anecdotal reports about failures of similar devices in the nuclear industry, it appears to the staff that an index of [redacted] may not be warranted.

10 CFR 70.61(b) requires that all high consequence events must be ensured to be highly unlikely. Demonstration that a criticality accident is highly unlikely is done in accordance with the licensee's ISA methodology, in which assignment of likelihood indices is done consistent with tables in Appendix A of NUREG-1520.

N8. Justify not including equipment in the boundary of an administrative IROFS, when that equipment is necessary to perform the operator action. Describe the management measures associated with the equipment involved [redacted].

During the staff's review prior to the site visit, the staff noted that [redacted] consists of the administrative action of verifying the measurement on a piece of equipment. However, the equipment is not identified as part of the IROFS. Therefore, it is not apparent that all components of the IROFS will be properly maintained so that it will perform its safety function as needed. (This is a specific instance of E2.)

10 CFR 70.62(d) requires licensees to establish management measures to ensure that IROFS are designed, implemented, and maintained to ensure they are available and reliable to perform their function when needed. Section 3.4.3.2(6)b of NUREG-1520 states that the description of each IROFS within an ISA Summary should identify what management measures are applied to the IROFS.

M1. Please describe the process for documenting and evaluating failures of IROFS and management measures, and discuss how the safety program and ISA procedures assure that all failures of IROFS and management measures are adequately addressed and that all involved personnel are aware of the process and procedural requirements.

During the staff's on-site review, requirements or instructions for IROFS and management measures failures were noted in a number of different procedures, including NFS-GH-56, "Management Measures Identification and Implementation of IROFS," and NFS-GH-65, "Problem Identification." In some cases, the procedures addressed requirements for IROFS, but not management measures. It was not clear to the staff that the regulatory requirements for documenting these failures were adequately addressed in the various procedures, and identified responsibilities for all licensee personnel that may, or should, be involved in observing, documenting and evaluating IROFS and management measures failures.

10 CFR 70.62(a)(3) requires the licensee to, as part of its safety program, maintain records of failures readily retrievable and available for the Nuclear Regulatory Commission (NRC) inspection, documenting each discovery that an item relied on for safety or management measure has failed to perform its function upon demand or has degraded such that the performance requirements of § 70.61 are not satisfied. These records must identify the item relied on for safety or management measure that has failed and the safety function affected, the date of discovery, date (or estimated date) of

[redacted]

[redacted]

the failure, duration (or estimated duration) of the time that the item was unable to perform its function, any other affected items relied on for safety or management measures and their safety function, affected processes, cause of the failure, whether the failure was in the context of the performance requirements or upon demand or both, and any corrective or compensatory action that was taken. A failure must be recorded at the time of discovery and the record of that failure updated promptly upon the conclusion of each failure investigation of an item relied on for safety or management measure.

C1. Explain how phase inversion [redacted] in the process equipment were considered during the accident analysis of the [redacted] process.

This information is required to comply with 10 CFR 70.65(b)(3), which states that the ISA summary must contain "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 10 CFR 70.62(c)(1)(i)-(iii) and a general description of the types of accident sequences."

C2. Confirm that the previous commitment made for the [redacted] amendment will be incorporated in the NFS site-wide ISA Summary:

> "In instances where [redacted] is defined by the same level of exposure, NFS commits to conservatively applying controls that apply [redacted]." [Taken from letter dated March 16, 2004; 21G-04-0041; GOV-01-55-04; ACF-04-0069)]

[redacted] intermediate consequence standards are the same [redacted]

This information is required to comply with 10 CFR 70.65(b)(7), which states that the ISA summary must contain "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)."

C3. Explain and justify the methodology used to assess high and intermediate consequences to the worker [redacted] since these scenarios are not discussed in the ISA Summary. Justify your assumptions.

This information is required to comply with 10 CFR 70.65(b)(3) which states that the ISA summary must contain "a description of each process (defined as a single reasonably simple integrated unit operation within an overall production line) analyzed in the

[redacted]

integrated safety analysis in sufficient detail to understand the theory of operation; and, for each process, the hazards that where identified in the integrated safety analysis pursuant to 10 CFR 70.62(c)(1)(i)-(iii) and a general description of the types of accident sequences."

C4. [redacted], provide a calculation [redacted] in the applicable process areas of the NFS site. Also, explain the impact of these [redacted] on IROFS such as operator actions and enhanced administrative controls. Justify your assumptions and conclusions.

This information is requested to determine compliance with 10 CFR 70.65(b) which states that "...The integrated safety analysis summary must contain...(4) Information that demonstrates compliance with the performance requirements of 10 CFR 70.61...; and, if applicable, the requirements of 10 CFR 70.64;..."

C5. Verify that proposed chemical quantitative standards for materials [redacted], which is also a fire hazard, are within the safety limits to avoid an explosive condition.

This information is required to comply with 10 CFR 70.65(b)(7) which states that the ISA summary must contain "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)." Also, 10 CFR 70.62(c)(1)(iii) mentions that the integrated safety analysis shall identify "facility hazards that could affect safety of licensed materials and thus present an increased radiological risk."

C6. Confirm that the previous commitment made for the Blended Low Enriched Uranium (BLEU) amendment will be incorporated in the NFS site-wide ISA Summary:

> "NFS commits to verify and distinguish between IROFS and controls designated as "Defense-in-Depth". A brief listing of IROFS will be contained in the ISA Summary as required under 10 CFR 70.65(b)(6). A description of the controls designated as "Defense-in-Depth" will also be contained in the ISA Summary." [Taken from letter dated March 16, 2004;21G-04-0041; GOV-01-55-04; ACF-04-0069)]

This information is requested to determine compliance with 10 CFR 70.65(b), which states that "...The integrated safety analysis summary must contain...(4) Information that demonstrates compliance with the performance requirements of 10 CFR 70.61...; and, if applicable, the requirements of 10 CFR 70.64;..."

C7. Include chemicals present at the NFS site and chemicals considered in the consequence analysis in Table 7.3, NFS Site Chemical Standards and 10 CFR 70.61 Standards, of the site-wide ISA Summary to ensure completeness of the ISA and ISA Summary documentation. Confirm if this table, the ISA, and the ISA Summary will be updated if the values of these standards change.

[redacted]

[redacted]

This information is required to comply with 10 CFR 70.65(b)(7) which states that the ISA summary must contain "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 ©)(4)."

C8. Provide and define the range of the chemical quantitative standards used to evaluate an intermediate consequence to the public due to an uranium intake. Table 7-1 depicts the ranges at which high, intermediate, and low consequences to the different receptors are evaluated. The intermediate consequence to the public includes the ERPG-1 (or equivalent) as the lower level of concern for this type of consequence. Table 7-3, NFS Site Chemicals and 10 CFR 70.61 Standards, does not include the ERPG-1 or equivalent value for soluble uranium.

This information is required to comply with 10 CFR 70.65(b)(7) which states that the ISA summary must contain "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)."

F1. Unfinished fire protection improvements are credited in some of the ISA analyses. Identify all unfinished fire protection improvements (especially IROFS), provide an estimated time for completion, and provide a description of compensatory measures which have been put in place in the interim.

10 CFR 70.65 (a)(6) requires the applicant to include in its ISA summary "A list briefly describing each item relied on for safety which is identified pursuant to 70.61(e) in sufficient detail to understand their functions in relation to their performance requirements of 70.61."

F2. Combustible loading controls appear to be supported solely by surveillances. They should also have an active component to prevent the placement of combustibles if a reliability index of [redacted] is to be assumed for these controls in the ISA. Active components might consist of combustibles permitting program and/or signs supported by training warning against placement of combustibles. More frequent surveillances could also help justify the assumed reliability index.

10 CFR 70.62(c)(1)(v) requires that the ISA identify "The consequences and likelihood of occurrence of each potential accident sequence identified pursuant to paragraph (c)(1)(iv) of this section and the methods used to determine the consequences and the likelihoods."

F3. Provide an analysis of fires in the [redacted]. The analysis should look at all possible causes, [redacted], potential consequences [redacted] and identify IROFS and/or other preventive measures or controls.

10 CFR 70.62(c)(1)(v) requires that the ISAidentify "The consequences and likelihood of occurrence of each potential accident sequence identified pursuant to paragraph

[redacted]

[redacted]

(c)(1)(iv) of this section and the methods used to determine the consequences and the likelihoods."

F4. Provide evaluation of [redacted] and identify IROFS as necessary.

10 CFR 70.62(c)(1)(v) requires that the ISA identify "The consequences and likelihood of occurrence of each potential accident sequence identified pursuant to paragraph (c)(1)(iv) of this section and the methods used to determine the consequences and the likelihoods."

F5. Identify how the ISA and fire protection program will be supported by trained fire protection engineer(s) and provide an organization chart showing the responsibility for fire safety within your organization.

10 CFR 70.62 (c)(2) requires that "..... the analysis must be performed by a team with expertise in engineering and process operations. The team shall include at least one person who has experience and knowledge specific to each process being evaluated, and persons who have experience in nuclear criticality safety, radiation safety, fire safety, and chemical process safety. ...." The staff considers the Integrated Safety Analysis to be an ongoing process which will require a knowledgeable staff for routine and non-routine evaluations throughout the life of the facility.