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21G-08-0206  
GOV-01-55-04  
ACF-08-0399  
December 5, 2008

Director  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

- References:
- 1) Docket No. 70-143; SNM License 124
  - 2) NFS letter from B. Marie Moore to Director, Office of Nuclear Material Safety and Safeguards, dated August 31, 2007, (TAC L32653) "License Amendment Request for Processing UF<sub>6</sub> in the CD Line Facility at the NFS Site," (21G-07-0086)
  - 3) NRC Letter from Kevin Ramsey to B. Marie Moore, dated May 23, 2008, (TAC L32653), "Nuclear Fuel Services, Inc., Request for Additional Information Concerning the CD Line Facility"
  - 4) NFS letter from B. Marie Moore to Director, Office of Nuclear Material Safety and Safeguards, dated June 19, 2008, "Reply to RAI Concerning NFS' CD Line Facility," (21G-08-0093)
  - 5) NFS letter from B. Marie Moore to Director, Office of Nuclear Material Safety and Safeguards, dated November 10, 2008, "Reply to RAI Concerning NFS' CD Line Facility," (21G-08-0185)

**Subject: Additional Information on RAI Question #9 Concerning NFS' CD Line Facility**

Dear Sir:

As a result of Nuclear Regulatory Commission (NRC) questions/concerns arising from Reference 4, Nuclear Fuel Services, Inc. (NFS) submitted additional information (Reference 5) to supplement its initial response to NRC Request for Additional Information (RAI) Question #9.

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**WHEN DETACHED, HANDLE THIS PAGE AS DECONTROLLED**

B.M. Moore to USNRC  
Page 2  
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ACF-08-0399

The NRC notified NFS that the response (Reference 5) did not include an appropriate level of detail to allow the NRC to conduct their review. Additional details were e-mailed to the NRC on December 4, 2008, to provide input for a conference call on December 5, 2008. As a result of the conference call on December 5, 2008, the additional details were determined to be adequate by the NRC. NFS hereby formally submits the additional details to supplement its initial responses to NRC Request for Additional Information (RAI) Question #9.

Information contained in Attachment 1 contains sensitive information, is marked as "Official Use Only," and is not suitable for public release. Attachment 2 contains a redacted version of Attachment 1 that is suitable for public release.

If you or your staff have any questions, require additional information, or wish to discuss this matter further, please contact me, or Mr. Randy Shackelford, Nuclear Criticality Safety Manager, at (423) 743-2504. Please reference our unique document identification number (21G-08-0206) in any correspondence concerning this letter.

Sincerely,

**NUCLEAR FUEL SERVICES, INC.**



B. Marie Moore  
Vice President, Safety and Regulatory

WRS/pdj  
Attachments

Copy:  
Regional Administrator  
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Project Inspector  
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Mr. Stephen Burris  
Senior Resident Inspector  
U.S. Nuclear Regulatory Commission

**ATTACHMENT 1**

**Additional Details to Support RAI Response to Question #9 Concerning  
NFS' CD Line Facility**

Please refer to the following additional details (excerpts from the related Nuclear Criticality Safety Evaluations) to support the response to RAI Question #9.

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May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552)

Exemption number 2

Nuclear Regulatory Commission review required before public release.

Name and organization of person making determination MCone (NRS)

Date of Determination 12/5/08

**ATTACHMENT 2**

**REDACTED VERSION**

**Additional Details to Support RAI Response to Question #9 Concerning  
NFS' CD Line Facility**

Please refer to the following additional details (excerpts from the related Nuclear Criticality Safety Evaluations) to support the response to RAI Question #9.

#### **4.1.15 Too Much U in ENCLOS-1B/C01 and VESSEL-1B/C01 or ENCLOS-1A02**

Item: CDL04/05.034 Too much U in ENCLOS-1B/C01, VESSEL-1B/C01  
CDL09.019 Too much U in ENCLOS-1A02

##### **4.1.15.1 Discussion**

ENCLOS-1B/C01, including the pass-throughs to the enclosures, is limited to a [REDACTED] ENCLOS-1A02 is limited to [REDACTED] with no more than one container allowed out of a rack position at a time. [REDACTED]

##### **4.1.15.2 Double Contingency Analysis**

ENCLOS-1B/C01 has only one heating chamber (VESSEL-1B/C01) [REDACTED] There are also no storage racks within these enclosures. [REDACTED]

In addition, ENCLOS-1B/C01 is limited [REDACTED] ENCLOS-1A02 is allowed to have up to two containers with only one out of a rack position at a time. This requirement is a simple administrative control that is flowed down into procedures that the operators are trained to follow. Based on this it is considered unlikely that more than the allowed number of cylinders or containers will be brought into the enclosures.

Previous experience at NFS shows one documented case where an empty extra container was positioned within an enclosure, but there are no documented cases of two extra containers being positioned inside an enclosure, in violation of the posted enclosure limit. Based on this history, the first additional container would probably be added as a result of an operator failing to observe that the container limit is already reached in the enclosure. An event leading to the introduction of more than two additional containers above the enclosure limit, by a trained and qualified operator, in accordance with an approved, written procedure is considered a malicious event and is not an accident.

For ENCLOS-1A02, there is some dependence between the upset of having too many containers in the enclosure and having too many out of a rack at a time (e.g., an operator brings in extra container without knowing one is already out of the rack). However, it is also expected that since the operator is trained on both of these separate controls, that should this upset occur, the operator would realize that: a) there are too many containers in the enclosure or b) there are too many containers outside of a rack position. In this regard, there are two controls present that would alert the operator to an abnormal condition.

Placing containers inside of an enclosure is a simple administrative action and there are no complex administrative tasks or multiple steps required. The interior of the process enclosure is relatively small and clearly visible through the front Lexan panels. The

enclosures also have fluorescent lighting installed on the top, providing for high visibility inside the enclosure. Routine housekeeping ensures the enclosure is clutter-free and the floor area is generally open such that there are no hidden areas for containers to be placed. Operators verify the enclosure container limit will not be exceeded prior to placing a container inside the enclosure. It is unlikely that if an operator sees the enclosure already contains the maximum number of containers, the operator would add one more container to the enclosure. In addition, the operator can only place one container inside the enclosure at a time since hand carry requirements allow only one item to be hand carried at a time. Almost all process enclosures at NFS have container limits and operators are well aware of the expectations regarding the handling of fissile material.

Since it is not possible to maximize the amount of mass (or number of containers) within an enclosure and still be subcritical, a second, independent verification of the container limit is required prior to placing item(s) in the enclosure. This peer check may be performed by a second operator or supervisor and helps to ensure upsets leading to an excess number of items in the enclosure are indeed the result of independent failures.

Reflection underneath the enclosure also affects the system reactivity for this upset condition. For this reason, it is necessary to include a restriction on entry underneath the enclosure when fissile material is present. Note this does not include the occasional use of hands or arms to perform various tasks under an enclosure. Typically, personnel would only need to access the area under an enclosure for maintenance purposes. Even under these conditions, it would be difficult to "fully" reflect the entire surface underneath an enclosure.

In the unlikely event that more than the allowed number of cylinders or containers is brought into the enclosure, subcriticality can still be assured. [REDACTED]

[REDACTED] Calculations in Section 4.3.2.7 demonstrate that even if an extra 2-liter container is brought into the enclosure in addition to the normal containers, the enclosure will remain subcritical. Based on this, the double contingency principle is satisfied.

An additional model is also developed for defense-in-depth purpose to consider two additional containers inside the enclosure. [REDACTED]

#### 4.1.15.3 Criticality Barriers

- ENCLOS-1B01, including the associated pass-through, is limited to [REDACTED]  
[REDACTED] Verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS1-24)
- ENCLOS-1B01, including the associated pass-through, [REDACTED]  
[REDACTED]

- [REDACTED] A second, independent verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS1-25)
- ENCLOS-1C01, including the associated pass-through, is limited [REDACTED]  
[REDACTED] Verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS1-26)
  - ENCLOS-1C01, including the associated pass-through, is limited [REDACTED]  
[REDACTED] A second, independent verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS1-27)
  - ENCLOS-1A02, including the associated airlock, is limited [REDACTED]  
[REDACTED] Verification of the container limit shall be performed prior to placing item(s) with fissile material in enclosure. (CDS1-28)
  - ENCLOS-1A02, including the associated airlock, is limited [REDACTED]  
[REDACTED] A second, independent verification of the container limit shall be performed prior to placing item(s) with fissile material in enclosure. (CDS1-29)
  - No more than one container shall be out of a rack position in ENCLOS-1A02 at a time. (CDS1-30)
  - Personnel shall not enter the space beneath enclosures when there is fissile material inside the enclosure. Note, hands and arms are permissible. (CDG-34)

**4.1.15.4 Risk Index**

ENCLOS-1B/C01

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

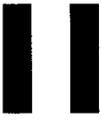
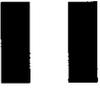
ENCLOS-1A02

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Accident Sequence	Initiating Events/ Enabling Events (IE/EE)	IROFS Effectiveness of Protection Index (E-Enhanced, A-Active, P-Passive)	Likelihood Index T Uncontrolled/ Controlled	Likelihood Category (LC)	Risk Index (LC x 3)
					
					

#### **4.1.16 Too Much Uranium in ENCLOS-1D01 and VESSEL-1D01 or ENCLOS-4A05**

Item: CDL06.034 Too much U in ENCLOS-1D01, VESSEL-1D01  
CDL10.001 Too much U in ENCLOS-4A05

##### **4.1.16.1 Discussion**

ENCLOS-1D01 is limited [REDACTED] A 2-liter bottle may be needed for cleanout operations. If more than one cylinder or container is brought into the enclosure, the interaction within the enclosure would result in greater reactivity. [REDACTED]

ENCLOS-4A05 will typically be used to size reduce empty cylinders and remove any remaining heel. The [REDACTED] cylinders will be cut open and the heel or remaining contents of the [REDACTED] cylinder may be transferred to an empty 2-liter or smaller bottle. The remaining pieces of the [REDACTED] cylinders will be size reduced and bagged out for disposal. Any 5A/B cylinder that fails the valve check may also be placed into this enclosure to be repaired. This enclosure is limited [REDACTED] (including overpack container with 1S or 2S cylinder inside) or one 2-liter, or smaller, bottle containing fissile material at a time.

##### **4.1.16.2 Double Contingency Analysis**

ENCLOS-1D01 has only one heating chamber (VESSEL-1D01) [REDACTED] There are also no storage racks within the enclosure for storing extra cylinders or containers. In addition, ENCLOS-1D01 is limited [REDACTED] This requirement is a simple administrative control that is flowed down into procedures that the operators are trained to follow. Based on this, it is considered unlikely that more than one cylinder or container will be brought into Sublimation Station #3.

Likewise, operations in ENCLOS-4A05 are limited [REDACTED] In fact, typical operations in this enclosure involve only empty cylinders. There are also no storage racks within this enclosure for storing extra cylinders or containers. ENCLOS-4A05 is limited [REDACTED] This requirement is a simple administrative control that is flowed down into procedures that the operators are trained to follow. Based on this, it is considered unlikely that more than one cylinder or container will be brought into the Heel Removal Station.

Previous experience at NFS shows one documented case where an empty extra container was positioned within an enclosure, but there are no documented cases of two extra containers being positioned inside an enclosure, in violation of the posted enclosure limit. Based on this history, the first additional container would probably be added as a result of

an operator failing to observe that the container limit is already reached in the enclosure. An event leading to the introduction of more than two additional containers above the enclosure limit, by a trained and qualified operator, in accordance with an approved, written procedure is considered a malicious event and is not an accident.

Placing containers inside of an enclosure is a simple administrative action and there are no complex administrative tasks or multiple steps required. The interior of the process enclosure is relatively small and clearly visible through the front Lexan panels. The enclosures also have fluorescent lighting installed on the top, providing for high visibility inside the enclosure. Routine housekeeping ensures the enclosure is clutter-free and the floor area is generally open such that there are no hidden areas for containers to be placed. Operators verify the enclosure container limit will not be exceeded prior to placing a container inside the enclosure. It is unlikely that if an operator sees the enclosure already contains the maximum number of containers, the operator would add one more container to the enclosure. In addition, the operator can only place one container inside the enclosure at a time since hand carry requirements allow only one item to be hand carried at a time. Almost all process enclosures at NFS have container limits and operators are well aware of the expectations regarding the handling of fissile material.

Since it is not possible to maximize the amount of mass (or number of containers) within an enclosure and still be subcritical, a second, independent verification of the container limit is required prior to placing item(s) in the enclosure. This peer check may be performed by a second operator or supervisor and helps to ensure upsets leading to an excess number of items in the enclosure are indeed the result of independent failures.

Reflection underneath the enclosure also affects the system reactivity for this upset condition. For this reason, it is necessary to include a restriction on entry underneath the enclosure when fissile material is present. Note this does not include the occasional use of hands or arms to perform various tasks under an enclosure. Typically, personnel would only need to access the area under an enclosure for maintenance purposes. Even under these conditions, it would be difficult to "fully" reflect the entire surface underneath an enclosure.

In the unlikely event that more than one cylinder or container is brought into the enclosure, subcriticality can still be assured. According to **Reference 1**, a 2-liter bottle is the bounding container that may be brought into the enclosure. Calculations in **Section 4.3.2.8** demonstrate that even if a 2-liter container is brought into the enclosure in addition to the normal [REDACTED] cylinder, the enclosure will remain subcritical. Given the size and mass of a [REDACTED] cylinder and the dimensions of the hatch/enclosure, it would be difficult to position more than one cylinder inside the enclosure at a time; however, for defense-in-depth, two [REDACTED] cylinders are also modeled inside the enclosure at one time and shown to be subcritical. Based on this, the double contingency principle is satisfied.

An additional model is also developed for defense-in-depth purpose to consider two additional containers inside the enclosure. [REDACTED]

#### 4.1.16.3 Criticality Barriers

- [REDACTED] Verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS3-16)
- [REDACTED] A second, independent verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS3-17)
- [REDACTED] The contents of the [REDACTED] cylinder may be transferred to an empty 2-liter or smaller bottle in ENCLOS-4A05. Any bottle containing fissile material shall be removed prior to bringing in another [REDACTED] cylinder or 2-liter or smaller bottle containing fissile material. In addition, a rinse bottle (1-liter or smaller) with no SNM may be used in ENCLOS-4A05. Verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS3-18)
- [REDACTED] The contents of the [REDACTED] cylinder may be transferred to an empty 2-liter or smaller bottle in ENCLOS-4A05. Any bottle containing fissile material shall be removed prior to bringing in another [REDACTED] cylinder or 2-liter or smaller bottle containing fissile material. In addition, a rinse bottle (1-liter or smaller) with no SNM may be used in ENCLOS-4A05. A second, independent verification of the container limit shall be performed prior to placing an item with fissile material in enclosure. (CDS3-19)
- Personnel shall not enter the space beneath enclosures when there is fissile material inside the enclosure. Note, hands and arms are permissible. (CDG-34)

#### 4.1.16.4 Risk Index



[REDACTED]

[REDACTED]

Accident Sequence	Initiating Events/ Enabling Events (IE / EE)	IROFS Effectiveness of Protection Index (E-Enhanced, A-Active, P-Passive)	Likelihood Index T Uncontrolled/ Controlled	Likelihood Category (LC)	Risk Index (LC x 3)
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]