

October 5, 2011

David Sexton, Chief Nuclear Officer
and Vice President of Operations
Louisiana Energy Services, LLC
National Enrichment Facility
P.O. Box 1789
Eunice, NM 88231

SUBJECT: INSPECTION REPORT NO. 70-3103/2011-201 AND NOTICE OF VIOLATIONS

Dear Mr. Sexton,

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced nuclear criticality safety (NCS) inspection of your facility in Eunice, New Mexico, from March 7-11 and July 18-21, 2011. The purpose of the inspection was to determine whether operations involving special nuclear material were conducted safely and in accordance with regulatory requirements. Inspection observations and findings were discussed with members of your staff and management throughout the inspection. Exit meetings were held on March 10, March 31, July 21, and September 6, 2011.

The inspection, which is described in the enclosure, focused on the more hazardous activities and plant conditions; controls relied on for safety and their analytical safety bases; and the principal management measures for ensuring controls will be available and reliable to perform their functions when needed. The inspection consisted of a review of safety basis documents, procedures, and records, examinations of relevant NCS-related equipment, interviews with NCS engineers and plant personnel, and facility walkdowns to observe plant conditions and activities.

Based on the results of this inspection, NRC has determined that two Severity Level IV violations of NRC requirements occurred. The violations were evaluated in accordance with the NRC Enforcement Policy included on the NRC's web site at www.nrc.gov; select Public Meetings & Involvement, then Enforcement. The violations are being cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding them are described in detail in the subject inspection report. The violations are being cited in the Notice because they were identified by the NRC. The first violation being cited as a Severity Level IV violation is the failure to identify and analyze a credible accident sequence leading to criticality in accordance with your approved ISA methodology. The second violation being cited as a Severity Level IV violation is the failure to demonstrate how the cascade meets the performance requirements or establish items relied on for safety for a credible accident sequence leading to criticality.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

D. Sexton

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In accordance with Title 10 of the *Code of Federal Regulations* 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be made publicly available in the public electronic reading room of the NRC's Agency-Wide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/ADAMS.html>.

If you have any questions concerning this report, please contact Thomas Marenchin, of my staff, at (301) 492-3209.

Sincerely,

/RA/

Margie Kotzalas, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No. 70-3103

Enclosures:

1. Notice of Violation
2. Inspection Report No. 70-3103/2011-201

D. Sexton

- 2 -

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NOTICE OF VIOLATIONS

Louisiana Energy Services, L.L.C.
Eunice, N.M.

Docket No. 70-3103
License No. SNM-2010

During a Nuclear Regulatory Commission (NRC) inspection conducted from March 7-11, 2011, and from July 18-21, 2011, violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are listed below:

- A. Special Nuclear Material License Number (No.) 2010 requires, in part, that the licensee shall conduct authorized activities at the Louisiana Energy Services, L.L.C., National Enrichment Facility (LES NEF) in accordance with statements, representations, and conditions, or as revised in accordance with the Safety Analysis Report (SAR) dated December 12, 2003, and supplements thereto.

Section 3.2.5.2 of the Safety Analysis Report states, in part, that any one of the following independent acceptable sets of qualities could define an event as not credible:

- a. An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years.
- b. A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive (In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such sequence of events can ever have actually happened in any fuel cycle facility).
- c. Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely.

Contrary to the above, the licensee failed to apply the aforementioned criteria in making the determination, as stated in Section 3.4.3.8.1 of its Integrated Safety Analysis (ISA) Summary, that criticality in the cascade following the occurrence of a centrifuge crash was not credible.

This is a Severity Level IV Violation (Supplement 6.2).

- B. Title 10 of the *Code of Federal Regulations* (10 CFR) 70.61(b) requires, in part, that the risk of each credible high-consequence event must be limited. Engineered and/or administrative controls must be applied to the extent needed to ensure that the likelihood of occurrence of such an event will be at least highly unlikely.

10 CFR 70.61(d) requires, in part, that the risk of criticality must be limited by ensuring that all nuclear processes will be subcritical under both normal and credible abnormal conditions.

Enclosure 1

10 CFR 70.61(e) requires, in part, that each engineered or administrative control system necessary to comply with paragraphs (b), (c), or (d) of 10 CFR 70.61 must be designed as an item relied on for safety (IROFS).

Contrary to the above, the licensee failed to identify or analyze a credible accident sequence leading to criticality in the cascade. Specifically, the licensee failed to analyze a criticality in the cascade following a centrifuge crash, or to establish IROFS sufficient to ensure that such a criticality would be highly unlikely, and that the system would remain subcritical under credible abnormal conditions.

This is a Severity Level IV Violation (Supplement 6.2).

Pursuant to the provisions of 10 CFR 2.201, Louisiana Energy Services, LLC is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555, with copies to the Chief, Technical Support Branch, Division of Fuel Cycle Safety and Safeguards, NMSS, and the Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation with a required response: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid further violations; and (4) the date when full compliance will be achieved.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an Order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agency-Wide Document Access and Management system (ADAMS), accessible from the NRC Web Site at <http://www.nrc.gov/reading-rm/adams.html> to the extent possible, it should not include any personal privacy, proprietary, classified, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withhold and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 5th day of October 2011.

**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS**

Docket No.: 70-3103

License No.: SNM-2010

Report No.: 70-3103/2011-201

Licensee: Louisiana Energy Services L.L.C

Location: Eunice, New Mexico

Inspection Dates: March 7-10, 2011
July 18-21, 2011

Inspectors: Dennis Morey, Senior Criticality Safety Inspector
Thomas Marenchin, Criticality Safety Inspector
Christopher Tripp, Senior Criticality Safety Inspector
Christian Fisher, Criticality Safety Inspector

Approved: Margie Kotzalas, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Enclosure 2

EXECUTIVE SUMMARY

Louisiana Energy Services, L.L.C, National Enrichment Facility NRC Inspection Report 70-3103/2011-201

Introduction

Staff performed a routine, scheduled criticality safety inspection at the Louisiana Energy Services, L.L.C. (LES) facility in Eunice, New Mexico, from March 7-11, 2011 and July 18-21, 2011. Staff reviewed the licensee's nuclear criticality safety (NCS) program, administrative and operating procedures, NCS-related internal events, NCS audits and inspections, the criticality alarm system, plant operations, and open items.

Results

- The inspectors identified a Severity Level IV violation due to the failure to identify and analyze an accident sequence leading to criticality in the cascade in accordance with its approved integrated safety analysis (ISA) methodology.
- The inspectors identified a Severity Level IV violation due to the failure to demonstrate compliance with the performance requirements or establish items relied on for safety (IROFS) for a credible event.
- The inspectors identified an Unresolved Item (URI) due to the failure to identify each credible accident sequence leading to criticality in the ISA Summary.
- The inspectors identified a URI due to the licensee's use of subcriticality as the sole screening criterion for determining whether the performance requirements were met for the purposes of determining reportability for the ventilated storage room event.
- The inspectors identified a weakness regarding inconsistencies in Section 3.4.3.8.1 of the ISA Summary.
- No safety concerns were identified regarding licensee audits and inspections.
- No safety concerns were noted regarding licensee internal events.
- No safety concerns were identified regarding the allowed outage period for the licensee's criticality alarm system.

REPORT DETAILS

1.0 Plant Status

LES enriches uranium to a maximum of 5% enrichment in its gaseous centrifuge facility near Eunice, NM. Large scale construction activities were underway at the site. During the inspection only part of the facility, the uranium hexafluoride (UF₆) handling area and cascade mini halls 1A and 1B, were in operation.

2.0 NCS Program (IP 88015, IP 88016)

a. Scope of Inspection

The inspectors reviewed selected criticality analyses and evaluations for risk-significant operations at the LES facility. The inspectors interviewed licensee criticality engineers, operators, and managers regarding operations, equipment and controls. The inspectors reviewed selected portions of the following documents:

- CA-3-1000-02, Rev 4, Apparent Cause Evaluation, Event Date 3/8/2011
- CC-EG-2009-0246, "IROFS [items relied on for safety] 16C and IROFS16D Product Venting Design Change," Revision 0, dated November 11, 2009
- CR [condition report]-2011-0785, "Accident Sequences not in the ISA Summary," Revision 0, dated March 8, 2011
- CR-2011-2335, "Documentation of NRC identified violations," dated July 21, 2011
- EG-3-3200-01, "NCSE of the Assay Sample Rig (System 426)," Rev 1, June 30, 2010
- ETC [Enrichment Technology Corporation] 4039881-1, "Criticality Calculations for Crashed Machines Completely Filled Bores," Revision 1, dated June 18, 2008
- ETC 4040101-1, "Criticality Calculations for Crashed Machines Partial Filled Bores," Revision 1, dated June 26, 2008
- ETC 4165200-1, proprietary document
- ISA-MEM-036, "Contingency Product Cylinder Storage ISA, HAZOP, and Risk Determination Analysis," Revision 0, dated February 10, 2011
- NCS-CSA [criticality safety analysis]-003, "Product Vent Subsystem – Vacuum Pump and Chemical Trap Set Analysis," Rev 0, December 15, 2008
- NCS-CSA-008, "Parametric Criticality Safety Evaluation Materials," Revision 2, dated May 20, 2010
- NCS-CSE [criticality safety evaluation]-022, "Ventilated Storage Room [VSR] in the UF₆ Handling Area," Revision 1, dated April 10, 2010
- NCS-CSE-029, "30B Product Cylinder Contingency Storage," Revision 0, dated February 9, 2011
- NEF-BD-C22, "Verify Subcriticality by Mass Balance Calculation," Revision 1, dated June 11, 2011
- NSR [nuclear safety release]-2010-002, "Product Pumping and Tails Trams and Spare Trams," Revision 4, dated August 9, 2010
- NSR-2010-004, "Assay Sample Rig (System 426)," Revision 2, dated May 27, 2010
- NSR-2010-005, "Cascade 1 Centrifuge," Revision 2, dated September 30, 2010

- NSR-2010-015, "Product Vent Pump and Trap Set," Revision 1, dated September 11, 2010
- OP-3-1000-21, "Inventory Control for the Ventilated Storage Room," Revision 1, dated April 21, 2010
- OP-3-1000-21-F-1, "Ventilated Storage Room Waste Drum Inventory Control and Index," Revision 1, dated April 21, 2010
- RW-3-1000-09, "Waste Container Setup, Handling and Disposition," Revision 5, dated September 24, 2010

The inspectors also interviewed LES and ETC staff concerning the issue of criticality in the cascade following a centrifuge crash. A classified "Data Room" was set up for this purpose. During the "Data Room" session, the inspectors discussed or reviewed selected portions of the following documents:

- ETC4037314, dated November 7, 2006
- ETC4177310, dated March 21, 2011
- ETC7097466, dated October 7, 2009
- ETC4088440, dated October 8, 2009
- ETC4168214, dated March 11, 2011
- RDO-Tt017/1, dated July 13, 2011
- ETC4160865, dated June 8, 2011
- 11-441, dated July 21, 2011

The licensee stated that it will maintain these documents for NRC review, if needed, in a future "Data Room" session.

b. Observations and Findings

Criticality in the Cascade

The inspectors questioned licensee personnel concerning a potential scenario involving criticality in the cascade following a centrifuge crash. The concern was that uranium may accumulate undetected over a long period of time, eventually exceeding a safe mass. The inspectors noted that the licensee had performed calculations to show the amount of material that would have to accumulate before the license k_{eff} limit of 0.95 could be exceeded (ETC 4039881-1 and ETC 4040101-1), as summarized in Section 3.4.3.8.1 of its ISA Summary. Reaching a critical condition would require (1) the failure of multiple centrifuges adjacent in an array, (2) subsequent wet air in-leakage, sufficient to produce uranium deposits, but not sufficiently large to stop the enrichment process in the affected cascade, (3) accumulation of sufficient mass to exceed what was assumed in the bounding calculations, and (4) moderation of the deposits to a sufficient hydrogen-to-uranium (H/U) ratio to cause criticality. The licensee stated, in its ISA Summary and in the current and previous inspection, that this set of conditions was not credible. The inspectors determined that there was no documentation justifying this assertion, other than the statements in the ISA Summary themselves.

The inspectors noted that, during the current and previous inspection, LES employees had asserted that the cascade equipment (including centrifuges) was safe-by-design. The inspectors determined that only individual centrifuges in isolation would meet the criteria for being safe-by-design; this would not be applicable to an array of centrifuges, due to neutron interaction between them. The licensee then asserted that the criticality safety basis for the cascade equipment was the determination of incredibility. During the second week of the inspection, the licensee brought in a number of criticality experts from the ETC, the developer of the centrifuge technology in Europe. These experts and some supporting documentation were made available to the inspectors in a specially arranged "Data Room." The inspectors determined that there was sufficient information to conclude that the scenario in question is credible, as discussed below.

The licensee's approved ISA methodology contains three criteria for classifying an event as not credible. The ISA methodology for classifying an event as not credible is found in Section 3.2.5.2 of the Safety Analysis Report. It states, in part, that any one of the following independent acceptable sets of qualities could define an event as not credible:

- a. An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years.
- b. A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive (In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such sequence of events can ever have actually happened in any fuel cycle facility).
- c. Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely.

The inspectors determined that the stated reasons in the ISA Summary for the accident being not credible could only be relevant to the third criterion—"Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely." The inspectors therefore questioned the ETC staff about the likelihood of the various process deviations that would have to occur for criticality to be possible. Based on information provided by the ETC staff, the inspectors concluded that, while the failure of individual centrifuges tends to be random, there are credible events that could result in the failure of multiple machines. These failures could result in an array of failed centrifuges larger than what was analyzed to be subcritical. With regard to wet air in-leakage, the inspectors determined that such in-leakage could be the cause, or could be the effect, of a centrifuge failure. There is a strongly fluorinating environment in the cascade, represented by the chemical reaction $UF_6 + 2H_2O \rightarrow UO_2F_2 + 4HF$. Because of this, rather than being retained as liquid water, most of the water in the wet air will be used to form UO_2F_2 deposits and HF, which will be removed as light gases.

With regard to the amount of material that could accumulate, the ISA Summary states that the safe mass as determined in the bounding array calculations:

“...far exceeds the UF₆ holdup in an intact machine under normal conditions or the observed amount of uranium material formed due to air in-leakage into a failed machine, which is typically on the order of grams. There is no credible mechanism for such a large accumulation of uranium material in a failed or crashed machine.”

Based on information provided by ETC staff, however, the inspectors determined that the amount of material inside a failed machine could eventually exceed a safe mass if allowed to accumulate indefinitely, based on the experts' judgement about the rate of wet air in-leakage.

The licensee staff presented information to the inspectors using the second criterion—‘a process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive.’ The inspectors determined that the sequence of unlikely errors include mass accumulation, geometry failure, moderator intrusion, and ignoring indications of air in-leakage. The licensee's determination was based on errors that the inspectors determined were not unlikely because the licensee had demonstrated that they have occurred in other facilities.

The safety analysis report (SAR) also states, in part, “one cannot claim that a process does not need IROFS because it is “not credible” due to characteristics provided by IROFS.” 10 CFR 70.61 requires the use of IROFS to demonstrate that a high consequence accident sequence is high unlikely. The SAR states, in part, “a qualitative determination of “highly unlikely” can apply to passive design component features of the facility that do not rely on human interface to perform the criticality safety function (i.e., termed “safe-by-design”). The licensee's argument is partially based on the centrifuges being ‘safe-by-design’ (SBD). The SBD components are treated the same as IROFS due to the fact that the desired outcome for each is to demonstrate that the accident sequence is highly unlikely. The inspectors determined that due to the sequence of events not being unlikely and the use of SBD components, the accident sequence was credible.

The inspectors therefore determined that the scenario of criticality in an array of failed centrifuges had not been demonstrated to be not credible. Both engineering analysis and available historical operating data indicate that, with the exception of accumulating gross amounts of moderator in the cascade, none of the listed conditions, whether singly or in combination, were sufficient to meet the licensee's approved definition of not credible. In addition, the likelihood of the conditions depends to a great extent on the design of the cascade equipment and not solely on physical law. The failure to identify and analyze an accident sequence leading to criticality in the cascade in accordance with its approved ISA methodology is **Violation (VIO) 70-3103/ 2011-201-01.**

The inspectors further determined that there were no controls in place to prevent the accumulation of an unsafe mass of material in a failed centrifuge, and there was no analysis demonstrating that the performance requirements were met. No IROFS or management measure had therefore been established. The failure to demonstrate compliance with the performance requirements or establish IROFS for a credible event is **VIO 70-3103/2011-201-02.**

The licensee initiated a condition report, CR-2011-2335, to document the two noncompliances identified by the inspectors.

Accident Sequences in ISA Summary

During review of the licensee's CSEs and CSAs, the inspectors observed that the approved evaluations contain a section discussing accident pathways leading to a potential criticality. In NCS-CSE-029, this section describes controls for each of the eight potential accident pathways. The inspectors determined that the licensee criticality safety staff had determined that these potential accident pathways were credible and had therefore established preventive controls. The inspectors could not determine how the performance requirements of 10 CFR 70.61 were being met for these accident pathways since they were not in the ISA Summary. The licensee acknowledged that the accident sequences were not identified in the ISA Summary and stated that the current process does not have a method for ensuring that accident sequences identified in CSEs end up in the ISA Summary. The licensee entered this item into its condition report system (CR-2011-0758) for resolution. The inspectors determined that the safety significance of this issue is low because each of the potential accident sequences has preventive controls adequately implemented. The licensee is performing an extent of condition review to determine if these accident sequences are bounded by other accident scenarios or if the controls that have been established need to be IROFS. The possible failure to identify each credible accident sequence leading to criticality in the ISA Summary is **URI 70-3103/2011-201-03**.

ISA Summary

In the ISA Summary, Section 3.4.3.8.1, Criticality Safety, Centrifuges and Cascades, the inspectors observed that there were inconsistent statements made in some of the paragraphs, specifically the statement, "this quantity far exceeds the UF₆ holdup in an intact machine under normal conditions or the observed amount of uranic material formed due to air in-leakage into a failed machine, which is typically on the order of grams." The statement conflicted with information provided to the inspectors during the "Data Room" discussions with the licensee and ETC. The licensee opened condition report CR-2011-2316 to initiate the review of the ISA Summary section to ensure that the ISA Summary was updated to remove any inconsistencies. The licensee's action to update Section 3.4.3.8.1 of the ISA Summary to remove inconsistencies will be tracked as **Inspector Follow-up Item (IFI) 70-3103/2011-201-04**.

c. Conclusions

The inspectors identified two Severity Level IV violations due to the failure to identify and analyze a credible accident sequence and to demonstrate how the cascade meets the performance requirements for potential criticality. These do not constitute an immediate safety concern, because, currently, there are no clusters of failed centrifuges, and any accumulation of an unsafe mass would take at least several years to occur. However, the licensee failed to establish controls to prevent this accident scenario from occurring.

A weakness was also identified regarding inconsistencies in Section 3.4.3.8.1 of the ISA Summary.

3.0 NCS Inspections, Audits, and Investigations (IP 88015)

a. Scope of Inspection

The inspectors reviewed recent NCS-related internal audits including selected portions of the following documents:

- CR-3-1000-03, "NCS Weekly Walkthroughs and Periodic Assessments," Revision 7, dated December 7, 2010
- CR-2010-2053, "Error in Equation for Mass Balance," closed July 27, 2010
- CR-2010-2678, "Mass Balance Verification Outside Apparent Operating Limits," closed October 27, 2011
- CR-2011-0765, "Update CR-3-1000-03 to add Definitions," dated March 8, 2011
- CR-2011-0878, "Error Identified in CAAS [criticality accident alarm system] Coverage Drawings," closed June 22, 2011
- CR-2011-0917, "Cascade Run Up Rig," identified March 22, 2011
- CR-2011-1147, "Written to Address and Track Extent of Condition"
- CR-2011-1266, "Exceedence of Enrichment Limit due to Rounding," closed April 18, 2011
- CR-2011-2330, "Inconsistencies in the Documentation of Walkthroughs," dated July 21, 2011
- CR-2011-2333, "Consideration of requiring actions to validate enrichment less than 5%," dated July 21, 2011
- NCSAS-10-0002, "Criticality Safety Assessment – UF₆ Handling Area/ IROFSC22 Mass Balance Enrichment Verifications," Revision 0, dated March 3, 2011
- NCSAS-11-0001, "SBM 1001 Mass Spec Room," June 17, 2011
- NCSI-10-0016, "Weekly Walkthrough – Ops Reusable Equip Storage and VSR," Revision 0, dated July 12, 2010
- NCSI-10-0041, "Weekly Walkthrough – Solid Waste Collection," Revision 0, dated March 3, 2011
- NCSI-11-0005, "Weekly Walkthrough – Separations Building Module [SBM] Exterior CASS," Revision 0, dated March 4, 2011
- NCSI-11-0006, "Weekly Walkthrough – Cascade Halls MH1A and MH1B," Revision 0, dated March 4, 2011
- NCSI-11-0009, "30B Contingency Storage
- NCSI-11-0020, "UF₆ Area Storage Arrays," May 16, 2011
- NCSI-11-0021, "UF₆ Area 30B Contingency Storage," May 27, 2011
- NCSI-11-0022, "TSB Environmental Laboratory," June 3, 2011
- NCSI-11-0023, "Process Services Corridor, SBM 1001, 2nd Floor," June 10, 2011
- NCSI-11-0024, "CRDB CAAS Compensatory Measure," June 29, 2011
- OP-3-0450-01, Rev 11, Run sheets for June and May 2011
- OP-3-0450-01, Rev 11, "Cascade System," Attachment 8, February 3, 2011

b. Observations and Findings

The inspectors reviewed recent licensee weekly inspections and assessments of the NCS program and plant areas. The inspectors noted that licensee weekly walkthroughs and assessments were conducted in accordance with written procedures. The inspectors observed that the procedure for conducting weekly walkthroughs, CR-3-1000-03, used terms such as “deficiency” that were not defined in the procedure. The licensee agreed that these terms should be defined so that the procedure could be consistently applied during walkthroughs. The licensee documented the observation in condition report CR-2011-0765 and updated the procedure between the two inspections. The inspectors reviewed the updated procedure and determined that there were no safety concerns regarding undefined terms in procedure CR-3-1000-03. The inspectors subsequently noted that some of the documentation of the walkthroughs is inconsistent from week to week. These inconsistencies included inconsistent references to analysis, inconsistency in the IROFS reviewed, and the use of prior IROFS reviews in the walkthroughs. This makes it difficult for an independent person to determine if the walkthroughs are being conducted consistently and in accordance with procedure. The licensee initialized a condition report CR-2011-2330 to investigate what should be included in the documentation for the walkthroughs.

The inspectors also accompanied the licensee on a walkthrough of IROFSC22. The criticality safety officer conducted the walkthrough, while two operators performed the IROFS. The inspectors noted that when performing IROFSC22, the procedure addresses what to do if the IROFS indicates that the licensee is above the 6% enrichment, where the criticality safety analysis would no longer be valid. However, the procedure is silent on what to do if the IROFS indicates that the licensee is above its license limit of 5%. The inspectors informed the licensee that continuing to operate in awareness that it is above the license limit would be a violation. The licensee initialized a condition report CR-2011-2333 to investigate if actions should be taken if IROFSC22 indicates that it may be above its license limit.

c. Conclusions

No safety concerns were identified in the licensee’s inspections, audits, and investigations.

4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015, 88016, 88017)

a. Scope of Inspection

The inspectors reviewed several recent internally reported NCS conditions. The inspectors reviewed selected portions of the following documents:

- CR-2010-2195, “Concrete density in calculations,” dated July 8, 2010
- CR-2010-2211, “Ventilated Storage Room Spacing Violation,” dated July 7, 2010
- CR-2010-2735, “NaF traps exceed criticality limits,” August 25, 2010
- CR-2010-2740, “Chemical trap wall thickness,” August 25, 2010
- CR-2010-3399, “7 liter vacuum limit in ISAS,” October 23, 2010

- CR-2010-3470, "Crashed centrifuge calculations," dated October 29, 2010
- CR-2010-3554, "Safe by design [SBD] verification information for the AU1001 components," dated February 28, 2011
- CR-2011-0638, "Relocate CAAS warning lights," dated February 24, 2011
- CR-2011-0665, " SBD verification information for the AU1001 components," dated February 28, 2011
- CR-2011-0676, "Verification of SBD components," dated March 2, 2011
- CR-2011-0774, "Reportability of the Ventilated Storage Room Event," dated March 9, 2011
- LS-3-1000-05, "Notifications and Event Reporting," Revision 4, dated November 3, 2010
- UF₆-03, "Ventilated Storage Room Storage Area," Revision 1, dated April 12, 2010

b. Observations and Findings

The inspectors reviewed licensee condition reports generated since the previous inspection and focused on several NCS-related problems. The inspectors determined that licensee internal events were identified and reported in accordance with written procedures and that the licensee condition report system was used to track corrective actions.

The inspectors reviewed multiple condition reports that the licensee had generated since the last inspection. The inspectors observed in CR-2010-2211 that the licensee had found a non safe-by-design container being stored outside the UF₆ Handling Area ventilated storage room (VSR). Inside the container were parts that had been exposed to enriched material. The NCS Posting (NCS-CSE-022) displayed on the VSR door stated: "no external storage of containers or vessels containing enriched uranic material within 180 cm of the storage room." SAR section 11.4, Procedures Development and Implementation, states that "all activities involving licensed materials or IROFS are conducted in accordance with approved procedures." It also states that NCS postings are established, and identifies administrative controls applicable and appropriate to the activity or area in question. The inspectors determined that the non safe-by-design container with parts that had been exposed to enriched material violates the NCS posting, which is a failure to follow procedure. The inspectors concluded that the issue was of minor safety significance as the parts inside the non safe by design container had little material in them and the situation was bounded by the NCSE that covered the VSR. The licensee had corrected the issue and conducted additional training for the operators to ensure that safe by design containers were used in the future. The inspectors determined that, although this issue was corrected, it constitutes a violation of minor significance that is not subject to enforcement action in accordance with Section 2.2.2 of the Enforcement Policy.

The inspectors examined the licensee's evaluation of the VSR event for reportability in accordance with 10 CFR 70 Appendix A. The licensee's evaluation had determined that neither IROFS14b nor the requirements of NCS-CSE-022 were violated. IROFS14b establishes restrictions on the movement of waste containers in the vicinity of storage arrays, and is not applicable to this event. NCS-CSE-022 is the NCSE for the VSR in

the UF₆ handling area. The analysis demonstrates that this process will remain subcritical even with the most reactive equipment stored outside the room. The only requirement limiting the material stored outside the VSR is the NCS posting. Therefore, the inspectors questioned whether this event should have been reported under 10 CFR 70 Appendix A.

The licensee reevaluated the event for reportability in CR-2011-0774 and restated the performance requirements were not exceeded. This determination was based on the bounding model of NCS-CSE-022 that demonstrated subcriticality even with the most reactive equipment outside the room. While this addresses the requirements of 10 CFR 70.61(d), the performance requirements also require that high-consequence events be demonstrated to be highly unlikely. The licensee's evaluation of whether the performance requirements were exceeded did not address the likelihood of criticality following occurrence of the upset condition (i.e., misplacement of equipment contrary to the posting). Demonstrating compliance with the performance requirements for the VSR event and the use of subcriticality as the sole screening criterion for event reportability will be tracked as **URI 70-3103/2011-201-05**.

c. Conclusions

An unresolved item was identified regarding the licensee evaluation of an upset condition. No other safety concerns were noted regarding licensee internal events.

5.0 Criticality Alarm System (IP 88017)

a. Scope of Inspection

The inspectors reviewed placement and functional logic of criticality alarm detectors. The inspectors reviewed selected portions of the following documents:

- CALC-S-00109, "Evaluation of CAAS placement in the SBM," Revision 0, dated January 8, 2010
- OP-3-2000-05 [operating procedure], "Criticality Accident Response," Revision 3, dated June 10, 2010
- OP-3-0560-02, "Criticality Accident Alarm System Alarm Response," Revision 0, dated April 30, 2010
- CR-2011-2317, "Basis for selecting 72 hours in OP-3-0560-01," opened July 20, 2011

b. Observations and Findings

The inspectors reviewed criticality alarm detector placement during walkdowns. The inspectors reviewed criticality alarm functional logic. The inspectors reviewed licensee procedures associated with criticality accident alarm operation and response. The inspectors had previously observed that the licensee did not have a procedure covering operations during a criticality alarm system detector or annunciator outage. The licensee has prepared a procedure to address operations during an alarm outage. In the new procedure, OP-3-0560-01, the licensee did not require compensatory measures to

be taken if the outage was less than 72 hours and did not consider suspending the movement of special nuclear material until after 7 days. The inspectors asked the licensee what the rationale for its time frame was. The licensee opened a condition report, CR-2011-2317, and updated the procedure to require compensatory actions to be taken within 24 hours and reevaluated every 7 days.

c. Conclusions

No safety concerns were noted regarding the licensee criticality alarm system.

6.0 Plant Operations (IP 88015, IP 88016)

a. Scope of Inspection

The inspectors conducted walkdowns of licensee facilities. The inspectors reviewed selected portions of the following documents:

- Procedure MA-3-2000-03, "Oil addition to Vacuum Pumps," Revision 1, dated November 15, 2010
- Procedure MA-3-2000-01, "PFPE Oil Sampling," Revision 0, dated September 18, 2009
- Procedure RW-3-1000-09, "Waste container setup, handling and disposition," Revision 5, dated September 24, 2010
- AD-3-1000-01, "Requirements for Procedures," Rev 11, June 15, 2011
- AD-2-1000-01, "Procedure Program," Rev 3, June 14, 2011
- AD-3-1000-02, "Procedure Use and Adherence," Rev 4, July 9, 2011

b. Observations and Findings

The inspectors performed walkdowns in mini halls 1A and 1B, the UF₆ handling area, the cylinder receipt and dispatch building, the centrifuge utilities building, and the uranium byproduct cylinder storage pads.

c. Conclusions

No safety issues were identified during the walkdowns of the plant.

7.0 Open Items

VIO 70-3103/2010-006-02

During a previous inspection, the inspectors identified that a failure of the licensee to request NRC approval prior to implementing changes to the SAR that changed the approved margin of subcriticality for safety. The violation cited four examples. In response to the violation the licensee submitted an amendment request (LAR-10-07) dated June 2, 2010, that sought approval for the four SAR changes identified in the violation. The NRC reviewed and approved these changes in Amendment 34, dated June 10, 2010.

During this inspection, the inspectors determined that all corrective actions to prevent reoccurrence of the violation, specifically the license commitment 30 for Amendment 34, were in place. This item is closed.

VIO 70-3103/2010-006-03

During a previous inspection, the inspectors identified that the licensee failed to perform analyses assuming a ^{235}U enrichment of 6.0 % for systems other than the contingency dump system traps as required by SAR Section 5.1.1. This violation was one of the examples cited in **VIO 70-3103/2010-006-02**. This change was reviewed and approved by the NRC in Amendment 34, dated June 10, 2010.

During this inspection, the inspectors determined that all of the corrective actions to prevent reoccurrence of the violation were in place. This item is closed.

URI 70-3103/2010-203-01

This item concerned whether the licensee's upset condition calculations for certain unsafe geometry or interacting systems were bounding. Because the details are classified, and were not reviewed during the previous inspection, the issue was characterized as an Unresolved Item.

During the current inspection, the inspectors interviewed ETC personnel and reviewed documents pertaining to this issue, as discussed in detail in Section 2.0 of this report. This issue is now addressed as Violations VIO 70-3103/2011-201-01 and VIO 70-3103/2011-201-02. URI 70-3103/2010-203-01 is closed.

IFI 70-3103/2010-203-02

This item concerned qualification of ETC engineers in accordance with licensee procedures. The inspectors reviewed qualification records for ETC engineers and determined that the engineers had been appropriately qualified. This item is closed.

8.0 Exit Meeting

The inspectors communicated observations and findings to the licensee's management and staff throughout the weeks of the inspection and presented the results to the licensee's management during exit meetings held on March 10, March 31, July 21, and September 6, 2011. The licensee's management acknowledged the results of the inspection and understood the findings presented.

SUPPLEMENTARY INFORMATION

1.0 Items Opened, Closed, and Discussed

Items Opened

VIO 70-3103/2011-201-01	The failure to identify and analyze an accident sequence leading to criticality in the cascade in accordance with its approved ISA methodology
VIO 70-3103/2011-201-02	The failure to demonstrate compliance with the performance requirements or establish IROFS for a credible event
URI 70-3103/2011-201-03	Tracks the licensee's extent of condition for determining if there are accident sequences that have been omitted from the ISA summary.
IFI 70-3103/2011-201-04	Tracks the licensee's commitment to update Section 3.4.3.8.1 of the ISA Summary to remove inconsistencies.
URI 70-3103/2011-201-05	Tracks the licensee's use of subcriticality as the sole screening criterion for determining whether the performance requirements were met for the purposes of determining reportability.

Items Closed

VIO 70-3103/2010-006-02	Failure to request NRC Approval Prior to Implementing Changes to the SAR that Changed the Approved Margin of Subcriticality for Safety
VIO 70-3103/2010-006-03	Failed to Perform Analyses Assuming a ²³⁵ U Enrichment of 6.0 w/o for Systems Other than Contingency Dump System traps as Required by SAR Section 5.1.1
URI 70-3103/2010-203-01	Tracks licensee determination that upset condition calculations for unsafe geometry or interacting systems are bounding. <i>Changed status to VIO 70-3103/2010-201-01 and VIO 70-3103/2010-201-02.</i>
IFI 70-3103/2010-203-02	Tracks qualification of ETC engineers in accordance with licensee procedures.

Items Discussed

None.

2.0 Event Reports Reviewed

None.

3.0 Inspection Procedures Used

IP 88015 Nuclear Criticality Safety Program
IP 88016 Nuclear Criticality Safety Evaluations and Analyses
IP 88017 Criticality Alarm Systems

4.0 Key Points of Contact

LES

*R. Albright	Health Safety and Engineering Manager
#A. Brown	ETC
#P. Fraser-Hopewell	ETC
*R. Griffin	ETUS
†*#R. Kohrt	Technical Services
*D. Lakin	Performance Assistance
†*#J. Laughlin	Technical Services Director
*#R. Lehman	Technical Services
*C. Markert	Engineering Manager
†*#†P. McCasland	Licensing
††W. Padgett	Licensing
#O. Parry	ETC
*J. Rollins	Licensing
#D. Sexton	Chief Nuclear Officer and Vice President of Operations
#S. Su	Technical Services
*T. Taylor	Licensing
#E. Titz	ETC
*O. Torres	Quality Assurance
*S. Troyer	Criticality Safety Officer
#B. Wheeler	ETC
*R. Williams	Operations Manager

NRC

†#J. Calle	RII Chief, Fuel Facility Inspection Branch 2
#C. Fisher	Criticality Safety Inspector
†#D. Hartland	RII Fuel Facility Inspector
#M. Kotzalas	Branch Chief
†*#‡T. Marenchin	Criticality Safety Inspector
†*#D. Morey	Senior Criticality Safety Inspector
#T. Naquin	Health Physicist
#‡B. Smith	Chief, Uranium Enrichment Branch
#‡C. Tripp	Senior Criticality Safety Inspector

* attended the exit meeting on March 11, 2011

† attended the re-exit meeting on March 31, 2011

attended the re-exit meeting on July 21, 2011

‡ attended the re-exit meeting on September 6, 2011

5.0 List of Acronyms and Abbreviations

CAB	centrifuge assembly building
CAAS	criticality accident alarm system
CR	condition report
CSA	criticality safety analysis
CSE	criticality safety evaluation
ETC	Enrichment Technology Corporation
ETUSA	Enrichment Technology-USA
IROFS	items relied on for safety
ISA	Integrated Safety Analysis
LES NEF	Louisiana Energy Services, L.L.C., National Enrichment Facility
NCS	nuclear criticality safety
NCSA	nuclear criticality safety analysis
NCSE	nuclear criticality safety evaluation
NSR	nuclear safety release
SAR	Safety Analysis Report
SBD	safe by design
SBM	separations building module
SNM	Special Nuclear Material
UF ₆	uranium hexafluoride
URI	Unresolved Item
VSR	Ventilated Storage Room