



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

November 21, 2011

Mr. Peter J. Miner  
Director  
Regulatory and Quality Assurance  
USEC Inc.  
6903 Rockledge Drive  
Bethesda, MD 20817

SUBJECT: USEC INC. (LEAD CASCADE) – NRC INSPECTION REPORT NO. 070-07003/2011-007

Dear Mr. Miner:

This letter refers to the inspection conducted from September 12-15, 2011, at the USEC Inc. Lead Cascade Facility in Piketon, Ohio. The purpose of the inspection was to perform a followup review of an event that occurred on June 11, 2011, which resulted in multiple centrifuge failures and to determine whether activities authorized under the license were conducted safely and in accordance with Nuclear Regulatory Commission (NRC) requirements. At the conclusion of the inspection on November 2, 2011, the findings were discussed with members of your staff.

The inspection consisted of an examination of activities as they relate to safety and compliance with the Commission's rules and regulations and with license conditions. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, three unresolved items were identified regarding your further review of the control circuitry for the auxiliary standby generator breakers, a potential unreviewed safety question involving multiple centrifuge casing breaches upon loss of electric power, and adequacy of your procedure and operator training programs given the multiple deficiencies identified. We acknowledge your commitment in your letter to us dated October 28, 2011, to not reintroduce uranium hexafluoride into the Lead Cascade machines until we have the opportunity to review the resolution of these issues.

In accordance with 10 CFR 2.390 of NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>

P. Miner

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If you have any questions, please contact me at (404) 997-4418.

Sincerely,

*/RA/*

Joselito O. Calle, Chief  
Fuel Facility Inspection Branch 2  
Division of Fuel Facility Inspection

Docket No. 70-7003  
License No. SNM-7003

Enclosure:  
NRC Inspection Report No. 70-7003/2011-007

cc w/encl: (See page 3)

P. Miner

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PUBLICLY AVAILABLE       NON-PUBLICLY AVAILABLE       SENSITIVE       NON-SENSITIVE  
ADAMS: x Yes      ACCESSION NUMBER: ML11325A265      x SUNSI REVIEW COMPLETE x FORM 665 ATTACHED

OFFICE	RII:CCI	RII:DFFI					
SIGNATURE	Via email	/RA/					
NAME	CJones	DHartland					
DATE	11/21/11	11/18/11	11/ /2011	11/ /2011	11/ /2011	11/ /2011	11/ /2011
E-MAIL COPY?	YES NO						

P. Miner

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cc w/encl:  
Dan Rogers  
General Manager  
American Centrifuge Plant Operations  
USEC Inc.  
Electronic Mail Distribution

Terry Sensue  
Regulatory Manager  
American Centrifuge Plant  
USEC Inc.  
Electronic Mail Distribution

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Bureau of Radiation Protection  
246 N. High Street  
Columbus, OH 43215  
Electronic Mail Distribution

P. Miner

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Letter to Mr. Peter J. Miner from Joselito O. Calle dated, November 21, 2011

Subject: USEC INC. (LEAD CASCADE) – NRC INTEGRATED INSPECTION REPORT  
NO. 070-07003/2011-007

Distribution w/encl:

B. Smith, NMSS

D. Hartland, RII

J. Calle, RII

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 70-7003

License No.: SNM-7003

Report No.: 70-7003/2011-007

Licensee: USEC Inc.

Facility: Lead Cascade

Location: Piketon, Ohio

Date: September 12-15, 2011

Inspectors: D. Hartland, Senior Fuel Facility Inspector  
C. Jones, Senior Construction Inspector

Approved by: J. Calle, Chief  
Fuel Facility Inspection Branch 2  
Division of Fuel Facility Inspection

Enclosure

## **EXECUTIVE SUMMARY**

USEC Inc. Lead Cascade  
Inspection Report 70-7003/2011-007

This report is a summary of the inspection of the followup to an event that occurred on June 11, 2011, which resulted in multiple centrifuge failures. The inspection was conducted on September 12-15, 2011. The results of the inspection are contained in the details section of this report. The report details section was prepared to exclude the use of information the licensee identified as proprietary. The inspection was conducted through a review of selected records, interviews with personnel, and direct observation of activities in the area of plant operations.

### **Reactive Inspection for Events at Fuel Cycle Facilities**

The inspectors identified three unresolved items regarding the licensee's further review of the control circuitry for the auxiliary standby generator breakers, a potential unreviewed safety question involving multiple centrifuge casing breaches upon loss of electric power, and adequacy of its procedure and operator training programs given the multiple deficiencies identified. (Section 2)

#### **Attachment**

Partial List of Persons Contacted

Inspection Procedures Used

List of Items Opened, Closed, and Discussed

List of Documents Reviewed

## **REPORT DETAILS**

### **1. Summary of Plant Status**

Centrifuges in the USEC Inc. Lead Cascade facility were being operated without process gas during the inspection period as the licensee was implementing corrective actions in response to the event that occurred on June 11, 2011, that resulted in the failure of multiple centrifuges. The inspectors conducted a safety walk down of the Lead Cascade facility, engaged in focused discussions with subject matter experts, and performed reviews of documentation.

### **2. Reactive Inspection for Events at Fuel Cycle Facilities (Inspection Procedure 88003)**

#### **a. Scope and Observations**

The inspectors performed a review of the event to determine a sequence of events based upon interviews with licensee personnel and reviews of operator logs, engineering evaluations, investigation reports, and condition notifications.

On June 11, 2011 an operations shift supervisor initiated a routine start of a standby machine cooling water pump in order to transfer operation from the in-service pump. Upon closure of the pump breaker, a three phase electrical fault occurred on the bus of the essential motor control center (EMCC) that provided power to the pump motor. The normal supply breaker for the EMCC tripped on instantaneous overcurrent and interrupted the fault. The shift supervisor noted the pump had failed to start and observed that black smoke had accumulated over the EMCC. The on-site fire department responded and verified that the fire had self-extinguished.

Some of the loads affected by the loss of power to the EMCC included the diffusion pumps for Lead Cascade 1, the bypass transformer for the uninterruptible power supply (UPS), and the ventilation fan for the station battery room. The diffusion pumps were necessary to support operation of the centrifuge machines. The battery room fan was required to be operable as an Item Relied On For Safety (IROFS).

The control room operators implemented alarm response and off-normal procedures which included the initiation of the removal of process gas from the centrifuge systems. As guided by procedure, operators also started the auxiliary standby generator. The operators then made repeated attempts to tie the generator to the faulted EMCC but were initially unsuccessful. Operators ultimately closed the alternate supply feeder breaker using the manual breaker control.

After reviewing licensee system drawings, the inspectors questioned whether the control circuitry for the generator output breaker and the alternate supply feeder breakers functioned in accordance with design. In addition, inspectors also questioned whether the design provided adequate protection for personnel and equipment. Further review of the control circuitry for the auxiliary standby generator breakers is an unresolved item (URI 70-7003/2011-007-01).

During the efforts to re-energize the EMCC, the shift supervisor at the scene responded to the UPS panel to acknowledge a general trouble alarm. However, instead of acknowledging the alarm, the individual mistakenly opened a protective cover and actuated the UPS shutdown pushbutton. Because the bypass transformer was still de-energized, power was lost to the 120 VAC loads served by the UPS.

Some of the vital loads powered by the UPS included centrifuge machine components and controls, the Distributed Control System (DCS), and the hydrogen concentration monitor for the battery room which was an IROFS. The loss of the DCS resulted in a loss of all process indications and operator controls in the main control room. Within a few minutes, four centrifuge machines crashed and one of the machine casings was breached.

During a review of the licensee's Integrated Safety Analysis Summary, the inspectors noted the licensee assumed that, upon a loss of all electric power, the centrifuges could potentially wreck but that a breach of the casings would not result. The inspectors identified a potential unreviewed safety question since electrical power and centrifuge casings were not designated as IROFS and, therefore, the integrity of the casings could not be relied upon to remain intact as a result of a prolonged loss of power as demonstrated by the casing that was breached. The licensee's analysis of the potential unreviewed safety question involving multiple centrifuge casing breaches upon loss of electric power is an unresolved item (URI 70-7003/2011-007-02).

Due to an inadequate procedure and lack of familiarity with operation of the UPS, operators experienced a significant delay in re-powering the UPS loads. After the system was restored, operator unfamiliarity with the DCS system and a lack of procedural guidance also caused a further delay in resetting the DCS and gaining normal operational control of the centrifuge systems.

Due to the delay in restoring functionality of DCS controls, licensee personnel opened a local electrical panel at the centrifuge machines and manually bypassed some protective circuitry in order to apply logic permissives that opened IROFS machine isolation valves which were IROFS. This had the effect of disabling IROFS protective features for approximately 20 minutes. During this period, two additional centrifuges crashed due to factors not associated with the disabled IROFS features.

After approximately five hours into the event, functionality of DCS controls in the control room was fully restored and the faulted EMCC returned to service. Operators successfully proceeded to stabilize conditions in the Lead Cascade.

The inspectors reviewed the licensee's investigation into the event and determined that it took the appropriate corrective actions to address each of the procedure and operator training deficiencies individually. However, the inspectors noted that the licensee did not address in its investigation the apparent weaknesses in its procedure and training programs that resulted in the multiple deficiencies. The licensee's further review of the adequacy of its procedure and operator training programs is an unresolved item (70-7003/2011-007-03).

b. Conclusion

The inspectors identified three unresolved items during followup to the June 11, 2011, event that resulted in the failure of multiple centrifuges. Those involved the licensee's further review of the control circuitry for the auxiliary standby generator breakers, the potential unreviewed safety question involving multiple centrifuge casing breaches upon loss of electric power, and adequacy of its procedure and operator training programs given the multiple deficiencies identified.

3. **Exit Meeting**

The inspection scope and results were presented to members of the licensee's staff on November 2, 2011. The licensee's staff indicated that no proprietary information had been discussed.

## ATTACHMENT

### 1. PERSONS CONTACTED

#### Partial List of Licensee Personnel Contacted

D. Roger, General Manger  
J. Bednarcysk, Engineering Manager  
G. Corzine, Nuclear Safety Manager  
S. Eilertson, Engineering Manager, Oak Ridge  
D. Fosson, Operations Manager  
S. Fout, Technical Services Manager  
M. MacCrae, Quality Assurance Manager  
J. Oppy, Enrichment Operations Manager  
T. Sensue, Nuclear Regulatory Affairs Manager  
D. Shaffer, System Engineering Manager

### 2. INSPECTION PROCEDURE USED

IP 88003 Reactive Inspection for Events at Fuel Cycle Facilities

### 3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

URI 70-7003/2011-006-01	Opened	Further review of the control circuitry for the auxiliary standby generator breakers.
URI 70-7003/2011-007-02	Opened	The licensee's analysis of the potential unreviewed safety question involving multiple centrifuge casing breaches upon loss of electric power.
URI 70-7003/2011-007-03	Opened	The licensee's further review of the adequacy of its procedure and operator training programs given the multiple deficiencies identified.

### 4. LIST OF DOCUMENTS REVIEWED

#### Audits and Assessments

ACP-2011-19, QA Independent Assessment of Operations Phase 2 Readiness Assessment," dated 8/31/2011  
ACP-2011-20, QA Independent Assessment of the June 11, 2011 Event Investigation Report, "Lead Cascade Re-Start Readiness Assessment – Phase 1," dated 6/29/2011  
Report, "Lead Cascade Re-Start Readiness Assessment (Phase 2)," dated 8/30/2011  
Report, 335-11-043, Management Assessment for Use of Procedures, dated 7/29/2011

**Procedures**

AC4-AR-006, Cascade Alarms  
AC4-AR-008, Power System Alarms  
AC4-ON-009, Change 14, Loss of Power  
AC4-ON-010, Change 7, Loss of Distributed Control System (DCS)  
AC4-OP-012, Change 11, Operation of the Lead Cascade Auxiliary Standby Generator  
AC4-OP-014, Operation of the Uninterruptible Power Supply

**Condition Notices**

CN 3288, ASG Breaker did not close  
CN 4376, ASG breaker did not close  
CN 4490, 83V relay tripped  
CN 4591, Feeder breaker failed to close for load test  
CN 4656, Loss of Control Power to Lead Cascade

**Other Documents**

Engineering Evaluation EE-2901-003, Rev. 0, Evaluation of Reportability Regarding  
Bypass of the Lead Cascade Machine Isolation Item Relied On For Safety”  
Drawing BDD-3001-QL2-009, Rev. 3, Machine Isolation Valves  
Drawing X-3001-0616-E-OC, Rev. 4, Standby Generator Switchgear Elementary  
Diagrams  
Drawing X-3001-1912.10-CI-Z, Rev. 1  
Work Order 1164247, dated 6/17/2011, Perform PM for 13-A1-EMC2  
Work Order 1163584, dated 5/13/2011, Pull out and PM breakers  
Work Order 1164301, dated 6/21/2011, Perform PM for 13-A2-EMC1  
Job No. CCCR039, dated 2/10/2005, Siemens Report of MCC and Circuit Breaker  
Inspection and Test