

September 12, 2008

Mr. Russell B. Starkey, Jr.  
Vice President, Production  
United States Enrichment Corporation  
Two Democracy Center  
6903 Rockledge Drive  
Bethesda, MD 20817

SUBJECT: INSPECTION REPORT NO. 70-7002/2008-202

Dear Mr. Starkey:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, scheduled, and announced nuclear criticality safety (NCS) inspection from August 11-13, 2008, at the Portsmouth facility in Piketon, Ohio. The purpose of this inspection was to determine whether activities authorized by your certificate involving special nuclear material were conducted safely and in accordance with regulatory requirements. Throughout the inspection, observations were discussed with your staff. An exit meeting was held on August 13, 2008, during which time inspection observations and findings were formally discussed with your management and staff.

The inspection, which is described in the enclosure, focused on NCS analysis; risk-significant NCS controls; and principal management measures for ensuring that NCS controls are capable, available, and reliable. The inspection consisted of reviews of new, changed, and other risk-significant NCS analyses; selective examinations of relevant procedures and records; examinations of safety-related equipment; interviews with plant personnel; and facility walk downs and observations of in-plant conditions and activities. Based on the inspection, your activities involving nuclear criticality hazards were found to be conducted safely and in accordance with regulatory requirements.

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

R. Starkey

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

Sincerely,

**/RA/**

Patricia Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards, NMSS

Docket No.: 70-7002

Enclosure: Inspection Report No. 70-7002/2008-202

cc: W. Jordan, Portsmouth General Manager  
R. DeVault, Regulatory Oversight Manager, DOE  
G. Workman, Nuclear Regulatory Affairs Manager, Portsmouth  
S. A. Toelle, Manager, Regulatory Affairs, USEC  
C. O'Claire, State Liaison Officer, Ohio

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<b>DATE</b>	9/03/08		9/03/08		9/12/08

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

Docket No.: 70-7002

Certificate No.: GDP-02

Report No.: 70-7002/2008-202

Certificatee: United States Enrichment Corporation

Location: Piketon, Ohio

Inspection Dates: August 11-13, 2008

Inspectors: Thomas Marenchin, Criticality Safety Inspector

Approved by: Patricia Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards, NMSS

**Enclosure**

**United States Enrichment Corporation  
Portsmouth Gaseous Diffusion Plant**

**NRC Inspection Report 70-7002/2008-202**

**EXECUTIVE SUMMARY**

**Introduction**

Staff of the U. S. Nuclear Regulatory Commission (NRC) performed a routine, scheduled, and announced criticality safety inspection of the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio, from August 11-13, 2008. The inspection included an on-site review of certificatee programs dealing with plant operations, the nuclear criticality safety (NCS) program, audits and inspections, and NCS-related corrective actions. The inspection focused on risk-significant fissile material processing activities including those in Buildings X-300, X-326, X-333, X-342, and X-344A.

**Results**

- No safety concerns were identified regarding the certificatee's NCS program.
- No safety concerns were identified regarding the certificatee's NCS walkthroughs, assessments, and surveillances.
- No safety concerns were identified regarding the certificatee's internal event reporting, investigation, and correction actions.
- No safety concerns were identified during walkdowns of the facility and operations.
- No safety concerns were identified regarding certificatee's NCS evaluations.
- No safety concerns were identified regarding certificatee's NCS evaluations for the Highly Enriched Uranium/Medium Enriched Uranium Deposit Removal Project.
- No safety concerns were identified regarding certificatee's Criticality Accident Alarm System (CAAS) coverage of fissile material operations

## REPORT DETAILS

### 1.0 Summary of Plant Status

U.S. Enrichment Corporation (USEC) enriches uranium for domestic and international customers at the Portsmouth Gaseous Diffusion Plant. In conjunction with routine enrichment activities, the certificatee performs laboratory operations, cleaning and decontamination services, and maintenance and support activities. During the inspection, the certificatee was performing routine enrichment and support operations.

### 2.0 Nuclear Criticality Safety Program (IP 88015)

#### a. Inspection Scope

The inspector reviewed the certificatee's NCS program. The inspector evaluated the adequacy of the program to assure the safety of fissile material operations. The inspector interviewed certificatee managers, NCS engineers, system engineers, and facility operators during document review and facility walkdowns. The inspector reviewed NCS administrative procedures and selected NCS controls to determine whether the procedures adequately implemented the NCS program described in the certificate. The inspector reviewed selected aspects of the following documents:

- POEL-LMUS-80, "Ports NCS Writers Guide for NCSA's [nuclear criticality safety approval] and NCSE's [nuclear criticality safety evaluation]," Revision 4, dated November 30, 1999
- XP4-EG-NS1100, "Nuclear Criticality Safety Calculations," dated April 28, 2006
- XP4-EG-NS1101, "Nuclear Criticality Safety Walk-Through and Review program," dated July 20, 2005

#### b. Observations and Findings

The inspector observed that the certificatee had an NCS program which was independent from production and was implemented through written procedures. The inspector determined that the licensee NCS program was conducted in accordance with written administrative procedures that reflected the program described in the certificate.

#### c. Conclusions

No safety concerns were identified regarding the certificatee's NCS program.

### 3.0 Nuclear Criticality Safety Inspections, Audits and Investigations (IP 88015)

#### a. Inspection Scope

The inspector reviewed records of previously-completed certificatee internal NCS walkthroughs of fissile operations in Buildings X-333, X-343, and X-705. The inspector reviewed selected aspects of the following documents:

- WTR-CS-2008-003, "NCS Walkthrough Report: X-333," dated January 31, 2008
- WTR-CS-2008-004, "NCS Walkthrough Report: X-705," dated July 1, 2008
- XP-2008-201, "NCS Walk-Through and Review Program," dated January 15, 2008
- XP-2007-S003, "NCS Walk-Through and Review Program," dated January 15, 2007
- XP-2007-S022, "X-343 Facility Walkdown Surveillance," dated June 15, 2007
- XP-2007-S036, "NCS Compliance," dated September 14, 2007
- XP-2008-S012, "Small Sample Cylinder Storage," dated June 3, 2008
- XP-2006-A001, "Tri-Annual Audit of the Nuclear Criticality Safety Program," dated February 3, 2006

b. Observations and Findings

The inspector determined that certificatee NCS engineers observed plant operations to determine adequacy of implementation of NCS requirements and ensured that implementation weaknesses were identified and entered into the corrective action system. The inspector observed that the certificatee NCS walkthroughs and assessments were conducted within the required time limit and were performed in accordance with written procedures. The inspector noted that the walkthroughs and assessments were performed by NCS engineers who: (1) reviewed NCS issues from previous audits; (2) reviewed the adequacy of control implementation; (3) reviewed plant operations for compliance with certificatee requirements, procedures, and postings; and (4) examined equipment and operations to determine that past evaluations remained adequate.

c. Conclusions

No safety concerns were identified regarding the certificatee's NCS walkthroughs, assessments, and surveillances.

#### **4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015)**

a. Inspection Scope

The inspector reviewed recent internally- reported NCS-related events. The inspector reviewed selected aspects of the following documents:

- Anomalous Condition Report NSI-08-01026, dated April 21, 2008
- Anomalous Condition Report NSI-08-01543, dated June 14, 2008
- Anomalous Condition Report NSI-08-01683, dated July 1, 2008
- Anomalous Condition Report NSI-08-01753, dated July 13, 2008
- Anomalous Condition Report NSI-08-01785, dated July 16, 2008
- Anomalous Condition Report NSI-08-01980, dated August 8, 2008

b. Observations and Findings

The inspector determined that events were investigated in accordance with written procedures and appropriate corrective actions were assigned.

c. Conclusions

No safety concerns were identified regarding the certificatee's internal event reporting, investigation, and correction actions.

**5.0 Plant Activities (88015)**

a. Inspection Scope

The inspector performed plant walkdowns to review activities in progress and to determine whether risk-significant fissile material operations were being conducted safely and in accordance with regulatory requirements. The inspector verified the adequacy of management measures for assuring the continued availability, reliability, and capability of safety-significant controls relied upon by the certificatee for controlling criticality risks to acceptable levels. The inspector performed walkdowns of Buildings, X-300, X-326, X-333, X-342, and X-344A. The inspector reviewed selected aspects of the following documents prior to performing the walkdowns:

- NCSA-0326-024, "X-326 Product Withdrawal Area," Revision 8, dated August 8, 2008
- NCSE-0326-024, "X-326 Product Withdrawal Area," Revision 8, dated June 8, 2008
- NCSA-PLANT-085, "X-340 Complex Autoclave Operation," Revision 9, dated July 14, 2008
- NCSE-PLANT-085, "X-340 Complex Autoclave Operation," Revision 9, dated June 19, 2008

b. Observations and Findings

The inspector verified that controls identified in the NCS analyses reviewed were adequate to assure safety. The cognizant NCS engineers were knowledgeable and able to explain the basis for changes in operations and controls.

c. Conclusions

No safety concerns were identified during walkdowns of the facility and operations.

**6.0 Nuclear Criticality Safety Evaluations and Analyses (IP 88016)**

a. Inspection Scope

The inspector reviewed NCS analyses to determine that criticality safety of risk-significant operations was ensured through engineered and administrative controls with adequate safety margin including preparation and review by qualified staff. The inspector accompanied NCS and other technical staff on walkdowns of NCS controls in selected plant areas. The inspector reviewed selected aspects of the following documents:

- NCSA-0330-004, "Cascade Operations in the X-330 Building," Revision 8, dated September 15, 2006



- NCSE-0330-004, "Cascade Operations in the X-330 Building," Revision 8, dated August 22, 2006
- NCSA-0705-002, "2.5-Ton, 10-Ton, and 14-Ton Cylinder Cleaning," Revision 6, dated January 15, 2008
- NCSE-0705-002, "2.5-Ton, 10-Ton, and 14-Ton Cylinder Cleaning," Revision 6, dated January 15, 2008
- NCSA-PLANT-043, "Fissile Material Transport," Revision 7, dated June 5, 2001
- NCSA-PLANT-062, "Cascade Maintenance, Equipment Removal and Storage," Revision 6, dated May 26, 2006
- NCSA-PLANT-076, "X-340 Complex Oil Interceptors, Scale Pits and Sumps," Revision 3, dated January 16, 2001
- NCSE-PLANT-076, "X-340 Complex Oil Interceptors, Scale Pits and Sumps," Revision 3, dated January 15, 2001
- NCSA-PLANT-085, "X-340 Complex Autoclave Operation," Revision 8, dated May 6, 2008
- NCSA-PLANT-097, "Tc Trap Handling and Maintenance," Revision 2, dated May 9, 2008

b. Observations and Findings

Current Operations

The inspector reviewed NCS Approvals, NCS Evaluations, and supporting calculations for new, changed, and other selected operations. Within the selected aspects reviewed, the inspector determined that the analyses were performed by qualified NCS engineers, that independent reviews of the evaluations were completed by qualified NCS engineers, that subcriticality of the systems and operations was assured through appropriate limits on controlled parameters, and that double contingency was assured for each credible accident sequence leading to inadvertent criticality. The inspector determined that NCS controls for equipment and processes assured the safety of the operations. Nuclear criticality safety analyses and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits.

c. Conclusions

No safety concerns were identified regarding certificatee's NCS evaluations.

**7.0 Highly Enriched Uranium/Medium Enriched Uranium Deposit Removal Project Nuclear Criticality Safety Operational Readiness Review (IP 88016)**

a. Inspection Scope

Region II is conducting a review of a plant modification for the Highly Enriched Uranium (HEU)/Medium Enriched Uranium (MEU) Deposit Removal Project. The inspector reviewed selected NCS analyses and Plant areas in support of the Region II review to determine that criticality safety of risk-significant operations was ensured through engineered and administrative controls with adequate safety margin. The inspector reviewed selected aspects of the following documents:

- NCSA-0326-013, "Cascade Operations in the X-326 Building," Revision 14, dated July 21, 2008
- NCSE-0326-013, "Cascade Operations in the X-326 Building," Revision 13, dated July 21, 2008
- NCSA-0326-014, "X-326 Seal Exhaust," Revision 3, dated July 25, 2008
- NCSE-0326-014, "X-326 Seal Exhaust," Revision 3, dated July 25, 2008
- NCSA-0326-024, "X-326 Product Withdrawal Area," Revision 8, dated August 8, 2008
- NCSE-0326-024, "X-326 Product Withdrawal Area," Revision 8, dated June 8, 2008
- NCSA-PLANT-029, "Cascade Datum Systems," Revision 3, dated July 9, 2008
- NCSE-PLANT-029, "Cascade Datum Systems," Revision 3, dated August 9, 2008
- NCSA-PLANT-033, "Surge Drums," Revision 5, dated August 14, 2008
- NCSE-PLANT-033, "Surge Drums," Revision 5, dated August 10, 2008
- NCSA-PLANT-049, "Portable, Small UF<sub>6</sub>[uranium hexafluoride] Release Gulpers," Revision 3, dated July 14, 2008
- NCSE-PLANT-049, "Portable, Small UF<sub>6</sub> Release Gulpers," Revision 3, dated August 6, 2008
- NCSA-PLANT-085, "X-340 Complex Autoclave Operation," Revision 9, dated July 14, 2008
- NCSE-PLANT-085, "X-340 Complex Autoclave Operation," Revision 9, dated June 19, 2008
- NCSA-PLANT-095, "Handling and Storage of UF<sub>6</sub> Bulb Samples, Can Samples, and Hydrolyzed Samples," Revision 1, dated August 11, 2008
- NCSE-PLANT-095, "Handling and Storage of UF<sub>6</sub> Bulb Samples, Can Samples, and Hydrolyzed Samples," Revision 1, dated August 7, 2008

b. Observations and Findings

The certificatee plans to remove residual deposits of HEU and MEU from the X-326 Cascade Building that is currently held up in installed, but shutdown, cells and equipment. The deposits will be removed through the use of in situ static chemical treatment of the cells, the deposits will be removed with the resultant UF<sub>6</sub> transferred by direct piping to holding drums. UF<sub>6</sub> and treatment gases will then be bled back to the operating cascade, where there will be near instantaneous enrichment blend down to Low Enriched Uranium (LEU) by the inter-stage flow. After the cascade sufficiently separates the oxidant gases from the LEU UF<sub>6</sub>, the UF<sub>6</sub> will be withdrawn into 12-inch cylinders that have been cooled in the refrigeration chambers located in the Product Withdrawal area of X-326.

The inspector reviewed NCS Approvals, NCS Evaluations, and supporting calculations for the new and changed analyses and walked down some of the effected areas for the removal of HEU and MEU deposits project. The inspector determined that credible accident scenarios leading to a potential criticality with the HEU and MEU deposit removal were properly identified. The certificatee had provided adequate protection against inadvertent criticality for the analyzed facilities, equipment, and processes using a conservative approach.

c. Conclusions

No safety concerns were identified regarding certificatee's NCS evaluations for the HEU/MEU Deposit Removal Project.

**8.0 Criticality Alarm System (IP 88017)**

a. Inspection Scope

The inspector reviewed documentation of criticality accident alarm detector coverage, interviewed engineering and maintenance staff, and performed facility walkdowns to determine the adequacy of the certificatee criticality alarm system. The inspector reviewed selected aspects of the following documents:

- Eval-NS-2006-0146, "Removal of CAAS LCO Boundaries on the North Side of the X-330 Building Operating Floor," Revision 0, dated April 10, 2006
- XP-2007-S029, "X-760 CAAS Cluster Replacement," dated July 23, 2007
- XP4-GP-RI6500, "Calibration of Neutron Criticality Monitor Model NCM-600," Revision 15, dated April 4, 2008

b. Observations and Findings

The inspector determined that the certificatee had installed and maintained a system of criticality detectors that were capable of monitoring fissile material operations at the facility and reliably detecting the minimum accident of concern.

c. Conclusions

No concerns were identified regarding certificatee's CAAS coverage of fissile material operations.

**9.0 Exit Meeting**

The inspector communicated the inspection scope and results to members of Paducah Gaseous Diffusion Plant management and staff throughout the inspection and during an exit meeting on August 13, 2008. Paducah Gaseous Diffusion Plant management and staff acknowledged and understood the findings as presented.

## SUPPLEMENTARY INFORMATION

### 1.0 Items Opened, Closed, and Discussed

#### Items Opened

None

#### Items Closed

None

#### Items Discussed

None

### 2.0 Inspection Procedures Used

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

### 3.0 Partial List of Persons Contacted

#### USEC

T. Brooks	Director, Infrastructure Operations
M. Conkel	Manager, Chemical Utilities
D. D'Aquila	Engineer, Nuclear Criticality Safety
D. Fogel	Manager, Nuclear Regulatory Affairs
K. James	Engineer, Nuclear Criticality Safety
R. Lemminc	Engineer, Nuclear Criticality Safety
P. Potter	Manager, Waste Management
L. Sendek	Engineer, Nuclear Regulatory Affairs
J. Shewbrooks	Nuclear Safety & Quality
A. Stone	Engineer, Nuclear Regulatory Affairs
E. Wagner	Manager, Nuclear Criticality Safety
D. Whittle	Manager, Technicium Feed

#### NRC

T. Marenchin	Criticality Safety Inspector NRC, Headquarters
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All attended the exit meeting on August 13, 2008.

#### 4.0 List of Acronyms and Abbreviations

ADAMS	Agency-Wide Document Access and Management System
CAAS	criticality accident alarm system
CFR	Code of Federal Regulation
DOE	U.S. Department of Energy
HEU	Highly Enriched Uranium
IP	inspection procedure
LEU	Low Enriched Uranium
MEU	Medium Enriched Uranium
NCS	nuclear criticality safety
NCSA	nuclear criticality safety approval
NCSE	nuclear criticality safety evaluation
UF <sub>6</sub>	uranium hexafluoride
USEC	U. S. Enrichment Corporation (certificatee)