

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

SUBJECT: INSPECTION REPORT NO. 70-7001/2007-201

Dear Mr. Starkey:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, scheduled, and announced criticality safety inspection February 12 through 16, 2007, at the Paducah Gaseous Diffusion facility in Paducah, Kentucky. The purpose of the 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 February 16, 2007, during which inspection observations and findings were discussed with your management and staff.

The inspection, which is described in the enclosure, focused on: (1) the most hazardous activities and plant conditions; (2) the most important controls relied on for safety and their analytical basis; and (3) the principal management measures for ensuring controls are capable, available, and reliable to perform their functions relied on for safety. The inspection consisted of analytical basis review, selective review of related procedures and records, examinations of relevant nuclear criticality safety (NCS)-related equipment, interviews with NCS engineers and plant personnel, and facility walkdowns to observe plant conditions and activities related to safety basis assumptions and related NCS controls.

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. B. Starkey, Jr.

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If you have any questions concerning this report, please contact Tamara Powell, of my staff, at (301) 415-5095.

Sincerely,

/RA/

Wilkins R. Smith, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards

Docket No.: 70-7001

Enclosure: Inspection Report No. 70-7001/2007-201

cc: S. Penrod, Paducah General Manager
S. R. Cowne, Paducah Regulatory Affairs Manager
W. Jordan, Portsmouth General Manager
S. A. Toelle, Director, Nuclear Regulatory Affairs, USEC
R. M. DeVault, Regulatory Oversight Manager, DOE
G. A. Bazzell, Paducah Facility Representative, DOE
Janice H. Jasper, State Liaison Officer

R. B. Starkey, Jr.

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March 7, 2007

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

Docket No.: 70-7001

Certificate No.: GDP-01

Report No.: 70-7001/2007-201

Certificatee: United States Enrichment Corporation

Location: Paducah, Kentucky

Inspection Dates: February 12 - 16, 2007

Inspectors: Tamara Powell, Criticality Safety Inspector
Thomas Marenchin, Criticality Safety Inspector

Approved by: Wilkins R. Smith, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Enclosure 1

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

NRC Inspection Report 70-7001/2007-201

EXECUTIVE SUMMARY

Introduction

Staff of the U. S. Nuclear Regulatory Commission (NRC) performed a routine, scheduled, and announced criticality safety inspection of the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, from February 12 through 16, 2007. 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 C-310, C-331, C-333, C-335, C-337, C-360, C-400, C-409, C-720, C-746-Q1, and C-754.

Results

- No safety concerns were noted regarding the NCS program.
- No safety concerns were identified regarding the certificatee NCS training and qualification program.
- No safety concerns were noted regarding certificatee NCS walkthroughs, assessments, and surveillance.
- No safety concerns were identified regarding the certificatee internal event reporting, investigation, and correction actions.
- No safety concerns were identified during walkdowns of the facility and operations.
- No safety concerns were noted regarding certificatee NCS evaluations.
- No concerns were identified regarding certificatee criticality accident alarm system (CAAS) coverage of fissile material operations.

REPORT DETAILS

1.0 Summary of Plant Status

U.S. Enrichment Corporation enriches uranium for domestic and international customers at the Paducah 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 (88015)

a. Inspection Scope

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

- CP2-BM-CI1030, "Paducah Self-Assessment," Revision 7, dated January 12, 2007
- CP2-BM-CI1031, "Corrective Action Process at PGDP," Revision 14, dated December 16, 2005
- CP2-BM-CI1033, "Trend Analysis," Revision 5, dated June 6, 2002
- CP2-EG-NS1031, "Nuclear Criticality Safety," Revision 9, dated February 1, 2007
- CP4-EG-NS1101, "Nuclear Criticality Safety Evaluations and Approvals," Revision 10, dated February 1, 2007
- CP4-EG-NS1107, "Nuclear Criticality Safety Oversight Program," Revision 3, dated April 6, 2005
- KY/S-251, "Guidelines for Nuclear Criticality Safety Evaluations at the Paducah Gaseous Diffusion Plant," Revision 5, dated January 30, 2007
- UE2-PS-PS1040, "Procedure Periodic Review Process," Revision 4, dated October 23, 2006

b. Observations and Findings

The inspectors observed that the certificatee had an NCS program which was independent from production and was implemented through written procedures. The inspectors 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 noted regarding the NCS program.

3.0 Nuclear Criticality Safety Training and Qualification (88015)

a. Inspection Scope

The inspectors reviewed the content of NCS training for general workers and for fissile material handlers. The inspectors evaluated the effectiveness of the certificatee NCS training through interviews with both categories of workers. The inspectors also interviewed the certificatee training management. The inspectors reviewed selected aspects of the following documents:

- CP2-EG-NS1030, "Nuclear Criticality Safety Training," Revision 1, dated January 5, 2001
- CP4-EG-NS1108, "Nuclear Criticality Safety Engineer Qualification," Revision 2, dated November 11, 1999
- TDAG.NS, "Training Development and Administrative Guide (TDAG) for Nuclear Criticality Safety Engineering," Revision 0, dated July 2, 2004
- C04195, EG031QG, "Nuclear Criticality Safety Engineer Qualification Guide," Revision 0, dated July 2, 2004
- C01819, GP303CR, "Nuclear Criticality Safety Principles and Practices," Revision 0, dated December 31, 2002

b. Observations and Findings

The inspectors determined that employees complete a general NCS training course that is required to be taken every two years. The inspectors observed that a PeopleSoft database is used by managers to track employee training and managers are alerted when an employee's training is due. If the training becomes overdue, fissile operations would be restricted for that employee. The inspectors determined that new NCS engineers must complete a series of requirements that are outlined in the "Nuclear Criticality Safety Engineer Qualification Guide" before being considered as a qualified NCS engineer.

The inspectors determined that the certificatee NCS training program adequately addressed NCS aspects of facility hazards affecting fissile material operations. The inspectors also determined that only qualified staff perform safety functions for the establishment of new safety analyses and reviews of new operating procedures.

c. Conclusions

No safety concerns were identified regarding the certificatee NCS training and qualification program.

4.0 Nuclear Criticality Safety Inspections, Audits and Investigations (88015)

a. Inspection Scope

The inspectors reviewed records of previously-completed certificatee internal NCS walkthroughs of fissile operations in Buildings C-335, C-337, C-709, and C-710. The inspectors observed a quarterly surveillance of the Building C-720 criticality accident alarm system (CAAS). The inspectors reviewed selected aspects of the following documents:

- CP2-BM-CI1030, "Paducah Self-Assessment," Revision 7, dated January 12, 2007
- CP2-BM-CI1031, "Corrective Action Process at PGDP," Revision 14, dated December 16, 2005
- CP2-BM-CI1033, "Trend Analysis," Revision 5, dated June 6, 2002
- CP2-EG-NS1031, "Nuclear Criticality Safety," dated February 1, 2007
- CP4-EG-NS1107, "Nuclear Criticality Safety Oversight Program," Revision 3, dated April 6, 2005
- C31-NCS SA-06-01, "NCS Group Self-Assessment: Waste Management," dated October 27, 2006
- P0617608 01, "Test the CAAS Local Cluster Horns and Building Horns," dated February 13, 2007
- 06-WS-006, "C-335 Process Building Walkthrough," dated September 28, 2006
- 06-WS-007, "C-337 Process Building Walkthrough," dated September 20, 2006
- 06-WS-008, "NCS Walkthrough for C-709/C-710," dated September 29, 2006

b. Observations and Findings

The inspectors 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 inspectors observed that the certificatee NCS walkthroughs and assessments were conducted within the required time limit and were performed in accordance with written procedures. The inspectors 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. During the surveillance testing of the building C-720 CAAS, the inspectors observed that the certificatee personnel conducted the surveillance and work in accordance with written procedures.

c. Conclusions

No safety concerns were noted regarding certificatee NCS walkthroughs, assessments, and surveillance.

5.0 Nuclear Criticality Safety Event Review and Follow-up (88015)

a. Inspection Scope

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

- NCSA [Nuclear Criticality Safety Approval]-WMO-001, "Operation of Temporary Fissile Storage Areas at PGDP," Revision 5, dated July 28, 2006
- NCS-INC-06-012, "C-400 Spray Booth Storage Tank Floor Pan," Revision 0, dated November 3, 2006
- NCS-INC-06-03, "C-400 Spray Booth," Revision 0, dated November 16, 2006
- NCS-INC-04-012, "Spacing Exempt Waste Drums," Revision 16, dated October 11, 2006
- NCS-INC-04-012, "Spacing Exempt Waste Drums," Revision 17, dated October 20, 2006
- NCS-INC-04-012, "Spacing Exempt Waste Drums," Revision 18, dated December 8, 2006
- NCS-INC-04-012, "Spacing Exempt Waste Drums," Revision 19, dated December 18, 2006

b. Observations and Findings

The inspectors 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 internal event reporting, investigation, and correction actions.

6.0 Plant Activities (88015)

a. Inspection Scope

The inspectors 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 inspectors 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 inspectors performed walkdowns of Buildings , C-310, C-331, C-333, C-335, C-337, C-400, C-409, C-720, C-746-Q1, and C-754. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- NCSE [Nuclear Criticality Safety Evaluations]-049, "Handling, Storage, and Valve Change Operations of Large UF₆ Cylinders at the Paducah Gaseous Diffusion Plant," Revision 9, dated December 15, 2006

- NCSA-GEN-003, "Handling, Storage, and Valve Change Operations of Large UF₆ Cylinders," Revision 7, dated December 15, 2006
- NCSE-115, "Nuclear Criticality Safety Evaluation for the Handling and Transportation of UF₆ Gas Samples in Bulbs\Bombs," Revision 0, dated January 11, 2007
- NCSE-045, "Nuclear Criticality Safety Evaluation of the Seal Exhaust/Wet Air Stations at the PGDP," Revision 5, dated October 15, 2003
- NCSE-097, "C-400 Uranium Recovery System at the PGDP," Revision 0, dated March 8, 2004
- NCSA-400-014, "C-400 Uranium Recovery System at the PGDP," Revision 0, dated July 26, 2004
- NCSE-041, "Normetex Pumps Used for UF₆ Product Withdrawal," Revision 8, dated February 16, 2006

b. Observations and Findings

The inspectors 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.

7.0 Nuclear Criticality Safety Evaluations and Analyses (88016)

a. Inspection Scope

The inspectors 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 inspectors accompanied NCS and other technical staff on walkdowns of NCS controls in selected plant areas. The inspectors review selected aspects of the following documents:

- NCSE-049, "Handling, Storage, and Valve Change Operations of Large UF₆ Cylinders at the Paducah Gaseous Diffusion Plant," Revision 9, dated December 15, 2006
- NCSA-GEN-003, "Handling, Storage, and Valve Change Operations of Large UF₆ Cylinders," Revision 7, dated December 15, 2006
- NCSE-115, "Nuclear Criticality Safety Evaluation for the Handling and Transportation of UF₆ Gas Samples in Bulbs\Bombs," Revision 0, dated January 11, 2007
- NCSE-091, "Fissile/Potentially Fissile Waste Container Storage and Handling," Revision 6, dated August 18, 2006
- KY/G-748, "Validation of the MCNP - 5 Nuclear Criticality Safety Code System Using the ENDF/B-V Cross-Section Library at the Paducah Gaseous Diffusion Plant," Revision 2, dated January 24, 2007

- DAC [Design Analysis and Calculation] -832-ZA1280-0042, "Calculations for 5.5 Gallon Drums, 2.1 Gallon Drums, and 21 - Liter Carboy Containers," Revision 3, dated August 11, 2006
- DAC-832-ZA1280-0078, "Self-Attenuation Correction Results for B-25 Type Boxes at C-754," Revision 0, dated January 26, 2007
- NCS-RG-05-001, "NCS Remediation Guide," Revision 5, dated January 26, 2007
- NCSE-112, "Handling and Storage of B-25 Shipping Boxes Containing 5.5 Gallon Drums," Revision 0, dated December 14, 2006
- NCSE-113, "Cell Servicing," Revision 0, dated September 28, 2006
- NCSE-042, "Operation and Maintenance of the C-360, C-333A and C-337A Autoclaves," Revision 6, dated January 30, 2007
- NCSE 114, "Receipt of Used UF₆ Process Equipment," Revision 0, dated October 19, 2006

b. Observations and Findings

The inspectors reviewed NCS Approvals, NCS Evaluations, and supporting calculations for new, changed, and other selected operations. Within the selected aspects reviewed, the inspectors 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 inspectors 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 noted regarding certificatee NCS evaluations met.

8.0 Criticality Alarm System (88017)

a. Inspection Scope

The inspectors 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 inspectors reviewed selected aspects of the following documents:

- CP2-CO-CA2030, "Operation of the CAAS," Revision 17, dated October 24, 2006
- CP2-CO-ON3031, "Abnormal Criticality Accident Alarm System Conditions," Revision 11, dated May 13, 2006
- DAC-832-ZA1280-0053, "CAAS Detection Coverages in Building C-720," Revision 0, dated May 28, 2004

b. Observations and Findings

The inspectors 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 CAAS coverage of fissile material operations.

9.0 Open Item Followup

IFI 70-7001/2006-201-01

This item tracks: (1) the certificatee's justification for inclusion of Mixed-Oxide (MOX)-driven benchmarks in the validation reports and establishment of criteria for demonstration of Area of Applicability (AOA) compliance in facility calculations, as well as (2) the certificatee's development of guidelines which will ensure a consistent minimum level of documentation for verifying the compliance of future facility calculations with the validated AOA. During this inspection, the inspectors determined that the certificatee had updated two procedures, CP4-EG-NS1101 and KY/S-251, to include detailed guidance on what to include in NCSEs to ensure adequate documentation of compliance with the AOA. At the time of this inspection, the certificatee had not completed AOA criteria revisions to the validation reports and expected to complete the revisions by May 2007. This item remains open.

10.0 Exit Meeting

The inspectors 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 February 16, 2007. 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

IFI 70-7001/2006-201-01 Tracks: (1) the certificatee's justification for inclusion of Mixed-Oxide (MOX)-driven benchmarks in the validation reports and establishment of criteria for demonstration of Area of Applicability (AOA) compliance in facility calculations, as well as (2) the certificatee's development of guidelines which will ensure a consistent minimum level of documentation for verifying the compliance of future facility calculations with the validated AOA.

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

K. Ahern	Manager, Production Support Functional
R. Beck	Engineer, Nuclear Criticality Safety
M. Boren	Nuclear Regulatory Affairs
T. Henson	Manager, Nuclear Criticality Safety
T. Hofer	Engineer, Nuclear Criticality Safety
L. Jackson	Manager, Operations
M. Keef	Plant Manager
J. Labarraque	Manager, Nuclear Safety & Quality
J. Lewis	Manager, Maintenance
R. Helme	Manager, Engineering
S. Penrod	General Manager
E. Paine	Manager, Chemical Operations
D. Stadler	Senior Engineer, Nuclear Regulatory Affairs

NRC

T. Powell	Criticality Safety Inspector, Headquarters
T. Marenchin	Criticality Safety Inspector, Headquarters
M. Thomas	Sr. Resident Inspector, RII

All attended the exit meeting on February 16, 2007.

4.0 List of Acronyms and Abbreviations

ADAMS	Agency-Wide Document Access and Management System
AOA	area of applicability
CAAS	criticality accident alarm system
CFR	Code of Federal Regulation
DAC	design analysis calculation
DOE	U.S. Department of Energy
GDP	gaseous diffusion plant
IFI	inspector follow-up item
IP	inspection procedure
MOX	mixed oxide
NCS	nuclear criticality safety
NCSA	nuclear criticality safety approval
NCSE	nuclear criticality safety evaluation
PDR	public document room
UF ₆	uranium hexafluoride
USEC	U. S. Enrichment Corporation (certificatee)