

September 11, 2009

EN 45042

Mr. Robert Van Namen
Senior Vice President – Uranium Enrichment
United States Enrichment Corporation
6903 Rockledge Drive
Bethesda, MD 20817

SUBJECT: INSPECTION REPORT NO. 70-7001/2009-203

Dear Mr. Namen:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, scheduled, and announced criticality safety inspection August 10-13, 2009, at the Paducah Gaseous Diffusion Plant 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 August 13, 2009, during which inspection observations and findings were discussed with your management and staff.

The inspection, which is described in the enclosure, focused on the most hazardous activities and plant conditions; the most important controls relied on for safety and their analytical basis; and the principal management measures for ensuring controls are 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 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 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>.

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at (301) 492-3112.

Sincerely,

/RA/

Patricia A. Silva, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7001

Enclosure: Inspection Report No. 70-7001/2009-203

cc: S. Penrod, Paducah General Manager
V. Shanks, 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

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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.: 70-7001/2009-203

Certificate holder: United States Enrichment Corporation

Location: Paducah, Kentucky

Inspection Dates: August 10-13, 2009

Inspectors: Dennis Morey, Senior Criticality Safety Inspector
Tamara Powell, Criticality Safety Inspector

Approved by: Patricia A. Silva, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Enclosure

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

NRC Inspection Report 70-7001/2009-203

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 in Paducah, Kentucky, from August 10-13, 2009. The inspection included an on-site review of certificate holder 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-310-A, C-331, C-333, C-335, C-360, C-400, C-409, C-615, C-709, C-710, C-712, and C-746-Q1.

Results

- No safety concerns were identified regarding the certificate holder's NCS program.
- No safety concerns were identified regarding the certificate holder's NCS walkthroughs, assessments, and surveillance activities.
- No safety concerns were identified regarding the certificate holder's internal event reporting, investigation, and correction actions for criticality-related events.
- No safety concerns were identified regarding certificate holder's criticality accident alarm system (CAAS) coverage of fissile material operations.
- No safety concerns were identified during walkdowns of the facility and operations.

REPORT DETAILS

1.0 Summary of Plant Status

U.S. Enrichment Corporation (USEC) enriches uranium for domestic and international customers at the Paducah Gaseous Diffusion Plant. In conjunction with routine enrichment activities, the certificate holder performs laboratory operations, cleaning and decontamination services, and maintenance and support activities. During the inspection, the certificate holder was performing summer, low-power operations including uranium enrichment and cell maintenance.

2.0 Nuclear Criticality Safety Program (IP 88015)

a. Inspection Scope

The inspectors reviewed the certificate holder's NCS program. The inspectors evaluated the adequacy of the program to assure the safety of fissile material operations. The inspectors interviewed certificate holder 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-EG-NS1033, "Enrichment and Exempt Waste Verification," Revision 12, dated July 17, 2009
- DAC-832-ZA1280-0028, "Small Cylinder Storage Calculations," Revision 2, dated June 15, 2009
- NCSA-CAS-021, "Operation and Shutdown of the Diffusion Cascade," Revision 2, dated May 1, 2009
- NCSA GEN 009, "Operation and Maintenance of Negative Air Machines," Revision 3, dated March 12, 2009
- NCSA GEN-046, "Handling and Storage of Sample Cylinders," Revision 2, dated June 18, 2009
- NCSA GEN-047, "NCS-Exemption of Items," Revision 1, dated July 17, 2009
- NCSA GPS-019, "Centrifugal Pump Disassembly," Revision 1, dated April 17, 2009
- NCSA 310-003, "Normetex Pumps Used for UF₆ Product Withdrawal," Revision 7, dated May 16, 2008
- NCSA 400-013, "Axial Compressor Disassembly and Decontamination in the C-400 Compressor Pit," Revision 2, dated June 25, 2009
- NCSA 710-004, "UF₆ Subsampling and Uranium Analysis Laboratories," Revision 3, dated June 15, 2007
- NCSA 710-005, "The Drain System in the C-710 Facility," Revision 4, dated July 19, 2007
- NCSE GEN-001, "General Limits Used at the Paducah Gaseous Diffusion Plant," Revision 8, dated June 25, 2009
- NCSE GPS-019, "Centrifugal Pump Disassembly," Revision 8, dated December 11, 2008
- NCSE 032, "Product and Side Withdrawal in the C-310 Building," Revision 10, dated May 14, 2009
- NCSE 045, "Seal Exhaust/West Air Stations," Revision 2, dated May 21, 2009

- NCSE 066, "Axial Compressor Disassembly and Decontamination in the C-400 Compressor Pit," Revision 2, dated June 4, 2009
- NCSE 078, "Handling and Storage of Sample Cylinders," Revision 2, dated June 18, 2009
- NCSE 088, "NCS-Exemption of Items," Revision 1, dated December 2, 2008
- NCSE 095, "Operation and Shutdown of the Diffusion Cascade," Revision 3, dated May 14, 2009
- NCSE 100, "Use and Handling of 1000 and 2000 cfm Nuclear Power Outfitters Negative Air Machines," Revision 3, dated March 12, 2009

b. Observations and Findings

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

The inspectors reviewed NCS analyses including 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 identified regarding the certificate holder's NCS program.

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

a. Inspection Scope

The inspectors reviewed records of previously-completed certificate holder internal NCS walkthroughs of fissile operations in Buildings C-333-A, C-333-C, C-400, C-720, and C-720-C. The inspectors also reviewed a self-assessment report related to NCS controls in maintenance and quality assurance procedures. The inspectors reviewed selected aspects of the following documents:

- 09-WS-001, "C-333A/C, C-337A Buildings NCS Walkthrough," dated June 12, 2009
- 09-WS-002, "C-720 Maintenance and receiving areas and C-720-C Walkthrough," dated June 16, 2009
- 09-WS-003, "CY 2009 Walkthrough of the C-400 Facility," dated June 26, 2009
- C28-SA-09-02, "NCS: Maintenance Self-Assessment Report," dated April 27, 2009
- CP2-BM-CI1030, "Paducah Self-Assessment," Revision 7, dated January 12, 2007

- CP4-EG-NS1107, "Nuclear Criticality Safety Oversight Program," Revision 3, dated April 6, 2005

b. Observations and Findings

The inspectors determined that the certificate holder's 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 certificate holder's 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 certificate holder 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 certificate holder's NCS walkthroughs assessments, and surveillance activities.

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

a. Inspection Scope

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

- ATRC-09-0849, "UF₆ Pigtail Found in Bag Lying on Waste Drum," dated April 13, 2009
- ATRC-09-1034, "Potential NCS Violation," dated May 4, 2009
- ATRC-09-1234, "Potential NCS Violation C-310 Cell 4/3B," dated May 21, 2009
- CP4-EG-NS1104, "Nuclear Criticality Safety Engineer Response to Emergency, Off-Normal, and Process Upset Conditions," Revision 2, dated January 14, 2006
- NCS-INC-09-005, "UF₆ Pigtail Improperly Stored in C-337A," Revision 0, dated April 14, 2009
- NCS-INC-09-006, "NCS Spacing Violation," Revision 0, dated May 4, 2009
- NCS-INC-09-007, "Equipment Removed without Required Tagging," Revision 0, dated May 21, 2009

b. Observations and Findings

The inspectors determined that events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspectors reviewed the certificate holder's response to a May 4, 2009, NRC reportable event, Event Notice (EN) 45042. The event involved the improper storage and spacing of a fissile sample buggy. The fissile sample buggy was placed next to a fissile high efficiency particulate air (HEPA) vacuum which was a violation of the requirement that vacuums and sample buggies are spaced a minimum of 2 feet from all other fissile material. The inspectors

reviewed the certificate holder's corrective actions for the event which were to: (1) identify storage areas for calibration/sample buggies to be returned after use; (2) identify storage areas for HEPA vacuums to be returned after use; (3) perform crew briefings with personnel in the Instrumentation and Controls Group on the location of newly identified storage areas for both calibration/sample buggies and HEPA vacuums and the management expectation that they be returned to one of these areas after each use; and (4) perform an effectiveness review to determine if any spacing violations of a calibration/sample buggy and a HEPA vacuum have occurred since June 18, 2008. Additionally, the certificate holder developed a lessons learned document that was communicated to all personnel who work in fissile operation areas during a briefing on May 8, 2009. The inspectors noted that the new storage locations for buggies and HEPA vacuums had been identified in C-310, C-331, C-333, C-335 and C-337. The inspectors performed walkdowns of the new storage locations in C-335. The crew briefings had not yet taken place but were anticipated to be completed by the action item due date, August 20, 2009. The effectiveness review had also not yet been completed, but the certificate holder anticipated completing this action by the December 22, 2009 due date. The inspectors did not identify any further concerns, and determined that the corrective actions were adequate. EN 45042 is closed.

c. Conclusions

No safety concerns were identified regarding the certificate holder's internal event reporting, investigation, and correction actions for criticality-related events.

5.0 Criticality Alarm System (IP 88017)

a. Inspection Scope

The inspectors reviewed documentation of CAAS detector coverage, interviewed engineering and maintenance staff, and performed facility walkdowns to determine the adequacy of the certificate holder's criticality alarm system. The inspectors reviewed selected aspects of the following documents:

- CP2-CO-CA2030, "Operation of the Criticality Accident Alarm System [CAAS]," Revision 20, dated May 16, 2009
- CP2-EG-NS1042, "On-Site Transportation of Fissile Material," Revision 6, dated December 17, 2007

b. Observations and Findings

The inspectors reviewed criticality alarm system operating procedures and performed walkdowns of facilities with criticality alarm detectors. The inspectors reviewed a portable detector buggy which had been placed in a permanent location in Building C-331. The hard-wiring of the portable alarm buggy into a permanent position was an upgrade of the system performed shortly after certification. The inspectors also reviewed temperature controlled detectors installed in Building 746Q which was an unheated warehouse. The 746Q detectors were located near a heater/fan unit which was activated by a temperature sensor next to the criticality detector to assure the reliability of the detector. The inspectors also reviewed criticality detectors in the C-710 laboratory. The inspectors determined that the certificate holder 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 safety concerns were identified regarding certificate holder's CAAS coverage of fissile material operations.

6.0 Plant Activities (IP 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 certificate holder for controlling criticality risks to acceptable levels. The inspectors performed walkdowns of Buildings C-310, C-310-A, C-331, C-333, C-335, C-360, C-400, C-409, C-615, C-709, C-710, C-712, and C-746-Q1. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- CP4-CO-CN2021a, "Operation of the Nometex Pump," Revision 16, dated June 24, 2008
- CP4-CO-CN6069, "Periodic Regulatory Checks," Revision 37, dated May 16, 2009

b. Observations and Findings

The inspectors verified that controls identified in the NCS analyses reviewed were adequate to assure safety. The inspectors accompanied NCS and other technical staff on walkdowns of NCS controls in selected plant areas. The inspectors observed that 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 Open Item Followup

IFI 70-7001/2009-201-01

This item tracks the certificate holder's clarification of the high ambient noise criticality alarm. During a previous inspection, the inspectors reviewed the certificate holder's compensatory measures for situations where the criticality alarm was inaudible due to high ambient noise levels. The inspectors noted that the use of a buddy system was required by TSR 2.6 for areas with high ambient noise levels such that the criticality alarm might not be heard and such areas were required to have an attendant stationed outside the high noise area to listen for the criticality alarm and warn affected workers. During the previous inspection, the inspectors noted that well-drilling operations were in progress in an outside area which created enough noise that criticality alarm horns might

not be audible near the drill rigs. The inspectors noted that portable toilets had been placed inside the high noise area and were being used by personnel not involved with the work underway inside the noise zone and who entered the zone solely to use the portable toilet. The inspectors determined that certificate holder procedures did not adequately cover this situation or the responsibilities of the attendant. During the previous inspection, the certificate holder's staff initiated a procedure change to clarify what could be inside the high noise area and to specify the duties of the attendant. During the current inspection, the inspectors noted that the criticality alarm operating procedure had been updated to require documentation of the affected area layout and the method of communication between the attendant and affected workers. The revised operating procedure also included instructions for verifying that changed conditions will not affect high noise compensatory measures prior to restarting the work activity. This item is closed.

8.0 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 August 13, 2009. 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

IFI 70-7001/2009-201-01 Tracks the certificate holder's clarification of the high ambient noise criticality alarm.

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

R. Beck	Senior Engineer, Nuclear Criticality Safety
M. Boren	Nuclear Regulatory Affairs
L. Fink	Engineer, Regulatory Affairs
R. Helme	Manager, Engineering
T. Henson	Manager, Nuclear Criticality Safety
J. Lewis	Plant Manager
L. Moffatt	Cascade Group Manager, Operations
J. Price	Manager, Production Support
V. Shanks	Manager, Nuclear Regulatory Affairs
D. Snow	Manager, H&S
D. Stadler	Senior Engineer, Nuclear Regulatory Affairs
C. Willett	Manager, Maintenance
M. Wilson	Engineer, NCS

NRC

D. Morey Senior Criticality Safety Inspector, Headquarters
T. Powell Criticality Safety Inspector, Headquarters

All attended the exit meeting on August 13, 2009.

4.0 List of Acronyms and Abbreviations

ADAMS	Agency-Wide Document Access and Management System
CAAS	criticality accident alarm system
DAC	design analysis calculation
DOE	U.S. Department of Energy
HEPA	high efficiency particulate air
IFI	inspector follow-up item
IP	inspection procedure
NCS	nuclear criticality safety
NCSA	nuclear criticality safety approval
NCSE	nuclear criticality safety evaluation
UF ₆	uranium hexafluoride
USEC	U. S. Enrichment Corporation (certificate holder)
VIO	violation