August 11, 2010

EN 46105

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

SUBJECT: INSPECTION REPORT NO. 70-7001/2010-203

Dear Mr. Van Namen:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, scheduled, and announced criticality safety inspection July 19-22, 2010, 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 July 22, 2010, 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/ Craig Hrabal for

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

Docket No.: 70-7001

Enclosure: Inspection Report No. 70-7001/2010-203

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.:	70-7001/2010-203
Certificate holder:	United States Enrichment Corporation
Location:	Paducah, Kentucky
Inspection Dates:	July 19-22, 2010
Inspectors:	Dennis Morey, Senior Criticality Safety Inspector Christian Fisher, Criticality Safety Inspector
Approved by:	Patricia A. Silva, Chief Technical Support Branch Special Projects and Technical Support Directorate Division of Fuel Cycle Safety and Safeguards Office of Nuclear Material Safety and Safeguards

Enclosure

EXECUTIVE SUMMARY

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
U. S. Nuclear Regulatory Commission
Inspection Report 70-7001/2010-203

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 July 19-22, 2010. The inspection included an on-site review of the certificate holder's 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-300, C-310, C-333, C-337, C-337A, C-360, C-400, C-709, C-710 and C-720.

Results

- No safety concerns were identified regarding the certificate holder's NCS program.
- No safety concerns were identified during review of the certificate holder's NCS administrative and operating procedures.
- 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 reporting, investigation, and corrective actions for internally-reported criticality-related events.
- No safety concerns were identified regarding the 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 PGDP. 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 mid-summer, low-power operations.

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 the certificate holder's managers, NCS engineers, system engineers, and facility operators during document review and facility walkdowns. The inspectors reviewed selected aspects of the following documents:

- NCSE [Nuclear criticality safety evaluation] 015, "Spray Booth Operations," Revision 6, dated June 24, 2010
- NCSA [Nuclear criticality safety approval] 400-006, "C-400 Spray Booth Operations," Revision 8, dated June 24, 2010
- NCSE 120, "Equipment Removal, Handling and Storage," Revision 2, dated April 1, 2010
- NCSA GEN 010, "Equipment Removal, Handling and Storage," Revision 7, dated April 1, 2010
- NCSE 070, "Operation and Maintenance of Autoclave Facility Process Piping, Evacuation Drums, and Relief Drums," Revision 6, dated January 22, 2010
- NCSA GEN-043, "Operation and Maintenance of Autoclave Facility Process Piping, Evacuation Drums, and Relief Drums," Revision 5, January 22, 2010
- NCSE 042, "Operation and Maintenance of the C-360, C-333A and C-337A Autoclaves," Revision 8, dated February 18, 2010
- NCSA GEN-038, "Operation and Maintenance of the C-360, C-333A and C-337A Autoclaves," Revision 6, dated February 18, 2010
- NCSE 073, "Operation and Maintenance of the liquid UF_6 [uranium hexafluoride] Sampling Systems in the C-310 Product Withdrawal Facility," Revision 3, April 30, 2010

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 certificate holder'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 and that independent reviews of the evaluations were completed by qualified NCS engineers.

c. Conclusions

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

3.0 Nuclear Criticality Safety Administrative and Operating Procedures (IP 88015)

a. Inspection Scope

The inspectors reviewed the certificate holder's NCS administrative and operating procedures to determine if the NCS program described in the certificate is adequately implemented and controlled through approved written procedures. The inspectors reviewed selected aspects of the following documents:

- CP4-EG-NS1107, "NCS Oversight Program," Revision 3, dated September 8, 2009
- CP2-EG-NS1033, "Enrichment and Exempt Waste Verification," Revision 12, dated March 16, 2010
- CP4-EG-NS1104, "NCS Engineer Response to Emergency, Off-Normal, and Process Upset Conditions," Revision 2, dated January 17, 2006
- CP2-EG-NS1041, "Remediation of NCSE and NCSA Non-Compliance," Revision 0, dated March 19, 1999
- CP4-EW-WM9003, "Remediation Requirements for C-754 Waste Storage Facility," Revision 1, dated April 26, 2007
- CP3-QA-QA1070, "Conduct of NS&Q Activities," Revision 8, dated May 25, 2010

b. Observations and Findings

The inspectors evaluated the certificate holder's administrative procedures controlling internal audits, NCS exemption processing, response to NCS events, and NCS event recovery. The inspectors interviewed the certificate holder's managers, NCS engineers, system engineers, and facility operators regarding NCS program implementation during document reviews and facility walkdowns. The inspectors determined that the certificate holder's NCS program is adequately controlled through compliance with approved administrative and operating procedures.

c. Conclusions

No safety concerns were identified during review of the certificate holder's NCS administrative and operating procedures.

4.0 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. 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-004, "NCS Walkthrough for the C-745 Cylinder Yards," dated September 2009
- 10-WS-001, "NCS Walkthrough of the C-360 Facility," dated March 2010
- 10-WS-002, "NCS Walkthrough of the C-333 Facility," dated May 2010
- 10-WS-003, "NCS Walkthrough of the C-409 Facility," dated May 2010
- 10-WS-004, "NCS Walkthrough of the C-331 Facility," dated June 2010
- C28-SA-10-02, "NCS: Independent Verification," dated May 31, 2010
- Memo to S. Gunn, "First Quarter 2010 NS&Q Area Owner Report for Operations," dated April 16, 2010
- Memo to S. Gunn, "NS&Q Surveillance KP-OP-S1001, Shift Operations," dated March 22, 2010
- CP3-QA-QA1072, "Nuclear Safety and Quality Surveillance Administration," Revision 1, dated December 12, 2009
- UE2-QA-QA1030, "Nuclear Safety and Quality Assessments," Revision 4, dated October 12, 2007

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 the certificate holder's 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.

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

a. Inspection Scope

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

- NCS-INC-10-004, "PEH spacing violation in floor storage," Revision 0, dated March 9, 2010
- NCS-INC-10-005, "Fissile Control Area boundary not painted in accordance with NCSA GEN-015, "Revision 0, dated May 12, 2010

- NCS-INC-10-006, “Loss of double contingency due to failure of C-400 spray booth storage tank floor pan,” Revision 0, dated July 18, 2010
- ATRC-10-0619, Issue ID C10I00711, March 9, 2010
- ATRC-10-1260, Issue ID C10I01413, May 12, 2010
- ATRC-10-1961, Issue ID C10I02186, July 17, 2010
- ATRC-10-1965, Issue ID C10I02190, July 18, 2010

b. Observations and Findings

The inspectors reviewed a recent reportable criticality control failure event and two internal criticality-related event reports. The inspectors determined that internal events were reported and investigated in accordance with written procedures and appropriate corrective actions were assigned.

The inspectors reviewed a reportable event (EN46105) which concerned cracks in the C-400 spray booth containment pan. The certificate holder cleans and decontaminates equipment in a large spray booth in the C-400 building and the resulting wash solution, containing up to 5.0% enriched material, is transferred to safe geometry storage tanks next to and outside of the spray booth. A large part of the C-400 floor under the storage tanks, the wastewater treatment equipment, and other solution handling equipment outside the spray booth is covered with a one-inch deep, stainless steel floor pan. The floor pan is credited as part of the double contingency arrangement for the wash solution storage tanks to take advantage of the ability of the pan to accumulate solution leaking from the tanks into a safe, one-inch slab. The storage pan is required to be inspected every two years and during the most recent inspection, the certificate holder identified cracks in the pan which would allow solution to leak to the C-400 floor thus defeating the double contingency arrangement.

The inspectors reviewed the cracked floor pan and the certificate holder’s response to the event. The inspectors noted that the pan was very large and the cracks were far away from the storage tanks so that the pan could be expected to retain a substantial amount of solution regardless of the cracks. The inspectors also noted that, due to the two-year pan inspection frequency, the exposure from the degraded control was approximately one-year which was minimal based on the overall risk of the accident sequence. The inspectors determined that the effect on the risk of the accident sequence of solution leaking from the spray booth storage tanks and entering an unsafe geometry volume was effectively addressed by the planned controls and that the effect on the risk of the cracks observed by the inspectors was minor. Although this issue should be corrected, it constitutes a violation of minor significance that is not subject to enforcement action in accordance with Section IV of the Enforcement Policy.

c. Conclusions

No safety concerns were identified regarding the certificate holder’s reporting, investigation, and corrective actions for internally-reported criticality-related events.

6.0 Criticality Accident 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 document:

- KY/S-255, "Criticality Accident Alarm Detector Placement and Coverage at the Paducah Gaseous Diffusion Plant," dated February 1996

b. Observations and Findings

The inspectors reviewed the criticality alarm system placement at Building 746Q1 and how this detector would cover the newly constructed cascade equipment storage pad 745X. The inspectors noted that the certificate holder coverage basis of 400 feet was based on a depletion assumption that 90% of the radiation from a criticality event would be absorbed and the remaining gammas would be enough to exceed the detector setpoint. Based on review of a scale drawing of the site, the inspectors determined that a 400 foot radius was adequate to cover the 745X storage pad. The inspectors performed walkdowns of the 745X storage pad and determined that 746Q1 criticality detectors were capable of monitoring fissile material operations and reliably detecting the minimum accident of concern.

c. Conclusions

No safety concerns were identified regarding the certificate holder's CAAS coverage of fissile material operations.

7.0 Plant Operations (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-300, C-310, C-333, C-337, C-337A, C-360, C-400, C-709, C-710 and C-720. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- CP4-TS-AL7001, "Independent Sampling and Analysis," Revision 4, dated September 18, 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.

8.0 Open Item Review

IFI 70-7001/2010-201-01

This item tracks the certificate holder's action to improve the wording of procedure CP4-TS-AL7001 to indicate that mixing is always performed when sampling in support of NCS exemption by concentration. During a previous inspection, the inspectors noted that the certificate holder had modified NCSE GEN-01 to allow treatment of very low concentration samples as non-fissile based on concentration. Specifically, if a sample was observed to have less than 50 ppm uranium, another independent sample could be taken and if that sample was observed to have less than 50 ppm uranium, the two samples and all associated waste could be treated as non-fissile. Certificate holder staff noted that the largest associated waste container would be a two-liter bottle and that larger containers had been evaluated because of a desire to expand the exception in the future. The inspectors noted that NCS controls based on concentration are dependent upon the uniformity of the concentration of the sampled solution. The inspectors noted that the certificate holder's procedure for sampling directed operators to mix or recirculate before sampling "if possible" without any mention of the importance of mixing or recirculating prior to sampling if a concentration control was involved. The certificate holder's staff then wrote ATRC-10-0373 to improve the wording of the sampling procedure to indicate that mixing is always performed when sampling in support of NCS exemption by concentration.

During this inspection the inspectors reviewed the certificate holders's independent sampling procedure, CP4-TS-AL7001. The inspectors determined that the certificate holder had updated the procedure to clarify that samples had to be mixed when concentration control is being established. The inspectors determined that the certificate holder had revised the procedure to adequately clarify that sample mixing is required if the sample will be used to establish concentration control. This item is closed.

9.0 Exit Meeting

The inspectors communicated the inspection scope and results to members of PGDP management and staff throughout the inspection and during an exit meeting on July 22, 2010. PGDP 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 70-7001/2010-201-01	Tracks the certificate holder's action to improve the wording of procedure CP4-TS-AL7001 to indicate that mixing is always performed when sampling in support of NCS exemption by concentration.

2.0 Inspection Procedures Used

IP 88015	NCS Program
IP 88016	NCS Evaluations and Analyses
IP 88017	Criticality Alarm Systems

3.0 Partial List of Persons Contacted

USEC

R. Beck	Senior Engineer, NCS
B. Chenier	Engineer, NCS
M. Boren	Nuclear Regulatory Affairs
L. Fink	Engineer, Regulatory Affairs
R. Helme	Manager, Engineering
H. Beane	Manager, NS&Q
T. Henson	Manager, Nuclear Criticality Safety
J. Lewis	Plant Manager
S. Penrod	General Manger
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

NRC

D. Morey	NCS Inspector, Headquarters
C. Fisher	NCS, Headquarters

All attended the exit meeting on July 22, 2010.

4.0 List of Acronyms and Abbreviations

ADAMS	Agency-Wide Document Access and Management System
CAAS	criticality accident alarm system
DOE	U.S. Department of Energy
IFI	inspector follow-up item
IP	inspection procedure
NCS	nuclear criticality safety
NCSA	nuclear criticality safety approval
NCSE	nuclear criticality safety evaluation
PGDP	Paducah Gaseous Diffusion Plant
UF_6	uranium hexaflouride
USEC	U. S. Enrichment Corporation (certificate holder)