

April 20, 2011

EN 46592

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

SUBJECT: INSPECTION REPORT NO. 70-7001/2011-201 AND NOTICE OF VIOLATION

Dear Mr. Namen:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, scheduled, and announced criticality safety inspection March 21-24, 2011, 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 March 24, 2011, 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. Throughout this inspection, observations were discussed with your managers and staff.

Based on the results of this inspection, NRC has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's web site at www.nrc.gov; select **Public Meetings & Involvement**, then **Enforcement**. The violation is being cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice because it was identified as the result of an event. The violation being cited as a Severity Level IV violation, is the failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room.

NRC has concluded that information regarding the reason for the violation, the corrective actions taken to correct the violation and prevent recurrence and the date when full compliance was achieved is already adequately addressed on the docket in the enclosed inspection report.

Therefore, you are not required to respond to this letter unless the description herein does not accurately reflect your corrective actions or your position. In that case, or if you choose to provide additional information, you should follow the instructions specified in the enclosed Notice.

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>.

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

Sincerely,

/RA/ P. Habighorst for

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:

1. Notice of Violation
2. Inspection Report No. 70-7001/2011-201

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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NAME	DMorey	TMarenchin	PJenifer	PSilva P. Habighorst for
DATE	4/19/11	4/19/11	4 /19/11	4/20/11

OFFICIAL RECORD COPY

NOTICE OF VIOLATION

USEC-PGDP
Paducah, Kentucky

Docket No. 70-7001
Certificate No. GDP-1

During an NRC inspection conducted from March 21-24, 2011, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Certificate Condition No. 9 of Certificate GDP-1 requires the conduct of operations in accordance with the Technical Safety Requirements that are contained in Volume 4, Revision 112 of the Application, dated August 11, 2008, and supplements thereto.

Technical Safety Requirement 3.11.5 requires, in part, that the double contingency principle, as described in the Safety Analysis Report, shall be used as the basis for the design and operation of processes using fissionable materials.

Section 5.2.2.3 of the Application [Safety Analysis Report (SAR) – Paducah Gaseous Diffusion Plant] states, in part, that “the Paducah Gaseous Diffusion Plant nuclear criticality safety program applies this principle [double contingency] by implementing controls either on two different parameters or by implementing two controls on one parameter” and “if two controls are implemented for one parameter the violation or failure scenarios of the controls shall be independent.”

Contrary to the above, on and before February 3, 2011, the certificatee failed to use the double contingency principle, as described in the SAR, for the design and operation of the crawl space above the C-310 Product Withdrawal room. Specifically, the crawl space contained large unsafe geometry areas capable of liquid accumulation greater than 0.5 inches and the heads on the fire sprinklers in the crawl space were set for 160 degrees Fahrenheit which is less than required to prevent immediate activation during a uranium hexafluoride (UF₆) release.

This was a Severity Level IV violation. (Enforcement Policy 6.2)

The NRC has concluded that information regarding the reason for the violation, the corrective actions taken to correct the violation and identify the extent of condition and the date when full compliance was achieved was already adequately addressed and is documented in the attached inspection report. However, you are required to submit a written statement or explanation pursuant to 10 CFR 2.201 if the description therein does not accurately reflect your corrective actions or your position. In that case, or if you choose to respond, clearly mark your response as a “Reply to a Notice of Violation, VIO-07007001/2010-004-01” and send it to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, One White Flint North, 11555 Rockville, MD 20852-2738, with copies to the Chief, Technical Support Branch, FCSS/NMSS and the Regional Administrator, U.S., Nuclear Regulatory Commission, Region II, within 30 days of the date of the letter transmitting this Notice of Violation (Notice).

Enclosure 1

NOV

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If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

If you choose to respond, your response 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>. Therefore, to the extent possible, the response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 20th day of April, 2011

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

Docket No.: 70-7001

Certificate No.: GDP-01

Report No.: 70-7001/2011-201

Certificate Holder: United States Enrichment Corporation

Location: Paducah, Kentucky

Inspection Dates: March 21-24, 2011

Inspectors: Dennis Morey, Senior Criticality Safety Inspector
Thomas Marenchin, 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 2

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

NRC Inspection Report 70-7001/2011-201

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 in Paducah, Kentucky, from March 21-24, 2011. 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-310, C-360, C-400, and C-409.

Results

- A Severity Level IV violation was identified regarding the failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room.
- No safety concerns were identified regarding the certificate holder's NCS program.
- No safety concerns were identified regarding the certificate holder's NCS evaluations.
- No safety concerns were identified regarding the certificate holder's NCS walkthroughs, assessments, and surveillance.
- No additional safety concerns were identified regarding the certificate holder's internal event reporting, investigation, and corrective actions.
- No 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 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 routine enrichment and support 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 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:

- Procedure CP2-EG-NS1031, "Nuclear Criticality Safety," Revision 9, dated February 1, 2007

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.

c. Conclusions

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

3.0 Nuclear Criticality Safety Evaluations and Analyses (IP 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 reviewed selected aspects of the following documents:

- NCSA [nuclear criticality safety approval]-310-005, "Operation and maintenance of the C-310 South Bank 10-inch Sodium Fluoride Traps," Revision 2, dated December 3, 2004
- NCSA-335-004, "Operation and Maintenance of the Favorable Geometry UF₆/R-114 Separation System in C-335," Revision 3, dated June 26, 2008
- NCSA-710-001, "UF₆ Standard Storage and Handling in the C-710 Building," Revision 2, dated September 16, 2010
- NCSA-CSA [criticality safety analysis]-010, "Operation, Maintenance, and Transportation of the Cascade Building Process Gas Analyzer," Revision 3, dated March 1, 2011
- NCSA-GEN-008, "Operation and Maintenance of Negative AIR Machines," Revision 4, dated January 6, 2010
- NCSA-GEN-024, "The Storage, Handling, and use of Radioactive Standards and Sources," Revision 5, dated December 11, 2009
- NCSA-GEN-042, "Operation, Maintenance, and Storage of the Tc-99 Traps," Revision 1, dated April 16, 2002
- NCSA-GEN-043, "Operation and Maintenance of Autoclave Facility Process Piping, Evacuation Drums, and Relief Drums," Revision 6, dated March 11, 2011
- NCSA-WMO-001, "Operation of Temporary Fissile Storage Areas," Revision 10, dated February 1, 2011
- NCSE-032, "Product and Side Withdrawal in the C-310 Building," Revision 12, dated February 17, 2011
- NCSA-310-004, "Product and Side Withdrawal in the C-310 Building," Revision 10, dated February 21, 2011
- NCSE-085, "Operation of the C-400 Cylinder Washing Hydrostatic Testing and Drying Facility," Revision 7, dated March 14, 2011
- NCSA-500-012, "Operation of the C-400 Cylinder Washing Hydrostatic Testing and Drying Facility," Revision 7, dated March 14, 2011
- NCSE-015, "C-400 Spray Booth Operations," Revision 8, dated December 10, 2010
- NCSA-400-006, "C-400 Spray Booth Operations," Revision 10, dated December 10, 2010
- NCSE-103, "C-400 and C-409 Floor Drains and Containment Pans," Revision 2, dated December 10, 2010
- NCSA-CHM-001, "C-400 and C-409 Floor Drains and Containment Pans," Revision 2, dated December 10, 2010

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 identified regarding the certificate holder's NCSEs.

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 in Buildings C-333, C-335, C-360, and C-400. The inspectors reviewed selected aspects of the following documents:

- Procedure CP2-BM-CI1030, "Self Assessment," Revision 7, dated January 12, 2007
- Procedure CP4-EG-NS1107, "NCS Oversight Program," Revision 3, dated April 6, 2005
- C28-SA-10-05, "Self Assessment of UF₆ Handling," dated September 29, 2010
- C28-SA-10-08, "Self Assessment of Cascade Operations," dated October 14, 2010
- 10-WS-005, "NCS Walkthrough of C-310/C-310A," dated August 11, 2010
- 10-WS-006, "NCS Walkthrough of C-337," dated October 18, 2010
- 10-WS-007, "NCS Walkthrough of C-335," dated October 27, 2010
- 10-WS-008, "NCS Walkthrough of C-709/C-710," dated September 30, 2010
- 11-WS-001, "NCS Walkthrough of C-333A/C-337A," dated January 24, 2010

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'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.

5.0 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:

- Procedure CP4-CO-CE5017a, "UF₆ Release in C-310 et al," Revision 12, dated March 2, 2011
- NCS-INC-10-007, "Failure to Perform HEFS Surveillance", Revision 0, dated September 22, 2010
- NCS-INC-10-008, "Unsafe Geometry Trash Bags in C-710 Laboratory", Revision 0, dated September 22, 2010
- NCS-INC-10-009, "Failure to Make Independent Verification of Cylinder Cool Down Time", Revision 1, dated October 6, 2010
- NCS-INC-10-010, "Improper Accumulation of Potentially Fissile Waste", Revision 1, dated December 2, 2010
- NCS-INC-10-011, "Non-exempt PPE in Rad Bag", Revision 0, dated December 8, 2010
- NCS-INC-10-012, "Incorrect Spacing of potentially Fissile Material", Revision 0, dated December 21, 2010
- NCS-INC-10-013, "Incorrect Spacing of potentially Fissile Material", Revision 1, dated December 21, 2010
- NCS-INC-10-014, "Pigtail Damage During Autoclave Operations", Revision 0, dated December 27, 2010
- NCS-INC-11-001, "Improper Storage of Potentially Fissile Items", Revision 0, dated January 5, 2010
- NCS-INC-11-002, "Double Contingency Failure in C-310 Crawl Space", Revision 0, dated February 3, 2010

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 a certificate holder reportable event, EN 46592, which involved the failure to establish double contingency in the crawl space above the C-310 Product Withdrawal room. The certificate holder identified water leaking into the C-310 Product Withdrawal room and determined that a steam condensate line had broken in the crawl space above the room. The certificate holder investigation revealed large unsafe geometry collection points in the crawl space capable of accumulating liquid greater than a depth of 0.5 inches. The licensee investigation further revealed that the fire sprinkler heads in the area were designed to activate at 160 degrees Fahrenheit (F) which was less than the activation temperature required by criticality analysis (200 degrees F) to prevent immediate activation in the event of a UF₆ release nearby. Activation of the fire sprinklers in the event of a UF₆ release in the area was credible and would provide both fissile material and moderator to the unsafe geometry collection points. The inspectors determined that that double contingency protection was not provided for this situation.

The inspectors evaluated the event in accordance with the Enforcement Policy for a fuel cycle facility non-compliance. Enforcement Policy 6.2(d)(2) defines a Severity Level IV violation as “a failure of safety systems or controls occurs such that an acceptable safety margin has not been maintained, but the failure does not result in a Severity Level I, II, or III violation.” The inspectors concluded that failure to maintain double contingency as required by the SAR demonstrated failure to maintain acceptable safety margin and was, therefore, at least a Severity Level IV violation. Enforcement Policy 6.2(c)(3) defines a Severity Level III violation as “a substantial increase in the likelihood of a consequence commensurate with a Part 70 high consequence” which would mean a change in risk from highly unlikely. The inspectors determined that this event is high consequence because it involves potential criticality. The initiating event would be a leak of UF₆ in the area substantial enough to activate one or more fire sprinklers and fill the unsafe geometry collection points before discovery and operator response. The inspectors noted that the monel pipe transporting liquid UF₆ through the area was extremely robust and that more than 2500 pounds of UF₆ in solution would have to accumulate in a slab geometry greater than 0.5 inches in height which would take several hours. The certificate holder maintains procedures requiring immediate action in the event of a UF₆ release. The inspectors determined that the combination of monel pipe integrity and the low probability that operators would not interrupt the leak before sufficient fissile solution accumulated made the likelihood of criticality in the situation on the order of highly unlikely. The inspectors concluded that the failure to establish double contingency as required by the SAR did not result in a substantial increase in the likelihood of potential criticality in this situation and, therefore, did not meet the requirements for a Severity Level I, II, or III violation. The failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room is **Violation (VIO) 70-7001-2011-201**. Event EN 46592 is closed.

The inspectors noted that the certificate holder’s corrective actions for the loss of double contingency included:

- Revision of the applicable NCSA/E to address specific NCS hazards in the C-310 crawl space.
- Elimination of NCSA/E limits on containers in the crawl space (control replaced by drain holes).
- Replacement of 160 degree F sprinkler heads with 210 degree F heads.
- Placement of drain holes in the crawl space.
- Performing crew briefings on lessons-learned from the event focusing on adequate implementation walkdowns.

The inspectors determined that double contingency for the crawl space had been established in accordance with procedures and that the violation could be closed without additional certificate holder response.

c. Conclusions

A Severity Level IV violation was identified regarding the failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room.

No additional safety concerns were identified regarding the certificate holder's internal event reporting, investigation, and corrective actions.

6.0 Criticality Alarm System (IP 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 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 April 20, 2009
- CP2-CO-ON3021, "Abnormal Criticality Accident Alarm System Conditions," Revision 13, dated July 13, 2010
- CP2-EP-EP5038, "Criticality and Radiation Emergencies," Revision 11, dated February 1, 2007
- CP4-GP-IM6128, "Criticality Accident Alarm System Calibration and Shop Test," Revision 6, dated March 5, 2007
- CP4-GP-IM6512, "C-333/C-333A CAAS Maintenance and Testing," Revision 12, dated April 29, 2009

b. Observations and Findings

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 concerns were identified regarding the certificate holder's CAAS coverage of fissile material operations.

7.0 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 and reliability 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-360, C-400, and C-409.

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.

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 on March 24, 2011. 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

VIO 70-7001/2011-201-01 Failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room

Items Closed

VIO 70-7001/2011-201-01 Failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room

EN 46592 Failure to establish double contingency in the crawl space over the C-310 Product Withdrawal room

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

M. Boren	Nuclear Regulatory Affairs
R. Beck	Engineer, Nuclear Criticality Safety
B. Chenier	Engineer, Nuclear Criticality Safety
T. Henson	Manager, Nuclear Criticality Safety
S. Penrod	General Manager
V. Shanks	Manager, Nuclear Regulatory Affairs
D. Stadler	Senior Engineer, Nuclear Regulatory Affairs
C. Willett	Manager, Maintenance

NRC

D. Morey	Senior Criticality Safety Inspector, Headquarters
T. Marenchin	Criticality Safety Inspector, Headquarters
R. Prince	Senior Resident Inspector, Region II
R. Russell	Resident Inspector, Region II

All attended the exit meeting on March 24, 2011.

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
CSA	criticality safety analysis
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
SAR	safety analysis report
UF ₆	uranium hexafluoride
USEC	U. S. Enrichment Corporation (certificate holder)
VIO	violation