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December 9, 2005
GDP 05-1046

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

**Paducah Gaseous Diffusion Plant (PGDP)**
**Docket No. 70-7001, Certificate No. GDP-1**
**Event Report ER-05-03**

Pursuant to 10CFR76.120(d)(2), enclosed is the final event report (Enclosure 1) pertaining to the inoperability of the C-337 Criticality Accident Alarm System (CAAS). The NRC was verbally notified of the event pursuant to 10CFR76.120(c)(2)(i) on November 29, 2005, at 2236 hours and NRC No. 42176 was assigned to the notification. Commitments contained in this report are included in Enclosure 2.

Any questions regarding this event report should be directed to Steve Cowne at (270) 441-6796.

Sincerely,

Steven R. Penrod
General Manager
Paducah Gaseous Diffusion Plant

Enclosures: As Stated

cc: NRC Region II Office
NRC Resident Inspector-PGDP

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USEC Inc.
6903 Rockledge Drive, Bethesda, MD 20817-1818
Telephone 301-564-3200 Fax 301-564-3201 http://www.usec.com

**EVENT REPORT**
**ER-05-03**

**A. Description of Event**

On November 29, 2005, the Technical Safety Requirements (TSR) quarterly surveillance of the C-337 process building CAAS was being conducted. The surveillance tests the ability of the CAAS to function as designed. A part of the test is to actuate the building CAAS horns by manually actuating selected CAAS clusters. This determines the "as found" condition of the system prior to any maintenance on the system. When Instrument maintenance (IM) personnel actuated the C-337 "U" cluster, the building horns failed to sound. The cluster was reset and actuated again, the horns again failed to sound. They next contacted the C-300 Central Control Facility (CCF) and asked them to verify that the horn control switch was in the AUTO position. The horn control switch is a three position rotary switch which is in OFF at 10 o'clock, AUTO at the 12 o'clock and ON at the 2 o'clock position. The C-300 operator looked at the switch and based on the switch arrow position responded that the switch appeared to be in AUTO (aligned to the AUTO line on console). IM then actuated the "AK" cluster and again the horns failed to sound. C-300 was contacted and again requested to check the switch. This time the C-300 operator moved the C-337 horn switch slightly past the AUTO line on the console toward the ON position. In doing so he felt the switch click into the AUTO position and the horns actuated. This reaction confirmed that the switch had actually been in a position between OFF and AUTO when it was aligned with the AUTO line on the console. If the switch is positioned between OFF and AUTO there is no power to the CAAS horn system. A review of prior activity related to the C-337 CAAS indicated that the switch had last been positioned from OFF to AUTO on November 5, 2005, as part of post-maintenance testing following an outage of the CAAS. Accordingly it is concluded that the C-337 CAAS horns were inoperable from November 5, 2005, until November 29, 2005. This also degraded the audibility of the C-337a Feed Facility CAAS in that the C-337 horns are designed to provide a portion of C-337a's audibility required by TSR.2.2.4.3b. The C-337 CAAS detection function and beacons located on the outside of the building were not affected by the broken horn circuit. The C-337 CAAS is required to be operable (audible) by TSR 2.4.4.2b. In accordance with 10CFR 76.120 the NRC Headquarters Duty Office was verbally notified on November 29, 2005.

During the time the C-337 CAAS horns were inoperable, the criticality detection function of the CAAS was not affected. When actuated the CAAS would have annunciated a distinct audible and visual CAAS alarm in the C-300 CCF. The C-300 operator would have entered the CAAS alarm response procedure and manually actuated the CAAS horns. Thus, the C-337 CAAS horns would have been actuated from C-300 within a few seconds of the alarm.

**B. Description of Equipment Failure**

The C-337 CAAS horns would not operate as designed due to the C-300 CAAS horn switch not being in the AUTO position.

**C. Exact Location of Event**

C-337 Process Building

**D. Description of Isotopes, Quantities, and Chemical and Physical Form of the Material Involved**

There was no radioactive material or chemicals involved.

**E. Causes of the Event**

Direct Cause of the Event

The C-337 CAAS horn switch in the C-300 CCF was in a position between OFF and AUTO position even though the arrow on the switch was properly aligned with the AUTO position line. Thus, there was no electrical power available to actuate C-337 CAAS air horn system.

Root Causes of the Event

The root cause of the inoperable CAAS horns is attributed to the improper installation of the CAAS horn control switches in the C-300 CAAS console when fabricated in the late 1980s. Following the event, the switches were inspected. It was discovered that the switch was installed without the switch alignment locking ring designed to hold the switch in place in the console and ensure the switch can not rotate in the mounting hole. The CAAS console was designed and fabricated and the switches installed into the console in Oak Ridge, Tenn. in the late 1980's. PGDP personnel installed the console as a complete unit in its present position and completed the final wiring ties. The failure to install the locking ring allowed the switch arrow to rotate slightly such that the arrow when pointed at the AUTO line was not in the position detent and not making up the horn circuit. When checked, all but one of the C-300 CAAS switches was slightly loose and the arrows on some of the switches were mis-aligned with the position detent up to approximately 5 degrees.

The surveillance procedure used for all PGDP process building CAAS causes the C-300 CAAS horn control switch to be re-positioned from AUTO to OFF and at the end of the surveillance back to the AUTO position. Positioning of this switch is the last step in the surveillance procedure, and if the switch is not fully in the AUTO position power will not be available to the horns and there is no indication in C-337 or C-300 of this inoperable condition. The subject switches have three positions (OFF, AUTO and ON) and each position is marked on the control panel around the switch. The switch position is indicated by an arrow on the switch. The subject switch was found to be pointed at the AUTO position line, but the switch contacts were not in the AUTO position, thus the circuit was not completed. The operator that operated the switch during the November 5,

2005, test stated that he saw the BLDG HORN LOCKED OUT light on the CAAS panel go out when he moved the switch from OFF to AUTO and lined up the arrow on the AUTO position line. These two indications led him to believe that the switch was in the AUTO position. In actuality the BLDG HORN LOCKED OUT light is powered by the OFF position circuit and goes out as soon as the switch moves out of the OFF position detent. Thus, this is not an indication that the switch is in the AUTO position.

Contributing Cause of the Event

The C-337 CAAS horn surveillance procedure did not include a step to provide positive verification that the horns were functional prior to exiting the procedure, and after the final positioning of the switch on November 5, 2005.

The design of the CAAS console did not include a positive indication of switch position. A visual indicator that the switch had completed the horn circuit would have ensured the switch was in the fully engaged position.

**F. Corrective Actions Taken**

1. On November 29, 2005, all other PGDP CAAS horn switches were verified to be indicating correct voltage.
2. On November 29, 2005, all C-300 CAAS panel switches were tightened and aligned.
3. On November 29, 2005, the CAAS TSR surveillance in-progress work instructions were revised to include a verification of horn system circuit voltage following placing the C-300 CAAS horn switch in the AUTO position.
4. On December 1, 2005, information was provided to all C-300 personnel to make them aware of the event and to provide detailed instruction about how the switches operate and that a verification of system function must be done after final positioning of the horns switches.
5. On December 2, 2005, a communication was transmitted to further explain the lessons learned from the event and ensuring that personnel understand that system function/operability must be verified as the last step prior to exiting testing or maintenance evolutions.
6. On December 5, 2005, Operations issued a Long Term Order requiring the PSS to ensure that voltage checks are being performed for each time the CAAS horn control switch is operated.

**G. Corrective Actions Planned**

1. By January 31, 2006, the alignment locking rings will be installed on the C-300 CAAS horn switches.
2. By April 1, 2006, Engineering will develop a modification that will inform the operator that the switch is in AUTO.
3. By June 1, 2006, the modification (action 1) will be installed.

4. By January 31, 2006, Maintenance will systematically review TSR surveillance procedures that test equipment covered by TSR specifications to validate that when TSR systems are returned to service following testing or maintenance the ability of the system to conduct its safety function is validated if possible.
5. By January 31, 2006, Operations will review systematically TSR surveillance procedures that test equipment covered by TSR specifications to validate that when TSR system are returned to service following testing or maintenance the ability of the system to conduct its safety function is validated if possible.
6. By January 31, 2006, Production Support will review systematically review TSR surveillance procedures that test equipment covered by TSR specifications to validate that when TSR system are returned to service following testing or maintenance the ability of the system to conduct its safety function is validated if possible.
   (In parallel with actions 4, 5, and 6 above Engineering will be involved in those reviews to determine if the TSR surveillance tests provide assurance that the system will perform its safety function. The result of this review may be additional design changes or enhancements to the TSR surveillance test. Each determination will be completed by February 28, 2006. If a modification is the desired path, a schedule for the design and implementation will be developed. )
7. By December 15, 2006, Maintenance procedures identified by actions 4, 5, and 6 will be revised as necessary.
8. By December 15, 2006, Operations procedures identified by actions 4, 5, and 6 will be revised as necessary.
9. By December 15, 2006, Production Support procedures identified by actions 4, 5, and 6 will be revised as necessary.

**H. Results of Any Evaluations or Assessments**

None

**I. Extent of Exposure of Individuals to Radiation or to Radioactive Material**

The event did not involve radioactive material.

**J. Lessons Learned**

Control switches should include a positive indication of position and test procedures should include positive verification that the system is being returned to operable service.

List of Commitments
ER-05-03

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