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REGION III

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Licensee: United States Enrichment Corporation

Facility: Paducah Gaseous Diffusion Plant

Location: 5600 Hobbs Road
P.O. Box 1410
Paducah, KY 42001

Dates: October 26 through December 6, 1999

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EXECUTIVE SUMMARY

United States Enrichment Corporation Paducah Gaseous Diffusion Plant NRC Inspection Report 70-7001/99016(DNMS)

Plant Operations

- The inspectors identified inconsistencies between the operations staff's handling of anomalous control room alarm conditions and the Safety Analysis Report accident analysis assumptions. (Section O1.1)
- The plant staff identified a communications weakness associated with alerting entrants inside the housing of an operating cell. The plant staff took an aggressive approach to the issue and developed reasonable corrective actions, including the use of strobe lights or tag lines to ensure the communications capability between the entrants and attendant were maintained. (Section O1.2)
- The inspectors determined that the operations staff had appropriately identified, planned, and implemented compensatory measures necessary to ensure continued, safe withdrawal operations during concurrent safety system modification outages. (Section O1.3)
- The inspectors identified a violation, in that training of uranium hexafluoride handlers, required by Compliance Plan Issue 24, was not completed by the Plan of Action and Schedule specified date, June 30, 1997. (Section O1.4)

Maintenance

- The plant staff identified a weakness in the use of plant procedures and inter-group communications which permitted a sprinkler system to be returned to service prior to all work associated with the system being implemented. Preliminary corrective actions were initiated to minimize a potential recurrence of the weakness. (Section M1.1)
- The inspectors observed the plant staff properly conduct portions of the post-modification testing for two major safety system design changes made in Building C-310. (Section M1.3)

Engineering

- The inspectors concluded that the certificatee had a program in place to identify and develop controls for fissile operations at Paducah. The selected operations reviewed or observed indicated that the approved controls had been included in the governing procedures and postings. In addition, the inspectors concluded that in the unlikely event that these controls failed and an inadvertent criticality occurred, the certificatee had an operable criticality accident alarm system for detecting the event and warning site personnel, as well as a detailed procedure to guide emergency response actions for such an event. Finally, the certificatee had processes in place to identify and develop corrective actions for deficiencies or upsets associated with the criticality safety program and systems important to criticality safety. (Section E1.1)

Report Details

I. Operations

O1 Conduct of Operations

O1.1 Control Room Alarms

a. Inspection Scope (88100)

The inspectors reviewed the operations staff's handling of control room alarm anomalies.

b. Observations and Findings

During the inspection period, the inspectors noted that over the past few months the operations staff had experienced problems with the continuous operation of some control room alarms. The inspectors determined that for each event, the plant staff appropriately documented the anomalous condition using the plant non-conformance reporting system and the Plant Shift Superintendent (PSS) reviewed the event to determine if the event had an impact on the operability of safety-related equipment. The inspectors noted that for those events involving cascade motor load alarms, the PSS determined that no safety-related systems were made inoperable and that a once-per-hour review of the control panels was an acceptable compensatory measure.

The inspectors performed a brief review of the Safety Analysis Report (SAR) to determine the significance of and the accident analysis reliance upon the motor load alarms. The inspectors noted that the SAR accident analysis relied upon an operator to respond in a "prompt" fashion to the control room motor load alarms. The inspectors also noted that the Safety Analysis Report Upgrade (SARUP), submitted to the NRC as a requirement of the Compliance Plan and currently undergoing licensing review, increased the quality status of some control room alarms, including the motor load alarms. The increased quality status of the motor load alarms appeared intended as a means of increasing both the availability and reliability of the alarms.

The inspectors reviewed some operations off-normal procedures to determine if predefined compensatory measures had been established for the different types of alarms located in the control rooms. The inspectors noted that the procedures did not include specific compensatory measures for each of the different control room alarms. The inspectors also could not determine how the off-normal procedures ensured the SAR accident analysis assumptions were maintained during equipment failures.

The inspectors discussed the findings with operations and regulatory affairs management. Operations management acknowledged the findings and noted that a long-term order (LTO 98-008, Revision 1) had been written, based upon the SARUP findings, to limit the amount of time that cascade motor load indicators, ammeters, could be inoperable. However, the LTO did not address the alarm function served by the ammeters.

As of the end of the inspection period, the inspectors and plant management were reviewing the plant procedures and the SAR to determine how the SAR accident analysis assumptions were maintained during both normal and off-normal control room alarm conditions. Pending the inspectors complete review of the SAR and operations procedures relative to the handling of anomalous control room alarm conditions, this finding will be tracked as an Unresolved Item (URI 70-7001/99016-01).

c. Conclusions

The inspectors identified inconsistencies between the operations staff's handling of anomalous control room alarm conditions and the Safety Analysis Report accident analysis assumptions. The inspectors also noted that operations off-normal procedures did not define compensatory measures required for non-functioning control room alarms.

O1.2 Confined-Space Entry Communications

a. Inspection Scope (88100)

The inspectors reviewed the issues surrounding a confined-space communications problem associated with an entry into the housing of an on-stream cell and the plant staff's corrective actions for the incident.

b. Observations and Findings

On November 1, two instrument and controls technicians in respirators entered the Building C-333 Unit 2 Cell 7 housing while the cell was on-stream and running to investigate the location of a plug in one of the instrument lines. Entry into the cell housing under these conditions was controlled as a confined-space entry under the site's industrial safety program. At the time of entry, the noise level was such that verbal communication was impossible. In addition, the inside of the housing was very dark and made visibility a challenge. The confined-space entry was limited to 15 minutes because of these issues and the heated environment.

Sometime into the entry, the confined-space attendant, required by the entry permit, noted an increase in dust or smoke in the area. The attendant attempted to alert the entrants by banging on the cell housing and yelling, but was unsuccessful. Shortly thereafter, an operator with a respirator appeared on the scene to investigate a process gas leak detection (PGLD) alarm that was probably the result of the dust or smoke. At this point, the attendant noted that the entrants were leaving the cell housing due to the 15-minute stay time being up. Subsequent air samples and urine samples did not identify that any radioactive materials were released as a result of the incident. However, the plant staff identified a communications weakness for this type of evolution in that the communications links between the entrants and the attendant were not effective in alerting the entrants of a possible hazard.

The inspectors noted that the certificatee had received a criticality accident alarm system (CAAS) audibility exemption for entry into running cell housings that was predicated upon the assumed effectiveness of the confined-space "buddy" system. The "buddy" or attendant was assumed to be able to alert the entrants immediately upon sounding of the CAAS horns. The plant staff agreed that the communications weakness

was a concern and undertook an aggressive approach to identify corrective actions. The plant staff immediately suspended confined-space entries for running cells while long-term corrective actions were developed. These included the use of strobe lights or tag lines to alert entrants when verbal communications were difficult or not possible. Also, additional emphasis on the importance of communication capability was included in pre-job briefings for confined-space entries. The inspectors concluded that the plant staff's response to the incident was reasonable.

c. Conclusion

The plant staff identified a communications weakness associated with alerting entrants inside the housing of an operating cell. The plant staff took an aggressive approach to the issue and developed reasonable corrective actions, including the use of strobe lights or tag lines to ensure the communications capability between the entrants and attendant were maintained.

O1.3 Conduct of Product Withdrawal Operations During Safety System Modifications

a. Inspection Scope (88100)

The inspectors reviewed the operation staff's conduct of withdrawal operations during the completion of major plant modifications involving the criticality accident alarm system and the process gas leak detection system.

b. Observations and Findings

During the inspection period, the operations staff scheduled and conducted concurrent outages of the Building C-310 CAAS and the PGLD system as a final step in major modifications to these systems. The inspectors determined that the operations staff had chosen to conduct the concurrent work efforts as a result of a thorough pre-outage review of the safety-system performance requirements included in the SAR, the Technical Safety Requirements (TSR), and operations procedures. During discussions with the building operations staff, the inspectors were briefed as to the contingencies developed for the work efforts, the staffing requirements identified, and the compensatory measures implemented.

The inspectors noted that operational flexibility and cascade stability was increased during the work efforts through the initiation of withdrawal cycles for both of the available withdrawal stations. The steady-state cascade conditions were noted to contribute to enhanced safety during the extended CAAS outage. Additional staff also were designated and pre-positioned to provide smoke watches, at required locations throughout the building, as a part of the PGLD system outage compensatory measures. Throughout the work activities, the inspectors verified that the presence and alertness of the smoke watches. The inspectors observed that a sufficient number of primary and support craft personnel and management also were available to address emergency issues.

The inspectors noted that the work activities were completed ahead of schedule and without incident.

c. Conclusion

The inspectors determined that the operations staff appropriately identified, planned, and implemented compensatory measures necessary to ensure continued, safe withdrawal operations during concurrent safety system modification outages.

O1.4 Compliance Plan Issue 24: Systems Approach to Training

a. Inspection Scope (88100)

The inspectors reviewed the plant staff's implementation of the Plan of Action and Schedule specified for Compliance Plan Issue 24, "Systems Approach to Training (SAT)."

b. Observations and Findings

The inspectors reviewed the closure records for uranium hexafluoride (UF₆) handlers, a subset of one of the groups included as a part of Compliance Plan Issue 24. During the records review, the inspectors determined that, in early 1997, the plant staff decided to define the training requirements for the UF₆ handlers separate from other cascade operations staff. As a result, the development of a training matrix for the position, a requirement of the Compliance Plan, was not completed by June 1997, the date specified for the completion of all of the activities required by Compliance Plan Issue 24.

The inspectors discussed the training provided to the job incumbents for UF₆ handlers with the operations and training staffs. Based upon the discussions, the inspectors determined that the job incumbents did not receive specific training based upon the newly defined training matrix. Instead, the job incumbents were qualified for the position of UF₆ handler based upon historical training that was provided to all cascade operations staff. The qualification also placed a heavy reliance on cascade operator testing that was performed in 1991 and 1993, and routine training provided over the years 1994-1997. As an example of this approach to the qualification of job incumbents, the inspectors noted that the evidence files included "Letters of Justification" for most of the currently qualified UF₆ handlers. The letters stated: "Each individual listed [below] may or may not have been instructed on each module contained in the UF₆ Handling Initial Courses for the duty areas... However, the training they are receiving and have received for their duty areas, along with their prior experience, will serve as justification for their continuing to operate the UF₆ Handling equipment..."

The inspectors discussed the qualification approach documented in the evidence file with operations and training management. Both managers indicated that the current training program would not allow the use of a blanket "Letter of Justification" to qualify staff for SAT-related positions. However, the operations management also stated that plant management did not initially believe that Compliance Plan Issue 24 required the training to be developed and completed prior to the Plan of Action and Schedule dates.

Subsequent to the inspectors review of the evidence file, operations management took compensatory measures to ensure continued safe operations by the currently approved UF₆ handlers, pending a further review of the training qualifications. The compensatory measures included restricting the activities of some job incumbents and requiring all UF₆

handlers to conduct their activities using in-hand procedures. As of the end of the inspection period, the plant operations and training management were conducting a review of all UF₆ handlers training against the training matrix requirements to determine those staff requiring further training, work restrictions, and training waivers in accordance with the approved training program.

Condition 8 of the Certificate of Compliance requires the Corporation to conduct activities in accordance with the Safety Analysis Report and the Compliance Plan. Compliance Plan Issue 24 required the Corporation to develop and implement training programs, based upon a systems approach to training, for workers who were relied upon to operate structures, systems, or components identified as "Q" or "AQ-NCS." Compliance Plan Issue 24 further required that training for the job classification incumbents of positions listed as a part of Issue 24 will be completed by June 30, 1997. The failure to complete training, in accordance with the newly developed training program, for incumbents to the job classification of UF₆ handlers, a position listed as a part of Issue 24, by June 30, 1997, is a Violation (VIO 70-7001/99016-02).

c. Conclusion

The inspectors identified a violation, in that, training of uranium hexafluoride handlers, required by Compliance Plan Issue 24, was not completed by the Plan of Action and Schedule specified date, June 30, 1997.

O8 Miscellaneous Operations Issues

08.01 Certificatee Event Reports (90712)

The certificatee made the following operations-related event reports during the inspection period. The inspectors reviewed any immediate safety concerns indicated at the time of the initial verbal notification. In the case of retracted notifications, the inspectors reviewed the basis for the certificatee's retraction of the notification at the time of the retraction. The inspectors will evaluate the associated written report for each of the events following submittal.

<u>Number</u>	<u>Status</u>	<u>Title</u>
36364	Open	Primary condensate alarm received on Building C-360 autoclave Water Inventory Control System.
36364	Retracted	Retracted 11/5/99. The inspectors reviewed the plant staff's assessment of the event which determined that the actuation was not caused by a valid signal. The inspectors determined that the assessment was reasonable and that it was unlikely that the actuation was caused by a valid signal. Therefore, the retraction was appropriate.

36342	Open	High pressure fire water system D5, located in Building C-337, does not meet NFPA Code 13.
36342	Retracted	Retracted 11/23/99. The inspectors reviewed the engineering evaluation performed for the as-found condition. The inspectors determined that the analysis supported an assessment that the system could perform its intended safety function. Therefore, the as-found condition was not reportable and the retraction was appropriate.

08.02 Bulletin 91-01 Reports (97012)

The certificatee made the following reports pursuant to Bulletin 91-01 during the inspection period. The inspectors reviewed any immediate nuclear criticality safety (NCS) concerns associated with the report at the time of the initial verbal notification. Any significant issues emerging from these reviews are discussed in separate sections of the report.

<u>Number</u>	<u>Date</u>	<u>Title</u>
36486	12/3/99	Building C-333 Seal Exhaust and Wet Air Station pumps were discovered to be hard-piped to the building lube oil supply.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Coordination of Fire Protection Activities Affecting Safety

a. Inspection Scope (88102, 88103)

On November 15, the plant staff identified that Building C-337 Sprinkler System D-5 had been returned to service with a nonconformity (the branch lines under a unit bypass duct were too far apart per the National Fire Protection Association (NFPA) code). The problem had been identified early in October 1999 and the last maintenance on the system had occurred on October 27. At the time of the initial identification, the sprinkler system had been declared inoperable by the PSS as a result of both the number of corroded heads (11) identified during a building sprinkler system inspection and the nonconformity.

In following up on the issue, the plant staff identified that the tracking sheet generated for the inoperable System D-5 did not include a discussion of the nonconformity and a maintenance work request was not generated to properly space the sprinkler lines. Upon identifying that the nonconformity had not been corrected, the plant staff entered the Limiting Condition for Operating (LCO) Action Statements for an inoperable sprinkler

system (TSR 2.4.4.5) and generated a work request. The branch line routing was subsequently corrected and the system was returned to service. In addition, an Operability Evaluation was developed by the engineering staff which demonstrated that the nonconformity did not actually affect the ability of the system to perform its intended safety function of covering the area under the bypass duct with water should there be a fire. However, the inspectors noted that the communications between the fire services, maintenance, and operations departments were not rigorous enough to ensure appropriate tracking and repair of a potentially inoperable system.

Corrective actions for the generic issue, i.e., returning system with a nonconformity which potentially made the system inoperable to service, included a review of the LCO tracking sheets for all TSR-related equipment to ensure all inoperable conditions were identified. In addition, the plant staff established a requirement that the PSS search the maintenance work control database for any open work orders prior to declaring a system back in operation.

c. Conclusions

The plant staff identified a weakness in the use of plant procedures and inter-group communications which permitted a sprinkler system to be returned to service prior to all work associated with the system being implemented. Preliminary corrective actions were initiated to minimize a potential recurrence of the weakness.

M1.2 Nuclear Criticality Safety Components Awaiting Maintenance

a. Inspection Scope (88102, 88020)

During plant tours, the inspectors observed the condition of fissile vacuum components awaiting decontamination and servicing in Building C-400.

b. Observations and Findings

The inspectors noted that the labels on the fissile vacuum components which identified nuclear criticality safety (NCS) requirements and the requirements identified on the associated NCS postings for the area were not consistent with the storage array in Building C-400. Specifically, the posting requirements identified that two-foot spacing was required between fissile items whenever the filter or motor sections were removed from the waste drums. The filters and motors in Building C-400 were stored in a planar array without two-foot spacing.

The inspectors reviewed the NCS requirements with members of the plant decontamination staff. The plant staff reviewed the governing nuclear criticality safety approval (NCSA) and procedure with the inspectors and pointed out that the components were allowed to be co-located in a planar array in Building C-400. The posting requirements were intended to apply to vacuum component handling in other process buildings. After further review, the inspectors agreed that the governing nuclear criticality safety evaluation and approval did address the condition observed, that is, an infinite plane of un-spaced filter and motor components in Building C-400. However, the inspectors indicated that the wording on the posting was not clear and could lead to confusion or a situation in which plant staff accepted a condition which did not appear to meet the posting requirements.

The plant staff indicated that the issue with the wording on the posting had been previously identified and that corrective actions were underway to revise the posting to more clearly articulate the applicable NCS requirements. However, the inspectors were not able to locate an assessment and tracking report (ATR) for the issue. The ATR process was the means for identifying and tracking conditions which needed to be corrected. The NCS staff did have a marked-up copy of the NCSA posting requirements which they had been working on as part of a more general NCSA revision. As a result, the inspectors had no further questions about the issue. The plant staff initiated an ATR after the discussions to formally identify and track the issue.

c. Conclusion

The inspectors identified that storage requirements for fissile vacuum components in Building C-400 were understood by the involved plant staff, but were not clearly communicated on the associated posting for the storage area.

M1.3 Building C-310 Modification Testing

a. Inspection Scope (88100, 88103)

The inspectors observed the conduct of post-modification testing associated with two major modifications in Building C-310 and performed a walkdown of selected safety equipment.

b. Observations and Findings

The inspectors observed portions of the post-modification testing conducted following the installation of a new air supply for the CAAS and a new monitoring system for the direct-current power supply to the PGLD system in Building C-310. The inspectors noted that the testing activities were controlled in accordance with written and approved procedures which were in active use by the craft, supervisory, and engineering staff involved in the activities. The results achieved during each step were also assessed against the acceptance values or performance specified in the procedures. The inspectors independently observed the successful performance of individual components installed during the modification efforts. No problems were identified.

The inspectors also conducted walkdowns of other Building C-310 safety-related equipment. During the walkdowns, the inspectors identified an anomalous condition associated with the CAAS, Cluster H. Specifically, the inspectors noted that one of the Cluster H's three modules was in a fault condition; however, the main CAAS console, located in Building C-300, did not indicate a trouble condition with the cluster.

The inspectors discussed the finding with operations and instrumentation staff to determine if any of the ongoing modification activities may have affected the supervisory circuits for the cluster. The plant staff were not aware of any ongoing activities which could have affected the cluster. The inspectors noted that the CAAS supervisory circuits were relied upon by the plant staff to ensure an early notification of system problems. An early notification of problems with one of the three cluster modules helped to ensure that the plant staff could take corrective actions before the number of functioning modules decreased to less than the two modules required for operability.

Based upon an independent confirmation of the inspectors findings, the plant staff removed the Cluster H detection modules and successfully retested the replacement modules during the ongoing outage. A further review of the removed modules was planned to determine the root cause for the failure and the absence of the trouble alarm. The plant staff's efforts to determine the generic impacts of the inspection finding will be tracked as an Inspection Followup Item (IFI 70-7001/99016-03).

c. Conclusion

The inspectors observed the plant staff properly conduct portions of the post-modification testing for two major safety system design changes made in Building C-310. The inspectors also identified an anomalous condition associated with a supervisory circuit for one of the building criticality accident alarm system clusters.

II. Engineering

E1 **Conduct of Engineering**

E1.1 Temporary Instruction (TI) 2600/005 (Criticality Safety Programs at Fuel Cycle Facilities) Results for Paducah Gaseous Diffusion Plant

a. Inspection Scope (TI 2600/005)

The inspectors reviewed the certificatee's implementation of their criticality safety programs in accordance with TI 2600/005 which was issued following a criticality accident on September 30, 1999, at a foreign fuel fabrication facility. The requirements of the TI are as follows:

1. Verify that the certificatee has implemented appropriate measures to assure that moderate or high enriched uranium cannot be commingled in a low enriched uranium (LEU) process when multiple enrichment categories are present onsite.
2. Select at least one activity involving the manual transfer and processing of moderate or high enriched uranium and verify that the activity is conducted in accordance with NRC requirements and facility procedures and postings. Focus on the implementation of administrative controls. Conduct discussions with the operators involved to verify that they are aware of, and understand the safety requirements and what actions they should take if an off-normal condition arises or is observed. Review applicable records and verify that the operators have been properly trained and qualified for the above observed operations.
3. Conduct a backshift inspection of an operation involving the manual transfer and processing of moderate or high enriched uranium and verify that the activity is conducted in accordance with NRC requirements and facility procedures and postings. Focus on the implementation of administrative controls. Conduct discussions with the operators involved to verify that they are aware of, and understand the safety requirements and what actions they should take if an off-normal condition arises or is observed. Review applicable records and verify that the operators have been properly trained and qualified for the above observed operations.

4. Verify that new operators (or operators in a new assignment/position) have completed any prerequisite classroom training and receive appropriate oversight while in "on-the-job-training" (OJT) status which is consistent with the plant manager's (senior ranking official onsite) expectations. Identify any situations where the plant manager's expectations are inconsistent with assuring that operators are appropriately trained.
5. Prior to the startup of any major new process or restart of a process that has been shutdown for more than one year, verify that the licensee has in place appropriate controls to ensure that the operations staff has been trained and updated in the operating procedures and safety limits and postings prior to the introduction of moderate or high enriched uranium into the process.
6. Review the facility emergency response procedures for a criticality accident and conduct discussions with shift operations management and health physicists to determine whether the procedures are up to date and technically adequate to provide reasonable protection for both onsite and offsite emergency response personnel from unnecessary radiation exposure and contamination should an event occur. Verify that the date of their last drill or exercise is consistent with plant procedures and review the status of any corrective actions that were identified as a result of these drills.
7. Review the maintenance and test records for the criticality accident alarm system and verify that the licensee is maintaining the system in an operable status.
8. Verify that calibrations, testing, and maintenance of systems, structures, and components important to criticality safety are current and up-to-date.
9. Review the backlog of criticality safety maintenance items and assess the safety impact to current operations.
10. Review the criticality safety corrective action log and assess the safety impact of overdue items and review the effectiveness of implemented corrective actions.

b. Observations and Findings

1. The certificatee was limited by the Certificate to fissile operations involving uranium enriched to 2.75 weight percent or less. The inspectors verified that the certificatee had a program as described in the Safety Analysis Report for identifying potentially fissile operations and developing nuclear criticality safety evaluations (NCSE) and nuclear criticality safety approvals (NCSA) for those operations. Compliance Plan Issue 5 required that, as part of the transfer of regulatory authority from the Department of Energy to the NRC, all operations involving uranium enriched to greater than 1.0 weight percent or 15 grams of uranium-235 would be reviewed to ensure appropriate controls were developed and documented. In addition, Compliance Plan Issue 6 required that the controls developed be included in approved written procedures and postings. During the inspection period, the resident inspectors and technical specialists from NMSS reviewed selected fissile operations to ensure that the Compliance Plan Issues had been completed. The inspectors and specialists concluded that the certificatee did have a process implemented to identify, analyze, and approve

controls for fissile operations. The process included placing the NCSA-documented controls into approved procedures and postings and providing training to operators prior to starting a fissile operation. In fact, the current review and approval process for new fissile operations requires that the nuclear criticality safety (NCS) staff perform a walkdown or table-top review of new fissile operations with the involved plant staff to ensure the NCSA controls are in place and understood prior to the start of operations under a new NCSA. As a result of the inspection and review activities, Compliance Plan Issues 5 and 6 were closed.

2. The inspectors and technical specialists reviewed selected activities involving the manual transfer or accumulation of fissile material in unsafe volumes to ensure the operations were conducted in accordance with the governing NCSAs and written procedures. In particular, the inspectors and specialists reviewed operations involving uranium-contaminated liquids in Building C-400 (spray booth and uranium recovery) and consolidation of fissile wastes from safe-volume 5.5-gallon drums to unsafe volume 55-gallon drums in Building C-335. The NCSAs defined sampling and survey requirements for ensuring fissile materials had sufficiently low uranium concentrations or mass prior to transferring the materials from safe volumes or geometries to unsafe volumes or geometries. The operators involved were knowledgeable of the NCSA and procedure requirements and the procedures or associated checklists were noted to be available and in use when the operations were underway. The operators were knowledgeable of and selected document review verified that sampling and survey requirements in the NCSAs to ensure an unsafe mass or concentration of uranium-235 was not accumulated were being maintained. The NCS staff analyzed the various plant waste matrices that might be involved in the Building C-335 waste operations to ensure valid results for the drum monitors used to characterize fissile or potentially fissile wastes.
3. The inspectors were not able to observe any manual transfers of enriched uranium on the backshift as there were no operations of this sort occurring during the inspection period due to equipment unavailability. However, the inspectors did observe backshift operations in Building C-310 which involved the upper end of the cascade at which the enriched product (1.6 weight percent) was withdrawn. The inspectors observed the operations staff implement the pressure and temperature controls associated with the Limiting Condition for Operation (LCO) Action Statements for an inoperable CAAS. The operator reviewed the governing procedure prior to taking measurements and utilized the associated check sheet while performing the pressure and temperature checks for the associated cells. No concerns were noted. In addition, during backshift tours of plant facilities, the inspectors did not identify any spacing violations for potentially fissile materials.
4. The inspectors were not able to review this item specifically for NCS training during the inspection period. However, see Section O1.4 for a review of Compliance Plan Issue 24 concerning training in general. Also, Inspection Report 70-7001/99014 identified a violation for failure to specify re-training frequencies for plant staff obtaining training that requires a systems approach to training (SAT). The inspectors did not identify any programmatic issues with initial training for plant staff, i.e., appropriate qualification training was being performed for the various site functions. In addition, the inspectors noted that the

plant staff have a process in place to restrict work for personnel who are past-due on training for a specific activity or activities.

5. The inspectors reviewed the requirements in Procedure UE2-PS-PS1031, Revision 6, "UE Procedure Control Process," which governed the development and use of procedures at Paducah. The procedure required that a walk-through or table-top verification of a new procedure be conducted before or at first use of the procedure. In addition, the procedure required that as part of the procedure development or change process, the appropriate training be developed, identified, and approved on the procedure development form. In addition, the procedure identified which types of operations were to be controlled by "in-hand" procedures which were to be reviewed step-by-step during the actual operation. Thus, the inspectors concluded that the certificatee had a process in place to identify and ensure appropriate procedural guidance and training were in place prior to the start-up of any new or modified fissile operation.
6. The inspectors reviewed the emergency response procedure for criticality accident, Procedure CP2-EP-EP5038, Revision 2, "Criticality and Radiation Emergencies." In addition, the inspectors observed a routine criticality accident drill conducted for the Building C-710 Laboratory. The procedure identified the response measures for a criticality accident alarm system (CAAS) actuation including immediate evacuation and assembly points; segregating exposed personnel based on surveys of the neutron-activation of underarm hair and indium foils in security badges; ensuring affected personnel would be promptly treated by competent medical authorities; taking personnel statements to identify the potentially involved process; providing guidance on performing surveys outside the affected facility and, if warranted, inside the affected facility to locate the exact area of the criticality; providing guidance on dose management if re-entry operations were needed to save personnel or protect health and safety; and providing guidance on determining when the CAAS actuation was a false alarm. The inspectors observed that the laboratory personnel, health physics, and emergency response personnel involved in the drill were knowledgeable of the procedural requirements and used the checklists provided with the procedure to ensure all activities pertinent to the response were covered. The inspectors concluded that the procedural guidance was technically adequate to respond to an inadvertent criticality and that plant staff were knowledgeable of the procedural requirements.
7. The inspectors reviewed the certificatee's process for maintaining the criticality accident alarm system in an operable status. The Paducah Technical Safety Requirements (TSR) required that the plant staff perform quarterly surveillances of the CAAS audibility (alert) function to ensure the CAAS horns and lights would activate upon a signal from two of three detectors in the alarm state for the affected CAAS cluster. The TSRs also required an annual calibration of the CAAS detectors. The detectors were calibrated in the maintenance calibration facility and detectors due for calibration were replaced on an annual basis. The inspectors verified that the plant staff had a work control database for tracking the surveillances for the CAAS clusters onsite which identified when the last surveillance was performed and flagged the date when the next surveillance was due. The plant staff reviewed daily status of surveillances for all safety systems onsite, including the CAAS systems, in the morning turnover meeting.

The inspectors reviewed the work packages associated with selected CAAS surveillances in Buildings C-335 and C-310. In particular, the inspectors walked down the new air system and observed and reviewed surveillances to support final operability determinations for the newly installed CAAS air horns in the major process buildings. The surveillances were performed in accordance with the new TSRs and procedures for the CAAS audibility upgrade, completed in response to Compliance Plan Issues 46 and 50, to ensure audibility in all areas in which a person could receive a 12-rad dose from an inadvertent criticality. The inspectors noted that the TSR requirements for operability (horns sounding, lights actuated, and system pressure) were met and successful completion of the testing was appropriately documented. In addition, the inspectors reviewed the valve line-up for an operable system and noted that all valve positions for supplying air to the CAAS horns were positioned and sealed as required by the governing procedure.

The inspectors also followed up on two ATRs indicating that one of three detectors in a CAAS cluster was repeatedly in a trouble alarm status as identified by a fault light on the CAAS detector and the cluster monitoring panel in the Building C-300 Central Control Facility. Since only two functioning detectors were required for operability, the CAAS system as a whole remained operable. However, the plant staff implemented compensatory measures to check the affected CAAS clusters on an hourly basis and replaced the clusters by the end of the next shift. The inspectors concluded that the plant staff had responded in a timely fashion to ensure that continued operability of the CAAS system (two of three detectors in a fault status) was not challenged.

8. The inspectors observed calibrations for and testing of selected systems and components important to criticality safety during routine tours of plant facilities, including CAAS air system pressure indicators, negative air machines (filtering systems), and drum monitors for measuring uranium-235 mass.
9. The inspectors reviewed the maintenance backlog for NCS systems and components. The certificatee had approximately 45 work orders open for NCS components. All of the items had been reviewed to determine the impact on operability for safety systems and none affecting operability were identified. The largest contributor to the backlog (22 percent) was out-of-tolerance pressure transmitters for various enrichment stages in the cascade. The pressure transmitters were used in conjunction with temperature indicators to ensure that enriched uranium hexafluoride remained in a gaseous state and thus could not create a critical configuration. However, the cascade pressure gradient for a given cell (8 or 10 stages) could be determined by as few as two stage transmitters, so the transmitters could be replaced within the overall work schedule for maintenance without impacting the criticality safety of continued cascade operations. The plant staff had identified a backlog of less than 50 open work orders on a monthly basis as "green" or acceptable performance.
10. The inspectors did not identify any NCSA violations during the routine tours of the plant performed during the inspection period and there were no assessment and tracking reports (problem reports) identifying NCSA violations during the month of November 1999. The certificatee conducted hundreds of operations with NCS requirements on a monthly basis. The inspectors noted that the Paducah

Performance Indicators documented that the number of NCSA violations identified by plant staff or the inspectors had declined from 4 - 5 violations per month in early 1999 to 1 violation for the months of August - September 1999. (None of these events involved a loss of control with more than a safe mass of uranium.) This downward trend appeared to be the result of corrective actions taken to standardize and simplify the NCS controls used across the site and provide additional training on NCS requirements to plant staff.

c. Conclusions

The inspectors concluded that the certificatee had a program in place to identify and develop controls for fissile operations at Paducah. The selected operations reviewed or observed indicated that the approved controls had been included in the governing procedures and postings. In addition, the inspectors concluded that in the unlikely event that these controls failed and an inadvertent criticality occurred, the certificatee had an operable criticality accident alarm system for detecting the event and warning site personnel, as well as a detailed procedure to guide emergency response actions for such an event. Finally, the certificatee had processes in place to identify and develop corrective actions for deficiencies or upsets associated with the criticality safety program and systems important to criticality safety.

E1.2 As-Found Evaluation of Nonconforming Seal Solder

a. Inspection Scope (88100)

The inspectors reviewed the plant staff's resolution of an as-found nonconformance associated with the solder used with process seal bellows.

b. Observations and Findings

During a review of information gathered to support Chapter 3 of the revised Safety Analysis Report Upgrade (SARUP), the plant staff identified that the solder, in use for the manufacturing axial compressor seal bellows, did not meet the specification identified in the current Safety Analysis Report (SAR). The current SAR described the use of a soft solder with five percent tin while the solder procured by the plant some time last year had a five percent antimony content. Numerous seal bellows had been installed in axial compressors in the cascade over the past 12-15 months using the antimony alloy solder. Upon identification of the issue, plant staff restricted placing any additional cells with nonconforming seals onstream, until the as-found nonconformance could be evaluated.

The plant staff completed Engineering Evaluation (EV) EV-C-821-99-015 to address the issue. The EV concluded that there was no safety significance for using seals manufactured with the nonconforming solder while the process pressure in the associated cell was below atmospheric. This conclusion was based on the discussion of the associated accident (uranium hexafluoride release) in SAR Section 4.3.2.1.4 which indicated that a seal bellows failure during sub-atmospheric operations would result in nitrogen or dry air leaking into the process equipment versus a hazardous materials release. As a result, a seal failure under such conditions was an operational, not a health and safety concern. The inspectors reviewed the EV and concluded that the analysis was reasonable. The plant staff indicated that further evaluation was underway

to determine whether or not the nonconforming seals could be used in cells operating at pressures above atmospheric.

After performing the engineering evaluation, the plant staff lifted the restriction on placing cells with the nonconforming solder back on-stream and reinstated the process for placing cells on-stream. At least two cells with the nonconforming seals were placed on stream. The inspectors questioned the rationale for re-initiating the cell startup without changing the SAR, since the plant staff were aware that the components were nonconforming, and the installation of known nonconformances did not appear to be an as-found condition. As such, the installation was a plant change requiring a SAR revision and a plant change review pursuant to Title 10 Code of Federal Regulations, Part 76.68 (10 CFR 76.68). The plant staff re-evaluated the issue and put another hold on the start-up of cells with the nonconforming seals until a SAR change and 10 CFR 76.68 review were completed. The plant staff subsequently performed a SAR change and 10 CFR 76.78 review to allow use of the nonconforming seals on compressors in sub-atmospheric cells. The inspectors reviewed the change documents and had no further questions. Based on the lack of safety significance for the issue, the inspectors concluded that the failure to initially process a SAR change and 10 CFR 76.68 review for the as-found was a violation of minor safety significance not subject to formal enforcement action.

c. Conclusion

The plant staff identified an as-found condition involving the use of nonconforming solder with axial compressor seal bellows in the cascade. The plant staff resolved the issue, after questions were raised by the inspectors, by revising the Safety Analysis Report to allow use of the nonconforming seals in cells operating at sub-atmospheric pressures because seal failures under these circumstances would not result in a hazardous materials release.

V. Plant Support

S8 **Miscellaneous Security Issues**

S8.1 Certificatee Security Reports (90712)

The certificatee made the following security-related 1 hour reports pursuant to 10 CFR 95 during the inspection period. The inspectors reviewed any immediate security concerns associated with the reports at the time of the initial verbal notification.

<u>Date</u>	<u>Title</u>
10/25/99	Laboratory notebook dated 7/9/52 found in Building C-710 vault containing Confidential Restricted Data (CRD) but not marked CRD.
11/3/99	Laboratory notebooks dated 1952, 1953 and 1977 found containing Confidential Restricted Data but not marked CRD.

11/3/99	Department of Justice inspector placed on the cleared access authorization list and issued a "Q" clearance temporary badge and should have been placed on the uncleared access authorization list.
11/30/99	Copy of a classified document which was created at Portsmouth and distributed at Paducah outside the Controlled Access Area.
11/30/99	Classified information discovered on an unclassified computer system.
12/2/99	Drawings which were marked as restricted data not controlled as required by the plant Security Plan.

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of the plant staff and management at the conclusion of the inspection on December 6, 1999. The plant staff acknowledged the findings presented. The inspectors asked the plant staff whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

United States Department of Energy

G. A. Bazzell, Site Safety Representative

United States Enrichment Corporation

- *M. A. Buckner, Operations Manager**
- *L. L. Jackson, Nuclear Regulatory Affairs Manager**
- *J. A. Labarraque, Safety, Safeguards and Quality Manager**
- *S. R. Penrod, Enrichment Plant Manager**
- *H. Pulley, General Manager**

U.S. Nuclear Regulatory Commission

- *J. M. Jacobson, Resident Inspector**
- *K. G. O'Brien, Senior Resident Inspector**

***Denotes those present at the exit meeting December 6, 1999.**

Other members of the plant staff were also contacted during the inspection period.

INSPECTION PROCEDURES USED

- IP 88020: Nuclear Criticality Safety**
- IP 88100: Plant Operations**
- IP 88102: Surveillance Observations**
- IP 88103: Maintenance Observations**
- TI 2600/005 Criticality Safety Programs at Fuel Cycle Facilities**

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

- | | | |
|------------------|-----|--|
| 70-7001/99016-01 | URI | Operations Handling of Anomalous Control Room Alarm Conditions |
| 70-7001/99016-02 | VIO | Failure to complete Compliance Plan Issue 24 Training for Uranium Hexafluoride Handlers |
| 70-7001/99016-03 | IFI | Non-functioning Criticality Accident Alarm System Supervisory Circuit Identified for Cluster H in Building C-310 |
| 36364 | CER | Primary Condensate Alarm Received on Building C-360 Autoclave Water Inventory Control System. |
| 36342 | CER | High Pressure Fire Water System D5, located in Building C-337, Does Not Meet NFPA Code 13. |

Closed

- | | | |
|-------|-----|---|
| 36364 | CER | Primary Condensate Alarm Received on Building C-360 Autoclave Water Inventory Control System. |
| 36342 | CER | High Pressure Fire Water System D5, located in Building C-337, Does Not Meet NFPA Code 13. |

Discussed

NONE

LIST OF ACRONYMS USED

ATR	Assessment and Tracking Report
CAAS	Criticality Accident Alarm System
CFR	Code of Federal Regulations
CRD	Confidential Restricted Data
DNMS	Division of Nuclear Materials Safety
EV	Engineering Evaluation
IFI	Inspector Followup Item
IP	Inspection Procedure
LCO	Limiting Condition for Operations
LEU	Low Enriched Uranium
LTO	Long-term Orders
NCS	Nuclear Criticality Safety
NCSA	Nuclear Criticality Safety Approval
NCSE	Nuclear Criticality Safety Evaluation
NFPA	National Fire Protection Association
NMSS	Nuclear Materials Safety and Safeguards
NRC	Nuclear Regulatory Commission
OJT	On The Job Training
PDR	Public Document Room
PGLD	Process Gas Leak Detection
PSS	Plant Shift Superintendent
SAR	Safety Analysis Report
SARUP	Safety Analysis Report Upgrade
SAT	Systems Approach to Training
TI	Temporary Instruction
TSR	Technical Safety Requirement
UF₆	Uranium Hexafluoride
URI	Unresolved Item
USEC	United States Enrichment Corporation