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June 4, 1997

United States Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-001

SERIAL: GDP 97-1011

**Paducah Gaseous Diffusion Plant (PGDP) - Docket No. 70-7001 - Event Report ER-97-09**

Pursuant to UE2-RA-RE1030, Appendix D.D.3, Enclosure 1 is the required 30-day written report covering ER-97-09. This event involves a UF<sub>6</sub> release which occurred in C-337, from a buffer panel. Additionally, a violation of a Technical Safety Requirement (TSR) occurred because of a failure to maintain a fire watch. The Nuclear Regulatory Commission (NRC) was notified of the event on May 5, 1997. Enclosure 2 is a list of commitments made in the report.

Should you require further information on this subject, please contact Bill Sykes at (502) 441-6796.

Sincerely,

Steve Polston  
General Manager  
Paducah Gaseous Diffusion Plant

SP:WES:JLH:mcl

Enclosure

cc: NRC Region III  
NRC Senior Resident Inspector, PGDP

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## EVENT REPORT ER-97-09

### BACKGROUND

There are two buffer systems located in the Cascade Buildings at the Paducah Gaseous Diffusion Plant (PGDP). One system supplies the compressor flanges, blowout preventers, control valves, and buffered expansion joints, and the other buffer system is dedicated to supplying only the Cascade block valves. This event involved a buffer system supplying the Cascade block valves.

Instrumentation is provided in the Area Control Room (ACR) to alarm a detected high buffer flow (indicating buffered component leakage) or abnormal buffer pressure. The buffer supply line to each buffered component is provided with an isolation valve to assist in locating leaks. To determine the location of an alarm, the local cell cubicle and buffer cabinet is checked.

During the initial stages of this event, personnel in C-337 were ordered to shelter in place which prevented personnel from performing scheduled hourly fire patrols of inoperable sprinkler systems (see ER-97-04, Rev. 1). During the event, multiple hourly fire patrol requirements for sprinkler systems were exceeded. The Plant Shift Superintendent (PSS) and the Incident Commander (IC) determined the fire patrols would be discontinued in accordance with the Technical Safety Requirements (TSR), Section 1.6.4, "Conditions Outside The TSR," because an emergency situation existed. The Nuclear Regulatory Commission Headquarters (NRC-HQ) was notified that a TSR deviation was being initiated under the authority of TSR 1.6.4.

### DESCRIPTION OF EVENT

On May 5, 1997, at 0603, a general alarm from a block valve buffer in C-337, Unit 2, Cell 1, was received in the ACR. An operator responded to the area of the source of the alarm and attempted to clear the alarm on the buffer panel. The operator observed "white smoke" which appeared to be coming from the alarm set knob and immediately departed the area. A second operator went to the effected area and upon seeing "white smoke" donned his respirator, closed valves V-1 and V-2, and departed the area returning to the ACR where he reported the incident to the front line manager (FLM). Valve V-1 isolates the air supply upstream from the pressure regulator on the buffer system. Valve V-2 isolates the buffer system from the block valves being buffered. By closing both valves the operator precluded a further Uranium Hexafluoride ( $UF_6$ ) release; however, the condition of the building's atmosphere; extent of the release; and assurance that the release was stopped, was unknown to the PSS. At 0635, the FLM and the Plant Shift Superintendent (PSS) were notified of a possible  $UF_6$  release. The PSS directed the Plant

Emergency Squad to report to building C-337 because of a possible  $\text{UF}_6$  release and to exercise hazardous materials precautions. Personnel in C-337 were instructed to shelter in place within the ACR.

The Plant Emergency Squad's Entry Team 1, after taking appropriate hazardous material precautions, entered C-337 at 0721, to take samples and to visually assess the situation. A series of air samples were taken while on the ground floor as well as on the cell floor. At 0736, Entry Team 1 exited the building. All samples were negative. At 0745, Entry Team 2 entered the building to set up a High Volume Sampler (HVS) in the area of the suspected release. At 0803, Entry Team 2 departed the building after setting up the HVS. At 0816, Entry Team 1 re-entered the building, retrieved the HVS, and departed the building at 0826. Samples from the HVS were determined to be normal. While retrieving the HVS, Entry Team 1 observed what was described as "yellow cake" (Uranyl Fluoride/ $\text{UO}_2\text{F}_2$ ) at one location on the outside of the buffer panel as well as at two locations on the inside of the panel. At 0835, the IC declared the ground floor to be clear, but restricted access to the cell floor. At 0925, after Health Physics concluded characterizing the area and examining for the spread of contaminants, the cell floor was declared "all clear."

Prior to the event, hourly fire patrols were being conducted because sprinkler systems C-2, C-9, and C-10 had been declared inoperable. Subsequent to the release, the PSS and IC directed all personnel in the building shelter in the ACR; therefore, during the event multiple hourly fire patrol requirements for sprinkler systems were exceeded. The fire patrols were resumed at 0845 after declaration of "all clear" on the ground floor by the IC.

Troubleshooting conducted by Instrument Maintenance to determine the cause of the  $\text{UF}_6$  release, indicates that the  $\text{UF}_6$  may have been in the buffer system for an extended period of time and became evident on May 5, 1997, when the  $\text{UF}_6$  migrated into the Photohelic pressure-switch/gage. Once inside the Photohelic, the  $\text{UF}_6$  exited through the set point knob, and/or from the "O" ring seal which is located between the Photohelic cover and body of the switch/gage. When the "O" rings on the Photohelic are deteriorated  $\text{UF}_6$  can migrate to atmosphere. However, the buffer system performed its intended function which is to signal a possible  $\text{UF}_6$  containment compromise.

The IC stated, that upon his arrival at the scene of the release, he established his command post on the opposite side of the street from C-337. As required by plant procedure, hazardous material precautions were taken by the Entry Teams, due to an unknown atmosphere which existed in the building. The IC believed that the potential hazards from an unknown quantity of  $\text{UF}_6$  release, as well as the status of the release, out-weighed the necessity to continue the fire

watches which were in-place prior to this event. Therefore, personnel in C-337 were ordered to shelter in the ACR. A series of air samples were taken by the Entry Teams, in addition to those taken by the HVS. The IC stated that he was not willing to accept the responsibility for releasing personnel back into the effected areas without obtaining the results of the HVS samples.

The IC stated he believed at the time of the event, personnel safety and U.S. Occupational Safety and Health Administration (OSHA) regulations would take priority until the area atmosphere inside the building could be determined. At the time (0635 ), the initial notification was received from Operations that a release had occurred in C-337, the IC and PSS were aware the operator had closed valves V-1 and V-2. However, the assurance that the release had been stopped did not exist. Further the duration and magnitude of the release could not be immediately determined.

PGDP Management Directive CP1-PO-PO 1002, "See and Flee," states that, "if an uncontrolled hazardous material release is suspected, leave the area immediately and notify the PSS unless you are trained and engaged in alarm response by procedure." Further, "personnel may take actions prior to egress to secure the operation which caused a hazardous material release, if they are wearing respiratory protection and the immediate action can be taken without hindering egress." In this instance, the operator that closed valves V-1 and V-2, saw "white smoke" and then donned his respirator.

TSR, Section 3.23, "Worker Protection From  $UF_6$  Process Hazards," states, "worker protection measures shall be established, implemented, and maintained to minimize the risk of and mitigate the consequences of releases of  $UF_6$ ,  $UF_6$  reaction products with moist air (e.g.,  $UG_2F_2$  and HF), and other associated process chemicals during normal, off-normal, and emergency conditions. Such measures shall address the radiation hazards presented by radioactive materials; the toxic (chemical) risk posed by radioactive materials and their reaction products with moist air; and plant conditions including chemical hazards that may adversely impact radiation risk or increase the probability of the release of radioactive materials."

USEC-01-EP, dated April 15, 1997, "Emergency Management Plan For The Paducah Gaseous Diffusion Plant," Appendix D, defines an emergency as "a sudden, usually unforeseen occurrence or occasion requiring time-urgent and immediate action/response. It may result from accidental causes, natural causes, or malicious man-made actions."

The IC and the PSS appear to have exercised conservative judgment by invoking TSR 1.6.4 in order to deviate from established fire patrols during this event. The uncertainty existing at the time relative to the extent of the release and the building's atmosphere; continued emphasis that a "conservative approach" be exercised by plant employees; past safety training; and the requirement to protect workers from  $UF_6$  process hazards (TSR 3.23), all were contributing factors that led to the decisions made at the scene. Further, the plant's definition of an emergency sustains the decisions made at the time since a "time-urgent and immediate action/response" was warranted based on the facts known by the IC and PSS.

## CAUSE OF THE EVENT

### A. Direct Cause

The direct cause of the release was the migration of UF<sub>6</sub> into the Photohelic pressure switch/gage. Troubleshooting to determine the cause of the migration to the Photohelic is continuing.

The direct cause of the failure to maintain a fire watch was the decision to operate outside of the TSR by invoking Section 1.6.4.

### B. Root Cause

The root cause of the release has not been determined.

The root cause of the failure to maintain fire patrols was invoking TSR 1.6.4. This decision was arrived at based on the situation at the time of the event.

### C. Contributing Cause

None

## CORRECTIVE ACTIONS

### A. Completed Corrective Actions

1. On May 20, 1997, a work request was submitted to Instrument Maintenance to aspirate the bellows on Unit 2, Cell 2 freezer/sublimator "B" valve to determine if a leak exists.
2. On May 20, 1997, a request was submitted to the Maintenance Organization requesting that the effected (Unit 2, Cell 1) Photohelic pressure-switch/gage be replaced.

### B. Planned Corrective Actions

1. By August 29, 1997, a policy will be developed regarding the conditions and requirements for entry into TSR 1.6.4.
2. By September 19, 1997, the PSS Assistant PSS and other individuals qualified as incident commanders, will be trained in the new policy (see corrective action No. 1). When training is completed, Long Term Order (LTO) 300-97-008 will be deleted.



3. By July 24, 1997, an Engineering Evaluation will be completed regarding the adequacy of the Photohelic pressure-switch/gage "O" rings to withstand exposure to  $UF_6$  and the ambient temperatures in the process buildings.
4. By August 15, 1997, troubleshooting relative to the  $UF_6$  buffer panel release will be completed and corrective actions initiated to prevent recurrence.

#### LESSONS LEARNED

When responding to an emergency situation, a conservative reaction is warranted until the situation can be properly assessed and decisions made based upon verifiable information.

#### EXTENT OF EXPOSURE OF INDIVIDUALS TO RADIOACTIVE MATERIALS

One of the operators had a urine bioassay result of 8 micrograms of uranium per liter. When retested, after three days, the operator's results were less than MDA (less than three micrograms of uranium per liter), and below the follow-up recall limit of 5 micrograms per liter. The intake from the event was not significant and well below regulatory limits

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**List of Commitments**

1. By August 29, 1997, a policy will be developed regarding the conditions and requirements for entry into TSR 1.6.4.
2. By September 19, 1997, the PSS, Assistant PSS and other individuals qualified as incident commanders, will be trained in the new policy (see corrective action No. 1). When training is completed, Long Term Order (LTO) 300-97-008 will be deleted.
3. By July 24, 1997, an Engineering Evaluation will be completed regarding the adequacy of the Photohelic pressure-switch/gage "O" rings to withstand exposure to  $UF_6$  and the ambient temperatures in the process buildings.
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