

June 4, 1999 GDP 99-2031

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

Portsmouth Gaseous Diffusion Plant (PORTS) Docket No. 70-7002 Event Report 99-10

Pursuant to the 10CFR76.120(d)(2), Enclosure 1 provides the required 30 day Event Report for an event that resulted from the failure of two Cascade Automatic Data Processing smokeheads in the X-330 Process Building at the Portsmouth Gaseous Diffusion Plant. Enclosure 2 is a list of commitments contained in the report.

Should you require additional information regarding this event, please contact Scott Scholl at (740) 897-2373.

Sincerely,

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Y. Morris Brown General Manager Portsmouth Gaseous Diffusion Plant

Enclosures: As Stated

cc: NRC Region III Office NRC Resident Inspector - PORTS

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Description of Event

On May 5, 1999, at 1430 hours, it was discovered during an NRC resident inspector review of problem reports that two adjacent smokeheads (S13 and S14) in Cell 31-3-1 in the X-330 Process Building were not operable on May 2, 1999, resulting in loss of equipment required to be operable by the Technical Safety Requirements (TSR). The review determined that smokehead S13 was inoperable at a time when the redundant detector, S14, was also inoperable. Smokeheads S13 and S14 provide coverage for half of cell 31-3-1. With no redundant detector available to perform the required safety function, the Cascade Automatic Data Process System (CADP) outleakage detection for cell 31-3-1 was no longer operable. The failure of the Cell 31-3-1 CADP safety system is reportable in accordance with 10CFR76.120(c)(2).

The first smokehead had been lost at 1945 hours on April 30, 1999, when smokehead S14 was declared inoperable due to smokehead hardware alarms. The redundant smokehead S13 was operable at that time, maintaining 50% coverage. At 1132 hours on May 2, 1999, the smokehead S13 went into hardware alarm. The smokehead continued to go into and out of a hardware alarm condition. A hardware alarm indicates that the smokehead is not firing properly. Generally, when a hardware alarm is received, either the smokehead will be firing high in range or the firing voltage will be erratic. In the case of S13, the firing voltage was continually erratic. However, an operability determination to address the erratic firing was not made. While reviewing problem reports, the NRC inspector identified that smokehead S13 was intermittently in a hardware alarm condition for approximately nine hours without an operability determination being made.

At 2053 hours on May 2, 1999, smokehead S13 went into process gas out-leakage alarm. The alarm was investigated per procedure and no indications of outgassing were detected. The night shift facility first line manager (FLM) initiated a problem report, but did not decide to take the smokehead out of service.

At 0828 hours on May 3, 1999, the oncoming day shift FLM noticed that S13 was sporadically going into and out of a hardware alarm condition. The FLM placed the smokehead out of service and it was declared inoperable. The X-330 Operations personnel then took the required TSR actions by establishing a smoke watch in the affected area. Smokehead S14 was repaired and declared operable on May 3, 1999 at 1330 hours, restoring the required 50% coverage.

The smokeheads are manufactured by Pyrotronics under model numbers F3/5A, F5B, and F5B4.

Cause of Event

The direct cause of the failure of the CADP smoke detection system was the failure of a second smokehead in cell 31-3-1. The smokeheads are electronic devices located in an adverse environment

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where they are subject to heat, dust, and chemicals. As such, they are subject to degradation and eventual failure. The cell 31-3-1 CADP is designed with redundant smokeheads so that the system can remain operable if one smokehead fails.

The sensitivity of the smokeheads is maintained by the ramping and firing of each detector. If a smokehead does not fire when the ramp voltage reaches a maximum of 110 VDC, a hardware alarm is received. The smokehead will remain in hardware alarm until the smokehead fires within the firing voltage range, in which case the alarm will clear.

The root cause of the loss of two smokeheads was that smokehead S14 was not repaired in a timely manner. Operations procedure XP4-CO-CA2245, step 5.3, requires that "Any UF₆ detector head known to be malfunctioning should be repaired as soon as possible". Smokehead S14 was out of service for nearly three days before being replaced. Higher prioritization of smokehead repairs would have prevented the smokehead from still being out of service when the second smokehead failed.

A contributing cause was the lack of preventative maintenance relating to tracking and trending of smokehead firing voltages. Prior to failure, smokeheads often show degradation by increased or erratic firing voltages. The post-failure firing voltage plot of S13 showed both high and erratic firing voltages. The investigation revealed that system reliability could be enhanced by periodic trending of the firing voltages using the firing voltage history provided by the CADP system. In addition, when a smokehead becomes inoperable, the reliability of the remaining detectors could be determined by a review of the their firing voltage history.

The investigation also determined that the failure to declare smokehead S13 inoperable while it was in a hardware alarm condition was the result a lack of procedural guidance for response to hardware alarms. The hardware alarm identifies that a smokehead is not operating as designed due to a malfunction or an unstable environment, but there are no requirements to make an operability determination. Making an operability determination would have prevented the smokehead from remaining in a hardware alarm condition for nine hours. When an operability determination was made, the smokehead was taken out of service and the appropriate TSR actions were taken.

Corrective Actions

- 1. On May 5, 1999, Operations issued Daily Operating Instructions to address CADP hardware alarms until operating procedures can be revised.
- 2. By June 21, 1999, Engineering will develop preliminary measures of detecting faulty smokeheads prior to failure by checking CADP voltage trends on a periodic basis.

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- 3. By June 30, 1999, Engineering will develop an engineering evaluation to determine smokehead distribution in X-330 cells necessary to detect a design basis accident.
- 4. By September 30, 1999, Operations will revise XP4-CO-CA2245, "Operation and Testing of the Smoke Detection Portion of the CADP System," to provide guidance for operability determination of CADP smokeheads and the CADP computer portion during hardware alarm conditions.
- 5. By September 30, 1999, Operations will revise the applicable procedures to correctly prioritize the repair of CADP smoke detection components when failure occurs.

Extent of Exposure of Individuals to Radiation or Radioactive Materials

There was no exposure to radiation or radioactive materials due to this event.

Lessons Learned

This event illustrated the importance of promptly repairing failed safety system components, especially when only one additional component failure can result in safety system inoperability. This event identified that the smoke detector firing voltage history produced by the CADP system has not been fully utilized to identify smokeheads which may be degrading and may eventually become inoperable.

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- 1. By June 21, 1999, Engineering will develop preliminary measures of detecting faulty smokeheads prior to failure by checking CADP voltage trends on a periodic basis.
- 2. By June 30, 1999, Engineering will develop an engineering evaluation to determine smokehead distribution in X-330 cells necessary to detect a design basis accident.
- 3. By September 30, 1999, Operations will revise XP4-CO-CA2245, "Operation and Testing of the Smoke Detection Portion of the CADP System," to provide guidance for operability determination of CADP smokeheads and the CADP computer portion during hardware alarm conditions.
- 4. By September 30, 1999, Operations will revise the applicable procedures to correctly prioritize the repair of CADP smoke detection components when failure occurs.