Richard L. Anderson
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AUG 26 2002

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2002-005-00
PLA - 005518 FILE R41-2

Docket No. 50-387
License No. NPF-14

Attached is Licensee Event Report 50-387/2002-005-00. This event was determined to be reportable per 10CFR72.75(d)(2), in that a NUHOMS® dry fuel storage Dry Shielded Canister (DSC) was filled with argon gas instead of helium gas, as required by Certificate of Compliance #1004. The error was detected prior to placing the DSC into its corresponding Horizontal Storage Module (HSM). The argon gas was removed, and the DSC was subsequently refilled with helium gas, weld repaired and placed into its HSM. This event was of low safety significance and resulted in no adverse consequences to the health and safety of the public.

Richard L. Anderson
Vice President – Nuclear Operations

Attachment

cc: Mr. H. J. Miller
Regional Administrator
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

cc: Mr. S. L. Hansell
Sr. Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 35
Berwick, PA 18603-0035

IE22

NRC FORM 366 (7-2001)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Susquehanna Steam Electric Station - Unit 1	05000387	1 OF 6

4. TITLE

Dry Fuel Storage Canister Filled With Incorrect Gas Due To Human Error

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Susq. SES - Unit 2	05000388
07	26	2002	2002	005	00	08	26	2002	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	X OTHER Specify in Abstract below or in NRC Form 366A **72.75(d)(2)**
20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	
20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Joseph J. Meter - Nuclear Regulatory Affairs	570 / 542-1873

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On July 26, 2002 at 19:30 with both Unit 1 and Unit 2 in Mode 1 at 100% power, a Maintenance Mechanic observed that argon gas had been used to backfill a NUHOMS® 52-B Dry Shielded Canister (DSC) instead of helium gas. The condition was discovered after the DSC vent and siphon port covers and the outer top cover were installed and welded into place, but prior to transporting the DSC from the reactor building to the Independent Spent Fuel Storage Installation. All dry fuel storage activities on the refueling floor were suspended. A procedure was developed to breach the outer top cover, remove the argon gas from the DSC, confirm and verify it was backfilled with helium gas and weld repair the outer top cover. Repair of the DSC was completed on August 11, 2002. The event occurred when maintenance mechanics erroneously connected the DSC backfill skid to argon compressed gas cylinders, rather than helium compressed gas cylinders. Management review identified that latent organizational weaknesses contributed to this human error event. In response to this event, dry fuel storage work crews received non-routine training to emphasize the need to read labeling when selecting gas cylinders. Routine procedures will be revised to require verification of the correct backfill gas prior to loading other DSCs. Maintenance shift turnover practices will be improved and pre-job checklists will emphasize important tasks. The identified latent organizational weaknesses have been entered into the corrective action process and will be further evaluated. This event is reportable under 10CFR72.75(d)(2), as a significant reduction in the effectiveness of the storage confinement system. However, since there was margin available in the other design parameters, there were no nuclear safety consequences as a result of the event. An analysis of the condition determined that the cladding temperature of the fuel stored in the DSC would not exceed the design basis fuel cladding temperature for the NUHOMS® design. It was also determined with a high degree of confidence that the DSCs already stored in the horizontal storage modules were backfilled with the correct helium gas. Therefore, there were no actual adverse consequences to the health and safety of the public as a result of this event.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2002	- 005 -	00	2 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

EVENT DESCRIPTION

On July 26, 2002 at 19:30, with both Unit 1 and Unit 2 in Mode 1 (Power Operation) at 100% power, a Maintenance Mechanic (Non-licensed, utility) observed that argon gas may have been used to backfill a NUHOMS® dry fuel storage 52-B Dry Shielded Canister (DSC) instead of helium gas. The Refueling Floor Manager (Non-licensed, utility) confirmed the condition and at 21:24 notified the Operations Shift Manager (Licensed, utility) that DSC #18 had been inadvertently filled with argon gas instead of helium gas as required by Certificate of Compliance #1004, Technical Specification 1.2.3. An initial prompt report was then made to the Nuclear Regulatory Commission via the Event Notification System. The condition was discovered after the DSC vent and siphon port covers and the outer top cover were installed and welded into place, and during preparations to move DSC #18 from the Reactor Building (EIIS Code: NG) refueling floor to the Independent Spent Fuel Storage Installation (ISFSI; EIIS Code: D). At the time of the event, 17 DSCs were stored at the ISFSI.

All dry fuel storage activities on the refueling floor were suspended, the manufacturer of the NUHOMS® 52-B DSC was contacted and an event investigation team (Non-licensed, utility) was formed to determine the cause of the event. The Transfer Cask (TC) lid was removed and thermocouples were installed to monitor the DSC temperature on the outer top cover and in the DSC/TC annulus region. An analysis of the condition was performed by the DSC manufacturer and approved by Station Engineering and management personnel. The analysis determined that the cladding temperature of the fuel stored in DSC #18 would not exceed the design basis fuel cladding temperature for the NUHOMS® design. The analysis also determined that the argon gas had no short-term adverse chemical effects on the fuel. Additionally, a periodic "feed and bleed" of the demineralized water in the DSC/TC annulus region was performed to keep the water temperature below 160 degrees Fahrenheit until restoration activities were complete.

A repair procedure was developed to breach the outer top cover, remove the argon gas from DSC #18, backfill it with helium gas and weld repair the outer top cover. The repair procedure was evaluated in accordance with 10CFR72.48 requirements. It included initial corrective actions developed by the event investigation team to ensure use of the correct backfill gas. A DSC mock-up was then used to practice the repair technique in the repair procedure. Repair of DSC #18 started on August 9, 2002 and was completed on August 11, 2002. Calculations showed that activation of argon within the DSC could produce possible peak activity of 59.6 μCi of Ar-41. That equated to a maximum concentration of 5.2 E-6 μCi / cc of Ar-41. No problems were encountered during the evacuation of argon gas from the DSC. The station cumulative radiation exposure dose was 162 milli-Rem (63 milli-Rem from discovery of the incorrect gas until start of repair, plus 99 milli-Rem for repair activities). DSC #18 was then transported to the ISFSI and loaded into its corresponding Horizontal Storage Module (HSM) on August 16, 2002.

CAUSE OF EVENT

Mechanical Maintenance work for the current dry fuel storage campaign is performed using three 8-hour shifts. Argon gas is used as welding shield gas and helium is used to backfill the DSC as heat transfer media. This event occurred when a first-shift Maintenance Mechanic (Non-licensed, utility) erroneously connected the DSC backfill skid helium supply hose to an argon compressed gas cylinder rather than a

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2002	- 005 -	00	3 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

helium compressed gas cylinder. The event continued when a different first-shift Maintenance Mechanic (Non-licensed, utility) connected the same helium supply hose to a second argon cylinder. Both Maintenance Mechanics believed that the gas connected to the DSC backfill skid was helium and did not specifically read the label on the argon gas cylinders prior to connecting them to the DSC backfill skid helium supply hose. Causal factors contributing to the human error event are:

- The argon and helium gas cylinders used for DSC # 18 were essentially the same color (teal) and were not segregated. They were stored on the same compressed gas storage cart near the DSC backfill skid. The cart held six cylinders comprised of four helium cylinders and two argon cylinders.

- The color of the compressed gas cylinders changed from previous dry fuel storage campaigns. In previous campaigns, the helium was supplied in cylinders that were dark blue, while the argon was supplied in teal colored cylinders. A change of compressed gas supply vendor prior to the current campaign resulted in a change of the helium cylinder color to teal.

- The physical arrangement of the compressed gas cylinders also changed from previous dry fuel storage campaigns. In previous campaigns, nitrogen was supplied in brown cylinders and was used for the vacuum drying skid pump seals as part of the DSC vacuum drying process (station service air is now used in lieu of nitrogen). The greater number of compressed gas cylinders required the use of multiple compressed gas storage locations on the refueling floor. Since multiple storage locations were used, argon was stored at a location separate from the helium.

- As part of the vacuum drying and inner top cover weld leak test activities, the Mechanic that connected the first argon cylinder had previously verified (by reading the labels) that two of the cylinders on the cart were helium. The mechanic erroneously assumed the other 4 cylinders in the cart also contained helium gas.

- The Mechanic that connected the first argon cylinder also removed the protective cap from the second argon cylinder. The second Mechanic then connected the second argon cylinder to the DSC backfill skid since the protective cap had been removed.

- The Nuclear Assurance Inspector assigned to the work verified that DSC #18 was backfilled to the correct pressure. The Inspector did not verify the correct backfill gas because verifying the correct gas is used to backfill the DSC was not identified as a "critical" procedure step.

- No peer check for use of the correct backfill gas was requested or performed.

Additionally, turnover/briefings between Mechanical Maintenance shifts were less than adequate. Members of the second-shift and third-shift Maintenance crews had identified the similar color of both the helium gas cylinders and argon gas cylinders as an error precursor. Subsequent communications to the first-shift crew were ineffective to ensure the first-shift crew understood the error precursor, or to ensure a configuration change of the cylinders.

A management review of the causes and corrective actions for the event concluded that additional latent organizational weaknesses allowed the above conditions to exist. This issue has been entered into the corrective action process to be further evaluated.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2002	- 005 -	00	4 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

ANALYSIS / SAFETY SIGNIFICANCE

This event was determined to be reportable per 10CFR72.75(d)(2), as a defect in a storage structure that is important to safety, and as a significant reduction in the effectiveness of the storage confinement system since argon gas has approximately 1/10th the thermal conductivity of helium gas. However, since there was margin available in other design parameters, there were no nuclear safety consequences as a result of the event.

DSC #18 contains 52 "8x8" General Electric fuel assemblies that had been stored in a Spent Fuel Storage Pool (EIIS Code: D) greater than ten years. The design heat load for a NUHOMS® 52-B DSC is 19.24 kW. The heat load generated by the fuel assemblies in DSC #18 was 9.152kW. A periodic "feed and bleed" of the demineralized water in the DSC/TC annulus region was performed to keep the water temperature below 160 degrees Fahrenheit until restoration activities were complete. This action helped limit peak fuel-cladding temperatures. An analysis of the condition was performed by the DSC manufacturer and approved by Station Engineering and management personnel. The analysis determined the maximum cladding temperature that the fuel stored in DSC #18 could reach was 717 degrees Fahrenheit. This value would not exceed the design basis short-term fuel cladding temperature limit of 1058 degrees Fahrenheit, or the long-term fuel cladding temperature limit of 790 degrees Fahrenheit. The analysis also determined that the argon gas had no short-term adverse chemical effects on the fuel.

It has been determined with a high degree of confidence that the DSCs already stored at the ISFSI were backfilled with the correct helium gas. Photographs taken during previous campaigns showed use of segregated compressed gas carts. Interviews conducted with personnel involved with previous dry fuel storage campaigns corroborate the information captured on the photographs. Personnel stated the argon gas cylinders and helium gas cylinders were different colors and were physically separated during the previous campaigns.

Since there was no fuel damage or radiological releases associated with filling DSC #18 with argon gas, and the remaining DSCs at the ISFSI are in compliance with the Certificate of Compliance #1004, there were no actual adverse consequences to the health and safety of the public as a result of this event.

In accordance with guidance in 10CFR72.4, the due date for this report is August 26, 2002.

CORRECTIVE ACTIONS

Corrective actions that have been completed:

- An analysis of the as-found condition determined that the cladding temperature of the fuel stored in DSC #18 would not exceed the design basis fuel cladding temperature for the NUHOMS® design. The analysis also determined that the argon gas had no short-term adverse chemical effects on the fuel.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2002	- 005 -	00	5 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

- A periodic "feed and bleed" of the demineralized water in the DSC/TC annulus region was performed to keep the water temperature below 160 degrees Fahrenheit until restoration activities were complete. This action helped limit peak fuel cladding temperatures.

- A station repair procedure was developed to breach the outer top cover, remove the argon gas from DSC #18, backfill it with helium gas and weld repair the outer top cover. A DSC mock-up was then used to practice the repair technique in the repair procedure.

- Procedure steps that require confirmation and verification for the use of the correct backfill gas were added to the repair procedure prior to the repair activities for DSC #18.

- All other "critical" procedure steps in the repair procedure were identified, and the necessary levels of confirmation and verification were added to those steps prior to the repair activities for DSC #18.

- Non-routine training of this event was provided to personnel performing dry fuel storage activities prior to the repair of DSC #18 to emphasize use of labeling when selecting compressed gas cylinders.

- Procedure steps were added to the repair procedure to require argon and helium gas cylinders be stored in separate storage locations, and that the storage locations are labeled with placards that identify the type of gas to be stored at that location.

- DSC #18 was backfilled with helium using the repair procedure. DSC #18 was then transported to the ISFSI and loaded into its corresponding HSM.

- An industry operating experience report was issued to provide information of the event to other dry fuel storage users.

Corrective actions to be completed prior to resuming the dry fuel storage campaign:

- The Vice President-Nuclear Operations will review and approve the adequacy of the corrective actions for the event.

- Senior Management will review the event and the use of human performance tools with dry fuel storage crews.

- Procedure steps that require confirmation and verification for the use of the correct backfill gas will be added to the routine procedure for loading dry fuel storage.

- Procedure steps will be added to the routine procedure for loading dry fuel storage DSCs to require argon and helium gas cylinders be stored in separate storage locations, and that the storage locations are labeled with placards that identify the type of gas to be stored at that location.

- All other "critical" procedure steps in the routine procedure for loading dry fuel storage DSCs will be identified and the necessary levels of confirmation and verification will be added to those steps.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station - Unit 1	05000387	2002	- 005 -	00	6 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

- Maintenance personnel performing dry fuel storage activities will use face to face shift turnovers that contain documentation of activities completed, activities in progress, activities scheduled for the next shift and problems encountered during the previous shift.

- Maintenance personnel performing dry fuel storage activities will use a pre-job briefing checklist each shift with emphasis on important tasks.

Other corrective actions to be completed:

- The Maintenance organization will reinforce the expectation for use of peer checking within Maintenance.

- If additional significant corrective actions for the latent organizational weaknesses of this event are identified, an update to this report will be submitted.

ADDITIONAL INFORMATION

Past Similar Events: None

Failed Component: None