

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report Nos. 50-277/85-07
50-278/85-07

Docket Nos. 50-277
50-278

License Nos. DPR-44
DPR-56

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station Units 2 and 3

Inspection At: Delta, Pennsylvania

Inspection Conducted: January 15-18, 1985

Inspectors: Robert M. Gallo for 1/29/85
T. P. Johnson, Sr. Resident Inspector date

Robert M. Gallo for 1/29/85
J. H. Williams, Resident Inspector date

Approved By: Robert M. Gallo 1/29/85
Robert M. Gallo, Chief, Reactor Projects date
Section No. 2A, DRP

Inspection Summary: January 15-18, 1985 (Combined Inspection Report 50-277/85-07 and 278/85-07) special inspection regarding routine safety and followup to a plant event involving apparent inoperability of one diesel generator and one loop of containment cooling subsystem. This inspection involved 40 hours by two resident inspectors.

Results: Concerns were identified regarding the operation of Unit 3 with the simultaneous inoperability of one emergency diesel generator and one loop of the containment cooling subsystem, the adequacy of technical specifications regarding the containment cooling subsystem (definition, limiting condition for operation and surveillance requirements), and licensee evaluation of the safety aspects of plant conditions with inoperable equipment.

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DETAILS

1. Persons Contacted

1.1 Licensee Personnel

- R. S. Fleischmann, Station Superintendent
- * D. C. Smith, Assistant Station Superintendent
- * W. T. Ullrich, Superintendent, Nuclear Generation Division
- * G. A. Hunger, Engineer in Charge, Nuclear Services
- * S. R. Roberts, Operations Engineer
- * J. E. Winzenried, Technical Engineer

Other personnel, including licensed operators, senior licensed operators, and staff engineers were also contacted.

*Present at exit interview on site and for summation of preliminary inspection findings.

1.2 NRC Inspection Participants

- T. P. Johnson, Senior Resident Inspector
- J. H. Williams, Resident Inspector
- R. M. Gallo, Chief, Reactor Projects Section 2A

2. Purpose and Sequence of Events

2.1 Purpose

On January 15, 1985, the licensee commenced an orderly shutdown of Unit 3 as required by the plant technical specifications for failure to meet a limiting condition for operation (LCO) action statement. This was due to the simultaneous inoperability of one diesel generator (DG) and one loop of the containment cooling (torus spray and cooling portion) subsystem. In addition, the licensee declared an Unusual Event as required by their Emergency Plan and associated implementing procedures.

This special inspection was conducted to determine whether the plant actions were adequate to assure safe operation within the plant design bases. Also, a review of related technical specifications was performed to determine their adequacy.

2.2. Sequence of Events (Times Approximate)

<u>Date</u>	<u>Time</u>	<u>Event</u>
1/7/85	2:40 am	RCIC surveillance testing. MO-10-39A opened to provide torus cooling.

<u>Date</u>	<u>Time</u>	<u>Event</u>
1/7/85	5:00 am	MO-10-39A (torus header valve) declared inoperable due to a stripped stem nut on the operator. Valve closed. (With valve inoperable, the torus spray and torus cooling portions of the A loop of containment cooling are also inoperable.)
1/7/85	2:20 pm	MO-10-39A valve stroked partially open for maintenance. Valve stuck in an intermediate position and cannot be stroked electrically nor manually.
1/8/85	2:00 pm	MO-10-39A closed by using a strap wrench and chain fall. Licensee verified valve closed.
1/15/85	1:25 am	E-4 Diesel Generator (DG) surveillance testing in progress.
1/15/85	1:35 am	E-4 DG tripped after 10 minutes of operation due to high crankcase pressure.
1/15/85	2:00 am	E-4 DG declared inoperable and technical specification LCO action statement 3.9.B entered (this refers to LCO 3.5.F and 3.9.A.1)
1/15/85	5:00 am	Testing on E-1,2,3 DG's completed and are operable.
1/15/85	6:05 am	Core spray loop A tested satisfactorily as required by technical specification 3.5.F.1 and 4.5.F.1.
1/15/85	8:00 am to 9:30 am	NRC Resident Inspectors (during routine daily inspections) noted that E-4 DG inoperability required all containment cooling subsystems to be operable per technical specification 3.5.F.1. NRC Senior Resident Inspector discusses situation with Shift Superintendent, operating shift personnel and the Station Superintendent.
1/15/85	10:00 am	RHR loop B tested satisfactorily as required by technical specification 3.5.F.1 and 4.5.F.1.

<u>Date</u>	<u>Time</u>	<u>Event</u>
1/15/85	10:40 am	With the plant at 87% power, the licensee declared an Unusual Event, notified NRC via ENS, and began an orderly shutdown as required by technical specification 3.5.F.1.
1/15/85	11:15 am	Core spray loop B tested satisfactorily as required by technical specification 3.5.F.1 and 4.5.F.1.
1/15/85	Various	Power reduction continuing. Investigation and repairs of E-4 DG and MO-10-39A continuing.
1/15/85	5:32 pm (Logged Time)	MO-10-39A valve was repaired, tested satisfactorily, and torus spray and cooling were declared operable. Unusual Event terminated. Plant at 25% power.
1/15/85	6:20 pm	HPSW system tested satisfactorily as required by technical specification 3.5.F.1 and 4.5.F.1.
1/15/85	6:50 pm	Power increase commenced.
1/15/85	10:15 pm	RHR loop A tested satisfactorily as required by technical specification 3.5.F.1 and 4.5.F.1..

3. Discussion

3.1 Inoperable Torus Header Valve

RHR motor operated valve MO-10-39A (RHR torus header valve) had been opened for torus cooling during RCIC testing and would not operate properly following the RCIC test on 1/7/85. The valve was closed, tagged, and a Suspected Maintenance Request Form (SMRF) completed. A suspected LER was written. Operator actions, ensuring that another valve in the line with the inoperable valve was closed and recorded as such, were based on the RHR torus header valve being a containment isolation valve. No apparent action was taken regarding the loss of containment cooling (torus spray and cooling) subsystem loop A. RHR motor operated valve MO-10-39A (RHR torus header valve) was declared inoperable at 5:00 am on 1/7/85 due to a mechanical binding problem (stripped stem nut) with the valve operator. The valve was mechanically closed with a strap wrench and tagged closed on 1/8/85.

With MO-10-39A closed and inoperable, the RHR flowpaths for containment cooling loop A (torus spray and torus cooling portions) were not available because motor operated valves MO-10-38A for torus spray and MO-10-34A for torus cooling (via full flow test line) were isolated from the main RHR header. During this period, Loop A drywell (DW) spray (via valves MO-10-26A and 31A) and Loop B of containment cooling apparently remained operable; however, there are no technical specification (TS) requirements for the containment cooling subsystem other than for the High Pressure Service Water (HPSW) pumps.

3.2 Inoperable Diesel Generator (DG)

At 1:00 am on 1/15/85, all four DGs were being routinely tested per ST.8.1, Diesel Generator Full Load Test. The E-1 DG was started and tested satisfactorily. The E-4 DG was started at 1:25 am and at 1:35 am, it tripped due to apparent high crankcase pressure. The E-4 DG was subsequently declared inoperable at 2:00 am on 1/15/85.

This event placed the plant in technical specification LCO action statement 3.9.B which allows continued operation in accordance with TS 3.5.F if specification 3.9.A.1 is satisfied. Technical specification 3.9.A.1 requires operability of both off-site power sources and the startup transformers and emergency transformers to provide power to the 4kV emergency buses. Technical specification 3.5.F. allows continued reactor operation for seven days provided that all of the low pressure core and containment cooling subsystems, and the remaining diesel generators are operable. If TS 3.5.F cannot be met, an orderly shutdown must be initiated and the reactor placed in the Cold Shutdown Condition within 24 hours. In addition, TS 4.5.F.1 (surveillance requirement) requires that all low pressure core cooling, containment cooling subsystem and the operable DGs be demonstrated operable immediately and daily thereafter.

The plant condition (inoperable DG and one loop of torus spray and cooling) was noted by the inspectors at approximately 8:00 am 1/15/85. The plant condition was brought to the attention of the shift licensed operating personnel and to the Station Superintendent. Discussions indicated that the licensee interpreted containment cooling (by section 3.5.B/4.5.B of technical specifications) as HPSW only, which was operable, even though the required flow path for the torus cooling heat sink (i.e., RHR piping) was not available for loop A. At 10:40 am on 1/15/85 the plant commenced an orderly shutdown per technical specification LCO action statement requirements.

During review of licensee actions, the inspectors noted that the RHR system A test was not completed until 10:15 pm on 1/15/85, more than 20 hours after the E-4 EG was declared inoperable. Also, the HPSW test was not completed until 6:20 pm on 1/15/85, more than 16 hours after the E-4 EG was declared inoperable.

Following completion of the testing, the inspectors reviewed the completed surveillance tests for the operable diesel generators, the HPSW and low pressure ECCS. In addition, portions of the plant shut-down (power reduction to 25%) were observed. No inadequacies were identified.

3.3 Containment Cooling Subsystem

The Peach Bottom Technical Specifications for the containment cooling subsystem are detailed as follows:

The technical specification Bases Section 3.5.B states that the containment cooling subsystem for Peach Bottom 2 and 3 consists of 4 loops each with 1 LPCI pump and 1 HPSW pump per loop. The design of these systems is predicated upon use of 1 LPCI pump and 1 HPSW pump for heat removal after a design basis event. Technical Specification LCO Section 3.5.B addresses only the HPSW portion of the containment cooling subsystem.

The Peach Bottom updated FSAR (August 5, 1983) Section 4.8.6.2, addresses the containment cooling subsystem. The containment cooling subsystem is an integral part of the Residual Heat Removal System (RHR) and is placed in operation to limit the temperature of the water in the suppression pool so that, immediately after the design basis LOCA has occurred, suppression water pool temperature does not exceed 170 degrees F. In this section of the FSAR reference is made to the various modes of containment cooling. These modes include suppression pool (torus) cooling via the RHR full flow test line (via valves MO-10-38 A,B), suppression pool (torus) spray via the spray ring in the torus (via valves MO-10-34 A,B), and drywell spray via the spray headers in the drywell (via valves MO-10-26A,B and 31 A,B). Valves MO-10-39A,B (RHR Torus Header Valves) isolate both torus cooling and torus spray lines. Further, FSAR Section 14.6.3.3.2 discusses containment response after the design basis LOCA and states that containment cooling is required to prevent exceeding the design 170 degrees F suppression pool water temperature limit. It also states that containment cooling is not required to prevent exceeding the containment drywell design pressure and temperature limits.

Conclusion

The technical specifications for the containment cooling subsystem appear to be incomplete as this TS section (3.5.B/4.5.B) only addresses the HPSW system. The containment cooling subsystem includes the following:

- RHR pumps
- RHR heat exchangers

- HPSW pumps for cooling
- Operable flow path from the torus to either DW spray headers, torus spray headers or torus full flow test line (torus cooling mode).

The Peach Bottom Technical Specifications do not address all of the above components. Review and revision of the Peach Bottom Technical Specifications appears to be warranted. At the January 18 management (exit) meeting, the licensee committed to provide interim guidelines for operation of the containment cooling subsystem. This item is unresolved (278/85-07-01).

3.4 Evaluation of Plant Status and Awareness of Inoperable Equipment

The design basis loss of coolant accident (DBLOCA) assumes a complete loss of normal AC power concurrent with the pipe break (reference FSAR Section 14.6.3.1). Peach Bottom Unit-3 was in a condition (E-4 DG inoperable) that if the analyzed accident (DBLOCA) were to occur, assuming loss of normal AC power to the emergency buses, the E-4 emergency auxiliary switchgear (E43) and associated emergency auxiliary load center (E434) and motor control centers would be without power. This would cause a loss of power to the B loop of containment cooling subsystem (valves MO-10-39B, 34B and 38B) and when combined with the inoperability of the A loop containment cooling (torus) subsystem (due to MO-10-39A inop and closed), no containment cooling (torus spray and torus cooling modes) would be available. The inspector discussed the potential loss of all containment cooling (torus modes) with the licensee. The licensee informed the inspector that the plant has the ability to provide alternate power to a de-energized 4KV emergency bus (and associated emergency load centers and motor control centers) from another diesel generator (one that is operable and providing power to its 4KV emergency bus). The inspector reviewed system operating procedure S.8.4.F, Cross Connecting 4KV Emergency Buses, which delineates the steps to accomplish this evolution. In addition, the inspector discussed and walked down this evolution with plant operating personnel. This operation requires access to the 4KV emergency buses in the switchgear rooms to remove fuses and a terminal wire, and would take about 15 minutes to accomplish. Also, local-manual operation of MO-10-39A could have been affected from the Unit-3 torus compartment, however, post accident radiation levels may prohibit local-manual valve operation.

Conclusion

Based on the review of the updated FSAR Sections 4.8.6.2 and 14.6.3.1, and on the ability of containment cooling subsystem to function as analyzed, the plant was apparently not operating within the design basis assumptions during the period while the E-4 DG and loop A of containment cooling (torus cooling and spray portion) subsystem were inoperable. This item is unresolved (278/85-07-02).

3.5 Operator Actions

Administrative procedure A-7, Shift Operations requires that Shift Supervision, Control Operator and Reactor Operators complete and sign a shift turnover checklist. A review of the completed shift turnover checklists for the Shift Supervisor, Unit-3 reactor operator and the control operator for the period 1/7/85 to 1/15/85 was performed by the inspector. The Unit-3 reactor operator shift turnover checklist had documented the inoperable containment cooling valve (MO-10-39A) only twice in the 23 checklists reviewed in the portion entitled "System or Component which is inop as permitted by technical specification." However, MO-10-39A inoperability was documented on the checklist under "other comments or info". In reviewing the completed Shift Supervision Shift Turnover Checklists for the period 1/7/85 to 1/15/85, it was noted that the MO-10-39A valve was not listed as inoperable. Also, a review of the completed control operator shift turnover checklists, noted that only common plant and electrical equipment was noted as inoperable.

Conclusion

Based on a review of shift turnover activities, there is a concern with respect to the documentation and evaluation of the safety aspects of plant status and conditions based on inoperable equipment status and other equipment required by plant technical specifications. This item will be reviewed in future inspections (278/85-07-03).

4.0 Documents Reviewed

P&ID M-361 Sheet 2, Rev. 27 (no date), RHR System - Unit 3

P&ID M-315, Rev. 17, 8/4/81, Emergency Service Water and High Pressure Service Water Systems

E-12, Rev. 5, 10/23/83, Standby Diesel Gens and 4180 Volt Emer Power System - Unit 3

E-1717, Rev. 15, 6/23/83, Single Line Meter and Relay Diagram E-334 & E-434 Emerg. LC and E334-R-B, E-434-R-B, E-334-R-D, E434-R-D Reactor MCC 440V-Unit 3

S.3.2.B.1, Rev. 10, 9/18/84, Drywell Spray Mode - Manual Initiation

S.3.2.B.3, Rev. 0, 9/11/84, Torus Spray Mode - Manual Initiation

S.3.2 C.3, Rev. 8, 5/18/84, Placing Torus Cooling In Service

S.8.4.F, Rev. 0, 4/28/82, Cross Connecting 4KV Emergency Buses

T-102, Rev. 0, 1/14/83, Containment Control (Transient Response Implementation Plant Procedure)

ST 8.1, Rev. 17, 7/9/84, Diesel Generator Fill Load Test, performed on 1/15/85 for the E-3 D/G

ST 8.1, Rev. 17, 7/9/84, Diesel Generator Fill Load Test, performed on 1/15/85 for the E-2 D/G

ST 8.1, Rev. 17, 7/9/84 Diesel Generator Fill Load Test, performed on 1/15/85 for the E-1 D/G

ST 8.1.3, Rev. 7, 7/9/84, Daily Diesel Generator Full Load Test performed on 1/16/85 for the E-3 D/G

ST 8.1.3, Rev. 7, 7/9/84, Daily Diesel Generator Full Load Test performed on 1/16/85 for the E-2 D/G.

ST 8.1.3, Rev. 7, 7/9/84, Daily Diesel Generator Full Load Test performed on 1/16/85 for the E-1 D/G

ST 6.10.1, Rev 4, 7/9/84 HPSW System Operability performed on 1/15/85

ST 6.8, Rev 24, 7/12/84 RHR "A" Pump, Valve, Flow and Unit Cooler Functional performed on 1/15/85

ST 6.9.1, Rev 14, 11/8/84, Daily RHR "B" System and Unit Cooler Operability performed on 1/15/85

ST 6.6.1, Rev 6, 7/25/84, Daily Core Spray "A" System & Cooler Operability (Unit 3 Only) performed on 1/15/85

ST 6.7.1, Rev 7, 7/25/84 Daily Core Spray "B" System & Cooler Operability (Unit 3 Only) performed on 1/15/85

Suspected Licensee Event Report dated 1/7/85 dealing with the MO-3-10-39A valve inoperability

Suspected Licensee Event Report dated 1/15/85 dealing with the E-4 D/G trip

5.0 Unresolved Items

Unresolved items are items about which more information is required to ascertain whether they are acceptable, violations, or deviations. Unresolved items are discussed in Detail 3.3 and 3.4.

6.0 Management Meetings

A verbal summary of preliminary findings was provided to the Superintendent, Nuclear Generation Division and the Assistant Station Superintendent at the conclusion of the inspection during the management meeting on January 18, 1985. During the inspection, licensee management was periodically notified verbally of the preliminary findings by the resident inspectors. No draft inspection report material was provided to the licensee during the inspection.

The licensee committed to develop interim guidelines for operation of the containment cooling subsystem and for determining subsystem operability. (The licensee issued interim technical specifications for the containment cooling subsystem on January 21, 1985.)