

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-278/86-09

Docket No. 50-278

License No. DPR-56

Licensee Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station Unit 3

Inspection At: Delta, Pennsylvania

Inspection Conducted: March 18 - 21, 1986

Inspectors: T. P. Johnson, Sr. Resident Inspector
J. H. Williams, Resident Inspector

Approved By:

Robert M. Gallo
Robert M. Gallo, Chief, Reactor Projects
Section No. 2A, DRP

3/25/86
date

Inspection Summary: March 18 - 21, 1986, (Inspection Report 50-278/86-09) special inspection regarding routine safety and followup regarding an out-of-sequence control rod withdrawal during a Unit 3 startup on March 17-18, 1986. The inspection involved 30 hours by two resident inspectors.

Results: The control rod sequence for rods 02-23 and 10-23 was not adequately followed and verified by a second licensed operator when the RWM was out of service. Also, the RSCS function for control rod 02-23 was bypassed by Shift Supervision in the full out position with the rod full in.

DETAILS

1. Persons Contacted

1.1 Licensee Personnel

- *R. S. Fleischmann, Manager, Peach Bottom Atomic Power Station
- D. C. Smith, Superintendent, Operations
- *W. T. Ullrich, Superintendent, Nuclear Generation Division
- G. A. Hunger, Engineer in Charge, Nuclear Safety Section
- *S. R. Roberts, Operations 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

2. Purpose and Sequence of Events

2.1 Purpose

On March 17, 1986, the licensee commenced a startup of Unit 3 after repairs were completed to the outer screens and the level was restored in the intake basin. On March 18, 1986, during reactor startup, the reactor operators deviated from the required control rod withdrawal sequence in that they left one Group 1 control rod 02-23 full in during the startup. Additionally, with the rod worth minimizer RWM out of service, the rod sequence control system (RSCS) function for control rod 02-23 was bypassed by the Shift Supervisor and Shift Superintendent concurrent with the failure of two licensed operators to adequately verify the proper control rod withdrawal sequence. A special inspection was conducted to review the licensee's investigation and to independently review the circumstances of this event.

2.2 Sequence of Events (Times Approximate)

<u>Date</u>	<u>Time</u>	<u>Event</u>
March 16, 1986	5:13 p.m.	Unit 3 shutdown due to fouling of the intake basin outer screens.

<u>Date</u>	<u>Time</u>	<u>Event</u>
March 17, 1986	10:18 p.m.	Unit 3 startup commenced (outer screens and intake basin returned to normal). RWM bypassed due to computer hardware fault. Two licensed operators assigned on Unit 3 to monitor control rod withdrawal per TS 3.3.B.3.b.
	11:00 p.m.	Shift change occurs; two different licensed operators assigned TS 3.3.B.3.b duties on Unit 3.
March 18, 1986	1:20 a.m.	Rod withdrawal recommenced at step #6, Group I, rod 58-31.
	1:28 a.m.	Rod 10-23 (Group 2) pulled from 00 to 48 in lieu of required Group I rod 02-23 which remained at 00. Rod 02-23 signed off on rod pull sheet as at position 48 by the two assigned licensed operators.
	1:40 a.m.	Group 1 rods on the pull sheet signed off as completed.
	1:42 a.m.	Group 2 rod withdrawal commenced.
	1:47 a.m.	Rod 10-23 signed off on rod pull sheet as withdrawn from 00 to 48, however rod 10-23 had been fully withdrawn at 1:28 a.m., in place of rod 02-23.
	2:05 a.m.	Reactor critical on Group 2, rod 42-39 at notch 12.
	2:30 a.m.	Group 2 rods on the rod pull sheet signed off as completed.
	2:30 - 2:55 a.m.	Group 3 rod withdrawal attempted, however rod 02-23 (at position 00) causes RSCS rod block. The Shift Superintendent and Shift Supervisor bypassed rod 02-23 RSCS full out key-lock switch.

<u>Date</u>	<u>Time</u>	<u>Event</u>
	4:34 a.m.	Group 3 rod withdrawal completed.
	4:50 a.m.	Group 4 rod withdrawal commenced.
	6:11 a.m.	Last remaining Group 4 rod (30-27) pulled to position 10.
	7:00 a.m.	Shift change occurs, no further rod withdrawal motion.
	7:00-7:40 a.m.	Shift Superintendent requested troubleshooting of RWM. RWM re-initialized and returned to service; insert error received on rod 02-23.
	7:48 a.m.	RSCS full out bypass key lock switch for rod 02-23 returned to normal; rod withdrawal block occurred due to rod on 02-23 out of sequence.
	8:44 a.m.	Two control rods inserted (46-27 and 38-19) pending decision to shut down.
	8:55 a.m.	Reactor manual scram inserted.
	9:03 a.m.	Scram reset; reactor in hot shutdown condition.

3. Discussion

3.1 Out-of-Sequence Control Rod

Unit 3 reactor startup commenced on March 17, 1986, at 10:18 p.m. The rod worth minimizer (RWM) was out of service due to an apparent inability to initialize computer program. A computer hardware fault alarm could not be cleared by the operators on shift, and it was decided to bypass the RWM with the manual key lock switch. Technical Specification (TS) 3.3.B.3.b allows bypassing the RWM as long as a second licensed operator verifies the control rod program (rod pull sequence). The licensee implements this TS requirement with procedure GP-2 Appendix 1. GP-2 Appendix 1 delineates the TS requirements, and specifies that the independent verification include observation of rod motion and rod position for each rod withdrawn.

Two licensed operators were present during the startup as indicated by log reviews, operator interviews, and the licensee's investigation. Step #13 of the rod pull sheet (GP-2 Appendix 1, Group 1) requires withdrawing rod 02-23 from full in to full out (00 to 48). The GP-2 Appendix 1 signoff sheet indicates that rod 02-23 was withdrawn to position 48 at 1:28 a.m. on March 18, 1986. However, rod 10-23 had been withdrawn in lieu of rod 02-23 as indicated by the computer alarm typer. Based on the licensee's investigation, when the operator came to step #28 of the rod sequence, i.e., control rod 10-23 which was earlier moved to position 48, the following occurred: The operator selected rod 10-23 and was then distracted to verify other plant parameters. When the operator returned to move rod 10-23, he noted it was already at position 48 and gave it an over-travel check, and then proceeded to the next step of the Group 2 sequence. Subsequently, the out-of-sequence rod movement was confirmed by the licensee when the RWM was reinitialized and by the licensee, and the NRC, through review of a computer OD-7 Option 2 printout for rod positions.

Failure of the operator to pull the correct rod, and subsequent failure of the second operator to adequately and independently verify that the correct control rod program was being followed with the RWM bypassed is an apparent violation of TS 3.3.B.3.b and procedure GP-2 Appendix 1 (278/86-09-01).

GP-2 Appendix 1, requires that the second licensed operator initial each step (rod pull) on the signoff sheets for independent verification of rod motion. GP-2 Appendix 1 completed on March 18, 1986, had steps #7 through #22 and steps #24 through #44 indicated as completed by initialing the first step and drawing an arrow through each sign-off block. Failure to initial each step of the startup rod withdrawal sequence is an apparent violation procedure GP-2, Appendix 1 (278/86-09-02).

3.2 Bypassing of the Rod Sequence Control System (RSCS) Function

The Unit 3 reactor startup proceeded through Group 2 rods, and the final step #44 was completed at 2:30 a.m. on March 18, 1986. The RSCS selector switch was placed in the Group A34 position, and a select error and rod block resulted. No Group 3 rod could be selected. Between 2:30 a.m. and 2:55 a.m., the operators attempted to determine the cause of rod block and select error. The process to perform this determination per System Operating Procedure S.4.3.N utilizes the keys and keylock switches which bypass the RSCS full in or full out permissive relays. Prior to bypassing the RSCS, the rod position must be known and the bypass switch must match the actual rod position. The operators determined that control rod 02-23 was causing the rod block.

The RSCS bypass switch was placed in full out position for rod 02-23, and the control rod block cleared. The operators left the control rod 02-23 RSCS bypass switch in full out position and proceeded with the startup with Group 3 rod withdrawals.

Control rod 02-23 was actually at position 00 (full in) when the RSCS bypass switch was placed in the full out position. TS 3.3.B.3.a, 3.3.A.2.d and 4.3.A.2.d, and procedure S.4.3.N allow bypassing the RSCS full in or full out switches if the rod position is known, and the rod is in the correct sequence position, as verified by a second licensed operator. Failure to ensure that the control rod 02-23 position was full out when the RSCS bypass switch was placed in full out position rendered the RSCS function inoperable for rod 02-23 and is a violation of TS 3.3.B.3.a, 3.3.A.2.d, and 4.3.A.2.d, and procedure S.4.3.N (278/85-09-03).

3.3 Manual Scram

The licensee proceeded with the startup through Group 3 and 4 control rods to step #88E, control rod 30-27 at position 10. Control rod 02-23 remained at position 00 (full in) with the RSCS bypass switch in the full out position during the continuation at plant startup activities.

Between 7:00 a.m. - 7:30 a.m. on March 18, 1986, the shift requested that the RWM be reinitialized and returned to service. At 7:38 a.m., the RWM was returned to service by the reactor engineers utilizing the normal RWM reinitialization procedure, and the operators noted that control rod 02-23 indicated an insert error. A check was made of actual rod positions on the full core display and OD-7 option 2 computer printout. Control rod 02-23 was confirmed to be out-of-sequence at position 00 (full in). The shift supervisor returned the RSCS bypass key for control rod 02-23 to normal.

The licensee inserted two control rods pending management decision to shut down, and then manually scrambled the reactor at 08:55 a.m., as required by TS 3.3.B.3.c. The inspector was notified of the out-of-sequence control rod at approximately 9:00 a.m. on March 18, 1986. The licensee made an ENS call at 9:23 a.m., to report the Unit 3 manual scram and out-of-sequence rod.

3.4 Initial NRC Review

At about 9:15 a.m. the inspector proceeded to the control room and observed post scram recovery actions. The inspector verified the control rod 02-23 was out-of-sequence prior to scram (full in instead of full out), by examining the OD-7 option 2 computer printout of rod positions.

The inspector reviewed the control room logs, documents listed in section 4.0, the licensee's investigation, and interviewed licensee engineers and operators. A telephone conference call was held between the NRC and licensee at 5:00 p.m., on March 18, 1986 to discuss the event and licensee immediate corrective actions.

The inspector reviewed the control rod drop accident (CRDA) design basis and assumption in the FSAR section 14.6.2 and discussed the subject with the licensee. The FSAR assumes that the RWM, RSCS and operating procedures are in place to ensure the correct control rod sequence. Control rod 10-23, which was moved out-of-sequence, may contribute to a higher than design control rod worth for the CRDA. The licensee indicated that their nuclear fuels group and GE have reviewed the effects of the out-of-sequence control rod condition and the preliminary results indicated a higher rod worth, but within the bounds of the CRDA analysis. The CRDA analysis for the out-of-sequence rod 10-23 is unresolved pending formal licensee evaluation and NRC review. (278/86-09-04)

4. Documents Reviewed

Technical Specifications sections 3.3.A, 4.3.A, 3.3.B, 4.3.B

FSAR Section 7.7, Reactor Manual Control System (RSCS)

FSAR Section 14.6.2, Control Rod Drop Accident

FSAR Section 7.16, Rod Worth Minimizer

Unit 3 Reactor Operators Logbook, March 17-18, 1986

Unit 3 Computer Typer Log, March 17-18, 1986

GP-2, Appendix 1, Startup Rod Withdraw Sequence Instructions, Revision 3, 2/21/86

GP-2A, Reactor Startup and Heatup, Revision 21, 11/3/85

COL GP-2A, Reactor Startup Order, Revision 65, 2/28/86

ST 10.6, Rod Sequence Control System (RSCS) Functional Test, Revision 15, 10/28/85

S.4.3.N, Operation of the Sequence Completion Permissive Switches of the RSCS, Revision 4, 12/1/85

S.4.3.L, Operation of the RSCS During a Reactor Startup, Revision 5, 7/21/80

S.5.5.D, Manual Bypass of the RWM, Revision 2, 12/2/85

5. Management Meetings

A verbal summary of preliminary findings was provided to the Superintendent, Nuclear Generation Division and the Superintendent, Operations, at the conclusion of the inspection during the management meeting on March 21, 1986. 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 was informed on March 21, 1986 that this event will be the topic at an enforcement conference to be held on March 27, 1986 with the NRC Region I.