

November 7, 2001

Mr. Oliver D. Kingsley  
President and CNO  
Exelon Nuclear  
Exelon Generation Company, LLC  
200 Exelon Way, KSA 3-E  
Kennett Square, PA 19348

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION - NRC EMERGENCY  
PREPAREDNESS PROGRAM SUPPLEMENTAL INSPECTION REPORT NOS.  
50-277/01-014 AND 50-278/01-014

Dear Mr. Kingsley:

On October 22, 2001, the NRC conducted a supplemental inspection at your Peach Bottom Atomic Power Station, Units 2 & 3 to assess the corrective actions associated with problems identified with the public address (PA)/evacuation alarm system which resulted in an NRC violation of White significance. The enclosed report documents the inspection findings which were discussed on October 26, 2001, with Mr. G. Johnston and other members of your staff.

The supplemental inspection was conducted to provide assurance that the root causes and contributing causes of the White finding were understood, to assess the licensee's extent of condition review, and to provide assurance that the corrective actions to significant performance issues were sufficient to address causes, and to prevent recurrence. To accomplish these objectives, the inspector reviewed your root cause analysis and evaluation of extent of condition and conducted an independent inspection to assess your conclusions. Based on our supplemental inspection, we concluded that your staff performed a sufficiently broad evaluation of the PA/evacuation alarm system and subsequent corrective actions appears to have corrected the underlying causes of the violation.

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Mr. Oliver D. Kingsley

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Should you have any questions regarding this report, please contact Mr. Richard J. Conte at (610) 337-5183.

Sincerely,

*/RA/*

Wayne D. Lanning, Director  
Division of Reactor Safety

Docket Nos: 50-277, 50-278

License Nos: DPR-44, DPR-56

Enclosure: Supplemental Inspection Report Nos. 50-277/01-014, 50-278/01-014

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Mr. Oliver D. Kingsley

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REGION I

Docket Nos: 50-277, 50-278

Report Nos: 50-277/01-014, 50-278/01-014

Licensee: Exelon Generation Company, LLC

Facility: Peach Bottom Atomic Power Station, Units 2 & 3

Location: Delta, Pennsylvania

Date: October 22-26, 2001

Inspector: N. McNamara, Emergency Preparedness Inspector, DRS, RI

Approved by: Richard J. Conte, Chief  
Operational Safety Branch  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000277/01-014, IR 05000278/01-014; on 10/22-26/2001; Exelon Generation Company, Peach Bottom Atomic Power Station, Units 1&2. Supplemental Inspection-Emergency Response Organization Augmentation.

This EP supplemental inspection was performed by a region-based inspector. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <http://www.nrc.gov/NRR/OVERSIGHT/index.html>.

### A. Supplemental Inspection - PA/Evacuation Alarm System (White)

Cornerstone: Emergency Preparedness

This supplemental inspection was performed by the NRC using inspection procedure 95001, to assess the licensee's evaluation and corrective actions associated with a violation in the emergency preparedness area for the inoperability and poor maintenance of the PA/evacuation alarm system. The finding was previously characterized as having low to moderate safety significance (White) in NRC Inspection Report 05000277/2001-011. The inspector determined that the licensee had performed a thorough evaluation, have taken immediate corrective actions and continue to address the long term corrective actions in response to this White finding. The licensee identified that when the PA/evacuation alarm system was operated for greater than 49 seconds, a power overload would occur which would trip the power supply breakers open. This resulted in the system operating on its backup power breaker for a period of two months and on two occasions the system was inoperable because the backup power breaker had tripped. In addition, during a review of the system in 2000, the licensee had found that 47% of the system had degraded. The licensee determined the cause and developed comprehensive corrective actions to address the causes and prevent recurrence. The licensee's root cause evaluation identified the contributing factors to be: (1) routine testing of the system was suspended in 1992; (2) no recognition of the importance of the audibility of the speakers in carrying out the requirements of the Emergency Plan (E-Plan); (3) less than adequate modification performed in the early 1990's due to not considering the operating loads required for the plant evacuation notifications; (4) less than adequate assessment of the impact to the emergency planning requirements when the breakers were discovered to be tripped.

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## Report Details

1. **REACTOR SAFETY**  
Cornerstone: Emergency Preparedness

### **SUPPLEMENTAL INSPECTION**

- 01 Inspection Scope (95001)

This supplemental inspection was performed to assess the licensee's evaluation and corrective actions associated with a White finding in which the PA/evacuation alarm system was not maintained and on several occasions did not function properly. This resulted in a degraded system that hindered the licensee's ability to evacuate onsite personnel during a radiological event as described in the E-Plan. The inspector reviewed pertinent corrective action reports, program procedures, self-assessment reports, and a root cause analysis report (PEP I0011714). In addition, interviews were conducted with the EP staff and system engineers responsible for maintaining, correcting and testing the PA/Evacuation system. A list of documents reviewed is attached.

#### Background

Both the PA system and evacuation alarm are activated when an evacuation of onsite personnel is necessary. In 1992, routine testing of the PA system was discontinued without consideration of the relation to the E-Plan for evacuating onsite personnel during a radiological event. During the period of 1992-2000, the lack of testing and inadequate maintenance resulted in the system not functioning correctly in the building of the power block. By April, 2000 up to 47% of the speakers were found either inaudible or degraded to the point in which an individual would not be able to clearly hear instructions. By the end of 2000, repairs to the system had made it fully functional. However, the licensee did not perform an evaluation of the power loads on the system when pulling full current. From January 19 to February 13 and March 20 to April 17, 2001, the system had been operating on the backup power breaker and the breaker would have tripped open after 49 seconds of operation. (The licensee is required per their emergency implementing procedures to activate the system twice for a minimum of one-minute intervals). On February 13 and April 17, 2001, the PA/evacuation alarm system was nonfunctional for the periods of 4.5 hours and 1.5 hours, respectively, because both the primary and backup breakers had tripped open following a test of the system resulting in a loss of power to the entire system.

- 02 Evaluation of Inspection Results

- 02.01 Problem Identification

- a. Determination of whom (i.e., licensee, self-revealing, or NRC) identified the issue and under what conditions.

Following an evacuation alarm test in January 2001 the system's primary breaker had unknowingly tripped open and the system operated on the backup breaker. Following a test on February 13, 2001, it was self-revealing when the backup breaker had tripped

open and the system became inoperable. The sequence repeated itself during the March test and left the system inoperable following a test conducted on April 17, 2001. The licensee didn't link the inoperability of the system with the E-Plan. On May 9, 2001, the NRC Resident Inspector made the onsite EP Manager aware of the ongoing problems with the PA/evacuation alarm system and expressed the NRC's concern with the licensee's capability for properly informing and evacuating onsite personnel.

- b. Determination of how long the issue existed, and prior opportunities for identification.

In 1979, an E-Plan implementing procedure governing the testing of the PA system was removed and made into a surveillance procedure (RT 2.6.1) which made reference to the system being linked to the E-Plan. However, a subsequent update of the surveillance procedure eliminated the E-Plan reference. In 1992, the testing of the system was discontinued. In April 2000, the licensee evaluated the PA system and had found that gradually over an eight year period, the system had degraded by 47%. The licensee was aware the system was not fully operational because, during emergency drills/exercises, responders observed they were not able to hear announcements. The licensee's response was to turn up the volume and repairs were specific to the problem rather than perform a formal assessment on the total system.

By the end of 2000, the PA system had been upgraded; however, the licensee failed to conduct an evaluation of the increased electrical load when the evacuation alarm and PA system were used simultaneously for making evacuation notifications. When it was discovered in February 2001 that the breakers had tripped after 49 seconds of operation, the licensee did not evaluate the reasons for the breakers tripping open. Based on the problems found in February, the licensee did not ensure the breakers had not tripped again following the March or April test. In addition, the engineering staff did not understand the importance of the system as related to emergency response which resulted in the failure to notify the EP Manager of the ongoing problems.

- c. Determination of the plant-specific risk consequences (as applicable) and compliance concerns associated with the issue.

The PA/evacuation alarm system is risk significant because the failure to maintain the emergency onsite communication system without adequate compensatory measures or without a backup power source resulted in an emergency preparedness function not being met. An inoperational system would not have allowed the licensee to properly inform and alert onsite personnel of protective actions and would unnecessarily delay a site evacuation during a radiological event. The failure of the PA/evacuation alarm system resulted in the licensee not meeting the requirements of the E-Plan and a significant planning standard 10 CFR 50.47(b)(8) and its related requirements of 10 CFR Part 50, Appendix E, Section IV.E.9, which requires that onsite emergency communication systems be maintained and have a backup power source.



## 2.02 Root Cause and Extent of Condition Evaluation

- a. Evaluation of methods used to identify the root causes and contributing causes.

The licensee's method for performing the root causes analysis was found to be adequate. The root cause analysis was conducted by using the TAPRoot method which is a multi-tiered root cause process. It included a root cause analysis flow chart, problem investigation, timeline development, extent of condition and corrective actions to prevent recurrence. The analysis included research back to the plant construction, review of modifications that were performed on the PA system, corrective maintenance performed on the system, identified system inadequacies, condition reports and interviews with personnel that had worked with the system in the past.

- b. Level of detail of the root cause evaluation.

The licensee's evaluation was thorough and had a sufficient level of detail. The licensee's root cause report indicated that the contributing factors were: (1) the surveillance procedure not updated with a reference to the E-Plan; (2) less than adequate modifications performed without consideration of the maximum operating loads of the system; (3) the testing of the PA system was discontinued in 1992 without the recognition of the importance of the audibility of the speakers in carrying out the requirements of the E-Plan; (4) the testing of the evacuation alarm was removed from the E-Plan and change to a surveillance procedure which inadvertently dropped the step to notify Emergency Planning of any problems or failures identified during the testing; (5) condition reports were open without consideration of long term correction and the significance of the system as it related to emergency response; and (6) once the breakers were found tripped or the system inoperable, less than adequate assessment was performed of the impact to the emergency planning requirements.

- c. Consideration of prior occurrences of the problem and knowledge of prior operating experience.

Since the PA system was not performing at maximum power, there were no other occurrences prior to 2001 of the breakers tripping open. However, there was knowledge of the breaker problem in February; yet, the licensee failed to adequately investigate the problem in order to prevent recurrence in March and April.

- d. Consideration of potential common causes and extent of condition of the problem.

The licensee's evaluation considered the potential for common cause and extent of condition associated with the PA/evacuation alarm system problem. The licensee performed a review of Class 1E electrical loads that contain variable loads such as lighting, plant radio equipment and other plant related equipment to determine if the existing load change process was adequate, and if other variable load conditions existed in the plant. The review included a revision, if necessary, to the design change process for evaluating electrical loading to ensure that the impact of all loads was adequately evaluated and calculations bound the conditions appropriately. The inspector reviewed

the extent of condition report (AR 00060984) and determined the report was thorough. The investigation showed there were no immediate concerns and that current procedures and practices were in place to adequately address all electrical sizing and protection issues associated with the electrical loads. Three actions were initiated which were: (1) develop a process to control lighting loads to prevent any future deficiencies with regards to replacing or adding lighting; and (2) develop controls for anyone adjusting PA and Radio Amplifier gains which could have an impact of electrical loads to the systems. Overall, the licensee's review of the potential causes and extent of condition was thorough.

### 02.03 Corrective Actions

#### a. Appropriateness of corrective actions.

The licensee's immediate corrective actions were to add to the surveillance procedure (RT-0-101-900-2) steps to verify the status of the breakers following activation and the EP Manager was to be informed of any discrepancies. A temporary change was made to the Emergency Response Procedure (ERP-130) to twice sound the alarm for 20 seconds and have Security simultaneously use bullhorns in areas within the power block. In August, they completed replacing the existing 30 amp circuit breakers in the PA/evacuation alarm system to 60 amp circuit breakers which appears to have fixed the overload problem.

Following the circuit upgrades, the surveillance procedure and ERP-130 have been changed back to reflect the one-minute time interval. However, the surveillance test procedure differs from ERP-130 in that ERP-130 does not include the step to verify the status of the breakers and to inform the EP staff of any associated problems. Should the control room staff have to evacuate onsite personnel, they would be following ERP-130, not the surveillance test procedure. The licensee acknowledged they should be consistent at least until they have consistent satisfactory data from the monthly testing.

The licensee's long term actions were related to the root and direct causes of the overall evaluation and were appropriately prioritized for completion. Some of the licensee's long term corrective actions were:

- The installation of a loss of power annunciator switch in the control room that would instantly alert the operators if the system was not operating.
- A system review of the PA/evacuation alarm system within the power block for location, audibility, etc.
- An extensive preventive maintenance program which includes upgrading the maintenance procedures, verifying electrical outputs and testing audibility on a routine basis.
- Develop and provide EP training for all Licensed Operators, Emergency Directors and EP personnel with a list of systems/components which are credited to implement the E-Plan and put compensatory measures in place when these systems become inoperable.

- Verify that the systems/components are properly identified in a tracking system, procedures and programs to provide the necessary barrier when initiating the work process and compensatory measures.
  - Develop a task force to evaluate all emergency response equipment and address any deficiencies, needed upgrades, equipment replacement, etc.
- b. Prioritization of corrective actions.

The licensee stated that all corrective actions associated with this issue are of a high priority and progress is routinely being monitored by senior management.

- c. Establishment of a schedule for implementing and completing the corrective actions.

The inspector determined that the short-term corrective actions has been completed. The engineering team stated the preventive maintenance procedures are scheduled to become effective on January 1, 2002 and the long-term corrective actions are to be completed in 2002.

- d. Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence.

During the months of August, September and October 2001 the licensee conducted surveillance tests on the PA/evacuation alarm and found that the breakers remained closed after operating the system for the required time period. The licensee will continue its monthly surveillance testing of the evacuation alarm and as stated above, will begin a routine preventive maintenance program on January 1, 2001.

#### **4. OTHER ACTIVITIES [OA]**

##### 40A6 Meetings, including Exit

The inspector presented the inspection results to Mr. G. Johnston, and other licensee personnel, at the conclusion of the inspection on October 26, 2001 and the licensee accepted the results of the inspection.

## Attachment 1

### SUPPLEMENTAL INFORMATION

#### KEY POINTS OF CONTACT

##### Exelon Generation Company

G. Johnston Plant Manager  
C. Hardee Peach Bottom Emergency Preparedness Coordinator  
S. Beck Regulatory Assurance  
K. Swing Communication System Engineer  
T. Franchitti Design Engineer

##### NRC

A. McMurtray Senior Resident Inspector, Peach Bottom  
M. Buckley, Resident Inspector, Peach Bottom

#### LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened: None

Closed: VIO 05000277/278/01-011-01 Failure to Maintain PA/Evacuation Alarm System.

Discussed: None

#### LIST OF DOCUMENTS REVIEWED\*

Emergency Plan for Limerick, Units 1&2 and Peach Bottom, Unit 2&3  
ERP-130, Site Evacuation, Rev. 16 and Rev. 17  
LS-AA-2120, Monthly PI Data Elements for DEP, Rev. 1  
EP-MA-125-1002, Collection and Evaluation of Data for Indicator R.EP.01, DEP, 6/21/01  
EP-MA-125-1003, Collection and Evaluation of Data for Indicator R.EP.02, ERO Participation, 6/21/01  
EP-MA-125-1004, Collection and Evaluation of Data for Indicator R.EP.03, ANS, 6/21/01  
LR-CG-15, Collection of NRC Performance Indicators, Rev. 0  
LS-AA-125, Corrective Action Program (CAP) Procedure, Rev. 0  
RT-0-101-900-2, Site Evacuation Alarm Test, Rev. 6  
50.59 Review #ECR PB01-00538, Improve Power Feed to Plan PA/Siren System  
Root Cause Evaluation Report, PEP I0012604, LTA Review of PA/Evac Alarm System found Inoperable  
Reply letter to the NRC dated September 18, 2001 regarding NOV.  
PEP No. I0012604, PA System and Evac found Inoperable  
Condition Report 00060984, Site Evacuation Alarm De-Activated During RT-0-101-900-2  
Condition Report No. 00060984, Attachments 13, 14, 15, 16, 17, Extent of Condition Report  
Plant Operations Review Committee Minutes (PORC), Report No. 01-33, dated 8/14/01.  
Condition Report No. 00061032, Review of PA System being Inoperable

Evaluation No. 3, Create PM/Procedure to Test the Plant PA System  
ECR No. 01-00538, Improve Power Feed to Plant Public Address/Siren System  
PEP No. I0012537, Site Evacuation Alarm De-Activated during Test conducted on 4/26/01  
50.59 Evaluation Report No. PB-2001-0146-S, Upgrading and Correcting Problems associated with the PA/Evacuation Alarm System.  
50.54(q) Evaluation for Temporary Changes to ERP-130, Site Evacuation  
RT-0-101-900-2, Evacuation Alarm Test conducted on August 25, 2001  
RT-0-101-900-2, Evacuation Alarm Test conducted on September 18, 2001  
RT-0-101-900-2, Evacuation Alarm Test conducted on October 16, 2001

#### LIST OF ACRONYMS

CR Condition Report  
DEP Drill and Exercise Performance  
EP Emergency Preparedness  
E-Plan Emergency Plan  
ERP Emergency Response Procedure  
PA Public Address  
PI Performance Indicator  
SDP Significance Determination Process

\* - Does not include all procedures reviewed in preparation for the supplemental inspection.