



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

March 8, 2010

Mr. Charles G. Pardee
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: OYSTER CREEK GENERATING STATION - NRC INSPECTION PROCEDURE
95001 - SUPPLEMENTAL INSPECTION REPORT 05000219/2010006

Dear Mr. Pardee:

On February 18, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection pursuant to Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," at your Oyster Creek Nuclear Generating station. The enclosed report documents the inspection results, which were discussed on February 18, 2010, with Mr. M. Massaro and other members of your staff.

As required by the NRC Reactor Oversight Process Matrix, this supplemental inspection was performed because a performance indicator for unplanned scrams per 7000 critical hours crossed a threshold from Green to White in the third quarter of 2009. This issue was communicated in the third quarter 2009 performance indicator results. The NRC staff was informed on January 20, 2010 of your staff's readiness for this inspection.

The objectives of this supplemental inspection were to provide assurance that: (1) the root causes and the contributing causes for risk-significant issues were understood; (2) the extent of condition and extent of cause of the issues were identified; and (3) corrective actions were or will be sufficient to address and preclude repetition of the root causes and the contributing causes. The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

The inspectors determined that your staff performed a comprehensive evaluation of the White performance indicator. Your staff's evaluation of the primary root causes associated with four reactor scrams that occurred over the period from November 2008 until July 2009 was appropriate. Your staff adequately identified the individual and collective performance issues associated with the White performance indicator and have appropriate corrective actions either implemented or planned to address these issues.

Based on the results of this inspection, no findings of significance were identified.

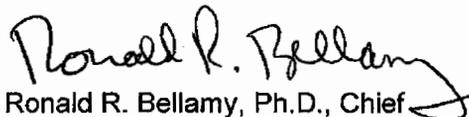
C. Pardee

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We appreciate your cooperation. Please contact me at (610) 337-5200 if you have any questions regarding this letter.

Sincerely,



Ronald R. Bellamy, Ph.D., Chief
Projects Branch 6
Division of Reactor Projects

Docket No. 50-219
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Inspection Report 05000219/2010006

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Sincerely,
/RAJ
Ronald R. Bellamy, Ph.D., Chief
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Division of Reactor Projects

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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.: 50-219

License No.: DPR-16

Report No.: 05000219/2010006

Licensee: Exelon Nuclear

Facility: Oyster Creek Generating Station

Location: Forked River, New Jersey

Dates: February 16, 2010 – February 18, 2010

Inspectors: S. Barber, Senior Project Engineer
C. Newport, Project Engineer

Observer: R. Pinney, Bureau of Nuclear Engineering, State of New Jersey

Approved By: Ronald R. Bellamy, Ph.D., Chief
Projects Branch 6
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000219/2010006; 2/16/2010-2/18/2010; Exelon Energy Company, LLC, Oyster Creek Generating Station; Supplemental Inspection (Inspection Procedure 95001) for a White performance indicator (PI) in the Initiating Events cornerstone.

The report covered a 3-day supplemental inspection for a White PI associated with Unplanned Scrams by a senior project engineer and a project engineer. No findings or violations were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Cornerstone: Initiating Events

The NRC performed this supplemental inspection to assess Exelon's evaluation associated with the Initiating Events PI for Unplanned Scrams per 7000 Critical Hours. This PI crossed the Green/White threshold (value > 3.0) in the third quarter of 2009 when Oyster Creek experienced its fourth reactor scram in the previous eight months of operation.

The inspectors concluded that Exelon's overall performance was acceptable in determining the root and contributing causes for the identified performance deficiencies that led to the White performance indicator. Additionally, Exelon has planned or completed corrective actions to prevent recurrence for these performance deficiencies. As a result, the NRC has concluded that Exelon has taken appropriate corrective action to address the White Unplanned Scrams PI and that consistent with Inspection Manual Chapter 0305, "Operating Reactor Assessment Program," plant performance is expected to return to the licensee response band of the NRC Action Matrix at the end of the first quarter of 2010.

REPORT DETAILS

INSPECTION SCOPE

The NRC conducted this supplemental inspection in accordance with Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess Exelon's evaluations associated with a White Initiating Events cornerstone performance indicator (PI) reported in the third quarter of 2009. The Unplanned Scrams per 7000 Critical Hours performance indicator was based on the number of unplanned scrams that are experienced by a unit within the previous 7000 critical hours of reactor operation as measured on a 12-month periodicity. During a time-frame spanning approximately eight months beginning in November 2008, Oyster Creek experienced four reactor scrams that resulted in plant performance crossing the Green/White performance indicator threshold (value of >3.0) for Unplanned Scrams per 7000 Critical Hours.

The following reactor scrams contributed to the White performance indicator:

- November 28, 2008, an unplanned automatic reactor scram associated with an internal fault on the M1A main transformer (See Inspection Report (IR) 05000219/2008005 for details);
- February 1, 2009, an unplanned automatic reactor scram and Unusual Event (on-site fire greater than 15 minutes) associated with a faulty bushing on the M1A main transformer. This transformer was replaced with a similar transformer from another site (See IR 05000219/2009002 for details);
- April 25, 2009, an unplanned manual reactor scram due to a loss of cooling to the M1A main transformer(See IR 05000219/2009003 for details); and
- July 12, 2009, an unplanned automatic reactor scram associated with a loss of offsite power (LOOP) due to a lightning strike on an offsite power line. The scram was complicated by improper operation of the "B" isolation condenser and a delayed start by one of two emergency diesel generators(See IR 05000219/2009007 for details).

The inspection objectives were as follows:

- Provide assurance that Exelon understood the root and contributing causes of the four reactor scrams and White performance indicator for the risk significant performance issues;
- Provide assurance that Exelon identified the extent of condition and extent of cause of the performance issues; and
- Provide assurance that Exelon has taken or planned corrective actions that are sufficient to address the root causes and contributing causes and to prevent recurrence.

Enclosure

Exelon performed a root cause analysis for each of the four reactor scrams and a common cause analysis that evaluated the collective impact of all four scrams to identify weaknesses that resulted in the performance indicator for Unplanned Scrams per 7000 Critical Hours exceeding the Green/White threshold.

The inspectors reviewed Exelon's evaluations and interviewed station personnel to determine whether Exelon personnel adequately identified plant performance issues that led to the reactor scrams, prior opportunities to correct the conditions, and the plant specific consequences and compliance concerns associated with the reactor scrams. The inspectors also determined whether Exelon personnel utilized appropriate methodologies to identify causes of the reactor scrams, considered the issues in appropriate scope and detail to identify the extent of the causes, extent of the conditions, and the safety culture components that may have contributed to the reactor scrams. Finally, the inspectors determined whether corrective actions were appropriately identified, prioritized, and scheduled to address each root or contributing cause identified in the evaluations. The documents reviewed are listed in Attachment 1.

02.00 EVALUATION OF INSPECTION REQUIREMENTS

02.01 Problem Identification

- a. Determination of who identified the issue and under what conditions.

During the time-frame spanning approximately eight months beginning in November 2008, the Oyster Creek reactor scrambled four times. This resulted in Oyster Creek crossing the Green/White performance indicator threshold (value of > 3.0) for Unplanned Scrams per 7000 Critical Hours during the third quarter of 2009.

The inspectors determined that Exelon's evaluations appropriately assessed the circumstances surrounding identification of the issues. Three of the four reactor scrams involved self-revealing event initiators that resulted in automatic reactor scrams. A manual scram was initiated for a loss of transformer cooling.

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

The Oyster Creek performance indicator for Unplanned Scrams per 7000 Critical Hours crossed the Green/White threshold (value of > 3.0) on July 12, 2009, (third quarter of 2009) and returned to the Green band in the first quarter of 2010 (removal of the November 2008 scram from the calculation).

The inspectors determined that Exelon's evaluations appropriately identified prior missed opportunities that contributed to the reactor scrams and White performance indicator. However, the inspectors noted that a 2005 assessment performed by Doble Engineering did indicate the possibility of transformer reliability issues. This assessment was evaluated based on existing information at the time and Exelon implemented a series of actions to address these issues. The inspectors found that the licensee's actions during that time frame were reasonable.

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

In response to each of the four reactor scrams in 2008 and 2009, the Oyster Creek resident inspectors evaluated operator actions during the transients, as well as equipment response for each event. The specific details of these evaluations were documented in the aforementioned inspection reports. In general, the resident inspectors determined that operator actions and post transient system response were in accordance with the design for the first three reactor scrams. Exelon implemented corrective actions to address NRC concerns and additional issues that were identified during these scrams.

The fourth scram (July 2009) was considered a complicated scram due to various equipment malfunctions and was reviewed by a special inspection team (SIT). The SIT identified findings related to operational performance of one of the two emergency diesel generators and one of the two isolation condensers. An unresolved item was identified for the improper operation of an offsite circuit breaker. The inspectors determined that Exelon implemented sufficient corrective actions to address open issues that needed to be resolved prior to plant restart. Additional actions are planned for the remaining issues. The inspectors reviewed completed and pending actions for these issues and determined that they were acceptable.

In their collective root cause report, the inspectors noted that Exelon assessed the risk consequences from four scrams over one year and concluded that the increase in core damage frequency (CDF) was similar to the results from the unplanned scrams PI. Specifically, Exelon estimated the Delta CDF increase to be approximately $1 \text{ E-}6$ which approximates the Green-White threshold for the PI. Thus, there was close agreement between Exelon's risk assessment and the NRC PI results. Overall, the inspectors determined that Exelon appropriately assessed compliance concerns and plant-specific risk consequences during NRC review of these events.

02.02 Root Cause, Extent of Condition and Extent of Cause Evaluation

a. Evaluation of method(s) used to identify the root cause(s) and contributing cause(s).

Exelon completed a root cause evaluation for each individual reactor scram and a common cause evaluation to identify causal factors associated with the White performance indicator and its individual reactor scram inputs. Several different root cause methodologies were used by Exelon to evaluate root and contributing causes related to the individual reactor scram events and the White performance indicator. The evaluation methodologies used included the Why Staircase methodology, Barrier Analysis, and Event and Causal Factor charts.

The inspectors determined that the evaluation methods used by Exelon were appropriate and that Exelon systematically applied the various methodologies to identify the causal factors associated with the individual reactor scrams and White performance indicator. During review of the root cause analysis report (RCAR) for the November 2008 scram, the inspectors noted that Exelon documented one root cause and two contributing causes. The inspectors questioned the reasons for the deletion of corrective actions for one of the contributing causes which noted that an oil monitoring program may have predicted the transformer failure. Exelon indicated that this particular cause was determined to be invalid when a March 31, 2009, Doble Engineering report concluded that oil monitoring being proposed as part of this cause would not have predicted the transformer failure. The inspectors reviewed this report and agreed with its conclusion.

The root cause and one of the remaining contributing causes remained valid; however, the oil monitoring program contributing cause was not valid and noted that it should have been deleted from the RCAR. The inspectors concluded that this deficiency was related only to the administrative accuracy of the RCAR and there was no actual effect on the planned corrective action for this scram. Thus, no additional actions were necessary to address this issue. As such, this performance deficiency is considered to be of minor significance and therefore, was not subject to enforcement action in accordance with the NRC's Enforcement Policy.

In general, the inspectors determined that Exelon's final issue reports (IRs), root cause evaluations, and licensee event reports appropriately assessed human performance and equipment issues identified during NRC review of these events.

b. Level of detail of the root cause evaluation(s).

Exelon completed individual root cause evaluations for each of the four reactor scrams. Additionally, Exelon performed a common cause evaluation that considered the collective impact of the four reactor scrams that occurred during 2008 and 2009.

The inspectors concluded that Exelon conducted an adequate evaluation of the White performance indicator and the associated individual reactor scrams that contributed to the White performance indicator. The inspectors determined that the evaluations were conducted to a level of detail commensurate with the significance of the problems.

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

Exelon completed reviews in the respective individual scram root cause evaluations that considered prior occurrences of the problem and knowledge of prior operating experience.

The inspectors concluded that Exelon's causal evaluations properly considered and documented prior occurrences of events, including prior operating experience related to a series of transformer failures that occurred throughout the industry from 1996 until 2002. Exelon assessed industry information that was available and developed a plan to address the primary causes for these failures. The inspectors determined that Exelon actions were responsive to this information and would not have reasonably been able to prevent the identified failures.

d. Determination of the extent of condition and the extent of cause of the problem.

Exelon completed individual extent of condition and cause reviews for each of the four reactor scrams. Additionally, Exelon performed a common cause evaluation that considered the collective impact of the four reactor scrams that occurred during 2008 and 2009.

For three of the four scrams, the inspectors determined Exelon's evaluations of extent of condition and extent of cause appropriately assessed extent of equipment and performance issues applicable to the individual and collective performance issues. For the April 2009 manual scram, the inspectors determined that Exelon did not fully evaluate the extent of cause of the scram with respect to single point vulnerabilities

(SPVs). Specifically, a single point vulnerability for the cooling system was not discovered while a transformer from another Exelon facility (Eddystone) was being prepared for installation at Oyster Creek. This allowed a malfunction in the transformer's cooling control system to lead to an initial rapid power reduction followed by a manual scram. The inspectors reviewed this matter and noted that Exelon concluded that an opportunity existed for Exelon personnel to identify this SPV on the cooling circuit during modification review. This performance deficiency resulted in a finding that was previously documented in IR 05000219/20009003. Issue Report 911709 was initiated to review this matter. Corrective actions are in progress, including a review of the newly ordered transformers for SPVs. The inspectors determined that the Exelon extent of condition and extent of cause reviews for these issues were appropriate.

- e. Determine that the root cause evaluation, extent of condition, and extent of cause appropriately considered the safety culture components as described in Inspection Manual Chapter 0305, "Operating Reactor Assessment Program."

Exelon reviewed the events for safety culture components as described in their Root Cause Manual and concluded that no additional investigations were warranted. This conclusion was supported by a March 2009 Nuclear Safety Culture Survey that concluded that Oyster Creek is aligned with the eight Exelon principles of a strong Nuclear Safety Culture. The inspectors did not identify any safety culture component that could reasonably have been a root cause or significant contributing cause that had not been addressed in Exelon's causal evaluations or self-assessments.

02.03 Corrective Actions

- a. Appropriateness of corrective actions.

The root cause and common cause reports identified appropriate corrective actions to address the root, contributing, and common causes for the individual reactor scrams and collective performance issues. The inspectors determined that most corrective actions for the reactor scrams and common cause evaluation were reasonable, with specific actions to address the personnel, procedural, and equipment issues associated with the White performance indicator and its associated individual reactor scram inputs.

- b. Prioritization of corrective actions.

Overall, based on Exelon's causal evaluation corrective actions and self-assessment corrective actions, the inspectors determined that the corrective actions were prioritized commensurate with their significance.

The inspectors noted that immediate corrective actions for each of the reactor scrams were performed in a timely manner to support plant restart. Longer term actions were scheduled in an appropriate time frame to support major improvements to the main transformer systems. The priority of these actions was reasonable based on the relative importance of the main transformer system.

- c. Schedule for implementing and completing the corrective actions.

At the time of the supplemental inspection, a significant portion of Exelon's corrective actions had been implemented with the remainder scheduled in the corrective action

program. Corrective actions to prevent recurrence, as well as a significant number of lower-tier corrective and preventive actions, identified in the root cause reports had been completed or were in-progress by the time of this inspection. Major corrective actions to prevent recurrence include the installation of new transformers in place of the existing M1A and M1B transformers. The new transformers are scheduled to be onsite by May 2010 and are scheduled to be installed during the fall 2010 refueling outage

- d. Measures of success for determining the effectiveness of the corrective actions to prevent recurrence.

Exelon completed effectiveness reviews for the individual reactor scram causal evaluations and corrective actions. The inspectors determined that Exelon's planned effectiveness reviews and review criteria contained sufficient methods for determining the effectiveness of the corrective actions associated with the individual reactor scrams and collective review of the White performance indicator.

O4 MANAGEMENT MEETINGS

4OA6 Meetings, Including Exit

95001 Exit Meeting: On February 18, 2010, the inspectors presented their overall findings to members of Exelon's management led by Mr. M. Massaro, Site Vice President, and other members of his staff who acknowledged the findings. The inspectors confirmed that proprietary information reviewed during the inspection period was returned to Exelon.

4OA7 Licensee-Identified Violations

None.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Massaro, Site Vice President
P. Orphanos, Plant Manager
R. Peak, Engineering Director
J. Dostal, Operations Director
J. Barstow, Manager, Regulatory Assurance
R. Skelsky, Senior Manager, Design Engineering
J. Wieging, Manager, Engineering Programs
D. Barnes, Manager, Electrical Design Engineering
C. Williams, Manager, Electrical Plant Engineering
R. Detwiler, Site PI Program Manager
C. Taylor, Principal Regulatory Specialist
S. Dupont, Regulatory Assurance Specialist
M. Fillipone, Senior Engineer, Electrical Plant Engineering

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

None

LIST OF DOCUMENTS REVIEWED

Licensee Events Reports

LER 2008-001-00, Automatic Reactor Shutdown Caused by Main Transformer Failure
LER 2009-001-00, Automatic Reactor Shutdown Caused by Main Transformer Fire
LER 2009-003-00, Manual Reactor Shutdown Caused by Loss of Cooling to the Main
Transformer
LER 2009-005-00, Reactor SCRAM Following a Transmission Line Lightning Strike

Procedures

LS-AA-125, "Corrective Action Process," Rev. 15
LS-AA-115, "Operating Experience," Rev. 14

Issue Reports(IR)

IR 0374213 IR 0374386 IR 0850348 IR 0867878 IR 0874816 IR 0911709
IR 0940992 IR 0958894 IR 0988299 IR 0980406 IR 1027985

Miscellaneous

Bushing Forensic Analysis, Doble Global Power Services, March 31, 2009
Failure Teardown Investigation Report, Doble Global Power Services, March 31, 2009

Reactor SCRAM Due to Internal Failure of the M1A Main Transformer Root Cause Investigation Report
M1A Transformer Fire/Rx SCRAM Due to 'B' Phase High Voltage Bushing Ground Fault Root Cause Investigation Report
Reactor SCRAM Due to Failure of Cooling for M1A Main Power Transformer Root Cause Investigation Report
Evaluation of Main Generator Trip and Reactor SCRAM on July 12, 2009 Root Cause Investigation Report
Oyster Creek Enters WHITE in Unplanned SCRAM ROP PI Root Cause Investigation Report

LIST OF ACRONYMS

ACE	Apparent Cause Evaluation
ADAMS	Agencywide Documents Access and Management System
Exelon	Exelon Energy Company, LLC
CFR	Code of Federal Regulations
IMC	Inspection Manual Chapter
IR	Issue Report
LER	License Event Report
LLC	Limited Liability Corporation
NEI	Nuclear Energy Institute
NCV	Non-cited Violation
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
PI	Performance Indicator
PI&R	Problem Identification and Resolution
RC	Root Cause
RCAR	Root Cause Analysis Report
SDP	Significance Determination Process
SSC	Structures, Systems and Components
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WO	Work Order