

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

October 22, 2009

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

## SUBJECT: THREE MILE ISLAND STATION, UNIT 1 – NRC INTEGRATED INSPECTION REPORT 5000289/2009004

Dear Mr. Pardee:

On September 30, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Three Mile Island, Unit 1 (TMI) facility. The enclosed inspection report documents the inspection results, which were discussed on October 13, 2009, with Mr. William Noll and other members of your staff.

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.

On the basis of the results of this inspection, no findings of significance were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice", a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <a href="http://www.nrc.gov/reading-rm/adams.html">http://www.nrc.gov/reading-rm/adams.html</a> (the Public Electronic Reading Room).

C. Pardee

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

Sincerely,

/RA/

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

Docket No: 50-289 License No: DPR-50

Enclosure: Inspection Report 05000289/2009004 w/Attachment: Supplemental Information

cc w/encls: Distribution via ListServ

C. Pardee

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Sincerely,

/RA/

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

Docket No: 50-289 License No: DPR-50

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Enclosure: Inspection Report 05000289/2009004 w/Attachment: Supplemental Information

Distribution w/encl: (VIA EMAIL) S. Collins, RA M. Dapas, DRA D. Lew, DRP J. Clifford, DRP R. Bellamy, DRP S. Barber, DRP C. Newport, DRP J. Greives, DRP D. Kern, DRP, SRI J. Brand, DRP, RI C. LaRegina, DRP, OA L. Trocine, RI, OEDO P. Bamford, PM, NRR E. Miller, NRR, Backup R. Nelson, NRR H. Chernoff, NRR <u>ROPreports@nrc.gov</u> Region 1 Docket Room (with concurrences)

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# U.S. NUCLEAR REGULATORY COMMISSION REGION 1

Docket No:	50-289
License No:	DPR-50
Report No:	05000289/2009004
Licensee:	Exelon Generation Company
Facility:	Three Mile Island Station, Unit 1
Location:	Middletown, PA 17057
Dates:	July 1 through September 30, 2009
Inspectors:	<ul> <li>D. Kern, Senior Resident Inspector</li> <li>J. Brand, Resident Inspector</li> <li>C. Newport, Project Engineer</li> <li>R. Nimitz, Senior Health Physicist</li> <li>D. Werkheiser, Senior Resident Inspector</li> <li>M. Modes, Senior Reactor Engineer</li> </ul>
Approved by:	R. Bellamy, Ph.D., Chief Projects Branch 6 Division of Reactor Projects (DRP)

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## SUMMARY OF FINDINGS

IR 05000289/2009004; 7/1/2009-9/30/2009; Exelon Generation Company, LLC; Three Mile Island, Unit 1, Routine integrated report.

The report covered a three-month period of baseline inspection conducted by resident inspectors and announced inspections by regional inspectors. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, Reactor Oversight Process, Rev. 4, dated December 2006.

## **REPORT DETAILS**

## Summary of Plant Status

Three Mile Island, Unit 1 (TMI) operated at approximately 100 percent rated thermal power for the entire inspection period.

## 1. REACTOR SAFETY

## Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

- 1R01 Adverse Weather Protection (71111.01 1 sample)
- a. <u>Inspection Scope</u> (Impending Adverse Weather)

The inspectors verified plant features and procedures for continued operation and reliability of the offsite power grid and onsite alternate AC power systems after a severe thunderstorm that occurred on August 19. The inspectors reviewed issue report (IR) 955299, IR 962543, and an associated prompt investigation performed to address indications of lightning strikes and triggering of plant seismic event monitoring equipment. Reviews included station procedures affecting operation of onsite electrical generation sources and communication protocols between control room operators and the transmission system operator to verify appropriate information is exchanged when issues arise that could impact the offsite power system. The inspectors reviewed procedures, equipment maintenance records, and corrective action program records. Additionally, the inspectors interviewed station personnel and performed in-plant walkdowns to physically verify the material condition and readiness of the offsite electrical transformers and onsite emergency diesel generators (EDGs). Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

- 1R04 Equipment Alignment (71111.04)
- a. Inspection Scope

Partial System Walkdowns (71111.04Q - 3 samples)

The inspectors performed three partial system walkdown samples on the following systems and components:

 On July 10, the inspectors walked down portions of the engineered safeguards and actuation system (ESAS) relays and portions of the makeup system and its associated safeguards and breaker panels, after an accidental short circuit caused inadvertent opening of the 'C' high pressure injection valve (MU-V-16C). The accidental short circuit occurred during scheduled replacement of an ESAS relay (IR 940480, see Section 4OA3).

- On July 16, the inspectors walked down portions of the 'A' decay heat river water system, its support systems, and its associated safeguards and breaker panels, while the 'B' decay heat river water pump was inoperable due to scheduled maintenance.
- On September 1, the inspectors walked down portions of the 'B' reactor building emergency cooling water system, its support systems, and its associated breaker panels while the 'A' reactor building emergency cooling water system train was inoperable due to scheduled maintenance.

The partial system walkdowns were conducted to ensure redundant trains and standby equipment relied on to remain operable for accident mitigation were properly aligned.

Complete System Walkdown (71111.04S – 1 sample)

On September 2, the inspectors performed one complete system walkdown sample on the reactor building spray system, external to the reactor building containment. This inspection was performed during maintenance activities which required the 'A' reactor building emergency cooling water system train to be inoperable. The inspectors conducted a detailed review of the alignment and condition of the system using piping and information diagrams and evaluated open corrective action program reports for impact on system operation. In addition, the inspectors reviewed the associated protected equipment log, and interviewed the system engineer and control room operators. Additional documents reviewed are listed in the attachment.

b. Findings

No findings of significance were identified.

- 1R05 Fire Protection (71111.05Q 4 samples)
- a. Inspection Scope

The inspectors conducted fire protection inspections for several plant fire zones, selected based on the presence of equipment important to safety within their boundaries. The inspectors conducted plant walkdowns and verified the areas were as described in the TMI Fire Hazard Analysis Report, and that fire protection features were properly controlled per surveillance procedure 1038, Administrative Controls-Fire Protection Program, Rev. 73. The plant walkdowns were conducted throughout the inspection period and included assessment of transient combustible material control, fire detection and suppression equipment operability, and compensatory measures established for degraded fire protection equipment in accordance with procedure OP-MA-201-007, Fire Protection System Impairment Control, Rev. 6. In addition, the inspectors verified that applicable clearances between fire doors and floors met the criteria of Attachment 1 of Engineering Technical Evaluation CC-AA-309-101, Engineering Technical Evaluations, Rev. 10. Fire zones and areas inspected included:

- Fire Zone CB-FA-2A, Control Building Elevation 322', 480V ES CC-1A & 1P Switchgear Room;
- Fire Zone CB-FA-3D, Control Building Elevation 338'6", Relay Room;

- Fire Zone IB-FZ-2, Intermediate Building Elevation 295', Turbine Driven EFW Pump Room; and
- Fire Zone IB-FZ-3, Intermediate Building Elevation 295', Motor Driven EFW Pump Area.
- b. Findings

No findings of significance were identified.

- 1R06 Flood Protection Measures (71111.06 1 sample)
- a. Inspection Scope

The inspectors performed visual inspections of flood barriers, system boundaries, and water line break sources located in portions of the intermediate building where internal flooding could adversely affect safety related systems needed for safe shutdown of the plant as documented in TMI-1 Fire Hazards Analysis Report, Rev. 23. The inspectors walked down the emergency feedwater pump rooms and the area enveloped by a circular retaining wall surrounding the reactor containment (commonly known at TMI as the "Alligator Pit"), and interviewed the system engineer. In addition, the inspectors reviewed IR 962669 which evaluated clogged floor drains in the intermediate building floor 322 foot elevation.

b. Findings

No findings of significance were identified.

- 1R11 Licensed Operator Regualification Program (71111.11Q 1 sample)
  - a. Inspection Scope

On September 15, the inspectors observed licensed operator requalification (LOR) training at the control room simulator for the 'D' operator crew. The inspectors observed the operators' simulator drill performance and compared it to the criteria listed in TMI Operational Simulator Scenario No. 60, NS Pump Trip, FW Transient, Turbine Trip – Reactor Trip, and selected postulated post-trip failures, Rev. 1.

The inspectors reviewed the operators' ability to correctly evaluate the simulator training scenario and implement the emergency plan. The inspectors observed supervisory oversight, command and control, communication practices, and crew assignments to ensure they were consistent with normal control room activities. The inspectors observed operator response during the simulator drill transients. The inspectors evaluated training instructor effectiveness in recognizing and correcting individual and operating crew errors. The inspectors attended the post-drill critique in order to evaluate the effectiveness of problem identification. The inspectors verified that emergency plan classification and notification training opportunities were tracked and evaluated for success in accordance with criteria established in Nuclear Energy Institute 99-02, Regulatory Assessment Performance Indicator Guideline, Rev. 5. Additional documents reviewed are listed in the attachment.

## b. Findings

No findings of significance were identified.

## 1R12 Maintenance Effectiveness (71111.12Q - 3 samples)

#### a. Inspection Scope

The inspectors evaluated the listed samples for Maintenance Rule (MR) implementation by: ensuring appropriate MR scoping; characterization of failed structures, systems, and components (SSCs); MR risk categorization of SSCs; SSC performance criteria or goals; and appropriateness of corrective actions. Additionally, extent-of-condition follow-up, operability, and functional failure determinations were reviewed to verify they were appropriate. The inspectors verified that the issues were addressed as required by 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants; Nuclear Management and Resources Council 93-01, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Rev. 2; and Exelon procedure ER-AA-310, Implementation of the Maintenance Rule, Rev. 6. The inspectors verified that appropriate corrective actions were initiated and documented in IRs, and that engineers properly categorized failures as maintenance rule functional failures and maintenance preventable functional failures, when applicable.

- On July 31, operators identified nuclear river water pump NR-P-1C flow was low and in the alert range (IR 948001) during performance of OP-TM-541-201, IST of NSRW Pumps and Valves, Rev. 7. Based on proper pump operation (no abnormal noise), steady bearing temperatures on the motor, normal lubricating oil samples, and normal vibration levels, engineers determined the pump remained operable. Actions included inspections and cleaning of flow instrumentation, calibration of the discharge pressure gauge, and increased monitoring.
- The inspectors reviewed TMI's performance centered maintenance for 480 volt motor control center breakers to verify that a deficiency identified at another facility was not applicable at TMI. The deficiency involved the incorrect designation of some of the breakers as run-to-failure components and subsequent removal of these breakers from the station preventive maintenance program (IR 948232). The inspectors verified that at TMI, the 480 volt breakers are scoped in the maintenance rule, and that TMI did not categorize these breakers as run-to-failure components. In addition, the inspectors verified the breakers are in a six year preventive maintenance program as recommended by the manufacturer.
- IRs 894642 and 967483 describe increased vibration on the 'B' nuclear river water pump motor (NR-P-1B) since March 18, 2009. The pump was declared inoperable on September 22, due to excessive column vibration (IR 968846). Corrective actions include inspections and pump replacement during the Fall 2009 refueling outage. The inspectors verified that redundant equipment remained operational and the nuclear river water system remained capable of performing its design safety function.

#### b. Findings

No findings of significance were identified.

## 1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 samples)

a. Inspection Scope

The inspectors reviewed the scheduling, control, and equipment restoration during the following maintenance activities to evaluate their effect on plant risk. This review was against criteria contained in Exelon Administrative Procedure 1082.1, TMI Risk Management Program, Rev. 8 and WC-AA-101, On-Line Work Control Process, Rev. 16A.

- On July 1, the inspectors observed activities to repair broken aircraft warning lights and electrical cables in one of the two Unit 2 cooling towers, to ensure that these activities did not impact the safe operation of TMI Unit 1. Due to the elevation and geometry of the cooling tower, the job required use of a helicopter operated by an off-site contractor. The inspectors attended multiple pre-job briefings, performed field walkdowns, and interviewed plant operators, maintenance technicians, and contractors. The online maintenance risk profile remained Green during this evolution.
- On August 19, a severe thunderstorm and lightning strikes triggered the plant seismic equipment, caused multiple unexpected control room alarms, and resulted in a meteorological tower failure. This condition elevated the online maintenance risk profile to Yellow (IR 955299).
- From September 1 through September 2, the 'A' reactor building emergency cooling river water pump (RR-P-1A) was taken out of service for scheduled replacement of the pump motor (IRs 881948, 888589). The online maintenance risk profile remained Green during this evolution.
- On September 12, the 'B' reactor building emergency cooling river water pump (RR-P-1B) was taken out of service for scheduled replacement of the pump motor. The online maintenance risk profile remained Green during this evolution.
- On September 22, the number 4 instrument air compressor (IA-P-4) was taken out of service for scheduled maintenance. This condition elevated the online maintenance risk profile to Yellow.
- b. Findings

No findings of significance were identified.

- 1R15 Operability Evaluations (71111.15 5 samples)
- a. Inspection Scope

The inspectors verified that degraded conditions in question were properly characterized, operability of the affected systems was properly evaluated in relation to technical specification (TS) requirements, applicable extent-of-condition reviews were performed, and no unrecognized increase in plant risk resulted from the equipment issues. The inspectors referenced NRC Inspection Manual Chapter Part 9900, Operability

Determinations & Functionality Assessments for Resolutions of Degraded or Nonconforming Conditions Adverse to Quality or Safety and Exelon procedure OP-AA-108-115, Operability Determinations, Rev. 9, to determine acceptability of the operability evaluations. The inspectors reviewed operability evaluations for the following degraded equipment issues:

- On July 2, the inspectors reviewed IR 937338 which documented elevated pressure in the fire protection system identified during performance of fire system wet sprinkler pressure test per 1104-45R, Rev. 50. Engineers determined that high pressure in the system did not impact operability. The inspectors interviewed operators and the system engineer, and verified that the system pressure returned to normal.
- On July 2, operators identified a buzzing ESAS relay (63Z-2B/R-C2B). Further investigation identified minor chafing of the nylon contact carrier (IR 937192). The inspectors verified that redundant ESAS relays remained operational and system operability was not impacted.
- On July 15, operators identified a noisy 'B' EDG fan AH-E-29B (IR 941901). The system engineer determined the noise is likely due to loose fan belts. However, the fan continues to run normally and operability of the fan and associated EDG is not affected. Corrective actions are scheduled to be implemented during the upcoming October refueling outage (1R18).
- On July 23, control room operators received an unexpected main transformer trouble alarm (L-2-5). Further investigation identified that one of the eight cooling banks (#8 bank) had tripped (IRs 945290 and 927141). The inspectors reviewed the circumstances associated with this issue, the condition of the remaining cooling banks, and interviewed applicable operations, electrical, and system engineering personnel to ensure operability was properly supported.
- On July 31, control room operators received an unexpected reactor coolant pump (RC-P-1C) seal water inlet temperature high alarm (A0527). Temperature rose quickly to the high alarm setpoint (225 degrees Fahrenheit) and continued to rise to 310 degrees. Other pump parameters including stator temperature, seal leak off flow, seal injection flow, and vibration remained normal (IRs 948130 and 950004). The inspectors reviewed the Adverse Condition Monitoring Plan, Monitoring RC-P-1C Following Receipt of Seal Water Inlet Temperature Alarm (A0527) and other deficiencies identified with this pump to more closely assess RC-P-1C performance trends. Other documents reviewed included the Adverse Condition Monitoring Plan, RC-P-1C Vibration Monitoring, and IR 901864 (Complex Troubleshooting Plan) for increased RC-P-1C vibration, dated March 17.
- b. Findings

No findings of significance were identified.

- 1R18 Plant Modifications (71111.18 1 sample)
- a. Inspection Scope

The inspectors reviewed the following temporary modification (TM) and associated implementing documents, interviewed the respective system engineer, and walked down the in-plant system to verify the plant design basis and the system or component operability was maintained. Procedures CC-AA-112, Temporary Configuration Changes, Rev. 14, and CC-TM-112-1001, Temporary Configuration Change Implementation, Rev. 5, specified requirements for development and installation of TMs.

- ECR TM-08-656, Scaffold Upgrade for FS-P-2 Discharge Piping Replacement, Rev. 0 was implemented to install temporary scaffolding in the intake screen and pump house beneath the pump room floor (308 foot elevation). The scaffold was erected to support investigation of piping due to microbiological induced corrosion. Additional documents reviewed during this inspection are listed in the Attachment.
- b. Findings

No findings of significance were identified.

- 1R19 Post Maintenance Testing (71111.19 3 samples)
- a. Inspection Scope

The inspectors reviewed and/or observed the following post-maintenance test activities to ensure: (1) the post-maintenance test was appropriate for the scope of the maintenance work completed; (2) the acceptance criteria were clear and demonstrated operability of the component; and (3) the post-maintenance test was performed in accordance with procedures.

- On July 31, operators performed procedure OP-TM-541-201 IST of NSRW Pumps and Valves, Rev. 4. NR-P-1B vibration point AV exceedance of the allowable range was evaluated in IR 904184. In addition, NR-P-1C flow in the alert range was evaluated in IR 948001.
- On September 2, operators performed procedure 1300-3KA IST of RR Pump 'A' and Valves, Rev. 2 following replacement of the motor.
- On September 10, operators performed a monthly EDG procedure 1303-4.16 Emergency Power, Rev. 121. Low temperature readings on #5 cylinder were evaluated in IR 616909.
- b. <u>Findings</u>

No findings of significance were identified.

- 1R22 <u>Surveillance Testing</u> (71111.22 6 samples)
- a. <u>Inspection Scope (4 Inservice Testing [IST] Samples and 2 Routine Surveillance</u> Samples)

The inspectors observed and/or reviewed the following operational surveillance tests to verify adequacy of the test to demonstrate the operability of the required system or

component safety function. Inspection activities included review of previous surveillance history to identify previous problems and trends, observation of pre-evolution briefings, and initiation/resolution of related IRs for selected surveillances.

- On July 7, 2009, OP-TM-533-202, IST of DR-P-1B and Valves, Interim Change IC-26968, Rev. 10B;
- On July 16, OP-TM-212-202, IST of DH-P-1B and Valves From ES Standby Mode, Rev. 9;
- August 13, General Activity GA213103, Inspection of Fuel Transfer Tube Area (WO-R2143163). In addition, the inspectors reviewed IRs 953404 and 641969, and Engineering Procedure ES-035T, Reference Manual for Inspection of Structures, Rev. 3;
- On September 2, 1300-3KA, IST of RR Pump 'A' and Valves, Rev. 2;
- On September 4, OP-TM-424-201, IST of EF-P-2A, Rev. 6; and
- On September 16, 1301-9.9A, Reactor Building (Non-D Ring) Snubber Inspections, Rev. 51 and Missed Surveillance risk assessment in IR 963873.
- b. Findings

No findings of significance were identified.

## **Cornerstone: Emergency Preparedness**

- 1EP6 Drill Evaluation (71114.06 1 sample)
- a. Inspection Scope

The inspectors observed an emergency event training evolution conducted on September 22, at the Unit 1 control room simulator and the technical support center to evaluate emergency procedure implementation, event classification, and event notification. The event scenario involved multiple safety-related component failures and plant conditions warranting simulated Alert, Site Area Emergency, and General Emergency events declaration. The inspectors observed the drill critique to determine whether the licensee critically evaluated drill performance to identify deficiencies and weaknesses. Additionally, the inspectors verified the Drill/Exercise performance indicators were properly evaluated consistent with NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Rev. 5. Additional documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

## 2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

#### 20S1 Access Controls (71121.01 - 1 sample)

a. Inspection Scope

The inspectors reviewed selected activities and associated documentation in the below listed areas.

Portions of this review included radiological controls planning and preparation aspects associated with steam generator replacement (see Section 40A5).

The evaluation of Exelon's performance in these areas was against criteria contained in 10 CFR 20, applicable TSs, and applicable Exelon procedures.

#### Plant Walkdowns and Radiation Work Permit Reviews

The inspectors toured radiological controlled areas and reviewed housekeeping, material conditions, posting, barricading, radioactive material and contamination controls, and access controls to radiological areas. The inspectors selectively reviewed and discussed ambient radiation levels and made independent radiation measurements.

The inspectors reviewed work areas to determine if radiological controls were adequate. The inspectors selectively reviewed the radiological controls for work activities associated with new fuel receipt and inspection activities and implementation of Fuel Receipt and Handling procedures. The reviews included evaluation of the adequacy of applied radiological controls including radiation work permits, procedure adherence, radiological surveys, job coverage, airborne radioactivity sampling and controls, and contamination controls.

#### Problem Identification and Resolution

The inspectors reviewed self-assessments and audits to determine if identified problems were entered into the corrective action program for resolution. The inspectors evaluated the database for repetitive deficiencies or significant individual deficiencies to determine if self-assessment activities were identifying and addressing the deficiencies.

The review included radiological controls related corrective action documents since the last inspection to determine if there was an observable pattern traceable to a similar cause (see Section 4OA2).

b. Findings

No findings of significance were identified.

#### 2OS2 ALARA Planning and Controls (71121.02 – 2 samples)

a. Inspection Scope

The inspectors reviewed operational, engineering, and administrative controls to maintain personnel occupational radiation exposure as low as is reasonably achievable (ALARA). Implementation of these controls was reviewed against the criteria contained in 10 CFR 20, applicable industry standards, and applicable Exelon procedures.

Portions of this review included planning and preparation for steam generator replacement (see Section 40A5).

#### Inspection Planning, Radiological Work Planning

The inspectors reviewed and discussed proposed occupational exposure goals for the 2009 refueling outage, including replacement of steam generators. The inspectors reviewed radiological work planning for outage related work activities including steam generator change-out. The review included radioactive material source term controls. The inspectors also reviewed planning for work activities including: Alloy 600 work, inservice inspection, insulation work activities, cavity decontamination, and reactor disassembly/re-assembly.

#### Problem Identification and Resolution

The inspectors selectively reviewed problem reports in this area since the last inspection to determine if Exelon was including ALARA deficiencies and issues in its corrective action program (see Section 4OA2).

b. Findings

No findings of significance were identified.

#### 2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03 - 1 sample)

a. Inspection Scope

#### Verification of Instrument Calibration, Operability, and Alarm Set Point Verification

The inspectors reviewed and discussed station radionuclide profile and use of appropriate radiation sources for calibration of instrumentation. The discussions included source terms associated with primary piping and concrete cutting for steam generator replacement. The inspectors also selectively reviewed the calibration of the station's whole body counting systems.

b. Findings

No findings of significance were identified.

### 4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

## .1 <u>Review of Issue Reports and Cross-References to Problem Identification and Resolution</u> <u>Issues Reviewed Elsewhere</u>

The inspectors performed a daily screening of items entered into the licensee's corrective action program. This review was accomplished by reviewing a list of daily IRs, reviewing selected IRs, attending daily screening meetings, and accessing the licensee's computerized corrective action program database.

- .2 <u>Annual Sample -- Review of Corrective Action to Resolve NRC Request for Additional</u> Information (RAI) 2.4.15-1 and RAI 2.4.19-1; Seemingly Contradictory Statements Regarding the Service Building and the Turbine Building (1 sample)
  - a. Inspection Scope

The inspectors reviewed licensee actions to resolve seemingly contradictory statements between the License Renewal Application (LRA) and the Updated Final Safety Analysis Report (UFSAR) regarding the presence of safety-related equipment including safe shutdown equipment in the service building and the turbine building.

The inspectors reviewed the licensee's corrective action to determine if their response was timely and whether actions were completed or scheduled in a timely manner commensurate with the safety significance of the issue. The inspectors reviewed the evaluation of operability and reportability to determine if it was complete and considered the extent-of-condition and generic implications. The inspectors evaluated whether the licensee classified and prioritized the resolution of the problem commensurate with its safety significance.

b. Findings and Observations

## Contradictory Statements Regarding the Service Building

No findings of significance were identified. On August 22, 2008, as part of the review of the application for a renewed license, the NRC staff issued RAI 2.4.16-1 requesting the applicant, Exelon LLC, provide additional information to clarify two seemingly contradictory statements between the LRA and the UFSAR regarding the service building:

The staff noted that the LRA stated that the service building provided support and shelter to "... safety-related mechanical components required for safe operation of the plant, including safe shutdown of the reactor." The staff also noted that Section 5.1.1.3 of the UFSAR lists the service building as a class III structure. The UFSAR states in subsection 5.1.1.3 that Class III structures are "those structures, components, and systems which are not related to reactor operation or containment".

In IR 809188 the licensee determined the basis for the LRA statement is a safety related valve located in the service building. The valve is connected to the condensate system piping connecting the "A" condensate storage tank to the emergency feedwater system. This valve terminates a vent line rising from the buried condensate system piping. The valve is not an active component during reactor operation, but constitutes a pressure boundary component that must be considered for aging affects under the license renewal rule. As a result, the licensee, as part of the license renewal process, concluded that although the vent and valve were not active components of safe-shutdown, the equipment in the service building was required for the safe shutdown of the reactor because the integrity of the piping pressure boundary must be maintained for that purpose.

The valve, identified as CO-V-135, is located in a service building closet in the southwest corner of the maintenance planning office. The valve entered into service on September

2, 1974. The current vent line and valve configuration is consistent with the originally licensed design. The licensee correctly concluded the UFSAR statement in Section 5.1.1.3 is correct and does not need revision. The current licensing basis was being maintained.

The licensee considered vulnerabilities caused by the location of the valve and pipe, such as missile protection, structural impact during an earthquake, and tampering. The licensee correctly concluded the valve would not be jeopardized during design basis events and the valve as configured was operable.

As a conservative measure in IR 809188, Assignment 03, the licensee performed a formal analysis of the seismic implications. This analysis is generally known as a Seismic Qualification Users Group assessment of CO-V-135. This analysis confirmed the valve was operable.

Although the NRC identified the seemingly contradictory LRA and UFSAR statements, the licensee used their corrective action program to respond in a timely manner commensurate with its safety significance. The evaluation and disposition of operability and reportability was complete and considered the extent-of-condition and generic implications. The licensee classified and prioritized the resolution of the problem commensurate with its safety significance. The licensee identified, scheduled, and implemented corrective actions in a timely manner commensurate with the safety significance of the issue.

#### Seemingly Contradictory Statement Regarding the Turbine Building

No findings of significance were identified. In the subsequent RAI 2.4.19-1, also dated August 22, 2008, the staff requested that the applicant provide additional information to clarify two seemingly contradictory statements from the LRA and the UFSAR regarding the turbine building.

The LRA stated that the turbine building provided support and shelter to "...mechanical and electrical equipment required for safe operation of the plant, including safe shutdown of the reactor." Section 5.1.1.3 of the UFSAR lists the turbine building as a class III structure. By definition noted in the UFSAR, class III SSCs are not related to reactor operation. Furthermore, Section 5.4.3.2.5 (Tornado Missiles) of the UFSAR states, "There is no equipment located in the turbine building that is required for safe shutdown of the plant." In its response to the RAI, dated September 19, 2008, the applicant stated that the turbine building is a class III structure that houses safety-related equipment.

The licensee identified in corrective action IR 795343 that the basis for the LRA statement is the presence of safety related hydraulic pressure switches in the turbine building that sense pressure in the oil lines to the main feedwater pumps. These switches provide input to the Heat Sink Protection System (HSPS) to start the emergency feedwater pumps on loss of both main feedwater pumps.

Per Quality Classification Evaluation Form 1-401-0005 dated April 8, 1997:

Switch senses main feedwater pump hydraulic oil pressure (sys #401) to monitor for loss of FW-P-1A and provides an interlock with emergency feedwater (EFW)/HSPS (sys #424 &644)

actuation logic. As documented in SDD-424A and the NRC Evaluation of the EFW Upgrade Modifications (NUREG-0680, C8, 2.1.7.a), the switch cannot be treated as 'fully safety grade' since it is installed in the non-seismic turbine building. However, a commitment was made that the switch would be treated as safety grade to the extent possible. Also see FSAR Section 7.1.4.2.b.

FSAR Section 7.1.4.2.b Emergency Feedwater Actuation HSPS states:

All of the EFW pumps receive an auto-start signal on loss of both main feedwater pumps, loss of all four reactor coolant pumps, low once-through steam generator (OTSG) water level, and on high reactor building pressure. This is accomplished by sensing FW pump turbine hydraulic oil pressure, using contacts from the reactor coolant pump power monitors, OTSG water level transmitters, and reactor building pressure transmitters. The reactor coolant pump power monitoring system and the main feed pump pressure sensing system are considered safety grade for the accidents during which they are required to operate. The hydraulic oil pressure switches are located in the turbine building. The remainder of the system is Class 1E. All sensors and cable for both HSPS trains meet the separation criteria as specified in Section 8.

EFW actuation logic on loss of both main feedwater pumps is arranged in two trains. The inspectors noted failure of a single pressure switch would not prevent operation of the opposite train. Further, the diverse safety grade EFW actuation logic on low OTSG level would remain available. The inspectors concluded the configuration of the system, as found in the turbine building today, is consistent with the original design as discussed in NRC's evaluation NUREG-0680. The current licensing basis was being maintained.

License renewal engineers reviewed the component database. Using the thresholds and location descriptions established for the independent plant evaluation the license renewal review identified over 100 safety-related SSCs that are coded as being located in the turbine building. Most of these SSCs are directly related to containment isolation, not safe plant shutdown and are not relied upon during a seismic event. Some of these SSCs, such as the feedwater isolation hydraulic pressure switches, support safe shutdown of the plant and were reviewed by inspectors.

Given the above descriptions of the safety function of system #401 and the revelations of the component database review, 10 CFR 54.4(a)(2) applies: "Plant SSCs within the scope of this part are — All nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1) (i), (ii), or (iii) of this section." For this reason the turbine building is within the scope of license renewal. The licensee correctly concluded in IR 795343 "The license renewal application was correct in considering the Turbine Building and the non-Class I part of the intermediate building in the scope of license renewal because they house equipment classified as being safety-related."

The licensee determined that the UFSAR had not been completely updated in 1997 to reflect the EFW/HSPS plant modification. The UFSAR statement "There is no

equipment located in the turbine building that is required for safe shutdown of the plant" (USFAR Sec. 5.4.3.2.5) is incorrect and needs to be clarified. The associated corrective action to revise the UFSAR is tracked as IR 809188, Assignment 04.

The NRC identified the seemingly contradictory statements and the licensee responded in a timely fashion, commensurate with its safety significance, by using their corrective action program to capture, investigate, and resolve the issue. The evaluation and disposition of operability and reportability was complete and considered the extent-ofcondition and generic implications. The licensee identified corrective actions and appropriately focused them to correct the problem. The actions associated with the corrective action were completed or scheduled in a timely manner commensurate with the safety significance of the issue.

## .3 <u>Annual Sample – Contractor Oversight and Actions to Address Fuel Handling</u> <u>Deficiencies</u> (1 sample)

#### a. Inspection Scope

During the Fall 2007 refueling outage (1R17), licensee and contractor personnel made several errors during fuel handling activities which consequentially damaged a fuel assembly in the reactor vessel, damaged a control rod assembly in the spent fuel pool, and extended the refueling outage duration. In each case, personnel did not properly verify the condition of equipment and completion of a procedural step prior to beginning the next step in a procedure. These performance deficiencies were previously documented as non-cited violation 05000289/2007005-06 and non-cited violation 05000289/2007005-07. The inspectors reviewed Exelon's common cause evaluation and corrective actions associated with these non-cited violations. The inspectors also reviewed training records, new fuel handling procedure revisions, contractor oversight procedures, industry operating experience, and interviewed station and contractor personnel to verify reasonable corrective actions were implemented to address the causes and provide reasonable assurance that fuel handling would be safely conducted during the upcoming Fall 2009 refueling outage. Additional documents reviewed are listed in the Attachment.

## b. Findings

No findings of significance were identified. The licensee determined the principle causes of the violations were low work standards, unclear accountability, and lack of preparation for work activities. Corrective actions included significant revision to fuel handling procedures to more clearly identify verification steps. Additionally, the responsibilities and communication protocols for the key workers (the fuel handling supervisor, the fuel bridge operator, and the spotter) were clearly documented. Responsibility for most fuel handling activities was transferred to Exelon Reactor Services personnel. Lessons learned briefings and hands-on training for all fuel handling supervisors, bridge operators, spotters, reactor services personnel, and contractor personnel who will move fuel were completed under the supervision of a TMI senior reactor operator. The inspectors determined the problem evaluation, extent-of-condition review, and scope of corrective actions were reasonable to address the causes of the fuel handling deficiencies identified during 1R17.

- .4 <u>Problem Identification and Resolution for Occupational Radiation Safety (71121.01,</u> 71121.02, 71121.03, 50001)
- a. Inspection Scope

The inspectors selectively reviewed problem reports, internal self-assessments, and audits to determine if identified problems were entered into the corrective action program for resolution. The inspectors reviewed the reports to evaluate Exelon's threshold for identifying, evaluating, and resolving problems. Additional documents reviewed during this inspection are listed in the Attachment.

This review was against criteria contained in 10 CFR 20, TSs, and the station procedures.

b. Findings

No findings of significance were identified.

- 4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153 2 samples)
- .1 <u>Degraded Emergency Assessment Capability Technical Support Center (TSC)</u> Ventilation Inoperable
- a. Inspection Scope

On July 27 at 10:00 a.m., station personnel identified that the TSC ventilation system was not maintaining positive pressure in the TSC (IR 946239). Prompt investigation determined a ventilation drain valve had failed, causing condensation to accumulate in the ventilation system. The associated water build-up partially submerged the fan motor and caused the fan drive belt to slip. The resulting lack of air flow affected the ability of the TSC ventilation to maintain adequate radiological habitability in the event of an emergency with an airborne radiological release. The shift manager concluded this was a major loss of emergency assessment capability and in accordance with station procedures notified the NRC Operations Duty Officer as required by 10 CFR 50.72(b)(3)(xiii). Operations and Emergency Preparedness management reviewed EP-AA-112-200-F-01, Station Emergency Director Checklist, Rev. F, to verify contingencies for TSC evacuation during an event were addressed and could be implemented. Repairs were completed and the TSC ventilation system was returned to service at 12:45 p.m. on July 28. The inspectors interviewed personnel, performed a walkdown of the TSC, reviewed maintenance records for selected TSC ventilation components, and reviewed station emergency plan implementing procedures to verify emergency response organization capabilities were properly restored.

b. Findings

No findings of significance were identified.

- .2 Inadvertent Electrical Short Resulted In Partial High Pressure Injection (HPI)
- a. Inspection Scope

On July 10, at 2:38 a.m., operators received an unexpected make-up tank low level alarm. The alarm was due to partial opening of one of the two high pressure injection (HPI) valves (MU-V-16C) in the "B" train. Complex troubleshooting and a prompt investigation (IR 940480) determined the cause of the partial opening of the HPI valve was an inadvertent contact with adjacent energized ESAS relays during the scheduled replacement of an ESAS relay 63Z-2B/R-C2B. This resulted in a momentary short circuit, which bypassed the normal actuation logic, causing the HPI valve to open approximately 0.17 inches before blowing the control power fuse that stopped the valve movement. This event caused the inadvertent transfer of approximately 100 gallons of water from the make-up tank into the reactor coolant system before the valve was manually closed by plant operations personnel. No other valves or components actuated as a result of the inadvertent short circuit. Station personnel concluded this issue was an invalid system actuation which did not require a written Licensee Event Report, and notified the NRC Operations Duty Officer via telephone within 60 days of discovery of the event as required by 10 CFR 50.73 (a)(1). The inspectors reviewed applicable documents, interviewed operators and technicians, and performed field walkdowns of the ESAS relays to verify station personnel responded in accordance with technical specification requirements and station procedures. The inspectors verified plant safety systems were properly operated and restored to the normal standby alignment.

b. Findings

No findings of significance were identified.

- 40A5 Other Activities
- .1 Quarterly Resident Inspector Observations of Security Personnel Activities
  - a. Inspection Scope

During the inspection period, the inspectors conducted the following observations of security force personnel and activities to verify that the activities were consistent with Exelon security procedures and regulatory requirements relating to nuclear plant security. These observations took place during both normal and off-normal plant working hours.

- Multiple tours of operations within the central and secondary security alarm stations;
- Explosive detector equipment testing;
- Owner controlled area and protected area access control posts; and
- Other security officer posts including the ready room and compensatory posts.

These quarterly resident inspector observations of security force personnel and activities did not constitute any additional inspection samples. These observations were considered an integral part of the inspectors' normal plant status review and inspection activities.

b. Findings

No findings of significance were identified.

## .2 Review of World Association of Nuclear Operators Plant Assessment

The World Association of Nuclear Operators performed a TMI plant assessment during the period March 16-27, 2009. The interim assessment report was issued in June 2009. The inspectors reviewed the interim plant assessment report. Problems identified in the report were consistent with NRC findings and no new safety issues were identified.

## .3 Radiological Controls Planning and Preparation for Steam Generator Replacement

## a. Inspection Scope (50001)

The inspectors selectively reviewed Exelon's radiation protection program controls, planning, and preparation in the following areas using applicable portions of the baseline inspection procedures 71121.01, 71121.02, 71121.03, and 71122.01 as guidance for steam generator change-out activities:

- ALARA planning including mock-up plans and station ALARA committee reviews;
- Dose estimates and tracking;
- Exposure controls including temporary shielding;
- Contamination controls;
- Radioactive material management;
- Radiological work plans and controls;
- Emergency contingencies;
- Effluent monitoring and control;
- Oversight and audit plans;
- Instrumentation; and
- Project staffing and training.

## b. Findings

No findings of significance were identified.

#### 40A6 Meetings, Including Exit

## Exit Meeting Summary

On October 13, 2009, the resident inspectors presented the inspection results to Mr. William Noll and other members of the TMI staff who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

## ATTACHMENT: SUPPLEMENTAL INFORMATION

# SUPPLEMENTAL INFORMATION **KEY POINTS OF CONTACT**

Licensee Personnel

R. Atkinson C. Baker R. Bleistine T. Bradley	Manager, Steam Generator Replacement Project Manager, Chemistry Normandeau Associates Normandeau Associates
G Chevelier	Senior Chemist
R Davis	Manager Radiation Protection
D. DiVitore	Manager, Radiological Engineering
T. Dougherty	Plant Manager
D. Etheridge	Manager, Radiation Protection Technical Support
J. Heischman	Director, Maintenance
J. Karkoska	Manager, Site Security
R. Libra	Director, Work Management
F. Linsenbach	Manager, OTSG Replacement Radiation Protection
A. Miller	Regulatory Assurance
J. Murray	Manager, Operations Training
D. Neff	Manager, Emergency Preparedness
W. Noll	Site Vice President
T. Roberts	Supervisor, Radiation Protection
J. Schork	Lead LORT Instructor
M. Sweigart	Supervisor, Radwaste/Environmental
D. Trostle	Operations Security Analyst
L. Weber	Senior Chemist
L. Weir	Manager, Nuclear Oversight Services
C. Wend	Manager, Radiation Protection

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## LIST OF DOCUMENTS REVIEWED

## Section 1R01: Adverse Weather

Procedures OP-AA-108-107, Switchyard Control, Rev. 2 OP-AA-108-107-1001, Station Response to Grid Capacity Conditions, Rev. 2 OP-TM-AOP-020, Loss of Station Power, Rev. 13 OP-TM-AOP-022, Load Rejection, Rev. 4 1107-11, TMI Grid Operations, Rev. 23

## Section 1R04: Equipment Alignment

Procedures OP-TM-214-101, ES Standby Alignment for BS System, Rev. 4

**Drawings** 

1-TD-010, ESAS Actuation High Pressure Injection, Rev. 0 302-202, Nuclear Services River Water System, Rev. 75 302-611, Reactor Building Normal and Emergency Cooling Water System, Rev. 12 302- 660, Makeup & Purification System, Rev. 44 302-661, Makeup & Purification System, Rev. 59

<u>Other</u>

Reactor Building Spray System Health Report (4/1/2009 to 6/30/2009)

## Section 1R011: Licensed Operator Requalification Program

Procedures

11.7.10.060, TMI LOR Operational Simulator Scenario No. 60, Rev. 1

EP-AA-1000, Exelon Nuclear – Standardized Radiological Emergency Plan, Rev. 19

EP-AA-1009, Radiological Emergency Plan Annex for the Three Mile Island (TMI) Station, Rev. 13

EP-M9-114-100, Mid-Atlantic State / Local Notifications, Rev. 13 (and completed form F-01)

- OP-AA-101-113-1006, Crew Critique Guidelines, SER 3-05 Fundamentals Checklist Attachment 2, Rev. 0
- OP-TM-EOP-010, Emergency Procedure Rules, Guides, and Graphs, Guide 9, RCS Inventory Control, Rev. 10

TQ-JA-150-23, Simulator Self Evaluation Form – Crew, Rev. 0

#### Section 1R18: Plant Modifications

### Procedures

MA-MA-796-024-1001, Scaffolding Criteria for The Mid Atlantic Stations, Rev. 6 MA-AA-796-024, Scaffold Installation, Inspection, and Removal, Rev. 7 MA-AA-796-025, Scaffold Installation, Modification, and Removal Request Process, Rev. 5

<u>Other</u>

Occupational Safety & Health Administration, CFR, Part 29, Subpart Numbers 1926.450, 451, 452, 453, and 454 for Scaffolds

## Section 1R22: Surveillance Test

Procedures

1300-3KA, IST of RR Pump 'A' and Valves, Rev. 2, performed on July 20, 2009

1300-3KA, IST of RR Pump 'A' and Valves, Rev. 2, performed on June 4, 2009

1301-9.9A, Reactor Building Non-D Ring Snubber Inspection, Rev. 53, completed on October 29, 2007

1410-Y-34, Corrective Maintenance - Hydraulic Snubber, Rev. 29A

<u>Other</u>

IR 963873, Snubber Visual Inspection Surveillance, 1301-9.9A Not Performed, Extent-of-Condition Review, and Risk Assessment

IR 888589, RR-R-1A High Pump Vibes - Alert Range

IR 881948, RR-P-1A Increasing Vibration Trend

Work Orders R1802111, R2077141

## Section 1EP6 Drill Evaluation

Procedures

EP-AA-125-1002, Attachment 1, Data Reporting Elements, Rev. 5

EP-MA-114-100-F-01, State/Local Event Notification Form, Rev. H

EP-AA-122-1001-F-10, Drill & exercise Post-Event Critique & Report Development Guidance, Rev. C

Other

IR 968629, OSC Chem Lead Computer Out of Service IR 969376, GPS Missing From E-Kit Field Team Kit IR 970486, EP Drill Scenario Data Error Created Unreasonable DAPAR IR 976062, September 22, 2009, Site Evacuee Monitoring/Decontamination Drill

## Sections 20S1, 20S2, and 20S3: Radiation Safety

Procedures

RP-AA-601-1002, Fuel Receipt and Handling, Rev. 0

CC-AA-212-1001, Configuration Change ALARA Review Guideline, Rev. 2

RP-AA-401, Operational ALARA Planning and Control, Rev. 9

RAF-07-003, Old Steam Generator Storage Facility Analysis, Rev. 1

RAF-07-004, SGRP Radiological Consequences of a Steam Generator Drop Accident, Rev. 0

RAF-09-005, Construction Opening Concrete and Metal Survey and Sampling, Rev.0

Other Documents

RP Controls for Incoming Sealants, Rev. 4 ALARA Plans For Steam Generator Replacement and Review Schedule

Waste Management Plan, Rev. 0

Accu-Scan Calibration Report, dated August 12, 2009

Fast-Scan Calibration Report, dated August 12, 2009

Audit AR 947082

Readiness Review 953414.

IRs 905191, 905803, 907795, 908908, 910924, 910929, 911254, 914394, 921688, 922453, 938043, 947261, 947269, 947312, 947621, 955774

## Section 4OA2: Identification and Resolution of Problems

**Procedures** 

AD-AA-2110, Management and Oversight of Supplemental Workforce, Rev. 6 OU-AO-4001, PWR Fuel Handling Practices, Rev. 4 1505-1, Fuel and Control Component Shuffles, Rev. 50 1507-3, Main Fuel Handling Bridge Operating Instructions, Rev. 26 1507-4, Auxiliary Fuel Handling Bridge Operating Instructions, Rev. 22 1507-5, Spent Fuel Handling Bridge Operating Instructions, Rev. 36 IRs 694278, 694289, 697120, 696075, 739315

## LIST OF ACRONYMS

Adverse Condition Monitoring Report
Agencywide Documents and Management System
As Low As is Reasonably Achievable
Code of Federal Regulations
Division of Reactor Projects
Emergency Diesel Generator
Emergency Feedwater
Engineered Safeguards and Actuation System
Final Safety Analysis Report
High Pressure Injection
Heat Sink Protection System
Issue Report
Inservice Testing
Licensed Operator Requalification
License Renewal Application
Maintenance Rule
Nuclear Regulatory Commission
Once Through Steam Generator
Pennsylvania Department of Environmental Protection
Publicly Available Records
Post-Maintenance Test
Request for Additional Information
Structures, Systems, and Components
Technical Support Center
Temporary Modification
Three Mile Island, Unit 1
Technical Specifications
Technical Support Center
Updated Final Safety Analysis Report