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

July 29, 2011

Docket Nos. 05000277
05000278

License Nos. DPR-44
DPR-56

Michael J. Pacilio
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION - NRC ISFSI INSPECTION REPORT 05000277/2010010 and 05000278/2010010 – CORRECTED COPY

Dear Mr. Pacilio:

On July 8, 2011, the NRC Region I office issued NRC ISFSI Inspection Report 05000277/2010 for Peach Bottom Atomic Power Station, Unit 2. An internal review identified that this inspection report should have also included a reference to Peach Bottom Atomic Power Station, Unit 3, because the inspection included a review of ISFSI activities associated with Units 2 and 3. Therefore, we have issued a corrected copy of the inspection report to reference both Units 2 and 3. Other than the addition of the License No., Docket No., and Report No. for Peach Bottom Atomic Power Station, Unit 3, no changes to the content of the report were made, except minor formatting changes to accommodate the reference to Unit 3.

In accordance with 10 CFR Part 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 component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web Site at http://www.nrc.gov/reading-rm/adams.html (the Public Electric Reading Room).

We apologize for any inconvenience this omission may have caused.

Sincerely,

Judith A. Joustra, Chief
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure:
Corrected Copy of Inspection Report Nos. 05000277/2010010 and 05000278/2010010

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Sincerely,

Judith A. Joustra, Chief
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure:
Corrected Copy of Inspection Report Nos. 05000277/2010010 and 05000278/2010010

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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Inspection Nos.	05000277/2010010 05000278/2010010
Docket Nos.	05000277 05000278
License Nos.	DPR-44 DPR-56
Licensee:	Exelon Nuclear
Location:	Peach Bottom Atomic Power Station 1848 Lay Road Delta, PA 17314
Inspection Dates:	November 1, 2010 - May 27, 2011
Inspectors:	Mark Roberts, Senior Health Physicist Decommissioning Branch Division of Nuclear Materials Safety Stephen Hammann, Senior Health Physicist Decommissioning Branch Division of Nuclear Materials Safety John Nicholson, Health Physicist Decommissioning Branch Division of Nuclear Materials Safety Fred Bower, Peach Bottom Senior Resident Inspector Branch 4 Division of Reactor Projects Adam Ziedonis, Peach Bottom Resident Inspector Branch 4 Division of Reactor Projects
Approved By:	Judith A. Joustra, Chief Decommissioning Branch Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

Exelon Nuclear
Peach Bottom Atomic Power Station
NRC Inspection Report Nos. 05000277/2010010 and 05000278/2010010

The inspection was a review of spent fuel storage activities at the Peach Bottom Atomic Power Station and the Independent Spent Fuel Storage Installation (ISFSI) at the site. The inspection included a review of activities during a routine spent fuel storage campaign and the troubleshooting, unloading, root cause evaluation, and corrective action development of a loaded spent fuel storage cask that had developed a helium leak in the main lid seal. The report covers announced safety inspection visits conducted by three regional inspectors with support from two NRC resident inspectors. The inspection included an evaluation of the licensee's programs for radiation protection, maintenance, and operations as they related to routine preparation, loading, and transport of a spent fuel cask and the non-routine activities associated with troubleshooting the helium leak, opening and unloading a loaded cask, conducting a causal analysis for the leaking cask, and developing and implementing corrective actions.

The licensee safely implemented its maintenance, radiation protection, and operations programs to support routine and non-routine activities associated with dry fuel storage.

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

REPORT DETAILS

1.0 Helium Leak Identification on ISFSI Cask #1

a. Inspection Scope

The inspectors reviewed the activities related to the response to a low pressure alarm condition on spent fuel storage cask TN-68-01. The inspectors interviewed personnel and reviewed the licensee's relevant documents.

b. Observations and Findings

Exelon Nuclear utilizes the Transnuclear, Inc. (Transnuclear) TN-68 cask storage system at the Peach Bottom site for storage of spent fuel assemblies at its ISFSI. TheTN-68 casks are vertical stainless steel casks with bolted lids. A metal (aluminum-clad) O-ring seal with an inner and an outer sealing surface is fitted into a groove in the bottom of the cask lid. After loading a cask in the fuel pool with spent fuel assemblies, the cask lid is bolted on and residual moisture is removed from the cask. When the lid bolts are torqued into the lid, the two sealing surfaces of the metal O-ring are compressed against the top of the cask to form two seals. Access to the cask once the lid is in place is through a pair of vent and drain ports. The cask is back-filled with helium and the drain and vent ports are bolted on. The vent and drain port covers also have metal O-ring seals with inner and outer sealing surfaces. The helium backfill provides an inert storage environment. A helium overpressure tank, positioned on a small port on the cask lid, supplies helium overpressure to the space between the cask seals. The combined helium leak rate for all closure seals and the overpressure system is continuously monitored for indications of helium leakage and compliance with the Certificate of Compliance (COC) technical specifications. A bolted on carbon steel protective cover, with an elastomer O-ring seal, provides environmental protection for the cask lid and helium pressurization system. Currently approximately 50 casks are stored at the Peach Bottom ISFSI.

On October 11, 2010, a cask seal overpressure monitoring system low pressure alarm was received for Cask TN-68-01. This cask was initially loaded with spent fuel assemblies on June 12, 2000, and was in storage at the ISFSI. Preliminary helium leak-testing was conducted at the ISFSI. In order to perform further troubleshooting of the low pressure alarm, the overpressure monitoring system was re-pressurized and the cask was moved to the Unit 2 Containment Building. Testing conducted on October 27, 2010, identified that a helium leak existed in the cask main lid sealing area at a leak rate greater than allowed by the ISFSI cask COC technical specifications.

No findings of significance were identified.

c. Conclusions

The licensee identified and responded to a cask seal overpressure monitoring system

low pressure alarm for Cask TN-68-01. The cask was safely moved to the Unit 2 Containment Building where testing confirmed a helium leak in the cask main lid sealing area at a leak rate greater than allowed by the ISFSI cask COC technical specifications.

2.0 Helium Leak Troubleshooting on ISFSI Cask #1

a. Inspection Scope

The inspectors reviewed the activities related to troubleshooting the low pressure alarm condition on cask TN-68-01. The inspectors observed troubleshooting activities performed on the cask, interviewed personnel, and reviewed the licensee's relevant documents.

b. Observations and Findings

The licensee, in consultation with Transnuclear, re-torqued each of the 48 cask lid bolts progressively to a level of 900 foot-pounds. The bolt torque sequence was provided by Transnuclear. Torquing was repeated until there was no visual movement of any bolt head. The licensee then performed a sequence of helium leak tests and identified that the outer sealing surface of the main cask lid seal was leaking. The cask inner seal and the seals on the vent and drain ports were confirmed to be functional. Although the licensee was able to reduce the helium leak-rate to levels below the requirements of the COC technical specifications, they decided that they did not want to return the cask to long-term storage at the ISFSI. Plans were then developed to breach the cask and unload the spent fuel assemblies back into the spent fuel pool in order to perform additional inspections on the cask lid and seals.

No findings of significance were identified.

c. Conclusions

The licensee conducted helium leak test troubleshooting of a loaded spent fuel storage cask and confirmed that the outer sealing surface of the main cask lid seal was leaking. Plans were developed to breach the cask and unload the spent fuel assemblies back into the spent fuel pool in order to perform additional inspections on the cask seals.

3.0 Spent Fuel Unloading Activities for ISFSI Cask #1

a. Inspection Scope

The inspectors reviewed the licensee's activities associated with opening the cask, returning the cask to the spent fuel pool, and unloading the spent fuel back into the spent fuel pool fuel storage racks. The inspectors interviewed licensee personnel, reviewed planning documents, and directly observed activities associated with opening, moving, and unloading the spent fuel cask.

b. Observations and Findings

The licensee had confirmed through testing that each of the fuel assemblies that were loaded into the cask were not leaking, when the cask was initially loaded. However, because the condition of the fuel assemblies in the cask were unknown after ten years of storage, licensee staff took conservative measures in coordinating maintenance and radiation protection activities to safely breach the cask. In addition to their own practical experience gained from loading spent fuel casks, the licensee used operating experience gained from another operating nuclear power plant licensee that breached loaded fuel casks with a similar helium leak problem. Major concerns that were considered if the fuel integrity had not been maintained were the potential for elevated radiation levels at the drain and vent port covers, high activity discrete radioactive particles, and release of fission product gasses. Pre-job briefings by maintenance and radiation protection personnel were thorough and appropriately emphasized the areas of major concern. Radiation protection surveys did not identify significantly elevated radiation levels or discrete radioactive particles. Radiological surveys and sampling and analysis of the atmosphere in the cask did not identify any release of fission product gasses once the cask was breached. The cask was then placed in the Unit 2 fuel pool for removal of the lid and unloading the fuel assemblies. The cask lid and cask were returned to Unit 2 fuel floor for inspection and evaluation.

No findings of significance were identified.

c. Conclusions

The licensee safely implemented its plan for breaching the spent fuel cask, placing the cask in the spent fuel pool, removing the cask lid, unloading spent fuel from the cask, and returning the cask lid and cask to the fuel floor for inspection. No unusual or unexpected conditions were identified.

4.0 Evaluation and Corrective Action Activities

a. Inspection Scope

The inspectors reviewed the licensee's activities associated with the cask seal evaluation, extent of condition implications, and corrective actions that had been implemented and proposed. The inspection consisted of field observations, review of licensee documentation, and interviews with responsible personnel.

b. Observations and Findings

Licensee and cask vendor personnel inspected the cask, cask lid, cask lid seals, vent and drain cover seals, protective cover, and the sealing surfaces on the protective cover. The inspections of the protective cover were performed during the initial cask disassembly on the fuel floor. The inspections of the cask, lid, and seals were conducted after the unloaded cask was returned to the fuel floor. The initial evaluation revealed corrosion of the main lid outer seal, lower-than-expected torque on some of the main lid bolts, and corrosion on the threads of the lid bolts. The inner seal remained

intact, and therefore the cask's primary containment was not compromised. Observations when the protective cover was removed found streaks of rust on the underside of the cover, a pronounced pattern of rust directly under the access plate, and water or signs of moisture around most of the bolt lid holes and bolts. The elastomer O-ring seal on the bottom of the protective cover was found to be completely intact and sealed against the top of the cask lid.

In order to determine the root cause of the event, the licensee initiated a root cause evaluation that included licensee and vendor personnel. The evaluation team concluded that the mechanical cause of the helium leak was determined to be galvanic corrosion of the main lid's outer seal due to the presence of moisture at the interface of the aluminum-clad seal and the stainless steel cask body. The presence of the moisture at the interface of the two dissimilar metals set up a galvanic cell that caused the aluminum to corrode and allow helium to leak through the outer seal of the metal O-ring. The helium leak test detection system performed its intended function.

The evaluation team identified two root causes for the event; both associated with the performance of the protective cover that was intended to prevent water infiltration. The first root cause was determined to be an inadequate design for sealing the access plate in the protective cover. The second root cause was the lack of any verification of the integrity of the water-tight cover. Based on the identified root causes, the licensee developed two primary corrective actions and additional corrective actions to prevent recurrence of the event. The two primary corrective actions, both intended to maintain the integrity of the protective cover, include improving the design of the access plate and developing a verification method for the integrity of the protective cover seals. The licensee and cask vendor are currently working on a redesign of the protective cover and developing a method for testing the integrity of the cover. Installation and testing for Cask #1 is planned for mid-2012. Additional corrective actions include a change to the torquing process for the lid bolts and ensuring that the access plate gasket and protective cover O-ring are inspected at installation. These changes are incorporated in the current procedure revision.

As part of the extent-of-condition review, the licensee has planned inspections for water infiltration under the protective cover for the remaining casks that have been previously loaded. Casks with a similar protective cover design (casks #2 - #9) are scheduled for testing in August 2011 followed by testing of the remaining casks (#10 - #52) that had previous design changes of the protective covers. Replacement of covers is expected to be based on the test results.

No findings of significance were identified.

c. Conclusions

The licensee conducted evaluations to determine the root cause of the helium-leak event and concluded that the mechanical cause of the event was corrosion of the lid seal from water infiltration through the protective cover. The licensee identified two root causes of the event, both related to performance of the protective cover. Long-term corrective actions to redesign the access plate to the protective cover and develop an enhanced cask monitoring method are in the design stages by the licensee and cask vendor and are expected to be completed and implemented in mid-2012. Short-term corrective actions including procedure changes for bolt torquing and verification steps for confirming the integrity of the elastomer seals on the protective cover and protective cover access plate have been implemented. As part of its extent of condition review, the licensee has planned testing of the protective covers of the remaining loaded casks.

5.0 ISFSI Routine Loading Campaign

a. Inspection Scope

The inspectors observed a routine ISFSI loading campaign from May 23, 2011 to May 27, 2011. The inspection consisted of field observations, review of license documentation, and interviews with responsible personnel.

b. Observations and Findings

The inspectors observed a portion of the cask preparation activities and movement of the cask from the preparation area into the spent fuel pool. The inspectors then observed the loading of spent fuel into the cask by the licensee's fuel handlers. The fuel assemblies were properly identified and verified before being moved into the cask. The licensee's reactor engineers did a further verification that the correct fuel assemblies had been loaded by making a video recording of the fully-loaded cask and viewing the recording for the identification numbers of the fuel assemblies. The inspectors also viewed portions of the video recording to spot check that the correct spent fuel assemblies were in the correct locations. The inspectors observed the placement of the lid on the cask, the removal of the cask from the spent fuel pool and subsequent draining of the cask and decontamination of the cask. Inspectors also observed placement of the neutron shield, gamma shield and protective cover on the cask as well as part of the overpressure system installation. Inspectors toured the ISFSI pad and the Central Alarm Station and viewed the alarm system for the cask overpressure system. All ISFSI procedures and procedures for ISFSI-related activities were examined. The personnel involved in the various ISFSI activities were interviewed and found to be knowledgeable and experienced. The pre-job briefings were thorough and covered all aspects of the activity to be performed.

No findings of significance were identified.

c. Conclusions

The licensee successfully performed the cask loading and storage on the ISFSI pad.

The licensee has a documented ISFSI program and trained personnel needed to meet the criteria set forth in the Certificate of Compliance (CoC), Final Safety Analysis Report (FSAR), and NRC regulations for an ISFSI.

Exit Meeting Summary

The inspection results were discussed with Garey Stathes, Site Manager and members of his staff on May 27, 2011, at the conclusion of on-site inspection activities.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

Jim Armstrong, Regulatory Assurance Manager
Jimmy Carter, Reactor Services Manager – Oyster Creek
Brian Cummings, Site Reactor Services Manager
Mark Dedrich, ISFSI Project Manager
Nick Dube, Reactor Services Supervisor
Dave Foss, Regulatory Assurance
Stuart Gray, Fuel Handling Director
Steve Hess, NOS Manager
Carl Kelly, Reactor Services Supervisor
Dan Kern, Lead Radiation Protection Technician
Brian Kozemchak, Work Group Supervisor
Pat Navin, Operations Director
Sarah Shewmaker, Reactor Engineer
Ron Smith, Regulatory Assurance
Garey Stathes, Plant Manager
Mike Summers, Reactor Services Supervisor

INSPECTION PROCEDURES USED

60855	Operation of an Independent Spent Fuel Storage Installation
60855.1	Operation of an Independent Spent Fuel Storage Installation at Operating Plants

ITEMS OPEN, CLOSED, AND DISCUSSED

None

LIST OF DOCUMENTS REVIEWED

50.59 Evaluation No. PB-2010-02-E
50.59 Screening No. PB-2010-019-5
72.48 Screening PB-2011-40-S
72.75 (g) Cask Event Report, December 1, 2010
AR 01131123 Report, ISFSI Cask #1 – Potential Helium Leak
AR 01201309 Report, ISFSI Cask #1 – Prepare for Storage
AR 01202466 Report, Site Align With ISFSI CoC and FSAR Review
AR 01207763 Report, Inspect ISFSI Casks 2-9 for Water Intrusion
AR 01207767 Report, Inspect ISFSI Casks 10-20 for Water Intrusion
AR 01207768 Report, Inspect ISFSI Casks 21-52 for Water Intrusion
AR 01214782 Report, ISFSI Cask 45 Main Lid Binding On Guide Pins
AR 01219452 Report, ISFSI Cask TN-68-47 0 Degree Upper Trunnion Gauge
ECR PB 10-00061 000, Incorporate TN-68 Amendment 1
ECR PB 11-00099 000, Process Rev. 5 of TN-68 Dry Storage Cask FSAR
ECR PB 11-00250 000, Removal of ISFSI Cask Alignment Pin for Lid Installation
FH-35, Control of Material Movement in the Fuel Pool

IR 1131123 ISFSI Cask #1 Helium Leakage – Root Cause
Letter TN to PB, Subject: Guidance for Rework of Damaged TN-68-47-0 Upper Trunnion
LS-AA-104-1001, 50.59 Review Coversheet Form
LS-AA-104-1002, 50.59 Applicability Review Form
LS-AA-104-1004, 50.59 Evaluation Form PB-2010-02-E
MA-AA-716-008, Foreign Material Exclusion Requirements
Micro ALARA Plan 10-085, ISFSI Cask 1 (TN-68-1), Transport to/from pad, Troubleshoot, Repair & Associated Support
Micro ALARA Plan 10-086, ISFSI Cask 1 (TN-68-1), Insert into SFP, Unload and/or repair main lid seal
RT-W-071-901-2, ISFSI Cask and Storage Area Inspection
SF-150, Control of Cask Placement and Location on ISFSI Pad
SF-210, Preparation For An Independent Spent Fuel Storage Installation Campaign
SF-220, Spent Fuel Casks TN-68-01 through TN-68-47 Loading and Transport Operations
SF-250, Varian 979-70 Helium Leak Detector Operations and Calibration
SF-290, Spent Fuel Cask Transport and Unloading Operations
SF-300, TN-68 Cask Spent Fuel Assemblies Storage Selection and Document Requirements
SF-420, Radiation Protection Requirements During Spent Fuel Cask Loading and Transport Operations
SF-490, Radiation Protection Requirements During Spent Fuel Cask Unloading and Transport Operations
ST-H-071-804-2, ISFSI Casks TN-68-48 through TN-68-52 Surface Dose Rate and Contamination
TN-68 Generic Technical Specifications
TN Drawing 972-30-1
TN Drawing 972-70-2

LIST OF ACRONYMS USED

ADAMS	Agency Wide Document Access and Management System
CFR	Code of Federal Regulations
COC	Certificate of Compliance
FSAR	Final Safety Analysis Report
ISFSI	Independent Spent Fuel Storage Installation
NRC	Nuclear Regulatory Commission