



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION I  
2100 RENAISSANCE BLVD.  
KING OF PRUSSIA, PA 19406-2713

October 31, 2016

Mr. Bryan C. Hanson  
Senior Vice President, Exelon Generation Company, LLC  
President and Chief Nuclear Officer, Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT – INTEGRATED INSPECTION  
REPORT 05000317/2016003 AND 05000318/2016003 AND INDEPENDENT  
SPENT FUEL STORAGE INSTALLATION REPORT 07200008/2016001**

Dear Mr. Hanson:

On September 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2. On October 19, 2016, the NRC inspectors discussed the results of this inspection with Mr. George Gellrich, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at CCNPP. In addition, if you disagree with the cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I, and the NRC Resident Inspector at CCNPP.

B. Hanson

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Sincerely,

*/RA/*

Anthony Dimitriadis, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

Docket Nos. 50-317 and 50-318  
License Nos. DPR-53 and DPR-69

Enclosure:  
Inspection Report 05000317/2016003 and  
05000318/2016003  
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos. 50-317 and 50-318

License Nos. DPR-53 and DPR-69

Report Nos. 05000317/2016003 and 05000318/2016003

Licensee: Exelon Generation Company, LLC (Exelon)

Facility: Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Location: Lusby, MD

Dates: July 1, 2016 through September 30, 2016

Inspectors: R. Clagg, Senior Resident Inspector  
C. Roettgen, Resident Inspector  
H. Anagnostopoulos, Health Physicist  
S. Barr, Senior Emergency Preparedness Inspector  
J. Nicholson, Senior Health Physicist  
A. Rosebrook, Senior Project Engineer  
E. Torres, Reactor Operations Engineer

Approved by: Anthony Dimitriadis, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

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## SUMMARY

Inspection Report 05000317/2016003, 05000318/2016003; 07/01/2016 – 09/30/2016; Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2; Operability Determinations and Functionality Assessments.

This report covers a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. The inspectors identified one non-cited violation (NCV) of very low safety significance (Green). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 4, 2014. All violations of U.S. Nuclear Regulatory Commission (NRC) requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated August 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### Cornerstone: Barrier Integrity

- Green. The inspectors identified a Green non-cited violation (NCV) of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion III, "Design Control," for Exelon's failure to establish measures to assure that the design basis was correctly translated into specifications affecting safety related functions of air operated valves (AOV). Specifically, when implementing a design change, Exelon failed to verify the air pressure supplied to AOVs in the component cooling (CC) water system was adequate to ensure that the valves would have performed their safety function to close during certain specific accident conditions. The inspectors determined that Exelon's failure to verify ECP-15-000213 ensured that air pressure supplied to safety related Unit 1 CC heat exchanger (HX) outlet AOVs was sufficient to support their safety function of closing during a design basis accident (DBA) was a performance deficiency that was reasonably within its ability to foresee and correct and should have been prevented. Exelon's immediate corrective actions included conducting an engineering evaluation that demonstrated the operability of the CC system in the degraded condition and increasing the air pressure supplied to the CC HX outlet valves to ensure the valves are capable of fully closing during a DBA. Exelon entered this issue into its corrective action program (CAP) as action request (AR) 02680281.

The inspectors reviewed IMC 0612, Appendix B, "Issue Screening," and determined the issue is more than minor because it adversely affected the design control attribute of the Barrier Integrity cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The inspectors also reviewed IMC 0612, Appendix E, "Examples of Minor Issues," and found it was sufficiently similar to Example 3.j, in that the design analysis deficiency resulted in a condition where reasonable doubt existed regarding the operability of the Unit 1 CC HX outlet valves. In accordance with IMC 0609, Attachment 4, "Initial Characterization of Findings," issued on June 19, 2012, and IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," issued on June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) since, the finding did not involve an actual open pathway in the physical integrity of reactor containment. The inspectors determined that the cause of the finding has a cross-cutting aspect in the area of Human Performance, Documentation, because Exelon's AOV program, as implemented by

ER-AA-410, "Air Operated Valve Implementing Program," Revision 2, did not require that complete, accurate, and up-to-date documentation on the CC HX outlet valves' design be maintained. [H.7] (Section 1R15)

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On September 11, 2016, operators reduced power to 83 percent for main turbine valve testing and restored the unit to 100 percent power the same day. The unit remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power. The unit remained at or near 100 percent power for the remainder of the inspection period.

## 1. REACTOR SAFETY

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

#### 1R01 Adverse Weather Protection (71111.01 – 2 samples)

##### Readiness for Impending Adverse Weather Conditions

##### a. Inspection Scope

The inspectors performed a review of Exelon's readiness for the impending adverse weather conditions listed below. The inspectors reviewed the implementation of adverse weather preparation procedures and conducted plant walkdowns before the onset of these adverse weather conditions. The inspectors verified that operator actions defined in Exelon's adverse weather procedure maintained the readiness of essential systems. The inspectors discussed readiness and staff availability for adverse weather response with operations and work control personnel. Documents reviewed for each section of this inspection report are listed in the Attachment.

- Forecasted high winds, July 18, 2016
- Tropical storm warning, September 1, 2016

##### b. Findings

No findings were identified.

#### 1R04 Equipment Alignment

##### Partial System Walkdowns (71111.04Q – 3 samples)

##### a. Inspection Scope

The inspectors performed partial walkdowns of the systems listed below. The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable procedures, system diagrams, the Updated Final Safety Analysis Report (UFSAR), technical specifications (TS), work orders (WOs), ARs, and the impact of ongoing work



activities on redundant trains of equipment in order to identify conditions that could have impacted the system's performance of its intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Exelon staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

- 1B emergency diesel generator (EDG) and 0C diesel generator during 1A EDG out of service due to a failed load sharing unit, July 28, 2016
- 22 and 23 auxiliary feedwater (AFW) pumps during 21 AFW pump out of service for drain line modification, August 30, 2016
- 12 Control Room heating, ventilation, and air conditioning (HVAC) during 11 saltwater (SW) air compressor out of service for 12 AFW emergency ventilation modification, September 20, 2016

b. Findings

No findings were identified.

1R05 Fire Protection

Resident Inspector Quarterly Walkdowns (71111.05Q – 4 samples)

a. Inspection Scope

The inspectors conducted a tour of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that Exelon controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out of service, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Unit 1, 69' Electrical Room, Fire Area 37, August 28, 2016
- Unit 2, 69" Electrical Room, Fire Area 38, August 28, 2016
- Unit 2, Horizontal Chase, Fire Area 35, September 13, 2016
- Unit 1, Horizontal Chase, Fire Area 36, September 13, 2016

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance  
(71111.11Q – 2 samples)

.1 Quarterly Review of Licensed Operator Regualification Testing and Training

a. Inspection Scope

The inspectors observed a licensed operator simulator training scenario on September 6, 2016, which involved a steam generator tube rupture resulting in an Alert declaration. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by, and the technical specification action statements entered by the shift manager. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

On August 10, 2016, the inspectors observed licensed operators in the main control room during a response to Unit 2 loss of 22 SW cooling header and verified operator performance met the standards of Exelon procedure OP-AA-101-111-1001, "Operations Standards and Expectations," Revision 18. The inspectors observed procedure use and adherence, crew communications, and coordination of activities between work groups to verify that established expectations and standards were met.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 3 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, and component (SSC) performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance WOs, and maintenance rule basis documents to ensure that Exelon was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by the Exelon staff was reasonable. As

applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that the Exelon staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Pressure switch 1-PS-10216, EDG 1A1 Lube Oil Pressure Switch, is leaking oil (AR02698078)
- 2-LI-1114D corrected for out of specification (AR02546816)
- Lost maintenance and test equipment (AR02709583)

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that Exelon performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that Exelon personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When Exelon performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Updated maintenance risk assessment for forecasted high winds affecting offsite power, July 19, 2016
- Updated maintenance risk assessment for tropical storm warning, September 1, 2016
- Unit 1, maintenance risk assessment activities for the week of September 5, 2016
- Unit 1, maintenance risk assessment activities for the week of September 19, 2016
- Units 1 and 2, updated maintenance risk assessment for 1A EDG out of service for unplanned maintenance, September 26, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 6 samples)a. Inspection Scope

The inspectors reviewed operability determinations for the degraded or non-conforming conditions listed below based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TS and UFSAR to Exelon staff's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, such as in the case of operator work arounds (OWA), the inspectors evaluated whether the measures in place would function as intended and were properly controlled by Exelon staff. The inspectors verified that Exelon staff identified OWAs at an appropriate threshold and addressed them in a manner that effectively managed OWA-related adverse effects on operators and SSCs.

- Failing indication on RCS loop 21 hot leg channel 'A' narrow range, 2-TE-112HA (AR02698815)
- Evaluate single CCHX line up (AR02439913)
- Ovation fiber optic cable separation (AR02706780)
- 21 main steam line radiation monitor, 2-RID-5321, declared inoperable (AR02701016)
- Water intrusion through cork expansion joints (AR02715199)
- Functionality of the 0C diesel generator during foreign material found on 1A EDG pistons (AR02720395)

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 3 samples)Permanent Modificationsa. Inspection Scope

The inspectors evaluated the modifications listed below and evaluated the design bases, licensing bases, and performance capability of the affected systems to determine if they were degraded by the modifications. In addition, the inspectors reviewed modification documents associated with the upgrade and design change. The inspectors also reviewed revisions to the UFSAR and system design basis documents to ensure the modifications were incorporated into these documents.

- ECP-12-000318, "AFW pump room emergency ventilation modification," Revision 0
- ECP-14-000184, "AFW auto drain modification," Revision 0

- ECP-15-000213, "Provide Safety-Related Air to Component Cooling Water Heat Exchanger Isolation Valves 1(2)-CV-3824 and 1(2)-CV-3826, Revision 0

b. Findings

Introduction. The inspectors identified a Green NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for Exelon's failure to establish measures to assure that the design basis was correctly translated into specifications affecting safety related functions of AOVs. Specifically, when implementing a design change, Exelon failed to verify the air pressure supplied to AOVs in the CC water system was adequate to ensure that the valves would have performed their safety function to close during specific accident conditions.

Description. On June 5, 2015, Exelon implemented engineering change package (ECP) 15-000213, "Provide Safety-Related Air to CCW HX Isolation Valves 1(2)-CV-3824 and 1(2)-CV-3826," Revision 0002, which provided safety related air and electrical power to the Unit 1 and Unit 2 CC HXs outlet valves, AOVs 1-CV-3824, and 1-CV-3826. ECP-15-000213 was implemented as a corrective action to an issue identified by the inspectors and documented in NCV05000317,318/2015001-01: Component Cooling Operated in Unanalyzed Condition. NCV05000317,318/2015001-01 documented a condition adverse to quality in which CCNPP Units 1 and 2 were operated in an unanalyzed condition with both CC trains inoperable. Specifically, heat removal capacity consistent with the CCNPP Units 1 and 2 containment response analysis could not be obtained from the containment spray (CS) system, which protects the containment from overpressure conditions. With each units' CC HX in service during accident conditions with SW cooling available to only one CC HX, insufficient heat would be removed from containment to meet the current analysis. ECP-15-000213 was implemented to provide Exelon with a safety-related means to secure CC flow to a CC HX, with SW cooling unavailable. Subsequent analysis demonstrated that for Unit 2, ECP-15-000213 increased design margin in meeting the CCNPP Unit 2 containment response analysis, but was not required, unlike Unit 1 which did require the modification to meet the CCNPP Unit 1 containment response analysis.

The inspectors reviewed ECP-15-000213 and noted that documentation had not been provided demonstrating that the actuators for 1-CV-3824 and 1-CV-3826 were adequately sized and setup to meet the newly prescribed safety functions. Exelon informed the inspectors that this documentation was not available because the subject valves were classified as low safety significance and Exelon's AOV program, as implemented by Exelon procedure ER-AA-410, "Air Operated Valve Implementing Program," Revision 2, did not require design calculations for this class of valves. Exelon provided documentation of actuator sizing and setup for an identical valve 1-CV-3828. The inspectors reviewed the provided documentation, and identified that, based on the data provided, 1-CV-3824 and 1-CV-3826 would not have been capable of achieving their safety function to fully shut with the current valve actuator air pressure settings. Exelon performed design calculations for the CC HX outlet valves and confirmed that the valves could potentially have remained up to 10 degrees open following an attempt to shut them during a DBA. The inspectors reviewed these design calculations and a subsequent evaluation by Exelon and noted that in the degraded condition, the CC HXs were capable of removing more heat than was assumed in the CCNPP Unit 1 containment response analysis and thus remained operable. The inspectors concluded that although reasonable doubt as to the Unit 1 CC HX outlet valves' ability to fully shut

under DBA conditions had existed, Exelon had demonstrated that the CC system safety function had not been lost at any time after June 5, 2015. Upon identification, Exelon entered this issue into its CAP as AR02680281.

Analysis. The inspectors determined that Exelon's failure to verify ECP-15-000213 ensured that air pressure supplied to safety related Unit 1 CC HX outlet AOVs was sufficient to support their safety function of closing during a DBA was a performance deficiency that was reasonably within its ability to foresee and correct and should have been prevented. The inspectors reviewed IMC 0612, Appendix B, "Issue Screening," and determined the issue is more than minor because it adversely affected the design control attribute of the Barrier Integrity cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The inspectors also reviewed IMC 0612, Appendix E, "Examples of Minor Issues," and found it was sufficiently similar to Example 3.j, in that the design analysis deficiency resulted in a condition where reasonable doubt existed regarding the operability of the Unit 1 CC HX outlet valves. In accordance with IMC 0609, Attachment 4, "Initial Characterization of Findings," issued on June 19, 2012, and IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," Exhibit 3 – "Barrier Integrity Screening Questions," issued on June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) since, the finding did not involve an actual open pathway in the physical integrity of reactor containment.

The inspectors determined that the cause of the finding has a cross-cutting aspect in the area of Human Performance, Documentation, because Exelon's AOV program, as implemented by ER-AA-410, "Air Operated Valve Implementing Program," Revision 2, did not require that complete, accurate and up-to-date documentation on the CC HX outlet valves' design be maintained. [H.7]

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications. ECP-15-000213, was implemented to enable the CC HX outlet valves to be shut during a DBA with a loss of one SW cooling train using a safety related air source.

Contrary to the above, from June 5, 2015, to June 10, 2016, measures had not been established to assure the design of the Unit 1 CC HX outlet AOVs was correctly translated into specifications for the air supply pressure needed to support their design function of completely closing during a DBA concurrent with a loss of one train of SW cooling. Exelon's immediate corrective actions included conducting an engineering evaluation that demonstrated the operability of the CC system in the degraded condition and increasing the air pressure supplied to the CC HX outlet valves to ensure the valves are capable of fully shutting during a DBA. Because this violation is of very low safety significance (Green) and has been entered into Exelon's CAP (AR02680281), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000317/2016003-01, Deficient Design Control of Air Pressure Available for Unit 1 Component Cooling Water Air Operated Valves)**

1R19 Post-Maintenance Testing (71111.19 – 6 samples)a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with information in the applicable licensing basis and/or design basis documents, and that the test results were properly reviewed and accepted, and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job briefs and post-job critique where possible, and confirmed work site cleanliness was maintained. Additionally, the inspectors witnessed the test or reviewed test data to determine if quality control hold points were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- WO C93523725, repair of 1A EDG following failed surveillance test due to 1A EDG ramping to 62.7 Hz during slow speed start, July 29, 2016
- WO C93055398, 11 AFW pump auto-steam drain modification, August 11, 2016
- WO C93185183, safety injection discharge to charging header, 2-MOV-269, lubricate operator, September 20, 2016
- WO C93208689, 21 containment cooler service water outlet, 2-SV-1582, solenoid replacement, September 21, 2016
- WO C93066454, test and calibrate 11 4 kilovolt (kV) bus relay, IRY1A100, September 26, 2016
- WO C93156580, repair the high temperature coolant leaks on 1A EDG coolant unions, September 27, 2016

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 2 samples)a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied TS, the UFSAR, and Exelon procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether

the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the surveillance tests listed below.

- STPO-08A-2, "Test of 2A DG and 4kV Bus 21 UV," Revision 03000, August 2, 2016
- STPO-5A21-2, "21 Auxiliary Feedwater Pump Quarterly Surveillance Test," Revision 00100, August 3, 2016 (in-service testing)

b. Findings

No findings were identified.

**Cornerstone: Emergency Preparedness**

1EP2 Alert and Notification System Evaluation (71114.02 - 1 Sample)

a. Inspection Scope

An onsite review was conducted to assess the performance, maintenance, and testing of the CCNPP alert and notification system (ANS). During this inspection, the inspectors conducted a review of the ANS testing and maintenance programs. The inspectors reviewed the associated ANS procedures and the Federal Emergency Management Agency (FEMA) approved ANS Design Report to ensure compliance with design report commitments for system maintenance and testing. The inspection was conducted in accordance with 10 CFR 50.47(b)(5) and the related requirements of 10 CFR Part 50, Appendix E as criteria for determining compliance.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation System (71114.03 - 1 Sample)

a. Inspection Scope

The inspectors conducted a review of the CCNPP Emergency Response Organization (ERO) on-shift and augmentation staffing requirements and the process for notifying and augmenting the ERO. The review was performed to verify the readiness of key Exelon staff to respond to an emergency event and to verify Exelon's ability to activate their emergency response facilities (ERF) in a timely manner. The inspectors reviewed the CCNPP Emergency Plan for ERF activation and ERO staffing requirements, the ERO duty roster, applicable station procedures, augmentation test reports, the most recent drive-in drill reports, and corrective action reports related to this inspection area. The inspectors also reviewed a sample of ERO responder training records to verify training and qualifications were up to date. The inspection was conducted in accordance with 10 CFR 50.47(b)(2) and related requirements of 10 CFR Part 50, Appendix E, as criteria for determining compliance.

b. Findings

No findings were identified.



1EP5 Maintenance of Emergency Preparedness (71114.05 - 1 Sample)

a. Inspection Scope

The inspectors reviewed a number of activities to evaluate the efficacy of Exelon's efforts to maintain the CCNPP emergency preparedness program. The inspectors reviewed: letters of agreement with offsite agencies; the 10 CFR 50.54(q) Emergency Plan change process and practice; Calvert Cliff's maintenance of equipment important to emergency preparedness (EP); records of evacuation time estimate population evaluation; and provisions for, and implementation of, primary and backup ERF maintenance. The inspectors also verified Exelon's compliance at CCNPP with NRC EP regulations regarding: emergency action levels for hostile action events; protective actions for on-site personnel during events; emergency declaration timeliness; ERO augmentation and alternate facility capability; evacuation time estimate updates; and on-shift ERO staffing analysis.

The inspectors further evaluated Exelon's ability to maintain the CCNPP EP program through its identification and correction of EP weaknesses, by reviewing a sample of drill reports, actual event reports, self-assessments, 10 CFR 50.54(t) reviews, and EP-related condition reports. The inspectors reviewed a sample of EP-related condition reports initiated at CCNPP from January 2015 through August 2016. The inspection was conducted with 10 CFR 50.47(b) and the related requirements of 10 CFR Part 50, Appendix E as criteria for determining compliance.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06 – 1 sample)

Emergency Preparedness Drill Observation

a. Inspection Scope

On July 19, 2016, the inspectors reviewed and observed Exelon's performance of an EP drill that involved a thrown turbine blade, loss of 4kV bus, stuck open containment purge valve, and loss of coolant accident which required a General Emergency to be declared. The inspectors observed emergency response operations in the simulator, technical support center, and emergency operations facility to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures. The inspectors also attended the station drill critique to compare inspector observations with those identified by Exelon staff in order to evaluate Exelon's critique and to verify whether the Exelon staff was properly identifying weaknesses and entering them into the corrective action program. Drill issues were captured by Exelon in the CAP as AR02698217.

b. Findings

No findings were identified.

## 2. RADIATION SAFETY

### Cornerstone: Public Radiation Safety and Occupational Radiation Safety

#### 2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03) (4 samples)

##### a. Inspection Scope

The inspectors reviewed the control of in-plant airborne radioactivity and the use of respiratory protection devices in these areas. The inspectors used the requirements in 10 CFR Part 20, "Standards for Protection Against Radiation," Regulatory Guide (RG) 8.15, "Acceptable Programs for Respiratory Protection," RG 8.25, "Air Sampling in the Workplace," NUREG/CR-0041, "Manual of Respiratory Protection Against Airborne Radioactive Material," TS, and procedures required by TS as criteria for determining compliance.

##### Inspection Planning

The inspectors reviewed the UFSAR to identify ventilation and radiation monitoring systems associated with airborne radioactivity controls and respiratory protection equipment staged for emergency use. The inspectors also reviewed respiratory protection program procedures and current performance indicators for unintended internal exposure incidents.

##### Engineering Controls (1 sample)

The inspectors reviewed operability and use of both permanent and temporary ventilation systems, and the adequacy of airborne radioactivity radiation monitoring in the plant based on location, sensitivity, and alarm set-points.

##### Use of Respiratory Protection Devices (1 sample)

The inspectors reviewed the adequacy of Exelon's use of respiratory protection devices in the plant to include applicable as low as reasonably achievable (ALARA) evaluations, respiratory protection device certification, respiratory equipment storage, air quality testing records, and individual qualification records.

##### Self-Contained Breathing Apparatus for Emergency Use (1 sample)

The inspectors reviewed the following: the status and surveillance records for three Self-Contained Breathing Apparatus (SCBAs) staged in-plant for use during emergencies, Exelon's SCBA procedures, maintenance and test records, the refilling and transporting of SCBA air bottles, SCBA mask size availability, and the qualifications of personnel performing service and repair of this equipment.

##### Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with the control and mitigation of in-plant airborne radioactivity were identified at an appropriate threshold and addressed by Exelon's CAP.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04) (5 samples)

a. Inspection Scope

The inspectors reviewed the monitoring, assessment, and reporting of occupational dose. The inspectors used the requirements in 10 CFR Part 20, RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," and RG 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses," TS, and procedures required by TS as criteria for determining compliance.

Inspection Planning

The inspectors reviewed radiation protection program audits, National Voluntary Laboratory Accreditation Program (NVLAP) dosimetry testing reports and procedures associated with dosimetry operations.

Source Term Characterization (1 sample)

The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored. The inspectors verified the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry (1 sample)

The inspectors reviewed dosimetry NVLAP accreditation, onsite storage of dosimeters, the use of "correction factors" to align electronic personal dosimeter (EPD) results with NVLAP dosimetry results, dosimetry occurrence reports, and CAP documents for adverse trends related to external dosimetry.

Internal Dosimetry (1 sample)

The inspectors reviewed internal dosimetry procedures, whole body counter measurement sensitivity and use, adequacy of the program for whole body count monitoring of plant radionuclides or other bioassay technique, adequacy of the program for dose assessments based on air sample monitoring and the use of respiratory protection, and internal dose assessments for any actual internal exposure.

Special Dosimetric Situations (1 sample)

The inspectors reviewed Exelon's worker notification of the risks of radiation exposure to the embryo/fetus, the dosimetry monitoring program for declared pregnant workers, external dose monitoring of workers in large dose rate gradient environments, and dose assessments performed since the last inspection that used multi-badging, skin dose or neutron dose assessments.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with occupational dose assessment were identified at an appropriate threshold and properly addressed in the CAP.

b. Findings

No findings were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index (10 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal of the CCNPP Unit 1 and Unit 2 Mitigating Systems Performance Index for the systems listed below for the period July 1, 2015, through June 30, 2016:

- Emergency alternating current power system (MS06)
- High pressure injection system (MS07)
- Heat removal system (MS08)
- Residual heat removal system (MS09)
- Cooling water system (MS10)

To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors also reviewed the Exelon's operator narrative logs, ARs, event reports, system health reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Emergency Preparedness Performance Indicators (3 samples)

a. Inspection Scope

The inspectors reviewed data for the following three EP Performance Indicators (PI): (1) drill and exercise performance (EP01); (2) ERO drill participation (EP02); and, (3) ANS reliability (EP03). The last NRC EP inspection at CCNPP was conducted in the third calendar quarter of 2015. Therefore, the inspectors reviewed supporting documentation from EP drills and equipment tests from the third calendar quarter of 2015 through the second calendar quarter of 2016 to verify the accuracy of the reported PI data. The acceptance criteria documented in NEI 99-02, "Regulatory Assessment

Performance Indicator Guidelines,” Revision 7 was used as criteria for determining compliance.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 1 sample)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, “Problem Identification and Resolution,” the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that Exelon entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended AR screening meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, Exelon staff performed an evaluation in accordance with 10 CFR Part 21.

b. Findings

No findings were identified.

.2 Annual Sample: Review of Effectiveness of Corrective Actions Related to Noble Gas Releases During Vacuum Drying of Independent Spent Fuel Storage Installation Dry Shielded Canisters

a. Inspection Scope

On September 17, 2015, at the end of vacuum drying of the first Dry Shielded Canisters (DSC), DSC-77, of the Independent Spent Fuel Storage Installation (ISFSI) dry cask campaign, a radioactive gas release was detected by the wide range noble gas monitor. In response to the alarm, Exelon stopped work and evacuated the area. After an initial evaluation of the alarm was completed, Exelon continued with cask processing and backfilled the DSC with helium while performing a technical evaluation of the gas release. Subsequently, Exelon determined they experienced a release of Krypton-85 (Kr-85) gas from the fuel assemblies in the DSC. Exelon concluded the fuel had a small defect site such as a pin-hole break or hairline crack and, therefore, considered the fuel was undamaged, met TS requirements, and was acceptable for long term storage. In response to the event, Exelon developed procedure, NF-CA-622-2000, “Action Plan for Radioactive Gas Release During DSC Loading,” Revision 0. This procedure was developed to assist the staff in responding to and evaluating any potential future noble gas releases.

The inspectors reviewed Exelon’s program associated with fuel characterization and selection for storage. The inspectors reviewed the fuel selection package for DSC-77

and verified that Exelon was loading fuel in accordance with the specific license, TS, and procedures. The inspectors also confirmed that Exelon's characterization of the condition of the spent fuel in DSC-77 met NRC Interim Staff Guidance-1, "Classifying the Condition of Spent Nuclear Fuel for Interim Storage and Transportation Based on Function." The inspectors also discussed the basis of the action levels for different levels of evaluation specified in procedure NF-CA-622-2000 with Exelon staff and concluded that the action levels had an adequate technical basis.

The inspectors, with assistance from technical experts from the NRC's Office of Nuclear Materials Safety and Safeguards reviewed Exelon's apparent cause evaluation (ACE) AR02567856 performed after the 2015 ISFSI Campaign, work group evaluations performed for the releases observed on September 17 and October 10, 2015, and documented in AR02556357 and AR02567463. Technical evaluation, ECP-15-000531, "Evaluation of DSC77 Radiogas Release during Vacuum Drying," Revision 0, procedure NF-CA-622-2000, and other documents related to the gas release. The inspectors evaluated the effectiveness of the corrective actions developed from ACE AR02567586 during the 2016 ISFSI campaign which occurred the week of August 14, 2016.

b. Findings

No findings were identified.

During the vacuum drying process for a DSC, the water in the cask is removed per procedure which causes the fuel cladding temperature to progressively increase as expected. However, any latent fuel cladding defects close to the surface may open up due to this temperature change, causing a rapid depressurization of the fuel pin and release of noble gases, such as Kr-85. The magnitude and duration of the gassing event supports the conclusion that the event was caused by a pinhole defect. Such a defect, still allowed the fuel assembly to be considered undamaged and suitable for dry storage and transportation. It is not reasonable to expect that gassing could have been prevented during this process, so corrective actions were focused on response and evaluation.

On August 17, 2016, two small noble gas releases were detected (253 and 1175 micro Curie per second peak respectively). Inspectors evaluated Exelon's action in response to these releases and determined that actions taken were in accordance with NF-A-622-2000. The inspectors concluded that corrective actions were effective to enhance monitoring and awareness of the potential for noble gassing to occur during this evolution and that the releases were promptly evaluated. The inspectors did note that although the releases were documented in the station logs, the condition was not entered into the CAP until prompted by the inspectors. However, this does not represent a condition adverse to quality because the release was below all limits and action levels. Therefore, no violation of NRC requirements occurred.

4OA3 Follow-Up Events and Notices of Enforcement Discretion (71153 –2 samples).1 (Closed) Licensee Event Report (LER) 05000317.318/2015-003-00: Diesel Generator Inoperable Due to Lube Oil Filter Fouling Due to Coolant Leakby on a Cylinder Liner

On June 17, 2015, during 1A EDG surveillance testing, Exelon received annunciators for high lube oil differential pressure and subsequently secured the 1A EDG prior to successful completion of the surveillance test. Initial investigation by Exelon determined that, due to a degraded O-ring on an engine cylinder liner, engine coolant containing glycol had contaminated the 1A EDG lube oil. This caused a condition where the lube oil filters became clogged resulting in the high lube oil differential pressure condition. Subsequent investigation by Exelon identified that the degradation occurred most likely from the O-ring becoming twisted during storage and corrective action were initiated to ensure that O-rings were stored flat. During the follow on investigation, Exelon determined that the 1A EDG had been inoperable since the last successful surveillance test on May 21, 2015. During the intervening time between the two surveillance runs, the 1B EDG and 2B EDG had also been inoperable at separate times for testing. This resulted in two instances where a loss of safety function had occurred; onsite power with respect to the 1B EDG and Unit 2 control room ventilation power with respect to the 2B EDG.

The inspectors reviewed the root cause evaluation associated with this event and the Exelon's subsequent corrective actions. The inspectors did not identify any issues during the review of this LER. This LER is closed.

.2 (Closed) LER 05000317/2016-003-00: Unit 1 Automatic Trip on Loss of Load Due to Spurious Steam Generator High Level Turbine Trip

On May 31, 2016, CCNPP Unit 1 experienced an automatic reactor trip due to a spurious steam generator high level signal that resulted from the failure of the steam generator 11 channel 'B' high level turbine trip Under Voltage Logic Module, 12/4BL-XA27. Although contained within the safety related engineered safety features actuation system (ESFAS) this module and its associated function are non-safety related. The spurious high level trip signal resulted in a turbine trip followed by an automatic reactor protection system trip on loss of load. Subsequent investigation by Exelon identified that the two most probable causes of the failure were either intermittent failure of an integrated circuit of the under voltage logic module or an inadvertent solder bridge between a pin on the integrated circuit chip and the board. A refurbished and tested logic module was installed prior to returning Unit 1 to power. Exelon's planned corrective action to prevent recurrence is to replace the current ESFAS, including this non-safety related module, with a system that will eliminate single point vulnerabilities within this system.

The inspectors reviewed the root cause evaluation associated with this event and Exelon's subsequent corrective actions. The inspectors did not identify any issues during the review of this LER. This LER is closed.

.3 (Closed) LER 05000317/2016-002-00, Pressurizer Safety Relief Nozzle Dissimilar Metal Weld Flaw Exceeded American Society of Mechanical Engineers Code Allowable Limit.

On February 20, 2016, during CCNPP in-service inspections of Unit 1 dissimilar metal welds, an evaluation of recorded ultrasonic examination (UT) data identified the presence of one axially oriented flaw in a 4 inch Unit 1 pressurizer safety relief nozzle to safe end weld. The indicated flaw exhibited characteristics indicative of primary water stress corrosion cracking (PWSCC). The flaw was inner diameter connected and measured 81.6 percent through-wall. This measured axial flaw depth did not meet the American Society of Mechanical Engineers (ASME) Code allowable limit. The UT of this weld done in 2006 and 2010 had determined the axial flaw depth was only approximately 8 percent through-wall. After re-analysis of the prior UT data, the root cause was determined to be limitations in sizing data collection and analysis techniques prior to 2016 that were unable to connect the detected inner diameter indication to the full through-wall extent of ultrasonic signal response of the flaw. The weld was repaired using a full structural weld overlay repair method using PWSCC resistant material deposited around the circumference of the weld area. Two other Unit 1 welds that had previously shown potential PWSCC were examined with the new techniques and showed no change in their indication characteristics and remain within ASME Code allowable limits.

The inspectors reviewed the root cause evaluation associated with this event and Exelon's subsequent corrective actions. The inspectors did not identify any issues during the review of this LER. Additional inspection and details are documented in Section 4OA5 of this report. This LER is closed.

#### 4OA5 Other Activities

##### .1 Closure of Unresolved Item 05000317/2016001-01, Issue of Concern Regarding Characterization and Acceptance of a Relevant Indication in Pressurizer to Nozzle Dissimilar Metal Weld

###### Background:

An unresolved item was opened by the inspectors in inspection report (IR) 05000317, 318/2016001 (ML16120A074) relating to an issue of concern involving Exelon's acceptance and characterization of relevant indications in weld 4-SR-1006-1 during prior refuel outages. Additional inspection, including review of Exelon's root cause of this issue, was warranted to determine whether a performance deficiency existed. Exelon's letter to the NRC dated February 25, 2016, (ML16057A002), concluded a relevant indication in weld 4-SR-1006-1 was mischaracterized by a sequence of acceptable ultrasonic tests. This repeated mischaracterization led to Exelon incorrectly accepting the flaw during prior refuel outages because the flaw was not physically in conformance with ASME Code Section XI, Article IWA 3000.

###### a. Inspection Scope

During the CCNPP Unit 1 refueling outage 1R23, an ASME Section XI, Appendix VIII qualified ultrasonic examination was performed of the dissimilar metal safe end weld on the pressurizer safety relief valve RV-201, as required by ASME Code Case N-770-1, Inspection Item E, and 10 CFR 50.55a(g)(6)(ii)(F). The examination found a flaw in weld 4-SR-1006-1 that was axial in orientation, connected to the inside surface, and approximately 80 percent through wall. Because this flaw was located in a weld, in a



Class I component, Exelon implemented the requirements of Technical Requirements Manual 15.4.3.A.

The inspectors reviewed Report No. 16000207.401.R0, March 1, 2016, "Past Operability Evaluation of Weld #4-SR-1006-1 Axial Flaw Indication on the Safety Relief System at Calvert Cliffs Nuclear Power Plant, Unit 1" noting that the maximum operating pressure and temperature used for the analysis is for the Power Operated Relief Valve, Safety Relief Valve, Once Through Core Cooling faulted condition. For this condition, the maximum pressure is 2,485 psig and the maximum temperature is 668° F. The inspectors compared this against the design pressure of 2,485 psig and the design temperature of 675° F which is higher than the normal operating pressure and temperature of 2,235 psig and 653° F, respectively assuring the supporting evaluation was conservative.

The inspectors verified the analysis used the material properties of Alloy 600, which is the base metal equivalent of the Alloy 82/182 weld metal, and used the safe-end material (SA-182 F316) which will produce a more conservative (i.e. shorter) length flow size. The inspectors noted the yield strengths,  $\sigma_y$ , and ultimate tensile strengths,  $\sigma_u$ , were conservatively based on a bounding temperature of 700° F and the resulting flow stresses,  $\sigma_f$ , were for both of the selected materials.

Material	Yield Strength KSI	Ultimate Strength KSI	Flow Stress ( $\sigma_f$ ) KSI
Alloy 600	29.4	80	54.7
SA-182 F316	18.2	67	42.6

(These values are per ASME Boiler Pressure Vessel Code, Section II, Part D, 2004 Ed)

The allowable through wall length was determined using ASME Code, Section II, IWB-3640/Appendix C. The inspectors noted that structural factors for Service Level D conditions were used in the evaluation, which is consistent with the guidance for operability determinations in IMC 0326, "Operability Determinations and Functionality Assessments for Conditions Adverse to Quality."

This guidance states that the criteria of Appendix F of the ASME Code, Section III, can be used for operability determinations. The inspectors noted that C-5410 for a critical flow analysis was used and the analysis applied a structural factor of 1.3 to the hoop stress per ASME Code Section XI, C-2622, for Service Level D, to determine the allowable flaw length. The inspectors independently reduced equation C-5410 and arrived at the same allowable length of 26 inches for Alloy 600 and 20.1 inches for SA-182 F316.

The inspectors also reviewed Exelon's leakage calculation. The inspectors noted the leakage was determined assuming the flaw was through-wall using a windows based derivative of the Electric Power Research Institute (EPRI) PICEP software code based on Henry's homogeneous non-equilibrium critical flow model with additional flow resistance introduced due to the crack face and crack path involving PWSCC. The inspectors noted the crack-opening-area was determined using a correlation derived from EPRI Report NP-6301-D, "Ductile Fracture Handbook," June 1989, to determine

the crack-opening-depth for an elliptical flaw. The inspectors noted the analysis then used the derivative PICEP analysis to calculate acceptable leak rates of 0.14 gpm for a 4" crack length up to a leak rate of 47.5 gpm for a 16" crack length.

To assess the adequacy of the derivative PICEP software used for this analysis, the inspectors reviewed Report DEV1106.404, "SI-PCEP Software Verification and Validation Report," Revision 0, dated April 2013. The inspectors noted that PICEP was used to perform the leakage analysis for the evaluation of the Millstone Unit 2 surge line submitted to the NRC May 4, 1999. The NRC evaluated the results by using PICEP with slightly different inputs to arrive at similar results. PICEP was also used to perform a leak-before-break analysis for three small lines at the Kewanee plant that was also accepted by the NRC Sept 5, 2002.

The inspectors reviewed Exelon's LER discussion regarding the causes for not identifying this flaw in 2006 and 2010 when weld 4-SR-1006-1 was volumetrically examined. Exelon determined the causes involved limitations in UT sizing data collection and analysis techniques in examinations prior to 2016 and the application of a mechanical stress improvement process which made sizing of the flaw more difficult.

b. Observations and Assessment:

The inspectors determined the evaluation of this flaw used appropriate assumptions and methodologies. Because the acceptable Service Level D calculated flaw length was substantially longer than the as-found flaw, and even at long flaw lengths the calculated leakage rate would have been well within make-up capacity to the reactor coolant system, the inspectors concluded the as-found flaw was very unlikely to impact safe operation of the plant. Furthermore the inspectors concluded the licensee utilized the best available non-destructive examination and analysis techniques in 2006 and 2010, meeting or exceeding the required testing standards applicable during each examination

The inspectors reviewed LER 05000317/2016-002-00, Pressurizer Safety Relief Nozzle Dissimilar Metal Weld Flaw Exceeded American Society of Mechanical Engineers Code Allowable Limit, dated April 14, 2016, as documented in Section 4OA3 of this report. The inspectors did not identify any performance deficiencies associated with the prior characterization and acceptance of relevant indications in weld 4-SR-1006-1 because the best available ultrasonic technology, which exceeded the applicable requirements, mischaracterized the flaw and structural integrity was maintained per the ASME code. This URI is closed.

.2 Operation of an Independent Spent Fuel Storage Installation at Operating Plants (IP 60855 and 60855.1)

a. Inspection Scope

On August 15 to August 19, 2016, the inspectors observed and evaluated Exelon's loading of a DSC, DSC-80, associated with Exelon's current ISFSI dry cask campaign. The inspectors also reviewed Exelon's activities related to long-term operation and monitoring of their ISFSI. The inspectors verified compliance with the TS, regulations, and Exelon procedures.

The inspectors observed and evaluated Exelon's loading of the second NUHOMS-32PHB canister associated with their current ISFSI dry cask loading campaign. The inspectors observed cask processing operations including: loading of fuel into the DSC, blowdown, vacuum drying, helium backfilling, welding operations, visual tests, and dye penetrant tests. During performance of these activities, the inspectors evaluated Exelon's compliance with procedures, supervisory oversight, and communication and coordination between the personnel involved. The inspectors attended an Exelon briefing to assess their ability to identify critical steps of the evolution, potential failure scenarios, and human performance tools to prevent errors. The inspectors also reviewed loading and monitoring procedures and evaluated Exelon's adherence to these procedures.

The inspectors reviewed Exelon's program associated with fuel characterization and selection for storage. The inspectors reviewed the cask fuel selection package to verify that Exelon loaded fuel in accordance with the TS and site procedures.

The inspectors reviewed radiation protection procedures associated with the ISFSI loading campaign. The inspectors also reviewed the ALARA goal for the cask loading to determine the adequacy of Exelon's radiological controls and to ensure that radiation worker doses were ALARA, and that project dose goals could be achieved. The inspectors reviewed radiological survey records from the current loading campaign.

The inspectors reviewed inspections of the ISFSI pad and horizontal storage modules to assess the material condition of the pad and the loaded horizontal storage modules. The inspectors verified that Exelon appropriately performed surveillances in accordance with TS requirements. The inspectors verified that transient combustibles were not being stored on the ISFSI pad or in the vicinity of the loaded casks. Environmental reports were reviewed to verify that areas around the ISFSI site boundary were within the limits specified in 10 CFR Part 20 and 10 CFR 72.104.

The inspectors reviewed Exelon's 10 CFR 72.48 screening to verify that Exelon had appropriately considered the conditions under which they may make changes without prior NRC approval. The inspectors also reviewed ARs, audit reports, and self-assessments that were generated since Exelon's last loading campaign to ensure that issues were being properly identified, prioritized, and evaluated commensurate with their safety significance.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On October 19, 2016, the inspectors presented the inspection results to Mr. George Gellrich, Site Vice President, and other members of the Exelon staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

## SUPPLEMENTARY INFORMATION

### KEY POINTS OF CONTACT

#### Licensee Personnel

G. Gellrich, Site Vice President  
 M. Flaherty, Plant General Manager  
 A. Abady, Engineer  
 P. Amos, Manager, Emergency Preparedness  
 N. Bates, Senior Radiation Protection Technical Specialist  
 C. Brevig, Radiation Protection Technician  
 W. Buchanan, Manager, Reactor Engineering  
 N. Cahill, Reactor Engineer  
 D. Camp, Chemistry Technician  
 E. Darrow, Control Room Operator  
 C. Donovan, Supervisor, Fuel Handling  
 K. Ellwein, Radiation Protection Technician  
 B. Erdman, Manager, RP Technical Support  
 M. Fick, Principal Engineer, Regulatory Assurance  
 J. Gaines, Director, Site Work Management  
 K. Greene, Principal Engineer, Regulatory Assurance  
 P. Gregory, Senior Program Manager, Dry Cask Storage  
 R. Haley, Fire Marshall  
 J. Norris, Supervisor, Radiation Protection  
 J. Phillippi, Supervisor, Operations Shift  
 M. Salley, NDE Inspector [National Inspection & Consultants, Inc. (NIC)]  
 S. Sanders, Manager, Radiation Protection  
 H. Simpson, Technical Specialist, Radiation Protection  
 R. Termini, Manager, ISFSI Implementation & Support  
 M. Thompson, Senior Radiation Material Processor Technician  
 T. White, Manager, Reactor Services  
 J. Wood, Manager, ISFSI Implementation & Support  
 J. Wynn, Senior Engineer

### LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

#### Opened/Closed

05000317/2016003-01	NCV	Deficient Design Control of Air Pressure Available for Unit 1 Component Cooling Water Air Operated Valves (Section 1R15)
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#### Closed

05000317,318/2015-003-00	LER	Diesel Generator Inoperable Due to Lube Oil Filter Fouling Due to Coolant Leakby on a Cylinder Liner (Section 4OA3.1)
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05000317/2016-003-00	LER	Unit 1 Automatic Trip on Loss of Load Due to Spurious Steam Generator High Level Turbine Trip (Section 4OA3.2)
05000317/2016-002-00	LER	Unit 1 Pressurizer Safety Relief Nozzle Dissimilar Metal Weld Flaw Exceeded American Society of Mechanical Engineers Code Allowable Limit. (Section 4OA3.3)
05000317/2016001-01	URI	Issue of Concern Regarding Characterization and Acceptance of a Relevant Indication in Pressurizer to Nozzle Dissimilar Metal Weld (Section 4OA5.1)

### LIST OF DOCUMENTS REVIEWED

#### **Section 1R04: Equipment Alignment**

##### Procedures

OI-32A-2, Auxiliary Feedwater System, Revision 02800

##### Drawings

62153SH0006, Barrier Segment Drawing For Plant Elevation 69'-0", Revision 0  
62583SH0002, Auxiliary Feedwater System (Condensate), Revision 8

##### Miscellaneous

Operations Oil Addition Log

#### **Section 1R05: Fire Protection**

##### Procedures

Fire Fighting Strategies Manual, Revision 00201

##### Calculations

CA02243, Combustible Loading Analysis, Revision 3

#### **Section 1R12: Maintenance Effectiveness**

##### Procedures

MA-AA-716-040 Attachment 1, Measurement and Test Equipment Out of Tolerance Evaluation,  
for AR02709583

MA-AA-716-040, Control of Portable Measurement and Test Equipment Program, Revision 10

##### Action Requests

AR01700236

AR02381085

AR02696690

AR02698078

AR02709583

Miscellaneous

ECP-16-000574, Engineering Technical Evaluation of 1A EDG loads at raised frequency  
ER-AA-310-1005, (a)(1) Action Plan for the 1A EDG dated 8/28/2015  
Apparent Cause Investigation Report, 1A DG Lube Oil Pressure Switch (1-PS-10216) Leak

**Section 1R15: Operability Determinations and Functionality Assessments**

Procedures

ER-AA-410, Air Operated Valve Implementing Program, Revision 2

Action Requests

AR01700252  
AR01700413  
AR01859506  
AR02443423  
AR02564655  
AR02716546

Drawings

62153SH0001, Appendix "R" Separation Requirements Auxiliary Building & Containment  
Structures EL 69' 0", Revision 10

Miscellaneous

ECP 15-000213, Provide Safety-Related Air to CCW HX Isolation Valves 1(2)-CV-3824 and  
1(2)-CV-3826, Revision 0002  
QL00849, Barrier Function Table

**Section 1EP2: Alert and Notification System Evaluation**

Procedures

EP-AA-1000, Exelon Nuclear Standardized Radiological Emergency Plan, Revision 28  
EP-AA-1011, Exelon Nuclear Radiological Emergency Plan Annex for Calvert Cliffs Station,  
Revision 1  
EP-AA-120-1006, EP Reportability – Loss of Emergency Preparedness Capabilities, Revision 4  
EP-AA-120-1006-F-03, EP Reportability – Calvert Siren Failure Population Calculations,  
Revision 0  
EP-MA-121-1002, Alert and Notification System Program, Revision 12  
EP-MA-121-1003, Alert and Notification System Monitoring, Troubleshooting, and Testing  
Program, Revision 6  
EP-MA-121-1004, Alert and Notification System (ANS) Program, Revision 9

Miscellaneous

Alert and Notification System (ANS) Design Report, Revision 0 dated March 1, 2013  
ANS Maintenance Records, 2014, 2015, 2016  
ANS Testing Records, July 2014 – July 2016  
Calvert Cliffs Alert and Notification System Design Report, Revision 0  
Letter from John Price (Federal Emergency Management Agency) to Kenneth Mallette  
(Maryland Emergency Management Agency), Dated March 28, 2014

**Section 1EP3: Emergency Response Organization Staffing and Augmentation System**

Procedures

EP-AA-1011, Addendum 1, Calvert Cliffs Nuclear Power Plant On-Shift Staffing Analysis, Revision 0  
EP-AA-122-100, Drill and Exercise Planning and Scheduling, Revision 6  
EP-AA-122-100-F-13, Call-In Drill Checklist, Revision C  
TQ-AA-113, ERO Training and Qualification, Revision 29

Action Requests

AR02631688  
AR02678425  
AR02683879  
AR02689819

Miscellaneous

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**Section 1EP5: Maintenance of Emergency Preparedness**

Procedures

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Action Requests

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AR02438014	AR02581232
AR02439926	AR02586279
AR02448635	AR02586658
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AR02486897	AR02646652
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AR02529625	AR02693593
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Miscellaneous

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### **Section 2RS3: In-Plant Airborne Radioactivity Control and Mitigation**

#### Procedures

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CP-972, Determination of Tritium Activity, Revision 01000  
CY-AA-130-3200, Tritium, Gross Alpha, and Gross Beta Sample Preparation for  
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EP-CC-124-1001-F-04, Revision A  
RP-AA-13, Respiratory Protection Program Description, Revision 0  
RP-AA-301, Radiological Air Sampling Program, Revision 8  
RP-AA-302, Determination of Alpha Levels and Monitoring, Revision 7  
RP-AA-440, Respiratory Protection Program, Revision 13  
RP-AA-441, Evaluation and Selection Process for Radiological Respirator Use, Revision 6  
RP-AA-443, Quantitative Respirator Fit Testing, Revision 13  
RP-AA-825, Maintenance, Care, and Inspection of Respiratory Protective Equipment,  
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RP-AA-825-1020, Operation and Use of Supplied Air Line Respirators, Revision 1  
RP-AA-825-1035, Issue and Control of Respirators, Revision 2  
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RSP 2-301, Respiratory Protection Device Maintenance, Revision 01404  
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#### Action Requests

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AR02406609  
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AR02526779  
AR02526997  
AR02526998  
AR02526999  
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AR02583902  
AR02622832

Miscellaneous

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**Section 2RS4: Occupational Dose Assessment**

Procedures

RP-AA-220, Bioassay Program, Revision 11  
RP-AA-221, Review, Correction, and Analysis of Whole Body Count Data, Revision 2  
RP-AA-222, Methods for Estimating Internal Exposure From In-Vivo and In-Vitro Bioassay Data, Revision 5

RP-AA-250, External Dose Assessments from Contamination, Revision 6  
RP-AA-270, Prenatal Radiation Exposure, Revision 7  
RP-AA-700, Controls for Radiation Protection Instrumentation, Revision 4  
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Action Requests

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Miscellaneous

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5/26/2016  
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Trending for Scaling Factors, RP-AA-605 Attachment 1, Unit-2, 2Q2016  
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**Section 40A1: Performance Indicator Verification**

Procedures

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EP-AA-125-1003, ERO Readiness - Performance Indicators Guidance, Revision 11

Miscellaneous

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**Section 40A2: Problem Identification and Resolution**

Procedures

NF-CA-622-2000, Action Plan for Radioactive Gas Release During DSC Loading, Revision 0  
CC-AA-309-101, Engineering Technical Evaluations, Revision 14

Action Requests

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**Section 40A5: Other Activities**

Procedures

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ISFSI-04, ISFSI Loading of NUHOMS 32 PHB DSC, Revision 00100  
MN-1-319, Structure and System Walkdowns, Revision 01200  
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NF-CA-310-2000, Special Nuclear Material and Component Moving Requirements for Calvert  
Cliffs  
NF-AA-309, Attachment 4, Special Nuclear Material and Core Component Move Sheet  
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Action Requests

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AR02556321	AR02705552
AR02557444	AR02705576
AR02560356	AR02705662
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AR02567463	AR02567856
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Miscellaneous

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**LIST OF ACRONYMS**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ACE	apparent cause evaluation
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
ALARA	as low as is reasonably achievable
ANS	Alert and Notification System
AOV	air operated valves
AR	action request
ASME	American Society of Mechanical Engineers
CAP	corrective action program
CC	component cooling
CCNPP	Calvert Cliffs Nuclear Power Plant
CS	containment spray
DBA	design basis accident
DSC	dry shielded canister
ECP	engineering change proposal
EDG	emergency diesel generator
EP	emergency preparedness
EPD	electronic personal dosimeter
EPRI	Electric Power Research Institute
ERF	emergency response facilities
ERO	Emergency Response Organization
ESFAS	engineered safety features actuation system
Exelon	Exelon Generation Company, LLC
FEMA	Federal Emergency Management Agency
HVAC	heating, ventilation, and air conditioning
HX	heat exchanger
IMC	Inspection Manual Chapter
IR	inspection report
ISFSI	independent spent fuel storage installation
kV	kilovolt
LER	licensee event report
NCV	non-cited violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
OPS	Operations
OWA	operator work around
PI	performance indicators
PWSCC	Primary water stress corrosion and cracking
RG	regulatory guide
SCBA	self-contained breathing apparatus
SDP	significance determination process
SSC	structure, system, and component
SW	saltwater
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
URI	unresolved item
UT	Ultrasonic Examination
WO	work order