



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

April 27, 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 05000317/2016001 AND 05000318/2016001

Dear Mr. Hanson:

On March 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on April 20, 2016, with Mr. George Gellrich, Site Vice President, and other members of your staff.

NRC inspectors examined activities conducted under your licenses as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your licenses. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

No findings were identified during this inspection.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the

B. Hanson

-2-

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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 05000317/2016001 and 05000318/2016001
w/Attachment: Supplementary Information

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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. 05000317/2016001 and 05000318/2016001

Licensee: Exelon Generation Company, LLC (Exelon)

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

Location: Lusby, MD

Dates: January 1, 2016 through March 31, 2016

Inspectors: R. Clagg, Senior Resident Inspector
C. Roettgen, Resident Inspector
H. Anagnostopoulos, Health Physicist
M. Modes, Senior Reactor Inspector
A. Rosebrook, Senior Project Engineer
A. Siwy, Project Engineer

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

Enclosure

TABLE OF CONTENTS

SUMMARY	3
REPORT DETAILS	4
1. REACTOR SAFETY	4
1R01 Adverse Weather Protection	4
1R04 Equipment Alignment	5
1R05 Fire Protection	5
1R06 Flood Protection Measures	6
1R08 In-Service Inspection Activities	6
1R11 Licensed Operator Requalification Program and Licensed Operator Performance	10
1R13 Maintenance Risk Assessments and Emergent Work Control	11
1R15 Operability Determinations and Functionality Assessments	12
1R18 Plant Modifications	13
1R19 Post-Maintenance Testing	13
1R20 Refueling and Other Outage Activities	14
1R22 Surveillance Testing	15
1EP6 Drill Evaluation	15
2. RADIATION SAFETY	16
2RS1 Radiological Hazard Assessment and Exposure Controls	16
2RS2 Occupational ALARA Planning and Controls	17
2RS3 In-Plant Airborne Radioactivity Control and Mitigation	18
4. OTHER ACTIVITIES	18
4OA1 Performance Indicator Verification	18
4OA2 Problem Identification and Resolution	19
4OA3 Follow-Up Events and Notices of Enforcement Discretion	19
4OA6 Meetings, Including Exit	20
ATTACHMENT: SUPPLEMENTARY INFORMATION	20
SUPPLEMENTARY INFORMATION	A-1
KEY POINTS OF CONTACT	A-1
LIST OF ITEMS OPENED, CLOSED AND DISCUSSED	A-1
LIST OF DOCUMENTS REVIEWED	A-1
LIST OF ACRONYMS	A-6

SUMMARY

Inspection Report 05000317/2016001 and 05000318/2016001; 01/01/2016 – 03/31/2016; Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2; Routine Integrated Inspection Report.

This report covered a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. No findings were identified during this inspection. The U.S. Nuclear Regulatory Commission's (NRC's) program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On January 24, 2016, operators reduced power to 10 percent to repair a 500 kV high line drop cable. On January 25, during power ascension following repair of the 500 kV high line drop cable, a main condenser tube leak was identified in 13A waterbox and operators manually scrammed the unit as directed by plant procedures. Following repairs to the 13A waterbox, unit startup commenced on January 25 and the unit reached 100 percent power on January 28. On February 10, operators reduced power to 88 percent for main steam safety valve testing and on February 11, operators returned the unit to 97 percent power, the maximum power allowable based on coast down operations. Operators shut down the unit for a planned refueling outage on February 14. Unit startup began on March 9 and on March 12, upon reaching 88 percent power, operators reduced power to four percent to repair a hydraulic leak on the 12 main steam isolation valve (MSIV) actuator. The unit was returned to 100 percent power on March 13. 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 entire 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 blizzard conditions, January 22, 2016
- Forecasted tornado warning, February 24, 2016

b. Findings

No findings were identified.

1R04 Equipment Alignment

Partial System Walkdowns (71111.04Q – 4 samples)

a. Inspection Scope

The inspectors selected the systems listed below 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), issue reports (IRs), 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 corrective action program (CAP) for resolution with the appropriate significance characterization. The inspectors performed partial walkdowns of the systems listed below.

- Units 1 and 2 spent fuel pool cooling trains during defueled conditions, February 23, 2016
- 2A emergency diesel generator (EDG) during 2B EDG testing, March 15, 2016
- 21 and 22 service water (SRW) during 23 SRW pump outage, March 17, 2016
- 11 and 12 auxiliary feedwater (AFW) trains during 13 AFW pump outage, March 25, 2016

b. Findings

No findings were identified.

1R05 Fire Protection

Resident Inspector Quarterly Walkdowns (71111.05Q – 9 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.

- Outside yard area and buildings, Fire Area Yard, February 2, 2016
- Unit 1, Containment, Fire Area CNMT, February 24, 2016
- Unit 1, Turbine Building, Fire Area TB, March 1, 2016

- Unit 2, Turbine Building, Fire Area TB, March 1, 2016
- Intake Structure, Intake Structure outside and Intake Structure Pump Room, Fire Area IS, March 15, 2016
- 2B EDG Room, Fire Area 28, March 16, 2016
- 1B EDG Room, Fire Area 30, March 16, 2016
- 2A EDG Room, Fire Area 31, March 16, 2016
- Unit 2, SRW Pump Room, Fire Area 40, March 18, 2016

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors evaluated the Units 1 and 2 intake structure for internal flooding on March 31, 2016. The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to assess susceptibilities involving internal flooding. The inspectors also reviewed the CAP to determine if Exelon identified and corrected flooding problems and whether operator actions for coping with flooding were adequate. The inspectors focused on the adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers.

b. Findings

No findings were identified.

1R08 In-Service Inspection Activities (71111.08P – 1 sample)

a. Inspection Scope

During the period February 16–19 and February 29 – March 2, 2016, the inspectors conducted a review of the in-service inspection program activities at CCNPP Unit 1 to assess the effectiveness of Exelon's program for monitoring degradation of the reactor coolant system (RCS) boundary, risk-significant piping system boundaries, and the containment boundary.

Non-destructive Examination and Welding Activities (Section 02.01)

The inspectors reviewed the non-destructive evaluation of welds 30-RC-12B-10 and 4 SR 1006-1. These welds were chosen from the augmented inspection program conforming with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 2004 Edition, no Addenda as modified by ASME Nuclear Code Case N-770-1 which is further modified by Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55a(g)(6)(ii)(F). The inspectors directly observed the encoded ultrasonic test data and reviewed the subsequent disposition of indications. The inspectors verified the activities were performed in accordance with Exelon's augmented inspection

program and associated examination procedure in conformance with Exelon's request for relief request (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15075A018) as granted by the NRC (ADAMS Accession No. ML16033A408). The inspectors verified that indications and defects, if present, were dispositioned in accordance with Exelon's procedures and NRC requirements.

The inspectors previously reviewed the volumetric examination of 4-SR-1006-1 (pressurizer safety relief valve RV-201 safe end weld) in 2010 as discussed in NRC Inspection Report 05000317/2010002 and 05000318/2010002, Section 1R08 (ADAMS Accession No. ML101250610). As stated in the report, the inspectors reviewed the conventional ultrasonic test data from 2006 for this weld, when mechanical stress improvement was applied, and reviewed the 2010 retest using the same methodology. In 2010, the inspectors reviewed the digitized construction radiographs with the Constellation Radiography Level III, and compared this with the ultrasonic mapping implemented by the Constellation Ultrasonic Test Level III qualified individual. Also in 2010, the inspectors reviewed all the data from these inspections, as well as the results of inspections of similar welds on the replaced pressurizer at the Crystal River plant and the pressurizer taken from a terminated Washington Nuclear Power Plant Project with Electric Power Research Institute ultrasonic test consultants. The inspectors then compared this data with the relevant indication(s) at CCNPP that were reported during the 2010 insonification of the weld, using best-available ultrasonic testing qualified to ASME Section XI, Appendix VIII, and accepted by the owners of CCNPP Unit 1 for continued service to determine if the acceptance was appropriate.

During the current refueling outage the inspectors verified, based on the currently applied higher resolution, ASME Section XI, Appendix VIII qualified, ultrasonic examination that the CCNPP staff's prior acceptance incorrectly characterized a relevant axial indication. The inspectors identified the prior return-to-service of an axial indication in weld 4 SR 1006-1 resulted in a rejectable flaw being returned to service. The inspectors discussed with Exelon staff the possibility this flaw had been present in 2006 and subject to mechanical stress relief. The inspectors noted the relevant indication was correctly recorded in accordance with ASME Code Section XI, Article IWA-3200. As directed by the inspection procedure, the inspectors informed the Office of Nuclear Reactor Regulation, Division of Engineering, Component Performance, Non-Destructive Examination and Testing Branch.

The inspectors reviewed Exelon's report of this flaw to the NRC in Event Notification #51747 dated February 20, 2016. The inspectors reviewed Exelon's subsequent letter (ADAMS Accession No. ML16057A002) dated February 25, 2016, to the NRC describing their previous examinations and conclusions, the preliminary causes of the flaw, and their plans to complete a root cause analysis.

Welding on Pressure Boundary Systems

The inspectors reviewed the pressure boundary risk significant welding activity, including associated non-destructive evaluation, of the full structural weld overlay repair of 4 SR-1006-1 necessitated by the presence of a relevant flaw, now characterized as an unacceptable defect. The inspectors verified that the welding and acceptance were performed in accordance with the requirements of ASME Nuclear Code Case N-740-1. The inspectors compared the design of the weld overlay with the requirements of Nuclear Code Cases N-504-4 and N-638-4. The inspectors discussed the essential

weld elements with the Exelon Welding Program manager, including compliance with the requirements of ASME Section III, NB-5400 for certification of the weld material for Delta Ferrite and ductility. The inspectors verified the following features of the welding activity:

- The welding procedure specification contained the essential, and where applicable, the supplemental essential variables in conformance with ASME Section IX, QW-200
- The welding procedure specification essential and supplemental essential weld variables were within the range qualified by the supporting Procedure Qualification Record as required by ASME Code Section IX, QW-250
- The weld records were reviewed to determine welding was performed with the base and weld filler materials listed in the welding procedure specification

The inspectors also reviewed the records of the final acceptance non-destructive examination against the above requirements. Details of the weld overlay repair were reported to the NRC in a letter dated March 5, 2016 (ADAMS Accession No. ML16069A020).

Vessel Upper Head Penetration Inspection Activities (Section 02.02)

No visual or volumetric examinations were performed. The inspectors noted the NRC granted relief from the volumetric examination frequency of ASME Code Case N-729-1 pursuant to 10 CFR 50.55 a(z)(1) as required by 10 CFR 50.55a(g)(6)(ii)(D) (ADAMS Accession No. ML15327A367). The mandated volumetric inspections have been deferred for Unit 1 until the spring 2022 outage and for Unit 2 until the 2023 spring outage. The inspectors noted the granted relief stipulated the visual examinations shall continue in conformance with ASME Code Case N-729-1, Table 1, item B4.30. The bare metal visual examination is to be performed in 2019 for Unit 1 and not later than 2016 for Unit 2.

Boric Acid Corrosion Control Inspection Activities (Section 02.03)

The inspectors reviewed the following engineering evaluations performed for boric acid found on RCS piping and components:

- ASME Section XI Repair/Replacement Program, "2015-2-032", Revision 1, WO C93049383
- ASME Section XI Repair/Replacement Program, "2014-2-270", Revision 1, Maintenance Order C92715497

The inspectors determined whether Exelon staff properly applied applicable corrosion rates to the affected components and properly assessed the effects of corrosion induced wastage on structural or pressure boundary integrity. The inspectors confirmed that corrective actions were consistent with requirements of the ASME Code and 10 CFR 50, Appendix B, Criterion XVI.

Steam Generator Tube Inspection Activities (Section 02.04)

Pressure Testing

No in situ pressure testing was performed.

Degradation Management

The inspectors compared the number of tubes affected by wear, and limiting flaw sizes, with that predicted by the previous refueling outage operational assessment to evaluate Exelon staff's relative accuracy in predicting degradation. The inspectors reviewed the results of the current examinations to determine how well Exelon staff were able to predict future tube performance by comparing the current results with the values predicted in the previous outage operational assessment. The inspectors then evaluated the scope of eddy current testing to determine if areas of potential degradation were inspected, noting if areas known to represent eddy current challenges were included. Lastly, the inspectors compared the steam generator tube eddy current examination scope and expansion criteria with TS requirements to determine if the scope and expansion criteria were in compliance with TS requirements.

The inspectors reviewed the level of tube degradation and repair attributable to secondary side structures such as foreign object abrasion. The inspectors reviewed secondary side examinations and compared the actions taken with the guidance contained in the Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines, Part 10 (ADAMS Accession No. ML1000480242). The inspectors reviewed Exelon's corrective action taken in response to any observed degradation.

Tube Repairs

No steam generator tubes required repair.

Generator Leakage

There was no steam generator leakage identified during the prior period of operation.

Eddy Current Technique Qualification

The inspectors reviewed a sample of Exelon's vendor and Electric Power Research Institute Appendices H and I (Pressurized Water Reactor Steam Generator Examination Guidelines) Examination Technique Specification Sheets to determine if the eddy current probes and equipment were qualified for detection or sizing of the expected types of tube degradation. In particular, the inspectors focused the review on the site specific factors potentially affecting the qualification of one or more techniques. The inspectors verified that the appropriate eddy current probe was used to detect the type of flaw that might be expected. The inspectors also verified that the equipment was calibrated in accordance with the eddy current test procedure(s) and ASME Code.

Secondary Side Degradation

The inspectors reviewed Exelon's corrective actions for loose parts or foreign material in the secondary side of the steam generator. The inspectors examined if Exelon staff planned repairs or if an engineering evaluation of affected steam generator tubes was performed. The inspectors observed the examination of the secondary side of the steam generator and the process to remove foreign objects. For foreign objects that were inaccessible, and not removed, the inspectors reviewed if Exelon staff performed an evaluation that considered the potential effects of object migration and tube fretting damage.

Identification and Resolution of Problems (Section 02.05)

The inspectors verified that Exelon staff were identifying in-service inspection and steam generator problems at an appropriate threshold and entering them in the CAP. The inspectors selected a sample of problems associated with in-service inspection and steam generator inspection documented by Exelon staff and verified the appropriateness of the corrective actions. The inspectors used the guidance in Inspection Procedure 71152, "Problem Identification and Resolution," to evaluate the corrective actions. The inspectors also determined if Exelon staff were assessing the applicability of operating experience to their plant.

b. Findings

Introduction. An unresolved item (URI) was identified by the inspectors relating to an issue of concern involving Exelon's acceptance and characterization of the relevant indication in weld 4-SR-1006-1 during prior refuel outages. Additional information is required to determine whether a performance deficiency, which is more than minor, exists.

Description. Based on a review of Exelon letter dated February 25, 2016, the inspectors preliminarily concluded the relevant indication in weld 4-SR-1006-1 was incorrectly accepted during prior refuel outages and was not in conformance with ASME Code Section XI, Article IWA-3000. Additional inspection, including review of Exelon's root cause analysis of this issue, is warranted to determine whether a performance deficiency, which is more than minor, exists related to characterization and acceptance of a relevant indication in weld 4-SR-1006-1. **(URI 05000317/2016001-01, Issue of Concern Regarding Characterization and Acceptance of a Relevant Indication in Pressurizer to Nozzle Dissimilar Metal Weld)**

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 3 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator training on February 8, 2016, which involved a scenario of a refueling outage shutdown. 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 classifications made by the shift manager and the TS 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

The inspectors observed licensed operators in the main control room performing the activities listed below. The inspectors observed pre-shift briefings, reactivity control briefings, procedure use and adherence, crew communications, and coordination of activities between work groups to verify that established expectations and standards were met.

- Unit 1 reactor startup on January 25, 2016
- Unit 1 reactor startup on March 9–10, 2016

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 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.

- Units 1 and 2, updated maintenance risk assessment for forecasted blizzard conditions, January 22, 2016

- Unit 2, updated maintenance risk assessment with transformer P-13000-1 out of service for maintenance, February 18, 2016
- Unit 2, updated maintenance risk assessment for forecasted severe weather/tornado warning during Yellow risk conditions, February 24, 2016
- Unit 1, maintenance risk assessment activities for the week of March 21, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 5 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- 12 atmospheric dump valve while in manual had a step open in valve position (IR02616453)
- 11 electric fire pump failed STP-F-696 (IR02601077)
- Broken lead on 12 engineered safety features actuation system (ESFAS) steam generator level indicating controller (IR02629863)
- 11 RCS Hot Leg temperature element is low out of specification during cross calibration (IR02637711)
- 11 AFW failed overspeed trip test (IR02633128)

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 determined 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 structures, systems, and components (SSC).

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 2 samples)Permanent Modificationsa. Inspection Scope

The inspectors evaluated the modifications listed below and verified that the design bases, licensing bases, and performance capability of the affected systems were not 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-13-000187, Replacement of Unit 1 Main Steam Safety Valves
- ECP-14-000060, Modify MSIV Closure Capability

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 9 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 verify quality control hold points were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- WO C91390004, replace check valve CKVIA-729, February 23, 2016
- WO C92894373, National Fire Protection Association 805 modification, fail open AFW steam admission valves, February 24, 2016
- WO C91950554, disassemble and inspect 1 CKVSI-410, 12 high pressure safety injection (HPSI) suction, February 25, 2016
- WO C92795994, operational check of 11 and 12 containment air cooler 1BKR252-1102, February 25, 2016
- WO C92758105, replace AFW power supply 1YX4507, February 29, 2016
- WO C92681898, rework power scheme for Unit 1 safety injection tank level and pressure wide range indication loops, March 1, 2016
- WO C92795946, replace 11 containment spray header valve ISV4150, March 2, 2016

- WO C92795488, environmental qualification replacement of 11 volume control tank inlet solenoid valve, March 4, 2016
- WO C92999690, perform positioner maintenance and calibrate control components on 1CV4525, March 21, 2016

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance and refueling outage 1R23, which was conducted February 14 through March 9, 2016. The inspectors reviewed Exelon's development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable TSs when taking equipment out of service
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that TSs were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of containment closure as required by TSs
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management
- Tracking of startup prerequisites, walkdown of the primary containment to verify that debris had not been left which could block the emergency core cooling system suction strainers, and startup and ascension to full power operation
- Identification and resolution of problems related to refueling outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 11 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.

- STP-O-8A-2, "Test of 2A EDG and 4kV Bus 21 Loss of Coolant Incident Sequencer," Revision 29, February 4, 2016
- STP-O-73I-2, "HPSI Pump and Check Valve Quarterly Operability Test," Revision 11, February 9, 2016 (in-service test)
- STP-O-63-2, "Remote Shutdown and Post Accident Monitoring Instrument Channel Check," Revision 33, February 16, 2016
- STP-O-56B, "ESFAS Equipment Response Time," Revision 18, February 16, 2016
- STP-O-108D, "Containment Penetration Local Leak Rate Test," Revision 603, (ICV505), February 18, 2016 (containment isolation valve)
- STP-O-073G-1, "HPSI Large Flow Test," Revision 8, February 19, 2016
- STP-O-073L-1, "Low Pressure Safety Injection Pump Performance Test, Revision 01001, February 19, 2016
- STP-O-13-1, "Shutdown ESFAS Logic Test," Revision 4, February 23, 2016
- STP-O-066I-1, "Salt Water Emergency Overboard Valve Operational Test," Revision 0, February 24, 2016
- STP-O-73M-1, "Containment Spray Flow Test," Revision 8, March 2, 2016
- STP-O-027-1, "Reactor Coolant System Leakage Evaluation," Revision 20, March 30, 2016 (RCS leakage)

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness1EP6 Drill Evaluation (71114.06 – 1 sample)Emergency Preparedness Drill Observationa. Inspection Scope

On March 24, 2016, the inspectors observed Exelon's performance of an emergency planning drill that involved a simulated toxic gas release that led to an explosion in the vital area followed by a loss of coolant accident resulting in a declaration of a general emergency. 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's staff and to evaluate whether the Exelon staff had properly identified weaknesses and entered them into the CAP. Drill issues were captured by Exelon in the CAP as IR02645286, IR02645349, IR02645368, IR02645437, IR02645452, and IR02645652, and were reviewed by the inspectors.

b. Findings

No findings were identified.

2. **RADIATION SAFETY**

Cornerstone: Public Radiation Safety and Occupational Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 1 sample)

a. Inspection Scope

The inspectors reviewed Exelon's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR 20, "Standards for Protection Against Radiation", TSs, applicable Regulatory Guides (RGs), and the procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the performance indicators for the occupational exposure cornerstone, radiation protection program audits, and reports of operational occurrences in occupational radiation safety since the last inspection.

Radiological Hazard Assessment

The inspectors reviewed recent plant radiation surveys and any changes to plant operations since the last inspection to identify any new radiological hazards for onsite workers or members of the public.

Instructions to Workers

The inspectors reviewed several occurrences where a worker's electronic personal dosimeter alarmed. The inspectors reviewed Exelon's evaluation of the incidents, documentation in the CAP, and whether compensatory dose evaluations were conducted when appropriate.

Contamination and Radioactive Material Control

The inspectors selected several sealed sources from inventory records and assessed whether the sources were accounted for and were tested for loose surface contamination. The inspectors evaluated whether any recent transactions involving nationally tracked sources were reported in accordance with requirements.

Radiological Hazards Control and Work Coverage

The inspectors evaluated in-plant radiological conditions and performed independent radiation measurements during facility walk-downs and observation of radiological work activities. The inspectors assessed whether posted surveys, radiation work permits, worker radiological briefings, and the use of continuous air monitoring and dosimetry monitoring were consistent with the present conditions. The inspectors examined the posting and physical controls for selected high radiation areas (HRAs), locked HRAs and very high radiation areas (VHRAs) to verify conformance with the occupational performance indicator.

Risk-Significant HRA and VHRA Controls (1 sample)

The inspectors reviewed the controls and procedures for HRAs, VHRAs, and radiological transient areas in the plant.

b. Findings

No Findings were identified

2RS2 Occupational ALARA Planning and Controls (71124.02 – 1 sample)

a. Inspection Scope

The inspectors assessed Exelon's performance with respect to maintaining occupational, individual and collective radiation exposures as low as is reasonably achievable (ALARA). The inspectors used the requirements contained in 10 CFR 20, applicable RGs, TSs, and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors conducted a review of Exelon's ongoing and planned radiological work activities.

Source Term Reduction and Control

The inspectors reviewed the current plant radiological source term and historical trend, plans for plant source term reduction, and contingency plans for changes in the source term as the result of changes in plant fuel performance or changes in plant primary chemistry.

Radiation Worker Performance (1 sample)

The inspectors observed radiation worker and radiation protection technician performance during the conduct of work activities.

Problem Identification and Resolution

The inspectors evaluated whether problems associated with ALARA planning and controls were identified at an appropriate threshold and properly addressed in the CAP.

b. Findings

No Findings were identified.

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

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 20; RG 8.15, "Acceptable Programs for Respiratory Protection"; RG 8.25, "Air Sampling in the Work Place"; NUREG/CR-0041, "Manual of Respiratory Protection Against Airborne Radioactive Material"; TSs; and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors also reviewed respiratory protection program procedures and current performance indicators for unintended internal exposure incidents.

Engineering Controls

The inspectors reviewed operability and use of temporary ventilation systems, and the adequacy of airborne radioactivity radiation monitoring in the plant.

Use of Respiratory Protection Devices

The inspectors reviewed the adequacy of Exelon's use of respiratory protection devices in the plant to include applicable ALARA evaluations and respiratory protection device certification.

b. Findings

No Findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

RCS Specific Activity and RCS Leak Rate (4 samples)

a. Inspection Scope

The inspectors reviewed Exelon's submittal for the RCS specific activity (BI01) and RCS leak rate (BI02) performance indicators for both Unit 1 and Unit 2 for the period of January 2015 through December 2015. 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 RCS sample analysis and control room logs of daily measurements for RCS

leakage and compared that information to the data reported by the performance indicator. Additionally, the inspectors observed surveillance activities that determined the RCS identified leakage rate, and chemistry personnel taking and analyzing an RCS sample.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

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 IR 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 21.

b. Findings

No findings were identified.

4OA3 Follow-Up Events and Notices of Enforcement Discretion (71153 – 2 samples)

Plant Event

a. Inspection Scope

For the plant event listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant event to appropriate regional personnel, and compared the event details with criteria contained in Inspection Manual Chapter 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that Exelon made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR 50.72 and 50.73. The inspectors reviewed Exelon's follow-up actions related to the event to assure that Exelon implemented appropriate corrective actions commensurate with their safety significance.

- Manual reactor trip of Unit 1 following a main condenser tube leak, January 25, 2016
- Reduction of reactor power on Unit 1 to four percent during repairs to MSIV actuator, March 12, 2016

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On April 20, 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
S. Agyem-Bediako, Site Industrial Safety Representative
N. Bates, Health Physicist
K. Greene, Regulatory Assurance Specialist
V. Johnson, Radiation Protection Supervisor
M. Layte, Exelon Corporate Health Physicist
R. Szocho, Organizational Effectiveness Manager
T. White, Site Reactor Services Manager
J. York, Radiation Protection Manager

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000317/2016001-01	URI	Issue of Concern Regarding Characterization and Acceptance of a Relevant Indication in Pressurizer to Nozzle Dissimilar Metal Weld (Section 1R08)
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LIST OF DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

Procedures

OI-32A, Auxiliary Feedwater System, Revision 02900

Drawings

60583SH0001, Auxiliary Feedwater System (Steam), Revision 64
60583SH0002, Auxiliary Feedwater System (Condensate), Revision 6

Section 1R05: Fire Protection

Procedures

MA-AA-716-025, Scaffold Installation, Modification, and Removal Request Process, Revision 11

Section 1R08: In-Service Inspection Activities

Procedures

BWXT Procedure "Multi-frequency Eddy Current Examination of Steam Generator Tubing, 8-QPP-761, Rev 004

BWXT Procedure Nondestructive Examination Personnel Qualification Eddy Current Method, 8-QPP-760, Revision 005.
Curtis – Wright, Nuclear Division, LMT, Nondestructive Examination Procedure, “Fully Encoded Phased Array Ultrasonic Examination of Dissimilar Metal Piping Welds”, LMT-10-PAUT-007, Revision 1, September 1, 2015
Performance Demonstration Initiative Program, PDQS 832
ASME Section XI Repair/Replacement Program, “2015-2-032”, Revision 1, Work Order C93049383
ASME Section XI Repair/Replacement Program, “2014-2-270”, Revision 1, Maintenance Order C92715497
Calvert Cliffs Nuclear Power Plant Technical Procedure, STP-M-574B-1, “Eddy Current Examination of CCNPP Unit 1 Steam Generator #12”, Revision 00200.
Calvert Cliffs Nuclear Power Plant Administrative Procedure, MN-3-123, “Boric Acid Corrosion Control Program”, Revision 00402, Undated
Boric Acid Corrosion Control (BACC) Program, ER-AP-331, Revision 8
Boric Acid Corrosion Control (BACC) Inspection Locations, Implementation, and Inspection Guideline, ER-AP-331-1001, Revision 8
Boric Acid Corrosion Control (BACC) Program Identification, Screening, and Evaluation. ER-AP-331-1002, Revision 9.
RCS Leakage Monitoring and Action Program, ER-AP-331-1003, Revision 8

Miscellaneous

Calvert Cliffs C1R23 – RSG ECT Inspection Plan, S000154.01-WKP-000002, 02/05/2016
Calibration Certificate Zetec MIZ-80 (iD) Eddy Current Tester, SN 165, Condition B, 11 January 2016
BWXT Project File (G-Ns00154) (ed. Preliminary ECT Field Report) 2/24/2016
Westinghouse MRS-SSP-3315, Rev 0, “Relief Nozzle Structural Weld Overlay”
ASME Code Relief ISI-04-05
WPS 8 MD-GTAW Rev 5
PQR 864 supported by 677, 750,770
WPS 43 MN-GTAW/SMAW
WPS 843/52MN-GTAW

Section 1R11: Licensed Operator Regualification Program and Licensed Operator Performance

Procedures

PSTP-02, Initial Approach to Critically and Low Power Physics Testing, Revision 03700
OP-AA-104-101, Communications, Revision 3
OP-AA-111-101, Operating Narrative Logs and Records, Revision 10

Issue Reports

02638029
02638470

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures

IMP98005, Bailey AV-1 Positioner Maintenance Checklist
VTM 15028-010-1002, Characterizable Pneumatic Positioners Type AV1 and AV2, Revision 02RP

MA-CA-743-310, Diagnostic Testing and Evaluations of Air Operated Valves, Revision 000

Section 1R15: Operability Determinations and Functionality Assessments

Procedures

STP F-696-0, Fire Pump Flow Test, Revision 902

STP-M-510CL-1, RPS Steam Generator Level Loop Calibration Check, Revision 00300

Drawings

61058, Logic Diagram Engineered Safety Features Actuation System, Unit 1, Revision 36

60904SH0013, 12 Steam Generator Level Channel "A" 201-58-ILT1123A, Revision 7

Calculations

M-93-124, Fire Protection System Relief Valve Modification, Hydraulic Calculation, Revision 0

Issue Reports

02601077

02618107*

02629863

*generated as a result of this inspection

Miscellaneous

Engineering Technical Evaluation IR 02601077, Revision 0

Engineering Technical Evaluation IR 02601077, Revision 1

Engineering Technical Evaluation IR 02601077, Revision 2

CCNPP UFSAR Section 9.9, Fire Protection Program, Revision 47

Section 1R20: Refueling and Other Outage Activities

Procedures

OP-2, Plant Startup from Hot Standby to Minimum Load, Revision 23

PSTP-02, Initial Approach to Critically and Low Power Physics Testing, Revision 03700

OI-43A, Main Turbine and Generator/Exciter Operation, Revision 04600

OP-3, Normal Power Operation, Revision 06600

Issue Reports

02637753

02637780

02638096

02638227

02638236

Section 1R22: Surveillance Testing

Procedures

STP O-63-2, Remote Shutdown and Post Accident Monitoring Instr Channel Check, Revision 33

STP-O-8A-2, Test of 2A EDG and 4KV Bus 21 LOCI Sequencer, Revision 29

STP-O-73M-1, Containment Spray Flow Test, Revision 8

Calculations

CA05689, Design Basis for the Minimum Performance Acceptance Criteria for the HPSI, LPSI, and Containment Spray Pump Large Flow Surveillance Test Procedures, Revision 1

Issue Reports

02619538

Miscellaneous

Calvert Cliffs Nuclear Power Plant Technical Specifications

Calvert Cliffs Nuclear Power Plant Technical Specifications Bases

Calvert Cliffs Nuclear Power Plant Surveillance Frequency Control Program List of Surveillance Frequencies, Revision 4

Regulatory Guide 1.9, Application and Testing of Safety-related Diesel Generators in Nuclear Power Plants, Revision 4

Calvert Cliffs Nuclear Power Plant Updated Final Safety Analysis Report

Section 2RS1: Radiological Hazard Assessment & Exposure ControlsProcedures

RP-AA-2-3-1001, Personnel Exposure Investigations, Revision 9

RP-AA-376, Radiological Postings, Labeling, and Markings, Revision 8

RP-AA-460, Controls For High and Locked High Radiation Areas, Revision 28

RP-AA-500, Radioactive Material Control, Revision 17

RP-AA-503, Unconditional Release Survey Method, Revision 10

Issue Reports

02431856	02440687	02454666	02455145
02455963	02455965	02456011	02456026
02459374	02463862	02463884	02464329
02473166	02513329	02522581	02524170
02529264	02529280	02529313	02529537
02529542			

Miscellaneous

Annual Inventory Reconciliation, Nationally Tracked Sources, dated 1/8/2015

Approval for Working in..., RP-AA-460-002 Attachment 3, dated 2/24/16

Establishing and Verifying VHRA Controls, RP-AA-460-001, dated 2/23/16

Graph, Steam Generator Dose Rates and Shutdown Cooling Dose Rates Following Hydrogen Peroxide Addition, 2012, 2014, and 2016.

High Radiation Key Index, Current

Multiple Dosimetry Issue Log, CC-1-16-00704

Radiological Risk Assessment Worksheet, RP-AA-401-1002, dated 2/3/16

Radiological Survey 2016-0149

Radiological Survey 2016-0171

Radiological Survey 2016-0172

Radiological Survey 2016-0186

Radiological Survey 2016-0241

Radiological Survey 2016-0246

Radiological Survey 2016-0269

Radiological Survey 2016-0283

Radiological Survey 2016-0306

Radiological Survey 2016-0309
Radiological Survey 2016-0310
Radiological Survey, Unit-1 Under-Vessel Area, dated 2/24/16
Radiological Work Permit (RWP) CC-0-15-00103, Revision 3
RWP CC-1-16-00502, Revision 0
RWP CC-1-16-00503, Revision 0
RWP CC-1-16-00505, Revision 0
RWP CC-1-16-00510, Revision 1
RWP CC-1-16-00613, Revision 0
RWP CC-1-16-00617, Revision 0
RWP CC-1-16-00619, Revision 1
Sealed Source Inventory Forms, RP-CA-800-10000, dated 1/20/16 and 2/16/16
Source Leak Test Record, RP-AA-800, dated 2/8/16
Source Leak Test Certificates, Radiation Safety & Control Services, for Four Ni-63 Sources, dated 1/19/16
Various CC1R23 Refueling Outage Schedule Products
Very High Radiation Area Briefing Form, RP-AA-460-001, dated 2/24/16
VHRA Access Log, RP-AA-460-001, dated 2/24/16
Whole Body Count Log, 1/1/16 to present

Section 2RS2: Occupational ALARA Planning and Controls

Miscellaneous

ALARA Briefing Form, RP-AA-401, ALARA Plan 16-0026, dated 2/24/16
ALARA Plan 16-0002, RP-AA-401, dated 2/1/16
ALARA Plan 16-0004, RP-AA-401, dated 2/2/16
ALARA Plan 16-0018, RP-AA-401, dated 2/8/16
ALARA Plan 16-0026, RP-AA-401, dated 1/27/16
ALARA Plan 16-0027, RP-AA-401, dated 1/15/16
ALARA Plan 16-0035, RP-AA-401, dated 2/2/16
ALARA Plan 16-0037, RP-AA-401, dated 1/15/16
ALARA Plan 16-0042, RP-AA-401, dated 2/2/16
ALARA Plan 16-0043, RP-AA-401, dated 2/2/16
ALARA Plan 16-0044, RP-AA-401, dated 1/15/16
ALARA Waiver, RP-AA-401, ALARA Plan 16-0026 dated 2/23/16
Radiological Survey Maps, Steam Generators, for 2012 and 2016
Radiological Survey Maps, Unit-1 Primary Containment, Initial Shut-Down Surveys, dated 2/15/16
Total Effective Dose Equivalent (TEDE) ALARA Evaluations, CC-0-15-00310
TEDE ALARA Evaluations, CC-0-16-00502
TEDE ALARA Evaluations, CC-0-16-00503
TEDE ALARA Evaluations, CC-0-16-00505
TEDE ALARA Evaluation, CC-1-16-00613
TEDE ALARA Evaluation, CC-1-16-00617
TEDE ALARA Evaluation, CC-1-16-00704
TEDE ALARA Evaluation Screening Worksheet, CC-1-16-00704

Section 2RS3: Airborne Radioactivity

Miscellaneous

Air Sample, ID# 20458, dated 2/16/16

Air Sample, ID# 26343, dated 2/16/16
 Air Sample, ID# 37771, dated 2/16/16
 Air Sample, ID# 42244, dated 2/16/16
 Air Sample, ID# 44762, dated 2/24/16
 Air Sample, ID# 46358, dated 2/24/16
 Air Sample, Upper Support Guide Lift, dated 2/24/16 at 1415

LIST OF ACRONYMS

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
ALARA	as low as is reasonably achievable
ASME	American Society of Mechanical Engineers
CAP	corrective action program
CCNPP	Calvert Cliffs Nuclear Power Plant
EDG	emergency diesel generator
ESFAS	engineered safety features actuation system
HPSI	high pressure safety injection
HRA	high radiation area
IR	issue report
MSIV	main steam isolation valve
NRC	Nuclear Regulatory Commission
OWA	operator work around
RCS	reactor coolant system
RG	regulatory guide
SRW	service water
SSC	structure, system, and component
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
URI	unresolved item
VHRA	very high radiation area
WO	work order