



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PA 19406-2713**

May 9, 2018

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 05000317/2018001 AND 05000318/2018001**

Dear Mr. Hanson:

On March 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2. On April 25, 2018, NRC inspectors discussed the results of this inspection with Mr. Mark Flaherty, 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 this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. 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 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/**

Michelle Catts, Acting 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 05000317/2018001 and  
05000318/2018001  
w/Attachment: Supplementary Information

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B. Hanson

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SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT – INTEGRATED INSPECTION REPORT 05000317/2018001 AND 05000318/2018001 DATED MAY 9, 2018

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## U.S. NUCLEAR REGULATORY COMMISSION

## REGION I

Docket Numbers: 50-317 and 50-318

License Numbers: DPR-53 and DPR-69

Report Numbers: 05000317/2018001 and 05000318/2018001

Enterprise Identifier: I-2018-001-0044

Licensee: Exelon Generation Company, LLC

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

Location: Lusby, MD

Inspection Dates: January 1, 2018 to March 31, 2018

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

Observer: A. Chereskin, Chemical Engineer

Approved by: Michelle Catts, Acting Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

## SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring Exelon Generation Company's, LLC (Exelon) performance at Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2 by conducting the baseline inspections described in this report in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/over-sight.html> for more information. NRC identified and self-revealed findings, violations, and additional items are summarized in the table below.

### List of Findings and Violations

Failure to Conduct Adequate Radiation Surveys and Evaluate Potential Radiological Hazards			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Occupational Radiation Safety	Green Non-Cited Violation 05000317/2018001-01 Closed	H.11 - Human Performance - Challenge the Unknown	71124.01
A self-revealed Green non-cited violation (NCV) of Title 10 <i>Code of Federal Regulations</i> (10 CFR) 20.1501, "Surveys and Monitoring: General," was identified when Exelon failed to perform adequate surveys of the 11 reactor coolant pump bay area following the aggregation of 25 high dose-rate in-core detectors in one area of the flooded refueling cavity, which is adjacent to the pump bay. Surveys were not performed as required after radiological conditions changed and radiological hazard mitigation measures, such as locking and controlling access in accordance with Exelon procedures, were not implemented, resulting in accessible dose-rates of up to 2,000 millirem per hour (mrem/hr) in the pump bay.			

## REPORT DETAILS

### PLANT STATUS

Unit 1 began the inspection period at rated thermal power and operated at or near full power until February 12, 2018, when the unit entered end-of-cycle coastdown operations. On February 18, 2018, operators commenced a shutdown, from 76 percent power, for a planned refueling outage. Operators commenced a reactor startup on March 16, 2018, and returned the unit to 100 percent power on March 18, 2018. On March 31, 2018, operators reduced power to 50 percent to repair a main turbine control valve.

Unit 2 operated at or near rated thermal power for the entire inspection period.

### INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors performed plant status activities described in IMC 2515 Appendix D, "Plant Status" and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess Exelon's performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards."

### REACTOR SAFETY

#### 71111.01 – Adverse Weather Protection

##### Impending Severe Weather (2 samples)

The inspectors evaluated readiness for impending adverse weather conditions for:

- (1) Forecasted high winds, March 1, 2018
- (2) Forecasted winter storm and high winds, March 21, 2018

#### 71111.04 - Equipment Alignment

##### Partial Walkdown (4 samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) 11 train onsite power distribution while the 14A 480V bus was out of service, February 23, 2018
- (2) 2B emergency diesel generator, 1A emergency diesel generator, 0C diesel generator while offsite power transformer P-13000-1 was out of service, February 27, 2018
- (3) Unit 1 containment fire protection (temporary) during overhaul of O-FP-141A, Fire Protection Supply Inboard Containment Isolation, March 7, 2018

- (4) Unit 2 'A' train auxiliary feedwater while 'B' auxiliary feedwater train was out of service for valve maintenance, March 7, 2018

#### 71111.05Q – Fire Protection Quarterly

##### Quarterly Inspection (6 samples)

The inspectors evaluated fire protection implementation in the following selected areas:

- (1) Unit 1, 27 foot Switchgear Room, Purge Air Room, and 45 foot Switchgear Room, Fire Areas 19, 19A, and 34 on January 12, 2018
- (2) Unit 1, Cable Spreading Room and 1C Chase, Battery Rooms, and Hallway Outside of Cable Spreading Room, Fire Areas 16, 16A, and 16B on January 29, 2018
- (3) Unit 2, Cable Spreading Room and 2C Chase, Battery Rooms, and Hallway Outside of Cable Spreading Room, Fire Areas 17, 17A, and 17B on January 29, 2018
- (4) Unit 1, Containment Building, Fire Area CNMT on February 20, 2018
- (5) Unit 1, Turbine Building, Fire Area TB on February 21, 2018
- (6) Unit 2, Turbine Building, Fire Area TB on February 22, 2018

#### 71111.06 – Flood Protection Measures

##### Internal Flooding (1 sample)

The inspectors evaluated internal flooding mitigation protections in the Unit 1 service water pump room during the week of February 26, 2018.

#### 71111.08 – Inservice Inspection Activities (1 sample)

The inspectors evaluated Exelon's non-destructive examination and welding activities at CCNPP, Unit 1 by reviewing the following activities and programs from February 26 to March 8, 2018:

- (1) Volumetric Examinations
  - a) Manual Ultrasonic Testing of Pipe to Elbow Weld, 16-FW-1218-10
  - b) Manual Ultrasonic Testing of Containment Liner, Plate 148
- (2) Surface Examination
  - a) Magnetic Particle Testing of Integral Attachment, 34-MS-1204-H-8
- (3) Visual Examinations
  - a) Bare Metal Visual Examination of the Reactor Vessel Upper Head and Nozzle Partial Penetration Welds
  - b) General Visual Examination of the Containment Liner
- (5) The inspectors evaluated Exelon's boric acid corrosion control program performance.
- (6) In accordance with the CCNPP Steam Generator Program, Exelon did not perform steam generator tube inspections during this refueling outage.

#### 71111.11 – Licensed Operator Requalification Program and Licensed Operator Performance

##### Operator Requalification (1 sample)

The inspectors observed and evaluated licensed operators during a positive moderator temperature coefficient startup/shutdown training on January 16, 2018.

Operator Performance (2 samples)

The inspectors observed and evaluated main control room performance during:

- (1) Unit 1 reactor shutdown and cooldown, February 18, 2018
- (2) Unit 1 heatup and reactor startup, March 16, 2018

71111.12 – Maintenance EffectivenessRoutine Maintenance Effectiveness (1 sample)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the 22 steam generator feed pump speed control trouble alarm on February 6, 2018.

Quality Control (1 sample)

The inspectors evaluated maintenance and quality control activities associated with the control of quality parts during work orders C91504027, "Replace Unit 2 to Unit 1 Auxiliary Feedwater System cross connect Solenoid valve, 2SV4550," and C91932471, "Replace 2PCV4550, air supply to 2SV4550."

71111.13 – Maintenance Risk Assessments and Emergent Work Control (4 samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

- (1) Unit 2 maintenance risk assessment during offsite power transformer P-13000-1 out of service for maintenance, February 27, 2018
- (2) Units 1 and 2 updated maintenance risk assessment during forecasted high winds, March 2, 2018
- (3) Unit 2, maintenance risk assessment for auxiliary feedwater train 'B' out of service for valve maintenance, March 6, 2018
- (4) Unit 1, updated maintenance risk assessment during reduced inventory in the reactor pressure vessel, March 10, 2018

71111.15 – Operability Determination and Functionality Assessments (5 samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Underground piping leakage north of turbine building (AR04087759) on January 5, 2018
- (2) 12 service water pump inboard bearing leaks oil (AR04095258) on January 19, 2018
- (3) Unit 1 turbine building service water isolation valve 1CV1638 sticks as it strokes (AR04114002) on March 12, 2018
- (4) Historical foreign material identified during refueling water tank inspection (AR04107455) on February 23, 2018
- (5) 0C diesel generator cracked fitting on pneumatic prelube manifold (AR04119229) on March 26, 2018

71111.18 – Plant Modifications (2 samples)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Engineering Change Package (ECP)--17-000416, Unit 1, "Replace reactor coolant pump motor oil level indication system."
- (2) ECP-18-00016, Unit 1, "Reactor Internal Inspections found one of eight Core Shroud Tie-rods Dis-engaged from the threaded connections at each end." Temporary modification accepting condition as is.

71111.19 – Post-Maintenance Testing (5 samples)

The inspectors evaluated post-maintenance testing for the following maintenance/repair activities:

- (1) Work Order (WO) C93596764, adjust packing on 'B' train Unit 2 service water strainer flushing valves, on February 13, 2018
- (2) WO C91833187, inspect and overhaul SI-414, 12 high-pressure safety injection discharge check valve, on March 6, 2018
- (3) WO C92789902, replace solenoid valve on service water turbine building header 12 isolation valve, on March 11, 2018
- (4) WO C93063804, replace 1SI-451-12, low-pressure safety injection pump mini flow check valve, on March 14, 2018
- (5) WO C92583375, replace upper flange on 1MOV636OP, 12A safety injection tank high pressure loop, and repack valve, on March 23, 2018

71111.20 – Refueling and Other Outage Activities (1 sample)

The inspectors evaluated Unit 1 refueling outage activities from February 19 to March 16, 2018.

71111.22 – Surveillance Testing

The inspectors evaluated the following surveillance tests:

Routine (5 samples)

- (1) STP-O-5A21-2, 21 Auxiliary Feedwater Pump Quarterly Surveillance Test, Revision 6, January 24, 2018
- (2) STP-O-8A-2, Test of 2A Diesel and 4kV Bus 21 Undervoltage, Revision 31, February 2, 2018
- (3) PSTP-10, Conduct of Coastdown, Revision 2, February 13, 2018
- (4) PE-1-036-3-O-R, Over Speed Testing of the 12 Auxiliary Feedwater Pump, Revision 3, March 11, 2018
- (5) STP-O-004B-1, B Train Integrated Engineered Safety Features Test Revision 32, March 12, 2018

In-service (1 sample)

- (1) STP-O-073H-1, Auxiliary Feedwater Pump Large Flow Test, Revision 11, February 15, 2018

Containment Isolation Valve (3 samples)

- (1) STP-M-003A-O, Online Main and Offline Steam Safety Valve Testing, Revision 008, February 14, 2018
- (2) STP-O108D9-1, Containment Penetration 9 Local Leak Rate Tests, Revision 0, February 23, 2018
- (3) STP-O-108D44-1, Containment Penetration 44 Local Leak Rate Tests, Revision 1, February 27, 2018

**RADIATION SAFETY**71124.01 - Radiological Hazard Assessment and Exposure ControlsRadiological Hazard Assessment (1 Sample)

The inspectors evaluated radiological hazards assessments and controls.

Instructions to Workers (1 Sample)

The inspectors evaluated worker instructions.

Contamination and Radioactive Material Control (1 Sample)

The inspectors evaluated contamination and radioactive material controls.

Radiological Hazards Control and Work Coverage (1 Sample)

The inspectors evaluated radiological hazards control and work coverage.

High Radiation Area and Very High Radiation Area Controls (1 Sample)

The inspectors evaluated risk-significant high radiation area and very high radiation area controls.

Radiation Worker Performance and Radiation Protection Technician Proficiency (1 Sample)

The inspectors evaluated radiation worker performance and radiation protection technician proficiency.

71124.02 – Occupational As Low As Reasonably Achievable Planning and ControlsRadiological Work Planning (1 sample)

The inspectors selected the following radiological work activities based on exposure significance for review:

- (1) As Low As Reasonably Achievable (ALARA) Plan 17RFO-0019, Dissimilar Metal Weld Inspections
- (2) ALARA Plan 17RFO-0010, Scaffold Activities
- (3) ALARA Plan 17RFO-0013, NSRX Reactor Disassembly/Reassembly
- (4) ALARA Plan 17RFO-0011, Outage Insulation

For each of these activities, the inspectors reviewed: ALARA work activity evaluations, exposure estimates, exposure reduction requirements, results achieved (dose rate reductions, actual dose), person-hour estimates and results achieved and post-job reviews that were conducted to identify lessons learned.

#### Verification of Dose Estimates and Exposure Tracking Systems (1 sample)

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors evaluated the adjustment of exposure estimates, or re-planning of work. The inspectors reviewed post-job as low as reasonably achievable evaluations of excessive exposure.

#### Implementation of As Low As Reasonably Achievable and Radiological Work Controls (1 Sample)

The inspectors reviewed ALARA practices and radiological work controls by reviewing the following activities:

- (1) ALARA Plan 18RFO-0005
- (2) ALARA Plan 18RFO-0006
- (3) ALARA Plan 18RFO-0007
- (4) ALARA Plan 18RFO-0018
- (5) ALARA Plan 18RFO-0021

#### Radiation Worker Performance (1 Sample)

The inspectors evaluated radiation worker and radiation protection technician performance.

### **OTHER ACTIVITIES – BASELINE**

#### 71151 – Performance Indicator Verification

The inspectors verified Exelon performance indicators submittals listed below for the period January 1, 2017, through December 31, 2017. (4 samples)

- (1) Units 1 and 2 Reactor Coolant System Specific Activity
- (2) Units 1 and 2 Reactor Coolant System Leak Rate

## INSPECTION RESULTS

Failure to Conduct Adequate Radiation Surveys and Evaluate Potential Radiological Hazards			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Occupational Radiation Safety	Green NCV 05000317/2018001-01 Closed	H.11 - Human Performance - Challenge the Unknown	71124.01
<p>A self-revealed Green non-cited violation (NCV) of Title 10 <i>Code of Federal Regulations</i> (10 CFR) 20.1501, "Surveys and Monitoring: General," was identified when Exelon failed to perform adequate surveys of the 11 reactor coolant pump bay area following the aggregation of 25 high dose-rate in-core detectors in one area of the flooded refueling cavity, which is adjacent to the pump bay. Surveys were not performed to evaluate the resulting dose rates after the licensee changed the storage location of the detectors and radiological hazard mitigation measures, such as locking and controlling access in accordance with Exelon procedures, were not implemented, resulting in accessible dose-rates of up to 2,000 millirem per hour (mrem/hr) in the pump bay.</p> <p><u>Description:</u> In-core detectors are used in the reactor in order to monitor reactor power. These detectors are exposed to a high neutron flux and become highly radioactive during normal operations. During the Calvert Cliffs Unit 1 refueling outage, 25 in-core detectors were removed from the reactor vessel and hung in a common location in the flooded refueling cavity for temporary storage prior to cutting and disposal. During this work, a change to the process was made in that the "cold ends" of the detector assemblies were positioned above the surface of the water in the refueling cavity (instead of the typical ten feet below the water surface) during storage. This resulted in a change in the relative position of the highly activated "hot ends". The collection of these 25 sources in one location, and the change in the position of the "hot ends" within the flooded cavity, created an intense source of radioactivity which affected the radiological conditions in the space adjacent to that portion of the refueling cavity.</p> <p>The 11 reactor coolant pump enclosure (i.e, "pump bay") is normally controlled as a high radiation area during refueling outages because doses of greater than 100 mrem in one hour are expected in accessible areas of the room. When the 25 in-core detectors were aggregated in the refueling cavity for temporary storage between February 23 and 24, 2018, radiation surveys were not re-performed in all areas where radiological conditions may have changed. Some of the in-core detectors were placed at a location approximately ten feet higher within the refueling cavity than usual due to larger number of detectors being replaced. As a result, an accessible radiation field of up to 2,000 mrem/hr in the 11 pump bay was not identified and controlled in accordance with Exelon procedures. This radiation field was nearly 100 times the value that workers were being briefed to using the existing radiological survey maps. On February 24, 2018, a worker in the 11 pump bay experienced an unexpected electronic personal dosimeter alarm due to the high dose rate. The worker immediately left the area and informed the radiation protection staff. The area was re-surveyed at this time and the 2,000 mrem/hr field was discovered. The worker's actual dose received was far below the 10 CFR 20 dose limits.</p> <p>The worker's electronic personal dosimeter alarm set-points were 30 mrem dose and 400 mrem/hr dose rate. Exelon radiation workers are required to check their electronic personal dosimeter for accumulated dose every 15 minutes. Electronic personal dosimeters for work in this area are monitored remotely by radiation protection personnel, which increases the likelihood that this unexpected condition would be detected prior to the worker being overexposed. As a result, there was no substantial potential for over exposure. A single</p>			

instance of failure to survey an area is also not considered to be a compromised ability to assess dose.

Radiological verification surveys of the 11 pump bay to check for unexpected radiation levels following the placement of 25 highly radioactive in-core detectors (in one location in the adjacent portion of the refueling cavity) were reasonable under the circumstances, and were needed to demonstrate compliance with 10 CFR 20.1601 "Control of Access to High Radiation Areas," and Exelon procedure RP-AA-460, "Controls for High and Locked High Radiation Areas." As a result of the failure to perform the surveys, one person was exposed to unexpected high dose rates, since radiological conditions in assessable areas of the pump bay had changed significantly.

The statements of consideration associated with the issuance of 10 CFR 20.1501 (as provided in the Federal Register Notice 56 FR 23398) indicate that "The principal role of the [radiation] survey is preventative. Adequate survey procedures provide measurable protection for the health and safety of the worker and the public because they provide the information necessary for the establishment of adequate protective measures. The usefulness of this early warning system may be seriously reduced if licensees are not held responsible for failure to conduct any survey or for failure to conduct an adequate survey [even] when violations of other Part 20 requirements have not occurred..."

#### Corrective Actions

Exelon conducted new radiation surveys, upgraded radiological controls in the 11 pump bay (including controlling the area as a locked high radiation area), restricted access to the area, and conducted a prompt investigation. The in-core detectors were lowered such that the "cold ends" were again at their usual position of ten feet below the water surface, which resulted in dose rates in the 11 pump bay returning to normal levels. The detectors were then cut and put into disposal containers as planned. Exelon entered the issue into their corrective action program. The inspectors reviewed the licensee's investigation and associated corrective actions and determined that they were reasonable and appropriate.

Corrective Action References: Exelon placed the issue in their corrective action program as AR04108011, AR04107884, and AR04108041.

#### Performance Assessment:

Performance Deficiency: The performance deficiency is the failure to perform radiological surveys in the 11 pump bay to evaluate the impact of a change in the storage location of highly radioactive sources within the adjacent refueling cavity. Specifically following the placement of in-core detectors at a location approximately ten feet higher within the refueling cavity than usual, surveys were not performed in the adjacent space, which was controlled as a High Radiation Area to which where personnel had access, to verify radiological conditions had not changed. 10 CFR 20.1501 is the standard not met. This performance deficiency was within Exelon's ability to foresee and correct, and should have been prevented. Specifically, Exelon was aware of the very high dose rates from the in-core instrumentation and reasonably should have evaluated the impact on adjacent locations in containment. Containment access restrictions are routinely employed when moving fuel and therefore Exelon had an opportunity to realize that highly radioactive sources such as the in-core instrumentation may have required similar precautions. As a result of the failure to perform the surveys, appropriate radiological controls were not established in accordance with Exelon procedure RP-AA-460 section 3.4 and one person was exposed to unexpected high dose rates.

Title 10 CFR 20.1501 requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in Part 20 and that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations or quantities of residual radioactivity, and the potential hazards of the radiation levels and residual radioactivity detected.

**Screening:** This finding is more than minor because it is associated with the Program & Process attribute of the Occupational Radiation Safety cornerstone and affects the cornerstone objective to ensure the adequate protection of the worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. Specifically, radiation levels in an adjacent and accessible area were not verified following a change in radiological conditions in that area. Thus a process radiation safety barrier was defeated. The deficiency is similar to Example 6F in IMC 0612 Appendix E, "Examples of Minor Issues".

**Significance:** Using IMC 0609.04, "Initial Characterization of Findings," issued October 7, 2016, and IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," issued August 19, 2008, the inspection finding was not related to ALARA practices (Step 1), did not result in an overexposure (Step 5), did not represent a substantial potential for overexposure (Step 11), and did not compromise Exelon's ability to assess dose (Step 14). As a result, this finding was determined to be of very low safety significance (Green).

**Cross Cutting Aspect:** This finding has a cross-cutting aspect in the area of Human Performance, "Challenge the Unknown," in that Exelon did not ensure that individuals stop when faced with uncertain conditions and ensure risks are evaluated and managed before proceeding. Specifically, no one questioned whether the placement of the in-core detectors at a higher level within the reactor cavity could adversely affect radiological conditions in adjacent areas. (H.11)

**Enforcement:**

**Violation:** 10 CFR 20.1501 requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in Part 20 and that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations or quantities of residual radioactivity, and the potential hazards of the radiation levels and residual radioactivity detected.

Title 10 CFR 20.1003 defines a survey as "an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present."

Title 10 CFR 20.1601, "Control of access to high radiation area," requires licensees to provide specific access controls for areas in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem in 1 hour at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates. These access controls include locking entryways to such areas or providing positive control over each individual entry when access to the areas is required. Title 10 CRF 20.1601(c) allows a licensee to request approval of alternate means for controlling access to high radiation areas.

The NRC had previously approved alternate means for controlling access to high radiation areas for Calvert Cliffs. These alternate means had been provided in the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 Technical Specifications, Section 6.12, "High Radiation Area."

In an August 26, 1996, letter issuing Amendment No. 216 to Facility Operating License No. OPR-53 and Amendment No.193 to Facility Operating License No.DPR-69 for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, respectively, the NRC approved the licensee's request to relocate the TS 6.12 controls to site procedures. As noted in the NRC letter, "since the licensee must comply with this regulation [10CFR 20.1601] and, specifically with 20.1601(c) regarding Commission approval of alternative methods, the relocation of TS 6.12 to plant procedures is acceptable."

Exelon Procedure RP-AA-460, "Controls for High and Locked High Radiation Areas", Revision 31 is the plant procedure implementing these alternate methods of compliance with 10 CFR 20.1601.

RP-AA-460 Section 3.4, "Locked High Radiation Area Controls (greater than **OR** equal to 1000 mrem/hr at 30 cm; < 500 Rad/hr at 1 meter)" states,

"POST AND CONTROL area as a Locked High Radiation Area when:

1. Dose rates accessible to an individual(s) are 800 mrem/hr at 30 cm or greater, unless waived by the RPM using Attachment 1, **OR**
2. Dose rate(s) accessible to an individual(s) equal **OR** exceed 1000 mrem/hr at 30 cm."

Contrary to the above, on February 23 - 24, 2018, Exelon did not make or cause to be made surveys that were necessary for the licensee to comply with the regulations in Part 20 and were reasonable under the circumstances to evaluate the magnitude and extent of radiation levels and, as a result, did not identify the presence of dose rates exceeding 1000 mrem/hr within an area being controlled as a High Radiation Area. Specifically, the licensee had been applying High Radiation Area access controls for the 11 pump bay, based on initial radiological surveys performed at the start of the outage and historical dose rates in the room from the adjacent refueling cavity, including the impact from the temporary placement of in-core detectors in the adjacent cavity. However, the licensee did not perform subsequent surveys to evaluate the resulting radiation levels in the 11 pump bay after changing the storage location of the in-core detectors to an area approximately ten feet higher within the cavity than had been historically used. These surveys were reasonable due to the change in location of the detectors and were necessary to demonstrate compliance with 10 CFR 20.1601(c). As a result, the licensee did not identify the presence of an area requiring control as a Locked High Radiation Area in accordance with Exelon procedure RP-AA-460 section 3.4 until a worker's electronic personal dosimeter alarmed.

Enforcement Actions:

This violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000317/2018001-01: Failure to Conduct Adequate Radiation Surveys and Evaluate Potential Radiological Hazards)**

**EXIT MEETINGS AND DEBRIEFS**

The inspectors verified no proprietary information was retained or documented in this report.

- On January 11, 2018, the inspectors presented the inspection results of activities related to Section 71124.02 to Mr. Mark Flaherty, Site Vice President, and other members of the Exelon staff.
- On March 2, 2018, the inspectors presented the inspection results of activities related to Sections 71124.01 and 71124.02 to Mr. Mark Flaherty, Site Vice President, and other members of the Exelon staff.
- On March 8, 2018, the inspectors presented the inspection results of activities related to Section 71111.08 inspection results to Mr. Mark Flaherty, Site Vice President, and other members of the Exelon staff.
- On April 25, 2018, the inspectors presented the quarterly resident inspector inspection results to Mr. Mark Flaherty, Site Vice President, and other members of the Exelon staff.

**DOCUMENTS REVIEWED****Section 71111.18 - Plant Modifications**Calculation:

CN-SDA-18-12, Calvert Cliffs Unit 1 Core Shroud Tie Rod Evaluation for Continued Operation of One Cycle with One Missing Core Shroud Tie Rod, Revision 0

Miscellaneous

ECP-17-000416, Unit 1, "Replace reactor coolant pump motor oil level indication system."

ECP-18-00016, Unit 1, "Reactor Internal Inspections found one of eight Core Shroud Tie-rods Dis-engaged from the threaded connections at each end."

FS1-0036628, Evaluation of Calvert Cliffs Bypass Flow, Revision 1

LTR-RC-18-13, Calvert Cliffs Unit 1 Cycle 24 Dropped Tie Rod "Use-as-is" 10 CFR 50.59 Input

**Section 71124.01 – Radiological Hazard Assessment and Exposure Controls**Procedures

NISP-RP-005, "Access Controls for High Radiation Areas," Revision 0

RP-AA-300-1006, "Radiological Controls for System Operations with Radiological Impact in Normally Accessible Areas," Revision 0

RP-AA-460, "Controls for High and Locked High Radiation Areas," Revision 31

RV-68, "In-Core Instrumentation Removal," Revision 02300

Miscellaneous

ALARA Plan 18RFO-0015, "RT 10842007, Remove ICI'S IAW RV-68 Procedure," dated 12/8/2017

ALARA Waiver Form, 18RFO-0015, dated 2/26/2018

AR04107884

AR04108011

AR04108041 and its related HURB report

Drawing C-261, "Containment Interior Section and CL Reactor Vessel," Sheet 5

Radiation Work Permit CC-1-18-00615, Revision 00

Radiological survey 2018-003297

Radiological survey 2018-002455

Radiological survey 2018-003277

Radiological survey 2018-003400

Radiological survey 2018-003269

Radiological survey 2018-00

WO C93489748

**Section 71124.02 – Occupational ALARA Planning and Controls**Procedures

RP-AA-1008, Unescorted Access to and Conduct in Radiologically Controlled Areas, Revision 6

RP-AA-400, As Low As Reasonably Achievable Program, Revision 14

RP-AA-401, Operational As Low As Reasonably Achievable Planning and Controls, Revision 22

RP-AA-403, Administration of the Radiation Work Permit Program, Revision 9

RP-AA-441, TEDE As Low As Reasonably Achievable Evaluation, Revision 8

Action Request

AR03973742 AR03980352 AR04027589 AR04040215 AR04042311 AR04064701

Documents

ALARA Plan 17RFO-0010, Scaffold Activities  
 ALARA Plan 17RFO-0011, Outage Insulation  
 ALARA Plan 17RFO-0013, NSRX Reactor Disassembly/Reassembly  
 ALARA Plan 17RFO-0019, Dissimilar Metal Weld Inspections  
 ALARA Plan 18Q-0009  
 ALARA Post-Job Review, 17RFO-0010  
 ALARA Post-Job Review, 17RFO-0011  
 ALARA Post-Job Review, 17RFO-0013  
 ALARA Post-Job Review, 17RFO-0019  
 ALARA Post-Job Review, 17RFO-0042  
 ALARA Work-In-Progress Review, 17RFO-0006, REM Discretion, 50%, Other  
 ALARA Work-In-Progress Review, 17RFO-0010, REM Discretion, 50%, 80%  
 ALARA Work-In-Progress Review, 17RFO-0011, 50%, 80%  
 ALARA Work-In-Progress Review, 17RFO-0019, 50%  
 Dose Excellence Plan, Calvert Cliffs Nuclear Power Plant, 2017-2021, Revision 0  
 List, 17RFO radiation exposure, actual vs estimate.  
 List, On-line work activities > 1 REM  
 Radiation Protection Outage Report, CC2R22  
 Radiation work permit CC-0-18-00312, Revision 1  
 Radiation work permit CC-2-17-00502, Revision 0  
 Radiation work permit CC-2-17-00503, Revision 0  
 Radiation work permit CC-2-17-00505, Revision 0  
 Radiation work permit CC-2-17-00613, Revision 0  
 Radiological survey, containment post-shutdown, Unit1, dated 2/15/2016  
 Radiological survey, containment post-shutdown, Unit2, dated 2/13/2017  
 Radiological survey, EPRI standard radiation monitoring program, Unit 1, dated 3/14/2010  
 Radiological survey, EPRI standard radiation monitoring program, Unit 1, dated 3/4/2016  
 Station ALARA Committee Agenda and Package, dated 1/10/18  
 Station ALARA Committee Meeting Minutes from 1/13/2017  
 Station ALARA Committee Meeting Minutes from 1/6/2017  
 Station ALARA Committee Meeting Minutes from 10/31/2017  
 Station ALARA Committee Meeting Minutes from 3/1/2017  
 Station ALARA Committee Meeting Minutes from 7/27/2017  
 Station ALARA Committee Meeting Minutes from 9/26/2017  
 Station ALARA Committee Meeting Minutes from 9/6/2017  
 TEDE ALARA Evaluation, CC-2-17-00502  
 TEDE ALARA Evaluation, CC-2-17-00503  
 TEDE ALARA Evaluation, CC-2-17-00505  
 TEDE ALARA Evaluation, CC-2-17-00613  
 Whole body count #14952