



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

February 1, 2019

EA-2018-075

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 05000317/2018004 AND 05000318/2018004 AND TEMPORARY  
INSTRUCTION 2690/011 AND EXERCISE OF ENFORCEMENT DISCRETION**

Dear Mr. Hanson:

On December 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2. On January 16, 2019, the NRC inspectors discussed the results of this inspection with Mr. Todd Tierney, Plant Manager, 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. The finding did not involve a violation of NRC requirements. Additionally, NRC inspectors documented one Severity Level IV violation with no associated finding. NRC inspectors also documented one licensee-identified violation, which was determined to be of very low safety significance, in this report. The NRC is treating these violations as non-cited violations (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

A violation of Exelon's site-specific licensing basis for tornado-generated missile protection was identified. Because this violation was identified during the discretion period covered by Enforcement Guidance Memorandum 15-002, "Enforcement Discretion for Tornado Generated Missile Protection Non-Compliance", Revision 1 and because Exelon was implementing compensatory measures, the NRC is exercising enforcement discretion by not issuing an enforcement action for the violation and is allowing continued reactor operation.

If you contest the violations or significance of these NCVs, 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 1; the Director, Office of Enforcement; and the NRC Resident Inspector at CCNPP. In addition, if you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 1, and the NRC Resident Inspector at CCNPP.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Part 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

**/RA/**

Erin Carfang, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

Docket Nos. 50-317 and 50-318 and 72-8  
License Nos. DPR-53 and DPR-69 and SNM-2505

Enclosure:  
Inspection Report 05000317/2018004 and  
05000318/2018004

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REPORT 05000317/2018004 AND 05000318/2018004 AND TEMPORARY  
INSTRUCTION 2690/011 AND EXERCISE OF ENFORCEMENT DISCRETION  
DATED FEBRUARY 1, 2019

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## U.S. NUCLEAR REGULATORY COMMISSION

## REGION I

Docket Numbers: 50-317 and 50-318 and 72-8

License Numbers: DPR-53 and DPR-69 and SNM-2505

Report Numbers: 05000317/2018004 and 05000318/2018004

Enterprise Identifier: I-2018-004-0064

Licensee: Exelon Generation Company, LLC

Facility: Calvert Cliffs Nuclear Power Plant, Units 1 and 2, and Independent Spent Fuel Storage Installation

Location: Lusby, MD

Inspection Dates: October 1, 2018 to December 31, 2018

Inspectors: R. Clagg, Senior Resident Inspector  
C. Roettgen, Resident Inspector  
H. Anagnostopoulos, Senior Health Physicist  
J. Ambrosini, Senior Emergency Preparedness Inspector  
M. Davis, Transportation and Storage Safety Inspector  
N. Floyd, Senior Reactor Inspector  
P. Ott, Operations Engineer  
J. Patel, Reactor Inspector  
S. Pindale, Senior Reactor Inspector  
A. Rosebrook, Senior Project Engineer

Approved by: Erin Carfang, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

Enclosure

## 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/oversight.html> for more information. NRC identified and self-revealing findings, violations, and additional items are summarized in the table below. Licensee-identified non-cited violations are documented in the Inspection Results section of this report.

### List of Findings and Violations

Failure to Store and Maintain FLEX Equipment Such that Reliable Starting was Reasonably Assured During Extreme Cold			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000317, 318/2018004-01 Closed	P.3 – Problem Identification and Resolution – Resolution	71152.4
The inspectors identified a Green finding (FIN) for Exelon's failure to ensure that diesel powered Diverse and Flexible Coping Strategies (FLEX) equipment would be reliable to mitigate postulated beyond-design basis external events during extreme cold conditions. Specifically, from July 2, 2015, to December 6, 2018, Exelon failed to maintain programs or procedures to prevent fuel crystallization or gelling and failed to maintain starting aids available to be used, if needed, to ensure the reliable starting of diesel powered FLEX equipment down to the required minimum temperature (-9°F).			

Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Severity Level IV NCV 05000317/2018004-02 Closed	Not Applicable	71153.2
A self-revealed, Severity Level IV, NCV of TS 3.4.10, Pressurizer Safety Valves, was identified when Exelon was notified that the as-found lift setpoint of a pressurizer safety valve was measured below the minimum allowable value. Specifically, the as-found lift setpoint of pressurizer safety valve, 1-RV-200, was measured below the minimum allowable value of 2,475 pounds per square inch, absolute as required by TS 3.4.10.			

### Additional Tracking Items

LER	05000317, 318/2018-002-00	Items Non-Conforming to Design for Tornado Missile Protection	71153.1	Closed
LER	05000317/2018-001-00	Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals	71153.2	Discussed
Enforcement Discretion	N/A	Enforcement Action EA-18-075: Nonconforming to Design for Tornado Missile Protection	71153.2	Closed

## REPORT DETAILS

### PLANT STATUS

Unit 1 began the inspection period at rated thermal power. The unit remained at or near rated thermal power for the remainder of the inspection period.

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

### INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IP) 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

##### Seasonal Extreme Weather (1 sample)

The inspectors evaluated readiness for seasonal extreme weather conditions prior to the onset of seasonal cold temperatures.

#### 71111.04 - Equipment Alignment

##### Partial Walkdown (3 samples)

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

- (1) 12 component cooling water train during 11 component cooling water heat exchanger out of service for maintenance, October 1, 2018
- (2) 1A, 2A, and 2B emergency diesel generators (EDG) during 1B EDG out of service for maintenance, October 10, 2018
- (3) 1A, 1B, 2A, and 2B EDGs during Fairbanks Morse east/west starting air header out of service for maintenance, October 24, 2018

### 71111.05Q – Fire Protection Quarterly

#### Quarterly Inspection (5 samples)

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

- (1) Unit 2, 21 and 22 emergency core cooling system pump rooms, fire areas 1 and 2, October 30, 2018
- (2) Unit 1, 11 and 12 emergency core cooling system pump rooms, fire areas 3 and 4, October 30, 2018
- (3) 11, 12, 13, 22, and 23 charging pump rooms, fire areas 5, 6, 7, 8, and 9, October 30, 2018
- (4) Unit 1, service water pump room, fire area 39, November 2, 2018
- (5) Unit 1, east and west electrical penetration rooms, fire areas 32 and 33, November 5, 2018

### 71111.07 – Heat Sink Performance

#### Heat Sink (1 sample)

The inspectors evaluated Exelon's monitoring and maintenance of the 11 component cooling heat exchanger performance.

### 71111.11 – Licensed Operator Regualification Program and Licensed Operator Performance (71111.11Q – 2 samples; 71111.11A – 1 sample)

#### Operator Regualification (1 sample)

The inspectors observed and evaluated a training event involving dropped control element assemblies, a station blackout, a steam generator tube leak, and a ruptured steam generator resulting in a Site Area Emergency declaration, November 19, 2018.

#### Operator Performance (1 sample)

The inspectors observed and evaluated licensed operator activities in response to a fire in disconnect switch 2 and 0C diesel unavailability, October 10, 2018; as well as shift turnover activities and routine activities, December 29, 2018.

#### Operator Regualification Exam Results (Annual) (1 sample)

The inspectors reviewed and evaluated requalification examination results, December 20, 2018.

### 71111.12 – Maintenance Effectiveness

#### Routine Maintenance Effectiveness (2 samples)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety significant functions:



- (1) Review of Exelon's Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65(a)(3) periodic assessment of the maintenance rule program covering November 2014 – October 2016
- (2) 1-MOV-4143, refueling water tank outlet motor operated valve maintenance, work orders (WO) C93611124 and C93659460, November 15, 2018

Quality Control (1 sample)

The inspectors evaluated maintenance and quality control activities associated with the review of quality verifications for WO C93628926, C93596471, C92957879, C93588436, and C93615654.

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

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

- (1) Unit 2, maintenance risk assessment for Yellow risk condition for 21 component cooling heat exchanger out of service for maintenance, October 2, 2018
- (2) Unit 1, maintenance risk assessment for Yellow risk condition for 1B EDG out of service for maintenance in conjunction with 13 containment air cooler (CAC) out of service for maintenance, October 9, 2018
- (3) Unit 1, updated maintenance risk assessment for Yellow risk condition for 1B EDG out of service during 0C auxiliaries bus out of service following equipment failure, October 10, 2018
- (4) Unit 1, maintenance risk assessment for Yellow risk condition for 13 auxiliary feedwater pump out of service for maintenance, October 22, 2018
- (5) Unit 1, updated maintenance risk assessment for Yellow risk condition for 11 and 12 auxiliary feedwater pumps out of service following equipment failure, December 2, 2018

71111.15 – Operability Determination and Functionality Assessments (4 samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Technical evaluation for 1B, 2A, and 2B EDGs following 1B EDG air start system failure, October 15, 2018
- (2) Engineering evaluation for removal of one Fairbanks Morse EDG starting air header from service during modification, October 24, 2018
- (3) Action Request (AR) 04200920, 12 low pressure safety injection recirculation check valve back leakage, December 7, 2018
- (4) AR04195499, 2B EDG #9 cylinder control side fuel pump sticking, December 18, 2018

71111.18 – Plant Modifications (1 sample)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Engineering Change Package-15-000662, replace agastat model E7000 relays on 1B, 2A, and 2B diesels

#### 71111.19 – Post-Maintenance Testing (6 samples)

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

- (1) WO C93645199, replace all 1B EDG #7000 relays per Engineering Change Package - 15-000622, October 11, 2018
- (2) WO C91702359, install isolation valves on Fairbanks Morse EDG east starting air header, October 25, 2018
- (3) WO C91768385, install isolation valves on Fairbanks Morse EDG west starting air header, October 29, 2018
- (4) WO C93684233, inspect 1B EDG air start distributor for internal damage, November 7, 2018
- (5) WO C93597433, repack 12 charging pump, November 28, 2018
- (6) WO C93685472, remove 11 saltwater pump and perform repairs, December 20, 2018

#### 71111.22 – Surveillance Testing

The inspectors evaluated the following surveillance tests:

##### In-service (1 sample)

- (1) STP-O-5A13-1, “13 auxiliary feedwater pump quarterly surveillance,” Revision 2, November 2, 2018

### **EMERGENCY PREPAREDNESS**

#### 71114.04 – Emergency Action Level and Emergency Plan Changes (1 sample)

The inspectors verified that the changes made to the emergency plan were done in accordance with 10 CFR 50.54(q)(3), and any change made to the emergency action levels, emergency plan, and its lower-tier implementing procedures, had not resulted in any reduction in effectiveness of the plan. This evaluation does not constitute NRC approval.

### **RADIATION SAFETY**

#### 71124.04 – Occupational Dose Assessment

##### Source Term Characterization (1 sample)

The inspectors evaluated Exelon’s source term characterization.

##### External Dosimetry (1 sample)

The inspectors evaluated Exelon’s external dosimetry program.

##### Internal Dosimetry (1 sample)

The inspectors evaluated Exelon’s internal dosimetry program.

### Special Dosimetric Situations (1 sample)

The inspectors evaluated Exelon's performance for special dosimetric situations.

## **OTHER ACTIVITIES – BASELINE**

### 71151 – Performance Indicator Verification

The inspectors verified Exelon performance indicators submittals listed below for the period October 1, 2017 through September, 30, 2018. (8 samples)

- (1) Units 1 and 2 unplanned scrams
- (2) Units 1 and 2 unplanned power changes
- (3) Units 1 and 2 unplanned scrams with complications
- (4) Occupational exposure control effectiveness
- (5) Radiological effluent technical specifications (TS)/offsite dose calculation manual radiological effluent occurrence

### 71152 – Problem Identification and Resolution

#### Semiannual Trend Review (1 sample)

The inspectors reviewed Exelon's corrective action program for trends that might be indicative of a more significant safety issue.

#### Annual Follow-up of Selected Issues (5 samples)

The inspectors reviewed Exelon's implementation of its corrective action program related to the following issues:

- (1) Review of Exelon's evaluation and corrective actions for continued containment air cooler motor starter issues (AR04056045)
- (2) Review of Exelon's evaluation and corrective actions for 22 steam generator feed pump speed control failure (AR04037583)
- (3) Review of Exelon's evaluation and corrective actions for Unit 1 containment tendon gallery external grease leakage (AR04038741)
- (4) Review of Exelon's evaluation and corrective actions for the cooldown profile of FLEX equipment (AR04000385)
- (5) Review of Exelon's evaluation and corrective actions for licensee event report (LER) 05000317/2018-001-00, Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals (AR04108119, AR04202247)

### 71153 – Follow-up of Events and Notices of Enforcement Discretion

#### Events (1 sample)

The inspectors evaluated response to the following events:

- (1) Response to 1B EDG control circuit failure resulting in inoperability of 1B, 2A, and 2B EDGs, October 11, 2018

### Licensee Event Reports (2 samples)

The inspectors evaluated the following LER which can be accessed at <https://lersearch.inl.gov/LERSearchCriteria.aspx>:

- (1) 05000317, 318/2018-002-00, Items Non-Conforming to Design for Tornado Missile Protection. The circumstances surrounding this LER are documented in the Inspection Results section of this report.
- (2) 05000317/2018-001-00, Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals. Additional aspects of LER 05000317/2018-001-00 are as discussed in the Inspection Results section of this report.

### **OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT, AND ABNORMAL**

#### Temporary Instruction 2690/011 - Review of Aging Management Programs at Independent Spent Fuel Storage Installations

The inspectors evaluated whether Exelon had adequate processes and procedures in place to implement an aging management program for the CCNPP independent spent fuel storage installation.

### **INSPECTION RESULTS**

Failure to Store and Maintain FLEX Equipment Such that Reliable Starting was Reasonably Assured During Extreme Cold.			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000317, 318/2018004-01 Closed	P.3 – Problem Identification and Resolution – Resolution	71152.4
The inspectors identified a Green finding (FIN) for Exelon's failure to ensure that diesel powered Diverse and Flexible Coping Strategies (FLEX) equipment would be reliable to mitigate postulated beyond-design basis external events during extreme cold conditions. Specifically, from July 2, 2015, to December 6, 2018, Exelon failed to maintain programs or procedures to prevent fuel crystallization or gelling and failed to maintain starting aids available to be used, if needed, to ensure the reliable starting of diesel powered FLEX equipment down to the required minimum temperature (-9°F).			
<u>Description:</u> The inspectors reviewed Exelon's evaluation and corrective actions for the cooldown profile of FLEX equipment as documented in AR04000385. AR04000385 was initiated as a result of inspection activities documented in inspection report 05000317, 318/2017007, Temporary Instruction 2515/191, "Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communications/Staffing/Multi-Unit Dose Assessment Plans." The inspectors noted that AR04000385 and its associated corrective actions documented that actions were required to protect FLEX equipment from extreme cold conditions. The inspectors subsequently identified that AR04000385 was closed with no further actions taken.			

The inspectors reviewed Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 2, which provided guidelines for licensees to assess extreme event hazards and implement mitigation strategies to ensure compliance with NRC Order Number Enforcement Action (EA) -12-049, "Issuance of Orders to Modify Licenses with Regards to Requirements For Mitigation Strategies For Beyond-Design-Basis External Events," dated March 12, 2012. The inspectors reviewed Exelon letters RS-16-063 and RS-15-099, "Report of Full Compliance with March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated May 4, 2016, and July 2, 2015, for Units 1 and 2 respectively and noted that they document CCNPP's compliance with the requirements as described in NEI 12-06, Revision 2, as endorsed by the NRC. Specifically, RS-16-063 and RS-15-099 document that CCNPP, Units 1 and 2, have developed, implemented, and will maintain the guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event in response to Order EA-12-049. The inspectors reviewed "Calvert Cliffs Nuclear Power Plant, Units 1 and 2 – Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049," dated September 29, 2016, and noted that the NRC staff evaluated Exelon's submissions and concluded that the final integrated plan adequately addressed the requirements of NRC Orders EA-12-049.

The inspectors reviewed NEI 12-06, Section 8.2.1, and noted that it states, "all sites should consider the temperature ranges and weather conditions for their site in storing and deploying FLEX equipment consistent with normal design practices." The inspectors also reviewed Exelon letter RS-16-141, "Revised Final Integrated Plan Document – Mitigating Strategies NRC Order EA-12-049," dated August 9, 2016, Section 2.1.4, Snow and Extreme Cold Assessment and noted that the FLEX storage robust building was designed such that the interior temperatures will not decrease below 40°F. The inspectors also noted that Section 2.1.4, documented that FLEX portable equipment was qualified for use at temperatures above (-)9°F. The inspectors also noted that the final integrated plan stated, "The purchase specification for diesel fuel to be used for FLEX portable equipment requires a fuel additive to prevent gelling during cold weather conditions." The inspectors reviewed the vendor technical manuals for FLEX portable equipment and noted that 32°F is the temperature below which the vendor recommended using either a "winter grade fuel . . ." which "has a lower cloud point," or a fuel additive, ". . . which contains anti-gel chemistry . . ." which, "generally extends operability to about 10°C below the fuel cloud point." The inspectors identified that the use of winter grade fuel or the addition of a fuel additive had not been completed and was not required in any Exelon procedure. The inspectors determined that a cloud point test for the FLEX fuel oil was not documented, but that fuel oil ordered under a similar purchase order had a tested cloud point of 12°F.

The inspectors walked down the FLEX portable equipment stored in the FLEX storage robust building and confirmed that the building is climate controlled and will maintain FLEX portable equipment at least 40°F until the time of a loss of alternating current power to the building. The inspectors reviewed the final integrated plan and noted that FLEX portable equipment is only required during an extended loss of alternating current power. The inspectors determined that during a FLEX event in extreme cold conditions, the FLEX portable equipment was susceptible to cooling to a temperature equal to the outside atmospheric temperature. The inspectors noted that particularly susceptible were the pieces of equipment that would be deployed later in the FLEX event timeline and may not be called upon unless the primary strategy to repower normally installed plant equipment fails (e.g. FLEX auxiliary

feed water pumps, FLEX reactor coolant system makeup pumps, 100KW generators for specific loads, etc.). The inspectors also noted that these pieces of equipment could potentially be exposed to extreme cold conditions for a longer period of time before they would be required by the final integrated plan.

The inspectors also reviewed Exelon procedure FSG-5, "Initial Assessment and FLEX Equipment Staging," Revision 1, and Exelon Report SL-012897, "Verification of Environmental Operating Conditions for FLEX Portable Equipment," Revision 0. The inspectors noted that Exelon Report SL-012897 documented that the FLEX portable equipment was designed and protected for extreme cold conditions. The inspectors identified that this conclusion was reliant on the assumption that starting aids (e.g. block heaters, fuel heaters, etc.) provided with FLEX portable equipment would be used below 32°F, as required by the vendor technical manual. The inspectors interviewed Exelon staff and identified that the use of starting aids for FLEX portable equipment was not covered by any licensee procedure, was not trained on by personnel that would be responsible for deployment of FLEX portable equipment, and that no power supplies for the use of starting aids were provided for if needed for FLEX strategy implementation during conditions where the ambient temperature was below 32°F.

The inspectors reviewed site temperature data from Exelon's onsite meteorological tower and determined that the site had experienced temperatures below 32°F for a period of twelve days and four hours during January 2018, and below 12°F for approximately eleven hours during January of 2018.

The inspectors concluded that Exelon's letters RS-16-063 and RS-15-099, established standards to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event as required by NRC Order EA-12-049. The inspectors concluded that Exelon failed to implement and maintain guidance and strategies for the storage of FLEX portable equipment to ensure reliability to mitigate postulated beyond-design basis external events during extreme cold conditions.

**Corrective Action(s):** On December 6, 2018, Exelon added the approved anti-coagulating fuel oil additive that will ensure fuel flow over the entire temperature range required for FLEX events at CCNPP.

**Corrective Action Reference(s):** AR04101431, AR04109513, AR04177148, and AR04193436

**Performance Assessment:**

**Performance Deficiency:** The inspectors determined that Exelon's failure to implement and maintain guidance and strategies for the storage of FLEX portable equipment to ensure reliability to mitigate postulated beyond-design basis external events during extreme cold conditions as required by RS-16-063 and RS-15-099, "Report of Full Compliance with March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated May 4, 2016 and July 2, 2015, was a performance deficiency. Specifically, from July 2, 2015, until December 6, 2018, Exelon failed to ensure the use of winter grade fuel, fuel additives, and/or starting aids to ensure the reliability of FLEX portable equipment during extreme cold conditions.

**Screening:** The inspectors reviewed IMC 0612, Appendix B, "Issue Screening," issued on December 13, 2017, and determined the issue is more than minor because it was associated with the protection against external factors attribute of the Mitigating Systems cornerstone, and adversely affected its objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the failure to ensure the use of winter grade fuel, fuel additives, and/or starting aids adversely affects the reliability of FLEX portable equipment when outside ambient temperatures are below 32°F.

**Significance:** The inspectors reviewed IMC 0609, Attachment 4, "Initial Characterization of Findings," issued on October 7, 2016, and IMC 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Pool Instrumentation (Orders EA-12-049 and EA-12-051)," issued on October 7, 2016, and determined that this finding involved significant programmatic issues in the areas of equipment storage, procedural guidance, maintenance and testing, and training. The inspectors reviewed IMC 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria," issued on April 12, 2012, and conducted an initial bounding evaluation. The inspectors determined the event of concern was a seismic event greater than 0.3g resulting in a loss of offsite power during extreme cold weather events. The review of available weather conditions for the site, from the time of full compliance, shows that the temperature was below the cloud point of the fuel or below the temperature where starting aids were required for approximately 200 hours. The CCNPP Unit 1 Risk Informed Notebook was utilized to estimate the risk and was determined to adequately model the risk of both units. Utilizing Table 5.3.2, sequences that included auxiliary feedwater, and high pressure makeup were evaluated. Assuming a 200 hour exposure time and the unavailability of affected diesel driven FLEX equipment, the risk was determined to be less than 1E-7/yr. Therefore, the inspectors determined this finding to be of very low safety significance (Green)

**Cross-Cutting Aspect:** The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," issued on December 4, 2014, and determined that this finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Resolution, because Exelon failed to take effective corrective actions to address issues in a timely manner commensurate with their safety significance. Specifically, Exelon failed to take effective corrective actions for issues with implementing FLEX strategies during extreme cold weather as documented in AR04000385 in a timely manner commensurate with the safety significance of the issues. [P.3]

**Enforcement:** The inspectors did not identify a violation of regulatory requirements associated with this finding.

**Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals (LER 05000317/2018-001-00)**

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000317/2018004-02 Closed	Not Applicable	71153.2
A self-revealed, Severity Level IV, NCV of TS 3.4.10, Pressurizer Safety Valves, was identified when Exelon was notified that the as-found lift setpoint of a pressurizer safety valve was measured below the minimum allowable value. Specifically, the as-found lift setpoint of			

pressurizer safety valve, 1-RV-200, was measured below the minimum allowable value of 2,475 pounds per square inch, absolute as required by TS 3.4.10.

Description: On February 25, 2018, Exelon received results for a Unit 1 pressurizer safety valve as-found lift setpoint test failure. Specifically, one of the two Unit 1 pressurizer safety valves, 1-RV-200, was measured below the minimum allowable value of 2,475 pounds per square inch, absolute as required by TS 3.4.10. The inspectors noted that Exelon concluded that the apparent cause of the valve test failure was due to a bulge in the valve's bellows nose, which resulted in non-uniform contact between the bellows nose and the valve disc and caused the valve to lift below the TS minimum allowable value. Exelon submitted LER 05000317/2018-001-00 as required by 10 CFR 50.73(a)(2)(i)(B) for any operation or condition which was prohibited by the plant's TS.

Corrective Action(s): Exelon replaced 1-RV-200 with a refurbished, tested, and certified spare. Exelon reviewed industry operating experience and consulted with the valve manufacturer. The inspectors noted that, although the specific cause for the nose bulge has not been identified, Exelon directed the test facility to replace the disc and bellows assembly on 1-RV-200 to ensure disc and bellows conformity. The inspectors also noted that Exelon directed the test facility to replace the bellows assembly for all additional safety valves upon disassembly to mitigate the potential age-related deformity. Exelon initiated AR04202247 to modify associated pressurizer safety valve purchase orders to require the test facility to perform a full disassembly and inspection of pressurizer safety valves regardless of whether they meet as-found testing acceptance criteria.

Corrective Action Reference(s): AR04108119 and AR04202247

Performance Assessment: The inspectors determined the violation was not foreseeable and preventable by Exelon and therefore is not a performance deficiency.

Severity: Because no performance deficiency, and therefore no finding, was identified it is necessary to address this violation using traditional enforcement to adequately deter non-compliance. The inspectors reviewed the NRC Enforcement Policy, Section 2.2.1, "Factors Affecting Assessment of Violations", issued on May 15, 2018. Section 2.2.1 states, in part, that in determining the appropriate enforcement response to a violation, the NRC considers, whenever possible, risk information in assessing the safety or security significance of violations and assigning severity levels. The inspectors also reviewed IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," Exhibit 2, "Mitigating Systems Screening Questions," issued on June 19, 2012. The inspectors determined the issue to be of very low safety significance (Green) because it did not represent a loss of system or function because 1-RV-200 remained capable of lifting to protect the reactor coolant system. As a result the inspectors determined that the issue is of Severity Level IV.

Violation: TS 3.4.10 requires that two pressurizer safety valves shall be operable. Specifically, the as-found lift setting is required to be between 2,475 and 2,575 pounds per square inch, absolute (inclusive).

Contrary to the above, on February 25, 2018, Exelon identified that pressurizer safety valve 1-RV-200 as-found lift setpoint was measured below the TS 3.4.10 minimum allowable value. Because this discovery occurred after the valve was removed from service, Exelon determined that it was reasonable to conclude that while the valve had been installed the lift setpoint was not within the TS required values resulting in the valve being inoperable for a period of time in excess of the TS 3.4.10 allowed outage time for one pressurizer safety valve.



Enforcement Action: This violation is being treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy.

Additional aspects of LER 05000317/2018-001-00 are as discussed above and in section 71152.5 of this report.

Enforcement Discretion	Enforcement Action EA-18-075: Nonconforming to Design for Tornado Missile Protection	71153.1
<p><b>Description:</b> During evaluation of protection for TS equipment from the damaging effects of a tornado generated missile in response to Regulatory Information Summary 2015-06, "Tornado Missile Protection," Exelon determined that a non-conforming condition existed with the saltwater system subsystem piping with respect to tornado missile protection. Specifically, since a tornado generated missile could strike saltwater system subsystem piping on Units 1 and 2, the design does not meet the licensing basis and a non-conforming condition exists.</p> <p><b>Corrective Action(s):</b> In accordance with the guidance in Regulatory Issues Summary 2015-06, "Tornado Missile Protection," and EGM 15-002, "Enforcement Discretion for Tornado Generated Missile Protection Non-Compliance," Revision 1, Exelon implemented compensatory measures to maintain the equipment in a non-conforming but operable condition. These actions included verifying that procedures, training, and equipment were in place to take appropriate action in the event of a tornado watch or warning and establishing a heightened level of awareness and preparedness to tornado missile vulnerabilities. To restore full compliance, Exelon evaluated the vulnerabilities utilizing methodologies approved in the CCNPP licensing basis, "Safety Evaluation by the Office of Nuclear Reactor Regulation Tornado Missile Protection for Emergency Diesel Generators Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2," dated May 1, 1995 per the timeline in Enforcement Guidance Memorandum 15-002, Revision 1.</p> <p><b>Corrective Action Reference(s):</b> AR04137452, AR04137474</p> <p><b>Violation:</b> A finding and an associated violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," was identified due to a non-conformance with tornado missile protection as described in Chapter 5 of the CCNPP Updated Final Safety Analysis Report.</p> <p><b>Significance:</b> A risk evaluation was performed, and the issue was determined to be of very low safety significance (Green).</p> <p><b>Discretion Basis:</b> The NRC exercised enforcement discretion in accordance with Section 2.3.9 of the NRC Enforcement Policy because this finding and violation was identified during the discretion period covered by Enforcement Guidance Memorandum 15-002, "Enforcement Discretion for Tornado Missile Protection Non-compliance," Revision 1 and because Exelon has implemented appropriate compensatory measures, the NRC is exercising enforcement discretion by not issuing an enforcement action and is allowing continued reactor operation. (EA-18-075)</p> <p>The disposition of this violation closes LER 05000317, 318/2018-002-00, Items Non-Conforming to Design for Tornado Missile Protection.</p>		

Observation	71152.1
<p>The inspectors reviewed Exelon's evaluation and corrective actions for continued containment air cooler (CAC) starter issues as documented in AR04056045. The inspectors reviewed work group evaluations, the corrective actions taken, the failure analyses, and the past operability determinations associated with two CAC starter failures, 13 CAC starter failure on August 7, 2017, and 23 CAC starter failure on July 28, 2017. The inspectors also reviewed Exelon's long term corrective action to implement a design change to be installed in October 2019, on all four CACs for each unit. The inspectors determined that Exelon's evaluations, extent of condition reviews, and corrective actions were adequate to address the issue and were commensurate with its safety significance.</p>	

Observation	71152.2
<p>The inspectors reviewed Exelon's evaluation and corrective actions for the 22 steam generator feed pump speed control failure as documented in AR04037583. In July 2017, CCNPP Unit 2 experienced a number of intermittent 22 steam generator feed pump (SGFP) speed control trouble alarms due to an undervoltage condition sensed on the SGFP low pressure governor drive. The governor valve will fail closed on a complete loss of voltage. The 22 SGFP governor valve position was observed to be cycling locally due to this intermittent condition. Troubleshooting revealed the low pressure governor drive current was fluctuating between 0 and 7.5 amps with an expected value of 1.0 amp. This indicated there was binding of the electrical actuator, servo drive, or a mechanical linkage. On August 2, 2017, Unit 2 was downpowered to 65% rated thermal power to remove the 22 SGFP from service and the servo-drive and electrical actuator was replaced. Further evaluation revealed the electrical actuator was binding. Degradation of the grease on the actuator roller screw assembly and cylinder was observed. Metal oxide particles were found in the grease and fretting wear observed on the rollers and roller sleeve and cylinder threads. This wear was believed to be due to excessive side loading of the actuator due to misalignment or inadequate tuning of the control system.</p> <p>Exelon conducted a work group evaluation, an extent of condition and cause review, and issued industry operating experience from the event. Corrective actions included revising maintenance procedure to verify actuator alignment during future replacements and revising the control system tuning procedure. The inspectors noted that revising the control system tuning procedures was deferred until after the 2019 Unit 2 refueling outage to allow the collection of more post actuator replacement data. The inspectors determined that Exelon's evaluations, extent of condition reviews, and corrective actions were adequate to address the issue and were commensurate with its safety significance.</p>	

Observation	71152.3
<p>The inspectors reviewed Exelon's evaluation and corrective actions for Unit 1 containment tendon gallery external grease leakage as documented in AR04038741. The inspectors interviewed engineering staff, performed a walkdown of the accessible containment concrete areas, and reviewed Exelon's evaluation of the condition. Based on a review of historical pictures, the grease leak has been present since the construction of the structure. Exelon determined the cause of the tendon grease leakage was due to an incomplete seal in the tendon duct/sheathing located within the concrete wall in conjunction with the grout patch installed in that area as part of the original construction of the containment. The tendon wires</p>	

were routed through the sheathing, which was filled with a grease for corrosion protection, and a leak in the sheathing travelled through cracks in the grout. Exelon concluded the structural integrity of the containment is maintained because the tendon wires remain coated with grease. The inspectors reviewed Exelon's maintenance activities and periodic tendon surveillance testing to verify there was no impact as a result of the condition. Based on discussions with Exelon, the inspectors understood that Exelon was considering an action to clean and/or repair the grouted area. The inspectors determined that Exelon's evaluations, extent of condition reviews, and corrective actions were adequate to address the issue and were commensurate with its safety significance.

Observation	71152.5
<p>The inspectors reviewed Exelon's evaluation and corrective actions for LER 05000317/2018-001-00, Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals as documented in AR04108119 and AR04202247. LER 05000317, 318/2018-001-00, and the associated action requests, document a Unit 1 pressurizer safety valve as-found lift setpoint test failure. Specifically, one of the two Unit 1 pressurizer safety valves, 1-RV-200, was measured below the minimum allowable value of 2,475 pounds per square inch, absolute as required by TS 3.4.10. The inspectors noted that Exelon concluded that the apparent cause of the valve test failure was due to a bulge in the valve's bellows nose, which resulted in non-uniform contact between the bellows nose and the valve disc and caused the valve to lift below the TS minimum allowable value.</p> <p>The inspectors focused this review on Exelon's prioritization and timeliness of their corrective actions to determine whether they were appropriately identifying, characterizing, and correcting problems associated with this issue and whether the completed and planned corrective actions were appropriate.</p> <p>The inspectors noted that this failure mode was the first of this type experienced at CCNPP. While Exelon had communicated with the valve vendor, it appeared that further investigation regarding the causes of the bellows nose bulge (i.e., whether a design issue was involved) was closed without a specific conclusion. In response to the inspector's observation, Exelon re-opened their evaluation into the 1-RV-200 failure and had ongoing discussion with the test facility and the pressurizer safety valve vendor to discuss the possible causes for the bellows nose bulge and to develop additional actions as appropriate to address this issue. The inspectors noted that Exelon initiated AR04203193 to track this ongoing evaluation.</p> <p>The inspectors noted that, although the specific cause for the nose bulge has not been identified, Exelon directed the test facility to replace the disc and bellows assembly on 1-RV-200 to ensure disc and bellows conformity. The inspectors also noted that Exelon directed the test facility to replace the bellows assembly for all additional safety valves upon disassembly to mitigate the potential age-related deformity.</p> <p>The inspectors noted that Exelon's review of this issue included an extent of condition review that documented "no bellows nose deformation noted" for several pressurizer safety valves recently sent to the test facility for testing, as needed refurbishment, and re-testing. The inspectors did not identify a specific inspection or procedural direction to look for this particular deformation. As a result, Exelon initiated AR04202247 to modify associated pressurizer safety valve purchase orders to require the test facility to perform a full disassembly and</p>	

inspection of pressurizer safety valves regardless of whether they meet as-found testing acceptance criteria.

The inspectors determined that Exelon's evaluations, extent of condition reviews, and corrective actions were adequate to address the issue and were commensurate with its safety significance.

Additional aspects of LER 05000317/2018-001-00 are as discussed in section 71153.2 of this report.

Observation	71153.2
<p>The inspectors reviewed LER 05000317/2018-001-00, Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals and corrective action documents related to this issue and identified some weaknesses with Exelon's response. Specifically, the inspectors noted that the LER incorrectly documented an as-found lift setting of 2,442 pounds per square inch, absolute. Upon further review, it appeared that the actual as-found units should be pounds per square inch, gauge. Exelon initiated AR04202738 to document and correct this issue. The inspectors also noted that LER 05000317/2018-001-00 stated that a probabilistic risk assessment analysis was performed and determined that the estimated increase in core damage frequency and large early release frequency were very small. The inspectors determined Exelon's risk evaluation for this issue was qualitative vice quantitative and that a specific analysis was not performed. The inspectors noted that a previously completed analysis was determined by Exelon to be bounding. Exelon initiated AR04211788 to document and correct this issue. The inspectors noted that Exelon intends to reopen their evaluation of the pressurizer safety valve failure and work with the test facility and the pressurizer safety valve vendor to discuss the possible causes for the bellows nose bulge and to develop corrective actions as appropriate. The inspectors also noted that Exelon intends to submit a supplemental LER to correct the deficiencies identified above and provide an update of the evaluation. Since the NRC did not rely upon any inaccurate information in making a regulatory decision and the issue has been entered into the corrective action program, this issue is being treated as a performance deficiency of minor significance in accordance with the NRC Enforcement Policy.</p> <p>As a result of the above observations, LER 05000317/2018-001-00 will remain open pending review of the supplemental information.</p> <p>Additional aspects of LER 05000317/2018-001-00 are as discussed in section 71152.5 of this report.</p>	

Licensee Identified Non-Cited Violation	71111.05A
<p>This violation of very low safety significance was identified by Exelon and has been entered into Exelon's corrective action program as AR04161664 and is being treated as a non-cited violation, consistent with Section 2.3.2.a of the NRC Enforcement Policy.</p>	
<p>Violation: CCNPP Unit 1 and Unit 2, Operating License Condition E, states, "Exelon Generation shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the license amendment request dated September 24, 2013; as supplemented by letters dated February 9, 2015, March 11, 2015, April 13, 2015, July 6, 2015, August 13, 2015, February 24, 2016, and April 22, 2016,</p>	

and as approved in the NRC safety evaluation report dated August 30, 2016.” The approved fire protection program described is a risk-informed, performance-based alternative that incorporates by reference National Fire Protection Association Standard 805.

National Fire Protection Association Standard 805, Section 3.4.1 (c), requires that during every shift, the fire brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria.

In the CCNPP letter dated February 9, 2015, Exelon specified that it would incorporate an exception to National Fire Protection Association Standard 805, Section 3.4.1(c), such that sufficient training and knowledge shall be permitted to be provided by an operations technical advisor dedicated to fire brigade support. Exelon further stated that administrative procedures and the Updated Final Safety Analysis Report ensure that an operations technical advisor, a licensed operator position, is dedicated to respond with the fire brigade. The NRC safety evaluation report dated August 30, 2016, approved the exception.

Exelon procedure OP-CA-101-111-0200, “Shift Complement and Responsibilities,” Revision 000, Section 4.1.1, “Minimum Staffing Requirements,” requires an operations technical advisor in all modes with the note, “The OTA cannot be one of the SROs, STAs, or ROs credited to meet minimum staffing.”

Contrary to the above, on at least 26 occasions between July 1 and August 25, 2017, Exelon failed to implement and maintain in effect all provisions of the approved fire protection program in that an operations technical advisor, a licensed operator position, was not dedicated to respond with the fire brigade.

Significance/Severity: The inspectors reviewed IMC 0609, Attachment 4, “Initial Characterization of Findings,” issued on October 7, 2016 and IMC 0609, Appendix A, “The SDP for Findings at Power,” Exhibit 2, “Mitigating System Screening Questions,” issued on June 19, 2012. The inspectors determined that the finding is of very low safety significance (Green) because the fire brigade demonstrated the ability to meet the required times for fire extinguishment for the fire drill scenarios and the finding did not significantly affect the ability of the fire brigade to respond to a fire.

Corrective Action Reference(s): AR04046035 and AR04161664

<p>TI-2690/011</p> <p>Review of Aging Management Programs at Independent Spent Fuel Storage Installations</p>	<p>OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT, AND ABNORMAL</p>
<p>The inspectors evaluated whether Exelon had adequate processes and procedures in place to implement an aging management program for the CCNPP independent spent fuel storage installation.</p>	

The inspectors determined that the procedures and processes Exelon has in place to implement the aging management program were consistent with the requirement for the Aging Management Program provided in the renewed independent spent fuel storage installation license and the requirements of 10 CFR72.

## **EXIT MEETINGS AND DEBRIEFS**

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

- On November 29, 2018, the inspectors debriefed the inspection results for the review of Exelon's evaluation and corrective actions for continued containment air cooler motor starter issues (AR04056045) with Mr. Mike Fick, Principal Regulatory Engineer.
- On December 6, 2018, the inspectors presented the Occupational Dose Assessment inspection results to Mr. Mark Flaherty, Site Vice President, and other members of the Exelon staff.
- On December 12, 2018, the inspectors debriefed the inspection results for the review of Exelon's evaluation and corrective actions for Unit 1 containment tendon gallery external grease leakage (AR04038741) with Mr. Michael Fick, Principal Regulatory Engineer.
- On January 16, 2019, the inspectors presented the quarterly resident inspector inspection results to Mr. Todd Tierney, Plant Manager, and other members of the Exelon staff.

## DOCUMENTS REVIEWED

### 71152 – Problem Identification and Resolution

#### Procedures

ER-AA-330-005, Visual Examination of Section XI Class CC Concrete Containment Structure, Revision 14  
 STP-M-663-1, Containment Tendon Surveillance - Full Scope Examination, Revision 01200  
 STP-M-665-1, Containment Visual Inspection, Revision 00700  
 STP-M-666-1 Containment Tendon Surveillance - Visual Examination and Grease Testing, Revision 00200

#### Action Request (\*initiated in response to inspection)

AR02264431  
 AR04037583  
 AR04202934

#### Drawings

63766SH0002, Containment Ring Girder Bearing Plate Unit 1, Revision 1

#### Miscellaneous

CC07-IV-279, IWL Visual Examination Sheet, dated August 28, 2009  
 CCC07-IV-277, IWL Visual Examination Sheet, dated August 28, 2009  
 CC-N1019-501, Final Report for the 30th Year Tendon Surveillance at Calvert Cliffs, dated March 19, 2009  
 CN-46499, Revision 1, Failure Analysis of an Electric Actuator, Dated 23 October, 2017  
 ECP-18-000500, Technical Evaluation of FLEX Fuel Oil Additive, revision 0  
 Fuel Oil and Lubricating Oil Sample Results, sampled at the DFO truck receipt on November 30, 2017  
 REP-1123-510, Final Report for the 40th Year Tendon Surveillance at Calvert Cliffs, dated February 31, 2017  
 VTM 15903-003-1001, Operator Manual for Generator Set QSB5 Engine with Power Command 1.1R Control, C100 D6R (Specs A and B), Revision 0  
 VTM 15903-003-1034, Power Tech Plus 4045HF485 and 6068HF485, Revision 0  
 VTM 15903-003-1035, Programmable Microprocessor-based pump controller for electronic J1939 CAN Bus Diesel Engines, Revision 0  
 WO C92961171  
 WO C93633529  
 WO C93629620