



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION I  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

August 10, 2020

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: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 –  
INTEGRATED INSPECTION REPORT 05000277/2020002 AND  
05000278/2020002**

Dear Mr. Hanson:

On June 30, 2020, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Peach Bottom Atomic Power Station, Units 2 and 3. On July 17, 2020, the NRC inspectors discussed the results of this inspection with Mr. Matthew Herr, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

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

If you contest the violation or the significance or severity of the violation documented in this inspection report, 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 Peach Bottom Atomic Power Station, Units 2 and 3.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; and the NRC Resident Inspector at Peach Bottom Atomic Power Station, Units 2 and 3.

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 at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

X /RA/

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Signed by: Jonathan E. Greives  
Jonathan E. Greives, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Docket Nos. 05000277 and 05000278  
License Nos. DPR-44 and DPR-56

Enclosure:  
As stated

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SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 –  
 INTEGRATED INSPECTION REPORT 05000277/2020002 AND  
 05000278/2020002 DATED AUGUST 10, 2020

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**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Numbers: 05000277 and 05000278

License Numbers: DPR-44 and DPR-56

Report Numbers: 05000277/2020002 and 05000278/2020002

Enterprise Identifier: I-2020-002-0039

Licensee: Exelon Generation Company, LLC

Facility: Peach Bottom Atomic Power Station, Units 2 and 3

Location: Delta, PA 17314

Inspection Dates: April 1, 2020 to June 30, 2020

Inspectors: S. Rutenkroger, Senior Resident Inspector  
J. Heinly, Senior Resident Inspector  
P. Boguszewski, Resident Inspector  
P. Ott, Operations Engineer

Approved By: Jonathan E. Greives, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Enclosure

## SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee’s performance by conducting an integrated inspection at Peach Bottom Atomic Power Station, Units 2 and 3, 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.

### List of Findings and Violations

E-1 Emergency Diesel Generator Low Coolant Pressure Trip			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000277,05000278/2020002-01 Open/Closed	[P.3] - Resolution	71153
<p>A self-revealing Green non-cited violation (NCV) associated with Title 10 of the <i>Code of Federal Regulations</i> (CFR) Part 50, Appendix B, Criterion XVI, “Corrective Action,” was identified because Exelon did not identify and correct a condition adverse to quality associated with the 'E-1' emergency diesel generator (EDG). Specifically, Exelon did not perform appropriate corrective actions to evaluate and address past 'E-1' EDG intercooler coolant low pressure trips. As a result, Exelon did not identify an incorrectly located scavenging air cooler constant vent and EDG venting procedure inadequacies prior to the trip of the 'E-1' EDG during a surveillance test on February 26, 2020.</p>			

### Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000277,05000278/ 2020-001-00	LER 2020-001-00 for Peach Bottom Atomic Power Station, Unit 2, Emergency Diesel Generator Shutdown Due to Intercooler Low Pressure Results in Condition Prohibited by Technical Specifications	71153	Closed

## PLANT STATUS

Unit 2 began the inspection period at rated thermal power (RTP). On May 28, 2020, the unit was down powered to 27 percent for single reactor recirculation loop operation for a '2A' adjustable speed drive controller repair, waterbox cleaning and inspection, condenser tube plugging, turbine valve testing, and a control rod pattern adjustment. The unit was returned to RTP on May 29, 2020. On June 18, 2020, the unit was down powered to 70 percent for a waterbox inspection, condenser tube plugging, control rod friction testing, and control rod pattern adjustment. The unit was returned to RTP the following day, and remained at or near RTP for the remainder of the inspection period.

Unit 3 began the inspection period at RTP. On June 7, 2020, the unit was down powered to 71 percent for a control rod pattern adjustment and turbine valve testing. The unit was returned to RTP the following day, and remained at or near RTP for the remainder of the 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 licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

Starting on March 20, 2020, in response to the National Emergency declared by the President of the United States on the public health risks of the coronavirus (COVID-19), resident inspectors were directed to begin telework and to remotely access licensee information using available technology. During this time the resident inspectors performed periodic site visits each week and conducted plant status activities as described in IMC 2515, Appendix D; observed risk significant activities; and completed on site portions of IPs. In addition, resident and regional baseline inspections were evaluated to determine if all or portion of the objectives and requirements stated in the IP could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed remotely and on site. The inspections documented below met the objectives and requirements for completion of the IP.

## REACTOR SAFETY

### 71111.04 - Equipment Alignment

#### Partial Walkdown Sample (IP Section 03.01) (3 Samples)

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

- (1) Unit 2 'A/C' residual heat removal (RHR) during Unit 2 'B/D' RHR system outage window (SOW) on April 21, 2020
- (2) Unit 3 'A' RHR while the Unit 3 'B' RHR was out of service for planned maintenance on May 5, 2020
- (3) Unit 3 'A' core spray (CS) during 'A' RHR SOW on June 9, 2020

#### 71111.05 - Fire Protection

##### Fire Area Walkdown and Inspection Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the implementation of the fire protection program by conducting a walkdown and performing a review to verify program compliance, equipment functionality, material condition, and operational readiness of the following fire areas:

- (1) Unit 2 PF-5J, 165' general area on June 23, 2020
- (2) Unit 2 PF-5G, CS instrument room on June 23, 2020
- (3) Unit 3 PF-12B, reactor building closed-cooling water room on June 24, 2020
- (4) Unit 3 PF-12C, motor generator set room on June 24, 2020
- (5) PF-108A, radwaste building, fan room on June 24, 2020

#### 71111.11A - Licensed Operator Requalification Program and Licensed Operator Performance

##### Requalification Examination Results (IP Section 03.03) (1 Sample)

- (1) The inspectors reviewed and evaluated the licensed operator examination failure rates for the requalification annual operating exam and biennial written exam completed on April 2, 2020.

#### 71111.11Q - Licensed Operator Requalification Program and Licensed Operator Performance

##### Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (1 Sample)

- (1) The inspectors observed and evaluated licensed operator performance in the control room during the Unit 2 control rod pattern adjustment and power ascension on June 19, 2020

#### 71111.12 - Maintenance Effectiveness

##### Maintenance Effectiveness (IP Section 03.01) (2 Samples)

The inspectors evaluated the effectiveness of maintenance to ensure the following structures, systems, and components (SSCs) remain capable of performing their intended function:

- (1) Unit 2 and Unit 3 CS level switches as of April 2, 2020
- (2) Unit 2 reactor core isolation cooling (RCIC) as of April 2, 2020

### 71111.13 - Maintenance Risk Assessments and Emergent Work Control

#### Risk Assessment and Management Sample (IP Section 03.01) (4 Samples)

The inspectors evaluated the accuracy and completeness of risk assessments for the following planned and emergent work activities to ensure configuration changes and appropriate work controls were addressed:

- (1) Unit 2 'B/D' RHR planned maintenance on April 21, 2020
- (2) Unit 2 RCIC planned maintenance and yellow risk on May 12, 2020
- (3) Unit 3 high-pressure coolant injection (HPCI) planned maintenance and yellow risk on June 4, 2020
- (4) Unit 3 'A/C' RHR planned maintenance and yellow risk on June 8, 2020

### 71111.15 - Operability Determinations and Functionality Assessments

#### Operability Determination or Functionality Assessment (IP Section 03.01) (2 Samples)

The inspectors evaluated the licensee's justifications and actions associated with the following operability determinations and functionality assessments:

- (1) Unit 2 and Unit 3 'B' emergency cooling tower (ECT) fan tripped due to a high vibration signal on April 8, 2020
- (2) Unit 3 high pressure service water (HPSW) return line isolation valve's operator 'MOV-3-3486' contained grease in the spring pack on April 29, 2020

### 71111.18 - Plant Modifications

#### Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (1 Sample)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Modification to install a backup compressed nitrogen cylinder supply to select containment atmosphere control primary containment isolation valves on June 24, 2020

### 71111.19 - Post-Maintenance Testing

#### Post-Maintenance Test Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the following post-maintenance test activities to verify system operability and functionality:

- (1) Unit 2 'B' ECT maintenance on April 20, 2020
- (2) Unit 2 'B' RHR/HPSW maintenance on April 21, 2020
- (3) Unit 2 and Unit 3 'A' ECT maintenance on April 29, 2020
- (4) Replacement of control room ventilation supply flow switch 'FS-0760B' on June 2, 2020
- (5) Replacement of control room ventilation supply flow switch 'FS-0760A' on June 10, 2020



### 71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

#### Surveillance Tests (other) (IP Section 03.01) (2 Samples)

- (1) 'E-1' EDG run on April 1, 2020
- (2) Unit 2 HPCI alternate control panel test on April 30, 2020

#### Inservice Testing (IP Section 03.01) (1 Sample)

- (1) Unit 2 'A' CS pump, valve, and flow (PVF) on April 27, 2020

#### FLEX Testing (IP Section 03.02) (1 Sample)

- (1) FLEX diesel powered pump dry run on June 10, 2020

### **OTHER ACTIVITIES – BASELINE**

#### 71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

#### BI01: Reactor Coolant System (RCS) Specific Activity Sample (IP Section 02.10) (2 Samples)

- (1) Unit 2 RCS activity on April 15, 2020
- (2) Unit 3 RCS activity on April 15, 2020

#### BI02: RCS Leak Rate Sample (IP Section 02.11) (2 Samples)

- (1) Unit 2 RCS leakage on April 15, 2020
- (2) Unit 3 RCS leakage on April 15, 2020

#### 71152 - Problem Identification and Resolution

#### Semiannual Trend Review (IP Section 02.02) (1 Sample)

- (1) The inspectors reviewed the licensee's corrective action program (CAP) for potential adverse trends that might be indicative of a more significant safety issue

#### Annual Follow-up of Selected Issues (IP Section 02.03) (1 Sample)

The inspectors reviewed the licensee's implementation of its CAP related to the following issues:

- (1) The inspectors reviewed engineering program performance, an engineering department recovery plan, and the associated corrective actions to improve accountability and performance following identification of a decline in performance on April 8, 2020

71153 - Followup of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (1 Sample)

The inspectors evaluated the following licensee event report (LER):

- (1) LER 2020-001-00 for Peach Bottom Atomic Power Station, Unit 2 EDG Shutdown Due to Intercooler Low Pressure Results in Condition Prohibited by Technical Specifications (TSs) (ADAMS Accession No. ML 20115E369). The inspection conclusions associated with this LER are documented in this report under Inspection Results Section 71153.

**INSPECTION RESULTS**

Observation: 71152 Problem Identification & Resolution - Engineering Program Ownership	71152
<p>The station experienced an unexpected failure of the 'E-1' EDG 4160 volt underground output cable on May 29, 2019, as documented in issue report (IR) 4252679. Subsequently, the station performed a root cause evaluation and determined that one of the contributing causes was the station did not establish appropriate engineering ownership and oversight of the cable management program. The evaluation determined that a comprehensive review of all station programs was warranted to ensure appropriate ownership and accountability was established. The outcome of the review would be presented to the plant health committee for station review and additional IR's would be generated for any future deficiencies identified. A finding associated with the failure of the 'E-1' diesel underground output cable was documented in the third quarter of 2019 inspection report, "Peach Bottom Atomic Power Station, Units 2 and 3 - Integrated Inspection Report 05000277/2019003 and 05000278/2019003," (ADAMS Accession No. ML19296A937).</p> <p>The NRC inspectors reviewed the cause evaluation as well as previous NRC-identified issues with station programs. For example, NRC inspectors previously identified (IR 4264530) that the station did not implement required ECT preventive maintenance tasks as required by ER-AA-340-2001, "Cooling Tower Performance Monitoring Program." Furthermore, the inspectors identified that the program owner was not aware of the program requirements. The NRC inspector's observations were consistent with the licensee's cause evaluation conclusions. The NRC inspectors determined that the licensee's cause evaluation adequately identified the causes and took corrective actions commensurate with its safety significance. No significant issues were identified by the review of the station's programs.</p>	
Observation: Semi-Annual Trend Review	71152
<p>The inspectors evaluated a sample of issues and events that occurred over the course of the first and second quarters of 2020 to determine whether issues were appropriately considered as emerging or adverse trends. The inspectors verified that these issues were addressed within the scope of the CAP or through department review. As part of this review, the inspectors included repetitive or closely-related issues documented by Exelon in the CAP, trend reports, major equipment problem lists, system health reports, and self-assessments.</p> <p>Equipment reliability continues to be an area of focus for the station. In particular, the station continues to experience safety-related equipment failures. Most notably, the 'E-1' EDG experienced a failure due to air entrapped in the coolant system in the second quarter of</p>	

2020 (Green NCV 2020002-01). Additionally, Exelon identified two trends dealing with equipment reliability (of both safety and non-safety related equipment). Specifically, the two trends were associated with equipment failures and equipment failures not effectively resolved. These trends were documented in IRs 04337863 and 04349262, respectively. The inspectors reviewed the completed and planned actions and determined they were adequate to address the trends.

Additionally, the inspectors reviewed a station self-assessment for the upcoming design basis assurance inspection. The inspectors noted that issues identified from the self-assessment were appropriately entered into the CAP, and Exelon took appropriate corrective actions.

Overall, the inspectors did not identify an adverse trend that might indicate the existence of a more significant safety concern during this semi-annual period.

**E-1 Emergency Diesel Generator Low Coolant Pressure Trip**

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000277,05000278/2020002-01 Open/Closed	[P.3] - Resolution	71153

A self-revealing Green non-cited violation (NCV) associated with Title 10 of the *Code of Federal Regulations* (CFR) Part 50, Appendix B, Criterion XVI, "Corrective Action," was identified because Exelon did not identify and correct a condition adverse to quality associated with the 'E-1' emergency diesel generator(EDG). Specifically, Exelon did not perform appropriate corrective actions to evaluate and address past 'E-1' EDG intercooler coolant low pressure trips. As a result, Exelon did not identify an incorrectly located scavenging air cooler constant vent and EDG venting procedure inadequacies prior to the trip of the 'E-1' EDG during a surveillance test on February 26, 2020.

Description: Peach Bottom has four EDGs that supply emergency power (4kV) to both Unit 2 and Unit 3. Each EDG has a cooling water system, which consists of two loops: the jacket water cooling loop and the air cooler coolant loop. The jacket water cooling loop removes the excess heat of combustion from the EDG. The air cooler coolant loop cools the EDG combustion air before the air enters the engine's cylinders. The air cooler coolant loop accomplishes this by using air-liquid heat exchangers, called scavenging air coolers.

During a monthly surveillance run of the 'E-1' EDG on February 26, 2020, approximately 35 seconds after the engine was raised to full speed, the 'E-1' EDG unexpectedly tripped due to low coolant pressure. The 'E-1' EDG was immediately declared inoperable, and Exelon commenced troubleshooting. Exelon performed a series of static and dynamic vents of the air coolant and jacket water systems to remove excess air from the coolant system, and the 'E-1' EDG was declared operable on February 27, 2020. Exelon entered the 'E-1' EDG failure into the CAP under IR 4321794. Exelon's corrective actions included performing a detailed walkdown of the 'E-1' EDG's venting configuration and completing a Corrective Action Program Evaluation (CAPE).

The station conducted a walkdown of the 'E-1' EDG on March 3, 2020, and identified an incorrectly located constant vent line on a scavenging air cooler. The constant vent line was not located at the piping high spot. Exelon determined, through conversations with the EDG vendor, that the positioning of the vent most likely contributed to residual air found in the system during the trip. Lack of proper venting in the scavenging air cooler could create a

vulnerability for air to accumulate at this localized high spot. However, it was determined that the coolant system could be made solid through more robust venting even with the incorrectly located scavenging air cooler constant vent, and once the system was properly vented, the issue with the constant vent line alone would not impact EDG operability. The station determined the vent was most likely placed in the incorrect location in 2017 when the scavenging air cooler was replaced as part of preventative maintenance.

Exelon's CAPE determined that the direct cause of the failure was excessive air trapped in the coolant system after the last maintenance window. Specifically, the station's EDG venting procedures did not include adequate instructions to fully vent all the air from the coolant system. Exelon concluded that the venting process should be enhanced to dynamically vent at multiple points during heat up and loaded running to ensure all air is removed. Exelon determined the incorrectly located vent line exacerbated the air entrapment condition that led to the trip of the 'E-1' EDG on February 26, 2020.

Additionally, Exelon's CAPE discussed that the 'E-1' EDG is the only EDG in recent history to have experienced intercooler coolant low pressure trips. Specifically, the 'E-1' EDG tripped due to intercooler coolant low pressure on three previous occurrences, in 2015, 2017, and 2018. Each of these trips occurred during the initial post-maintenance testing, prior to the system being declared operable.

Peach Bottom's post-maintenance testing of the EDGs requires venting the coolant system using procedures SO 52A.8.C, "Diesel Generator Running Inspection," and RT-O-052-251-2, "Diesel Generator Inspection Post-Maintenance Test." Upon review of Exelon's past low coolant pressure trips, the inspectors noted that procedure RT-O-052-251-2 was reviewed as a corrective action following the 2017 trip and was determined to be adequate. After the 2020 trip, the station determined that the coolant venting guidance in this procedure was not adequate and improvements were necessary to ensure proper venting. Additionally, the 2017 'E-1' EDG trip occurred immediately following the system maintenance window that included replacement of the scavenging air cooler. No documented walkdown of the 'E-1' venting system was performed following the 2017 'E-1' EDG intercooler coolant low pressure trip which followed replacement of the scavenging air cooler.

Corrective Actions: Exelon vented the entrapped air in the 'E-1' EDG coolant system and returned the system to operable status. Additionally, the station relocated the scavenging air cooler constant vent line to the proper location and performed a CAPE to evaluate the failure. Exelon is revising applicable procedures that provide EDG coolant system venting guidance to require venting when the machine is hot and loaded.

Corrective Action References: IR 4321794

Performance Assessment:

Performance Deficiency: The inspectors determined that failing to identify and correct conditions adverse to quality associated with the 'E-1' EDG was a performance deficiency that was within Exelon's ability to foresee and correct. Specifically, Exelon did not perform adequate corrective actions to evaluate and address past 'E-1' EDG intercooler coolant low pressure trips. As a result, Exelon did not identify an incorrectly located scavenging air cooler constant vent and EDG venting procedure inadequacies prior to the trip of the 'E-1' EDG during a surveillance test on February 26, 2020.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the 'E-1' EDG was unavailable to perform its safety function when it tripped on intercooler coolant low pressure.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The inspectors determined that the finding resulted in the actual loss of a function of a single train ('E-1' EDG) for longer than its TS allowed outage time and required a detailed risk evaluation.

The senior reactor analyst (SRA) noted that a previous fail to start condition associated with the 'E-1' EDG had been evaluated within Peach Bottom Atomic Power Station Integrated Inspection Report 05000277/2019003 and 05000278/2019003. For this current evaluation, the SRA determined that the trip of 'E-1' due to the lack of appropriate venting occurred during the start of the EDG and consistent with the previous cable failure evaluation would be considered a fail to start condition. The SRA noted through discussions with the resident inspectors and a review of relevant information that the exposure time associated with this performance deficiency would be 21 days.

The SRA performed a detailed risk evaluation (DRE) using the Peach Bottom Unit 2 and Unit 3 Standardized Plant Analysis Risk (SPAR) models, with the Unit 2 model being used as a surrogate for external events for Unit 3. The SRA used Unit 2 SPAR model, version 8.53 and Unit 3 SPAR model, version 8.59. The models had been updated to include FLEX modifications, which the station had developed in response to Order 12-049, "Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," because this affects how the operators respond to an extended loss of alternating current power. The SPAR model determined the total (internal and external events) contribution to the increase in core damage frequency (CDF) to be  $3E-7$ /yr. This was determined to bound the impact to Unit 3. The SRA turned on FLEX credit by changing the basic event, FLX-XHE-XE-ELAP to a value of  $4E-2$ . This value was considered to be conservative through a SPAR-H calculation and factored in actions related to deep direct current load shedding. Based on the timeline for FLEX events, credit was only given for the first FLEX diesel generator within the model. These changes were made for the nominal and condition case. Additionally, the failure to line up and start the FLEX diesel, basic event FLX-XHE-XM-480, was set to 0.1 given the dominant events being associated with fires. The SRA used the endstate gather method to ensure a more accurate calculation of the estimated risk. The SRA discussed this recent 'E-1' EDG failure with Exelon probabilistic risk analysis (PRA) personnel to understand if the previous evaluation related to the cable failure would still be technically adequate with respect to dominant events and core damage sequences. It was determined that the impact on the increase in CDF for the fail to start of 'E-1' EDG was similar to the previous review performed within Inspection Report 2019003. The SRA noted that Exelon's fire model had a slightly higher estimate for increased external risk associated with the exposure time within the mid  $E-7$ /yr range for Unit 2 and slightly lower for Unit 3. The SRA noted this had included sensitivity analysis considerations for increased FLEX equipment failure rates and FLEX operator failure rates above the licensee's baseline model assumptions.

The SRA used the SPAR model to determine the internal events increase in CDF/yr. The dominant sequences consisted of a grid related loss-of-offsite-power (LOOP), common cause

failure of all the EDGs, with the failure to establish the Conowingo tie line setup (station blackout source), failure to recover offsite power and EDGs, and failure of the RCIC pump to run, or the failure of the FLEX generator to run. The internal events increase in CDF/yr for the 'E-1' EDG fail to start was determined to be in the mid E-8/yr range for the 21-day exposure. The SRA determined the final best estimate total risk increase in CDF using the SPAR model for internal events and Exelon's fire risk model output for external events to be 5E-7/yr for Unit 2 and 3E-7/yr for Unit 3 or of very low safety significance (Green). Exelon's internal event risk was higher than the SPAR model but would not change the conclusion of the risk evaluation. The risk was dominated by the postulated fire events and was noted to be higher for Unit 2 because of the differences in power sources for the divisional batteries and subsequent effect of the 'E-1' EDG failure having a greater impact on Unit 2.

Exelon's fire model revealed that fire events dominated the risk increase of the 'E-1' EDG failure, similar to what the SPAR model revealed. The dominant risk contributor for Unit 2 was a fire within the 'E-42' 4kV switchgear room. This included electrical high energy arc fault (HEAF) fires involving the '20A18' switchgear and the '00C026DX' 'E-4' diesel generator alternate control panel fires. The highest contributing core damage sequences included the fire scenario initiating event within this room, failure of high-pressure injection long term, and for some initiating events, the normally aligned offsite power feeder breaker spuriously opening resulting in a LOOP to the 'E-12' 4kV switchgear. Other sequences include losing power because the '00A19' (4kV bus duct feeding the safety busses from offsite power) could be damaged by the HEAF or the breaker upstream of '00A19' opens due to damage to its associated differential relay cabling and failure of the opposite offsite power breaker to close due to cable damage. Therefore, because of the nature of the postulated fire, even though offsite power is being delivered to the station and in various cases the '00A19' and '00A20' bus ducts are still delivering 4kV power to other 4kV switchgears, these events are not considered total LOOP events. However, the above scenarios result in failure of the direct current (DC) power supply to the safety relief valves resulting in the failure to depressurize, with failure of the high-pressure systems and resultant core damage.

The Unit 2 SPAR model was consistent in reflecting the HEAF within the 'E-42' switchgear room to be a dominant contributor to the conditional increase in CDF due to the 'E-1' failure. This sequence consisted of the HEAF event, with failure to align alternate power to battery charger '2AD03,' and failure of the 'E-3' EDG to run resulting in the loss of high-pressure injection with failure to depressurize with no ability to cross tie AC power.

For Unit 3, Exelon's fire model determined that a fire within the Unit 3 'E-43' 4kV switchgear room was a dominant contributor to the conditional increase in CDF/yr. A HEAF results in the LOOP feed to the safety busses with the 'E-3' EDG in assumed maintenance (loss of all EDG's) and a failure to align FLEX equipment as one of the dominant sequences.

Exelon previously had performed detailed model runs for the effect on the increase on large early release frequency (LERF). The SRA noted that fires dominated the conditional increase in risk with Unit 2 and Unit 3 resulting in a CDF increase in the very low E-8/yr range for the exposure time. This was a Level 2 methodology analyzing issues such as magnitude and timing of calculated radionuclide releases through level 2 containment event trees. This resulted in a LERF multiplier for both units relative to the CDF sequences of a nominal 5E-2. Therefore, the LERF results were consistent with the CDF determinations of a very low safety significance issue (Green).

Cross-Cutting Aspect: P.3 - Resolution: The organization takes effective corrective actions to address issues in a timely manner commensurate with their safety significance. Specifically, Exelon had documented multiple 'E-1' EDG low intercooler coolant low pressure trips in the CAP and did not effectively correct the issue.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires that measures be established to assure that conditions adverse to quality are promptly identified and corrected. Peach Bottom Units 2 and 3 TS 3.8.1 requires all four EDGs to be operable in Mode 1, and if any one EDG is determined to be inoperable, it shall be returned to an operable status within 14 days or the unit shall be shut down and in Mode 3 within 12 hours.

Contrary to the above, Exelon did not promptly identify and correct an incorrectly located scavenging air cooler constant vent line and inadequacies in the EDG coolant venting procedures, which represent conditions adverse to quality. Consequently, the 'E-1' EDG was rendered inoperable prior to February 26, 2020, for a period longer than its TS allowed outage time, and the unit had not been shut down and placed in Mode 3.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

## **EXIT MEETINGS AND DEBRIEFS**

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

- On July 17, 2020, the inspectors presented the integrated inspection results to Mr. Matthew Herr, Site Vice President, and other members of the licensee staff.

**DOCUMENTS REVIEWED**

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71152	Corrective Action Documents	4337863		
		4349262		
	Self-Assessments		Self Assessment: Design Basis Assurance Inspection	
71153	Corrective Action Documents	2537610		
		4050989		
		4052816		
		4269359		
		4321794		
		4323405		
	Drawings	M-377 Sheet 2	Diesel Generator Auxiliary Systems (Air Coolant and Jacket Coolant Systems)	Revision 47
		M-377 Sheet 9	Diesel Generator Auxiliary Systems (Combustion Air Intake/Exhaust System)	Revision 9
	Miscellaneous	E-5-168	Emergency Diesel Generator Vendor Technical Manual	Revision 11
	Procedures	RT-O-052-251-2	'E-1' Diesel Generator Inspection Post-Maintenance Functional Test	Revision 36
		SO 52A.1.B	Diesel Generator Operations	Revision 66
		SO 52A.8.C	Diesel Generator Running Inspection	Revision 45
		ST-O-052-311-2	'E-1' Diesel Generator Slow Start Full Load Inservice Test	Revision 23
	Work Orders	04243305		
		05014235		