



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

February 8, 2017

Mr. George A. Lippard III, Vice President  
Nuclear Operations  
South Carolina Electric & Gas Company  
Virgil C. Summer Nuclear Station  
P.O. Box 88, Mail Code 800  
Jenkinsville, SC 29065

**SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 – NRC INTEGRATED  
INSPECTION REPORT 05000395/2016004**

Dear Mr. Lippard:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Virgil C. Summer Nuclear Station, Unit 1. On January 25, 2017, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented three findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. Additionally, inspectors documented one Severity Level IV violation under the traditional enforcement process with no associated finding. The inspectors also documented three licensee-identified violations, which were determined to be of very low safety significance, in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

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 Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Virgil C. Summer Nuclear Station, Unit 1.

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 II; and the NRC resident inspector at the Virgil C. Summer Nuclear Station, Unit 1.

G. Lippard

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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 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

*/RA/*

Anthony D. Masters, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket No.: 50-395  
License No.: NPF-12

Enclosure:  
IR 05000395/2016004  
w/Attachment: Supplemental Information

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Letter to George A. Lippard III from Anthony D. Masters dated February 8, 2017

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 – NRC INTEGRATED  
INSPECTION REPORT 05000395/2016004

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**U. S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No. 50-395

License No. NPF-12

Report Nos. 05000395/2016004

Licensee: South Carolina Electric & Gas (SCE&G) Company

Facility: Virgil C. Summer Nuclear Station, Unit 1

Location: Jenkinsville, SC 29065

Dates: October 1 through December 31, 2016

Inspectors: J. Reece, Senior Resident Inspector  
E. Coffman, Resident Inspector  
C. Smith, Acting Resident Inspector  
D. Lanyi, Senior Operations Engineer (Section 1R11.3)  
G. Ottenberg, Senior Reactor Inspector (Section 4OA5.2)

Approved by: Anthony D. Masters, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Enclosure

## SUMMARY

IR 05000395/2016004; 10/01/2016 - 12/31/2016: Virgil C. Summer Nuclear Station, Unit 1; Fire Protection, Operability Determinations and Functionality Assessments, Followup of Events and Notices of Enforcement Discretion, Other Activities.

The report covered a three-month period of inspection by resident and regional inspectors. Two NRC-identified and one self-revealing violation as well as one SL IV traditional enforcement violation were identified and documented in this report. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP), dated April 29, 2015. The cross-cutting aspects were determined using IMC 0310, "Aspects Within the Cross Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### Cornerstone: Mitigating Systems

- Green. The inspectors identified a Green, non-cited violation (NCV) of the V.C. Summer Nuclear Station Operating License, Condition 2.C (18), "Fire Protection Program," for the failure to establish procedures requiring corrective action for conditions, including significant and repetitive, adverse to fire protection. The licensee immediately notified the corrective action program (CAP) supervisor and entered the problem into their CAP as condition report CR-16-05270.

The inspectors reviewed Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," dated September 7, 2012, and determined the performance deficiency (PD) was more than minor and therefore a finding because it impacted the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, and the related attribute of protection against external factors such as fire. Specifically, the failure to establish corrective action program requirements specific to fire protection with appropriate definitions for significant and repetitive would result in corrective actions not commensurate with the significance of the adverse condition. The inspectors used IMC 0609, "Significant Determination Process," Appendix F, "Fire Protection Significance Determination Process," Attachment 1, dated September 20, 2013, to perform a Phase 1 analysis and determined that the reactor oversight process (ROP) finding was of very low safety significance (Green) based on the response for Question 1.3.1A, in which the reactor was able to reach and maintain safe shutdown. While the licensee does not have the required corrective actions defined, they have generally addressed conditions adverse to fire protection within the existing corrective action program. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of human performance and the aspect of resources, H.1, because the licensee leadership failed to ensure that adequate procedures were in place to address significant and repetitive conditions adverse to fire protection. (Section 1R05)

- Green. A self-revealing, Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the failure to promptly identify and correct a condition adverse to quality (CAQ) involving welded joint indications in the 'B' emergency diesel generator (EDG) exhaust manifold. The licensee immediately removed the EDG from service to perform repairs, and the issue was entered into the licensee's CAP as Condition Report CR-16-05421.

The inspectors reviewed Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," dated September 7, 2012, and determined the PD was more than minor and therefore a finding, because it affected the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and the respective attribute of equipment performance. Specifically, the 'B' EDG was declared operable but degraded or nonconforming due to a circumferential weld failure and resulting separation of an exhaust manifold joint causing a small reduction in EDG power. The inspectors used IMC 0609, "Significant Determination Process," Attachment 4, dated October 7, 2016, and Appendix A – Exhibit 2, dated July 1, 2012, and determined the finding was of very low safety significance or Green because the finding was not a design deficiency or loss of function. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of problem identification and resolution and the aspect of resolution, P.3, because the licensee failed to take effective corrective actions commensurate with an issue's safety significance in that they failed to promptly identify and correct a CAQ involving welded joint indications in the 'B' EDG exhaust manifold. (Section 1R15)

- Green. The inspectors identified a Green, non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," involving the failure to accomplish safety-related (SR) station administrative procedure, SAP-0363, "Foreign Material and Debris Control," Revision 8H, for foreign material exclusion (FME) control during a SR breaker refurbishment. A subsequent breaker failure occurred due to foreign material. The licensee immediately initiated corrective actions to repair the breaker, and the licensee entered condition report, CR-16-03099, in their CAP.

The inspectors reviewed IMC 0612, Appendix B, "Issue Screening," dated September 7, 2012, and determined that the PD was more than minor and therefore a finding because it impacted the Mitigating Systems Cornerstone by adversely affecting the cornerstone objective to ensure in part the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the equipment reliability attribute was impacted because foreign material rendered the SR breaker nonfunctional causing inoperability of the pressurizer backup group 2 heaters for greater than the Technical Specification limiting condition for operation. The inspectors used IMC 0609, "Significant Determination Process," Attachment 4, dated October 7, 2016, and Appendix A – Exhibit 2, dated July 1, 2012, and determined that the finding required a detailed risk evaluation. A regional senior risk analyst performed a bounding risk evaluation in accordance with NRC IMC 0609 Appendix A using the VC Summer SPAR model. The finding was modelled as a

transient initiator with a loss of the B EDG as a surrogate for the group 2 pressurizer heaters for a 94 hour exposure interval. The dominant sequence was a transient initiator with a consequential loss of offsite power without recovery, failure of the A EDG without recovery leading to a station blackout and loss of core heat removal after battery depletion. The risk was mitigated by the available normal and group 1 pressurizer heaters. The bounding assessment determined that the performance deficiency represented an increase in core damage frequency of  $< 1.0 \text{ E-6/year}$ , a GREEN finding of very low safety significance. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of Problem Identification and Resolution and the aspect of work management, H.5, because the licensee failed to ensure the planning and execution of the respective work order for breaker refurbishment followed SAP-0363 for FME control to support nuclear safety-related work. (Section 4OA3.2)

### Other Findings

- SL IV. The NRC identified a severity level IV (SL IV) non-cited violation (NCV) of 10 Code of Federal Regulations (CFR) 50.71(e) for the licensee's failure to update the final safety analysis report (FSAR) with the latest information developed, regarding the design functions of the equipment and floor drain system. Specifically, the licensee failed to update the FSAR to reflect the high-energy line break (HELB) steam propagation barrier (SPB) function of the floor drain system following installation of new floor drain orifices used as SPBs. The licensee entered this issue into their corrective action program as CR-16-06003.

The inspectors treated the noncompliance with 10 CFR 50.71(e) as traditional enforcement because not having an updated FSAR hinders the licensee's ability to perform adequate 10 CFR 50.59 evaluations and impacts the NRC's ability to perform its regulatory function such as license amendment reviews and inspections. This was determined to be a SL-IV violation of 10 CFR 50.71(e) because it was similar to the NRC Enforcement Policy, Section 6.1.d.3, SL IV example of, "a licensee fails to update the FSAR as required by 10 CFR 50.71(e) but the lack of up-to-date information has not resulted in any unacceptable change to the facility or procedures." Cross-cutting aspects are not assigned to traditional enforcement violations. (Section 4OA5.2)

Three violations of very low safety significance that were identified by the licensee have been reviewed by the NRC. Corrective actions taken or planned by the licensee have been entered into the licensee's CAP. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.



## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at full Rated Thermal Power (RTP) and operated at or near full RTP for the remainder of the period.

#### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R01 Adverse Weather Protection

##### .1 Seasonal Weather Susceptibilities

###### a. Inspection Scope

The inspectors performed one seasonal extreme weather inspection for readiness of cold weather for two risk significant components. The inspectors verified the licensee had implemented applicable sections of operations administrative procedure, OAP-109.1, Revision (Rev.) 4E, "Guidelines for Severe Weather." The inspectors reviewed preparations for extreme cold weather and walked down the emergency diesel generators (EDG) and the service water (SW) pumphouse components to assess whether the equipment was adequately protected from cold weather and would function as expected during an accident event. Also, the inspectors reviewed the licensee's corrective action program (CAP) database to verify that freeze protection problems were being identified at the appropriate level, entered into the CAP, and appropriately resolved.

###### b. Findings

No findings were identified.

##### .2 Impending Adverse Weather

###### a. Inspection Scope

On October 7, 2016, the inspectors reviewed the licensee's actions associated with operations administrative procedure, OAP-109.1, "Guidelines for Severe Weather," Rev. 4E, implemented in response to Hurricane Matthew. The inspectors additionally reviewed samples of protected area yard conditions to verify that no potential missile hazards existed for potential tornadic conditions.

###### b. Findings

No findings were identified.

## 1R04 Equipment Alignment

### Partial System Walkdowns

#### a. Inspection Scope

The inspectors conducted two partial equipment alignment walkdowns which are listed below, to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out of service (OOS). Correct alignment and operating conditions were determined from the applicable portions of drawings, system operating procedures (SOP), and technical specifications (TS). The inspections included review of outstanding maintenance work orders (WOs) and related condition reports (CRs) to verify that the licensee had properly identified and resolved equipment alignment problems that could lead to the initiation of an event or impact mitigating system availability.

- Partial walkdown of 'A' and 'B' motor driven emergency feedwater (MDEFW) during scheduled maintenance on turbine driven emergency feedwater (TDEFW) related components
- Partial walkdown of 'A' EDG during scheduled maintenance on 'B' EDG

#### b. Findings

No findings were identified.

## 1R05 Fire Protection

### Quarterly Fire Protection Walkdowns

#### a. Inspection Scope

The inspectors reviewed recent CRs, WO, and impairments associated with the fire protection system. The inspectors reviewed surveillance activities to determine whether they supported the operability and availability of the fire protection system. The inspectors assessed the material condition of the active and passive fire protection systems and features, and observed the control of transient combustibles and ignition sources. The inspectors conducted routine inspections of the following five areas (respective fire zones also noted):

- Control building 412 elevation (fire zones CB02 and CB05)
- Heating, ventilation, air conditioning (HVAC) chilled water pump rooms A, B, C (fire zones IB07.01, IB07.02, and IB07.03)
- Intermediate building 412 elevation (fire zone IB27)
- Intermediate building 436 elevation (fire zones IB01.25.05.01, IB01.25.05.02, IB01.25.06.01, IB01.25.06.02, and IB01.14)
- Turbine building (fire zone TB01.01)

b. Findings

Introduction: The inspectors identified a Green, non-cited violation (NCV) of the Virgil C. Summer Nuclear Station (VCSNS) Operating License, Condition 2.C (18), "Fire Protection Program," for the failure to establish procedures requiring corrective action for conditions, including significant and repetitive, adverse to fire protection.

Description: On October 12, 2016, the inspectors identified that the licensee had not established procedures requiring corrective action for conditions adverse to fire protection including those that are significant or repetitive. The inspectors noted that Operating Licensee Condition 2.C.(18) states, in part, that the South Carolina Electric & Gas Company (SCE&G) 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 licensee amendment request (LAR) dated November 15, 2011 (and supplements dated January 26, 2012, October 10, 2012, February 1, 2013, April 1, 2013, October 14, 2013, November 26, 2013, January 9, 2014, February 25, 2014, May 2, 2014, May 11, 2014, August 14, 2014, October 9, 2014, and December 11, 2014) and as approved in the safety evaluation report dated February 11, 2015. Section 4.7.3 of the LAR states, in part, that VCSNS will implement a revised quality assurance program to ensure compliance with Section 2.7.3 of National Fire Protection Association (NFPA) 805 and the revised fire protection quality assurance program which is based on Regulatory Position 1.7, "Quality Assurance," in Regulatory Guide (RG) 1.189, Rev. 2, "Fire Protection for Operating Nuclear Power Plants." Section 1.7.8 of RG 1.189 states, in part, that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible materials, and non-conformances are promptly identified, reported, and corrected. Additionally, Section 1.7.8 states that in the case of significant or repetitive conditions adverse to fire protection, including fire incidents, the cause of the conditions is determined and analyzed, prompt corrective actions are taken to prevent recurrence, and the cause and corrective actions are promptly reported to cognizant levels of management for review and assessment.

The inspectors noted that the licensee had revised their Quality Assurance manual as follows: South Carolina Electric & Gas Co., V. C. Summer Unit 1 Quality Assurance Program Description, Rev. 3, Section 2, "Non-safety-Related SSCs Credited for Regulatory Events," states: "SCE&G implements quality requirements for the Fire Protection System in accordance with Regulatory Position 1.7, "Quality Assurance," in Regulatory Guide 1.189, Rev. 2 "Fire Protection for Operating Nuclear Power Plants" as identified in FSAR Chapter 3, Appendix 3A." However, the inspectors' review of the various applicable fire protection program documents revealed that procedures denoting the specific language in Section 1.7.8 of RG 1.189 had not been included in the appropriate documents. The inspectors also noted that transition to the new NFPA 805 Operating License conditions specified in 2.C.(18) in accordance with 10 CFR 50.48(c) was required by March 31, 2016.

The inspectors concluded that the failure to establish the procedures constituted non-compliance with Operating License Condition 2.C.(18). The licensee entered the problem into their CAP as CR-16-05270.

Analysis: The inspectors determined that the failure to establish procedures requiring corrective action for conditions, including significant and repetitive, adverse to fire

protection was a performance deficiency (PD). The inspectors reviewed Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," dated September 7, 2012, and determined the PD was more than minor and therefore a finding because it impacted the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, and the related attribute of protection against external factors such as fire. Specifically, the failure to establish corrective action program requirements specific to fire protection with appropriate definitions for significant and repetitive would result in corrective actions not commensurate with the significance of the adverse condition. The inspectors used IMC 0609, "Significant Determination Process," Appendix F, "Fire Protection Significance Determination Process," Attachment 1, dated September 20, 2013, to perform a Phase 1 analysis and determined that the ROP finding was of very low safety significance (Green) based on the response for Question 1.3.1A, in which the reactor was able to reach and maintain safe shutdown. While the licensee does not have the required corrective actions defined, they have generally addressed conditions adverse to fire protection within the existing corrective action program. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of human performance and the aspect of resources, H.1, because the licensee leadership failed to ensure that adequate procedures were in place to address significant and repetitive conditions adverse to fire protection.

Enforcement: Operating Licensee Condition 2.C.(18) states, in part, that the South Carolina Electric & Gas Company (SCE&G) 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 licensee amendment request (LAR) dated November 15, 2011 (and supplements dated January 26, 2012, October 10, 2012, February 1, 2013, April 1, 2013, October 14, 2013, November 26, 2013, January 9, 2014, February 25, 2014, May 2, 2014, May 11, 2014, August 14, 2014, October 9, 2014, and December 11, 2014) and as approved in the safety evaluation report dated February 11, 2015. Section 4.7.3 of the LAR states, in part, that VCSNS will implement a revised quality assurance program to ensure compliance with Section 2.7.3 of National Fire Protection Association (NFPA) 805 and the revised fire protection quality assurance program which is based on Regulatory Position 1.7, "Quality Assurance," in Regulatory Guide (RG) 1.189, Rev. 2, "Fire Protection for Operating Nuclear Power Plants." Section 1.7.8 of RG 1.189 states, in part, that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible materials, and non-conformances are promptly identified, reported, and corrected. Additionally, Section 1.7.8 states that in the case of significant or repetitive conditions adverse to fire protection, including fire incidents, the cause of the conditions is determined and analyzed, prompt corrective actions are taken to prevent recurrence, and the cause and corrective actions are promptly reported to cognizant levels of management for review and assessment.

Contrary to the above on March 31, 2016, the licensee failed to establish procedures for corrective actions to address conditions adverse to fire protection including those that are significant or repetitive as stipulated in Section 1.7.8 of RG 1.189. Because the finding is of very low safety significance and because it was entered into the licensee's

corrective action program as CR-16-05270, this violation is being treated as a Green NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2016004-01, Failure to Establish Procedures for Corrective Actions to Address Conditions Adverse to Fire Protection.

1R06 Flood Protection Measures

Internal Flooding

a. Inspection Scope

The inspectors reviewed and walked down the EDG building regarding internal flood protection features and equipment to determine consistency with design requirements, Updated Final Safety Analysis Report (UFSAR), and flood analysis documents. Risk significant structures, systems, and components (SSCs) in these areas included the EDGs and associated support systems. The inspectors reviewed the licensee's CAP database to verify that internal flood protection problems were being identified at the appropriate level, entered into the CAP, and appropriately resolved. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program

.1 Licensed Operator Regualification

a. Inspection Scope

The inspectors observed an operator regualification simulator training scenario occurring on October 17, 2016, involving multiple failures leading to entry into abnormal operating procedures followed by emergency operating procedures in order to combat the problems. The inspectors observed crew performance in terms of communications; ability to prioritize failures in order to take timely and proper actions; prioritizing, interpreting, and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; timely control board operation and manipulation, including high-risk operator actions; and oversight and direction provided by the shift supervisor, including the ability to identify and implement appropriate TS actions and emergency action levels. The inspectors reviewed the licensee's critique comments to verify that any performance deficiencies were captured for appropriate corrective action.

b. Findings

No findings were identified.

## .2 Resident Quarterly Observation of Control Room Operations

### a. Inspection Scope

During the inspection period, the inspectors conducted two observations of licensed reactor operator activities to ensure consistency with licensee procedures and regulatory requirements. For the listed activities covering a total four hour period, the inspectors observed the following elements of operator performance: 1) operator compliance and use of plant procedures including TS; 2) control board component manipulations; 3) use and interpretation of plant instrumentation and alarms; 4) documentation of activities; 5) management and supervision of activities; and 6) control room communications.

- 'A' train solid state protection system (SSPS) surveillance test
- Reactor coolant system (RCS) dilutions for temperature control and various safety-related and non-safety related tagout administrative actions.

### b. Findings

No findings were identified.

## .3 Annual Review of Licensee Requalification Examination Results

### a. Inspection Scope

On August 25, 2016, the licensee completed the annual requalification operating examinations required to be administered to all licensed operators in accordance with Title 10 of the Code of Federal Regulations 55.59(a)(2), "Requalification Requirements," of the NRC's "Operator's Licenses." The inspectors performed an in-office review of the overall pass/fail results of the individual operating examinations and the crew simulator operating examinations in accordance with Inspection Procedure (IP) 71111.11, "Licensed Operator Requalification Program." These results were compared to the thresholds established in Section 3.02, "Requalification Examination Results," of IP 71111.11.

### b. Findings

No findings were identified.

## 1R12 Maintenance Effectiveness

### a. Inspection Scope

The inspectors evaluated equipment issues described in the two CRs listed below to verify the licensee's effectiveness with the corresponding preventive or corrective maintenance associated with structure, system, and components (SSCs). The inspectors reviewed Maintenance Rule (MR) implementation to verify that component and equipment failures were identified, entered, and scoped within the MR program. Selected SSCs were reviewed to verify proper categorization and classification in accordance with 10 CFR 50.65. The inspectors examined the licensee's 10 CFR

50.65(a)(1) corrective action plans to determine if the licensee was identifying issues related to the MR at an appropriate threshold and that effective corrective actions were implemented. The inspectors' review evaluated if maintenance preventable functional failures or other MR findings existed that the licensee had not identified. The inspectors reviewed the licensee's controlling procedures consisting of engineering services procedure (ES)-514, Rev. 6, "Maintenance Rule Program Implementation," and station administrative procedure (SAP)-0157, Rev. 1, "Maintenance Rule Program," to verify consistency with the MR program requirements.

- CR-16-04703, Steam propagation barrier door for 'C' chiller room was propped open which led to both trains of chilled water system non-functionality and entry into TS 3.0.3
- CR-16-05632, York chillers placed in Maintenance Rule (a)(1) status due to excessive unavailability

b. Findings

The enforcement aspects related to CR-16-04703 are discussed in section 4OA7 of this report.

1R13 Maintenance Risk Assessment and Emergent Work Control

a. Inspection Scope

The inspectors performed risk assessments, as appropriate, for the four scheduled work activities involving a yellow risk condition for the associated components listed below to assess, as appropriate: 1) the effectiveness of the risk assessments performed before maintenance activities were conducted; 2) the management of risk; 3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and 4) that emergent work problems were adequately identified and resolved. The inspectors evaluated the licensee's work prioritization and risk characterization to determine, as appropriate, whether necessary steps were properly planned, controlled, and executed for the planned and emergent work activities.

- Work week 40, yellow risk condition for scheduled maintenance on TDEFW related components
- Work week 41, yellow risk condition for scheduled 'A' train SSPS surveillance test
- Work week 44, fire emergency procedure (FEP) red risk condition for emergent 'B' EDG exhaust manifold repairs
- Work week 44, yellow risk condition for 'B' train SSPS surveillance test

b. Findings

No findings were identified.

## 1R15 Operability Determinations and Functionality Assessments

### a. Inspection Scope

The inspectors reviewed the four operability evaluations listed below, affecting risk significant mitigating systems to assess, as appropriate: 1) the technical adequacy of the evaluations; 2) whether operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred; 3) whether other existing degraded conditions were considered; 4) that the licensee considered other degraded conditions and their impact on compensatory measures for the condition being evaluated; and 5) the impact on TS limiting conditions for operations and the risk significance in accordance with the significance determination process. The inspectors verified that the operability evaluations were performed in accordance with SAP-209, Rev. 1C, "Operability Determination Process," and SAP-999, Rev. 13C, "Corrective Action Program." Documents reviewed are listed in the Attachment.

- CR-16-03099, breaker 1DB-05 springs found discharged during weekly 7.2 kV breaker verification
- CR-16-04260, Fire trace #CB5255 does not have internal conduit seal installed
- CR-16-05421, 'B' EDG exhaust manifold weld circumferential break
- Operator workaround review

### b. Findings

Introduction: A self-revealing, Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the failure to promptly identify and correct a condition adverse to quality (CAQ) involving welded joint indications in the 'B' emergency diesel generator (EDG) exhaust manifold.

Description: On October 27, 2016, during a 'B' EDG starting air surveillance test, a circumferential weld failure and resulting separation of a section of exhaust manifold for cylinder numbers 6, 3 and 2 occurred. The engine reached rated speed within the acceptance criteria of the surveillance test. The licensee initiated CR-16-05421 for corrective action, and the inspectors reviewed the subsequent operability determination which concluded the engine was operable but degraded or nonconforming for the small impact on power. The inspectors also reviewed the historical issues associated with EDG exhaust manifolds.

On July 22, 2013, the licensee initiated CR-13-03047 for a similar failure of the 'A' EDG exhaust manifold as described above but at a different welded joint. At the time of the failure no other similar failures had occurred in the nuclear industry. The licensee performed extent of condition testing on exhaust manifold welds for the 'A' and 'B' EDGs based on welds most susceptible to failure. Following repairs of weld indications on both EDGs, the licensee performed an operability evaluation concluding operable but degraded for both the 'A' and 'B' EDGs. An Operational Decision Making (ODM) team developed short and long term recommendations which included contracting a vendor to perform modeling analysis of EDG performance with exhaust manifold cracks of varying sizes to support a potential return of both EDGs to full operable status. This report was completed and a new operability determination returned both EDGs to operable status on March 27, 2014. New stainless steel exhaust manifolds and related heat shields were



received/inspected in October, 2014, and the ODM report recommended replacement of the components at the next available refueling outage. The 'A' EDG exhaust manifold was replaced on October 23, 2015, during the Fall, 2015 refueling outage. However, the licensee decided to delay the replacement of the 'B' EDG exhaust manifold until a Spring, 2017 refueling outage.

The inspectors noted that the 'B' EDG exhaust manifold weld failure occurred on a section not inspected during the 'A' EDG event due to the licensee's evaluation of welds they considered most susceptible to failure. The inspectors concluded this evaluation was faulty in that a failure did occur. The inspectors also concluded the failure to inspect the remaining exhaust manifold welds on the 'B' EDG for any indications constituting a CAQ was contrary to the requirements of 10 CFR 50, Appendix B, Criterion XVI which subsequently led to a circumferential weld failure of an exhaust manifold joint causing a reduction in EDG power and a determination of operable but degraded or nonconforming.

Analysis: The inspectors determined that the failure to promptly identify and correct the CAQ involving welded joint indications in the 'B' EDG exhaust manifold was a PD. The inspectors reviewed Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," dated September 7, 2012, and determined the PD was more than minor and therefore a finding, because it affected the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and the respective attribute of equipment performance. Specifically, the 'B' EDG was declared operable but degraded due to a circumferential weld failure of an exhaust manifold joint causing a reduction in EDG power. The inspectors used IMC 0609, "Significant Determination Process," Attachment 4, dated October 7, 2016, and Appendix A – Exhibit 2, dated July 1, 2012, and determined the finding was of very low safety significance or Green because the finding was not a design deficiency or loss of function. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of problem identification and resolution and the aspect of resolution, P.3, because the licensee failed to take effective corrective actions commensurate with an issue's safety significance in that they failed to promptly identify and correct a CAQ involving welded joint indications in the 'B' EDG exhaust manifold.

Enforcement: 10 CFR 50, Appendix B, Criterion XVI states, in part, that measures shall be established to assure that CAQs are promptly identified and corrected. Contrary to the above, on August 9, 2013, the licensee failed to promptly identify and correct a CAQ involving welded joint indications in the 'B' EDG exhaust manifold. Specifically, failure to correct the CAQ in a timely manner resulted in a circumferential weld failure that challenged EDG operability on October 27, 2016. Because the finding was of very low safety significance (Green) and was entered into the licensee's CAP as CR-16-05421, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2016004-02, Failure to Promptly Identify and Correct a Condition Adverse to Quality for 'B' Emergency Diesel Generator Exhaust Manifold Weld Indications.

## 1R18 Plant Modifications

### a. Inspection Scope

The inspectors reviewed one temporary modification implemented by work order as noted below, for adverse effects on system availability, reliability, and functional capability. Documents reviewed included site drawings, applicable sections of the UFSAR, supporting 10 CFR 50.59 evaluations, TS, and design basis information. The inspectors evaluated the change documents and associated 10 CFR 50.59 reviews against the system design basis documentation and UFSAR to verify that the changes did not adversely affect the safety function of safety systems. The inspectors reviewed any related CRs to confirm that problems were identified at an appropriate threshold, were entered into the CAP, and appropriate corrective actions had been initiated. Documents reviewed are listed in the Attachment.

- WO1500769, Connect temporary power to XCP6200 for 'A' train outage

### b. Findings

No findings were identified.

## 1R19 Post Maintenance Testing

### a. Inspection Scope

For the three maintenance activities listed below, the inspectors reviewed the associated post-maintenance testing (PMT) procedures and either witnessed the testing and/or reviewed test records to assess whether: 1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; 2) testing was adequate for the maintenance performed; 3) test acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; 4) test instrumentation had current calibrations, range, and accuracy consistent with the application; 5) tests were performed as written with applicable prerequisites satisfied; 6) jumpers installed or leads lifted were properly controlled; 7) test equipment was removed following testing; and 8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with general test procedure, (GTP)-214, "Post Maintenance Testing Guideline," Rev. 5F.

- WO 1611258, Replace regulator for IFV03536-EF
- WO 1615314, Repair 'B' EDG exhaust leak
- WO 1616484, Repair excessive air leak on XVM10997A-DG

### b. Findings

No findings were identified.

1R22 Surveillance Testinga. Inspection Scope

The inspectors observed and/or reviewed one surveillance test procedure (STP) listed below to verify that TS or risk significant surveillance requirements were followed and that test acceptance criteria were properly specified to ensure that the equipment could perform its intended safety function. The inspectors verified that proper test conditions

were established as specified in the procedures, that no equipment preconditioning activities occurred, and that acceptance criteria were met.

Routine

- STP-125.009, "Diesel Generator 'B' 24 Hour Load Test," Rev. 9B

b. Findings

No findings were identified.

2. EMERGENCY PREPAREDNESS

Cornerstone: Emergency Preparedness

1EP6 Drill EvaluationEmergency Preparedness Drilla. Inspection Scope

On October 12, 2016, the inspectors reviewed and observed the performance of an emergency preparedness (EP) drill that involved reactor fuel leakage, a medical emergency involving an injured contaminated individual, a radioactive release within the auxiliary building, failure of radiation monitors, and a release of gaseous activity offsite which required entry into increasing emergency action levels starting with a Notification of Unusual Event and ending in a General Emergency. The inspectors assessed abnormal and emergency procedure usage, emergency plan classifications, protective action recommendations, respective notifications and the adequacy of the licensee's drill critique. The inspectors verified that drill deficiencies were captured into the licensee's corrective action program.

b. Findings

No findings were identified.

3. OTHER ACTIVITIES4OA1 Performance Indicator (PI) VerificationMitigating Systems Cornerstone

a. Inspection Scope

The inspectors verified the accuracy of the licensee's PI submittals listed below for the period July 2015 through June 2016. The inspectors used the performance indicator definitions and guidance contained in Nuclear Energy Institute (NEI) 99-02, Rev. 7, "Regulatory Assessment Performance Indicator Guideline," and licensee procedure SAP-1360, Rev. 3, "NRC and INPO/WANO Performance Indicators," to check the reporting of each data element. The inspectors sampled licensee event reports (LERs), operator logs, plant status reports, CRs, and performance indicator data sheets to verify that the licensee had properly reported the PI data.

- Mitigating System Performance Index (MSPI) - Emergency AC Power System
- MSPI - High Head Safety Injection System
- MSPI – Residual Heat Removal System

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution

.1 Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As required by inspection procedure IP 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished by either attending daily screening meetings that briefly discussed major CRs, or accessing the licensee's computerized corrective action database and reviewing each CR that was initiated.

b. Findings

No findings were identified.

.2 Annual Sample Review of CR-16-05035

a. Inspection Scope

The inspectors reviewed CR-16-05035, DRIB/313 will not secure, in detail to evaluate the effectiveness of the licensee's corrective actions for important safety issues. The inspectors assessed whether the issue was properly identified, documented accurately and completely, properly classified and prioritized, adequately considered extent of condition, generic implications, common cause, and previous occurrences, adequately identified root causes/apparent causes, and identified appropriate and timely corrective actions. Also, the inspectors verified the issues were processed in accordance with procedure, SAP-999, "Corrective Action Program," Rev. 13C.

b. Findings

The inspectors reviewed CR-16-05035 in detail including historical problems for the past approximate two years and monitored problems for the remainder of the quarter. The inspectors noted that DRIB/313, 436 foot elevation turbine building to intermediate building, is a multi-function door (fire, security) and had problems involving a total of 19 CRs from both 2015 and 2016 as listed below:

- CR-15-00697: Door will not fully close without being pushed.
- CR-15-04443: Door will not open from either side.
- CR-15-04529: Door has a loose strike plate and will not consistently re-latch.
- CR-15-04653: Numerous alarms occurring on DRIB313.
- CR-15-05227: Door is not latching closed; latch is stuck inside door.
- CR-15-05654: The door closing arm is broken; door will not self-close.
- CR-15-05721: Latch is sticking inside door; door not latching.
- CR-15-05994: DRIB/313 not closing under its own power.
- CR-15-06312: Door closure needs to be adjusted; door is not self-closing.
- CR-15-06439: Numerous nuisance alarms occurring; recommend door closure replacement.
- CR-16-00213: Multiple alarms on DRIB313 occurring.
- CR-16-01060: During rounds identified DRIB/313 will not self-close and latch.
- CR-16-04245: Door will not open.
- CR-16-05035: Latch is not working properly; door will not secure.
- CR-16-05717: DRIB/313 will not close under its own power.
- CR-16-05911: Strike plate is missing a screw.
- CR-16-05924: Surveillance test deficiency for small void in door skin.
- CR-16-06056: DRIB/313 will not open from the Turbine Building side.
- CR-16-06389: DRIB/313 will not close and latch under its own power.

The inspectors had identified a failure of the licensee to establish procedures to address conditions adverse to fire protection including significant and repetitive as discussed in Section 1R05 of this report. Following a discussion with the licensee regarding the CRs above in regards to the repetitive aspect, the licensee will evaluate for further corrective actions. The inspectors continue to monitor licensee actions to address adverse door conditions.

4OA3 Followup of Events and Notices of Enforcement Discretion

.1 (Closed) LER 05000395/2016-001-01: Low Refrigerant Renders Chiller Non-Functional and 'A' Train of Charging System Inoperable

On December 16, 2015, a past operability evaluation conducted by the licensee concluded that safety-related mechanical water chiller 'A' (XHX0001A) had been non-functional from July 24, 2015, through September 17, 2015, due to a refrigerant leak in circuit 2. This rendered XHX0001A incapable of removing the design basis heat load of the system which, in part, supports room cooling for the 'A' charging/safety injection pump (XPP0043A). Consequently, TS 3/4.5.2 action requirements for XPP0043A were exceeded. The licensee entered the problem into their CAP as CR-15-04395.

Revision 1 of the LER was issued to document an additional cause for refrigerant leakage involving the evaporator gasket. The inspectors determined that there are no additional issues warranting a regulatory response, and the enforcement aspect that is documented in Section 4OA7 of NRC integrated inspection report 05000395/2016-001 is bounding. This LER is closed.

.2 (Closed) LER 05000395/2016-002-00: Pressurizer Heater Inoperable Longer Than Technical Specification Limiting Condition for Operation 3.4.3

On June 18, 2016, the licensee discovered safety-related breaker, XSW1DB05, pressurizer backup group 2 heaters, open with its charging springs discharge. Subsequent evaluation determined the closing coil plunger was mechanically bound due to foreign material. On July 22, 2016, the licensee completed a past operability review that determined that the pressurizer backup group 2 heaters were inoperable from 0600 hours on June 15, 2016, to 0400 hours on June 19, 2016, when repairs were completed to return the breaker to service. The licensee entered this problem into their CAP as CR-16-03099. The enforcement aspects are discussed below. This LER is closed.

Introduction: The inspectors identified a Green, non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," involving the failure to accomplish safety-related (SR) station administrative procedure, SAP-0363, "Foreign Material and Debris Control," Revision 8H, for foreign material exclusion (FME) control during a SR breaker refurbishment. A subsequent breaker failure occurred due to foreign material.

Description: On June 18, 2016, the licensee discovered safety-related breaker, XSW1DB-05, pressurizer backup group 2 heaters, open with its charging springs discharged and initiated CR-16-03099. Subsequent evaluation determined the closing coil plunger was mechanically bound due to foreign material for which the licensee initiated CR-16-03498. On July 22, 2016, the licensee completed a past operability review that determined that the pressurizer backup group 2 heaters were inoperable from 0600 hours on June 15, 2016, to 0400 hours on June 19, 2016, when repairs were completed to return the breaker to service. The licensee also performed an apparent cause evaluation (ACE) under CR-16-03099.

The residents reviewed the licensee's ACE, noted their comments regarding the discovery of foreign material, and their corrective actions to revise the SR electrical maintenance procedure, EMP-405.021, "7.2kV Breaker Mechanism Refurbishment," to incorporate steps to disassemble and inspect the closing coil. However, the inspectors noted the ACE did not discuss the licensee's procedure for FME control, SAP-0363. The inspectors reviewed WO1204929 used for refurbishment of XSW1DB-05 and noted that FME classification was 'standard' controls. The inspectors then reviewed SAP-0363 for applicability to WO1204929 and noted the following:

- Step 7.1.2 states, "The Planner or designee performs an evaluation using Part A, Part B, and Part C of Enclosure A for each work activity to determine FME classification.
- Enclosure A, Part A, "Job Scope Evaluation (Step 7.1.1) Does the job scope involve any of the following High Risk Criteria?" lists in part "7.2 kV Switchgear bus work?"

- Enclosure A, Part B, “FME Hazards Evaluation (Step 7.1.2) Does the job scope involve any of the following hazards?” lists in part “Potential for item/debris to fall into the work area and into the system or component breach,” and “Internal breaker work.”
- Enclosure A, Part C, “Final FME Risk Determination (Step 7.1.3) Based on results from Part A and B above,” lists in part “In any of the criteria in Part A are applicable, High Risk FME controls are required,” and “If any of the criteria in Part B are applicable and closeout would not assure 100% foreign material removal, High Risk FME controls are required.”

The inspectors noted that the Part A criteria was specific relative to switchgear bus work and therefore as written would not be applicable. However, the criteria in Part B were applicable relative to item/debris hazards and internal breaker work. And, the inspectors noted that the version of EMP-405.021 used could not assure 100% foreign material removal since a revision was required for more disassembly and inspection. Consequently, the inspectors concluded that based on Part C, High Risk FME controls were required, and that WO1204929 was planned and implemented with the incorrect FME controls.

The inspectors reviewed IMC0612, “Power Reactor Inspection Reports,” dated May 6, 2016, and noted that step 03.09, “NRC-Identified,” states, “NRC-identified findings and violations also include issues initially identified by the licensee to which the inspector has identified inadequacies in the licensee’s characterization or evaluation of the issue of concern.” The inspectors noted that the licensee had initially identified the breaker problem through implementation of their internal, routine SR preventative test procedure, PTP-101.002, “7.2kV ESF Bus Breaker Alignment Verification,” Rev. 2A. However, the inspectors determined that the licensee’s causal evaluation was inadequate because it failed to identify the non-compliance with SAP-0363 in planning WO1204929 for adequate FME control. Consequently, the NRC determined a change from licensee-identified to NRC-identified was warranted.

Analysis: The inspectors determined that the failure to accomplish SAP-0363 for FME involving a SR breaker and respective failure was a PD. The inspectors reviewed IMC 0612, Appendix B, “Issue Screening,” dated September 7, 2012, and determined that the PD was more than minor and therefore a finding because it impacted the Mitigating Systems Cornerstone by adversely affecting the cornerstone objective to ensure in part the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the equipment reliability attribute was impacted because foreign material rendered the SR breaker nonfunctional causing inoperability of the pressurizer backup group 2 heaters for greater than the Technical Specification limiting condition for operation. The inspectors used IMC 0609, “Significant Determination Process,” Attachment 4, dated October 7, 2016, and Appendix A – Exhibit 2, dated July 1, 2012, and determined that the finding required a detailed risk evaluation. A regional senior risk analyst performed a bounding risk evaluation in accordance with NRC IMC 0609 Appendix A using the VC Summer SPAR model. The finding was modelled as a transient initiator with a loss of the B EDG as a surrogate for the group 2 pressurizer heaters for a 94 hour exposure interval. The dominant sequence was a transient initiator with a consequential loss of offsite power without recovery, failure of the A EDG without recovery leading to a station blackout and loss of core heat removal after battery depletion. The risk was mitigated by the available normal and group 1 pressurizer

heaters. The bounding assessment determined that the performance deficiency represented an increase in core damage frequency of  $< 1.0 \text{ E-6/year}$ , a GREEN finding of very low safety significance. The inspectors reviewed IMC 0310, "Aspects Within Cross Cutting Areas," dated December 4, 2014, and determined the cause of this finding involved the cross-cutting area of Human Performance and the aspect of work management, H.5, because the licensee failed to ensure the planning and execution of the respective work order for breaker refurbishment followed SAP-0363 for FME control to support nuclear safety-related work.

Enforcement: 10 CFR 50, Appendix B, Criterion V, requires in part that activities affecting quality shall be accomplished by documented procedures of a type appropriate to the circumstances. Contrary to this, on June 15, 2016, the licensee failed to accomplish SAP-0363 for FME control during a SR breaker refurbishment and a subsequent breaker failure occurred. Because the finding is of very low safety significance and because it has been entered into the licensee's CAP as CR-16-03099, this violation is being treated as a Green NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2016004-03, Failure to Accomplish Procedure for Foreign Material Exclusion Control Involving Failure of a Safety-Related Breaker.

.3 (Closed) LER 05000395/2016-003-00: Steam Propagation Door Discovered Propped Open

On September 13, 2016, the licensee discovered a steam propagation barrier (SPB) door, DRIB/107, for the 'C' chiller room located on the 412 foot elevation of the intermediate building propped open. They subsequently determined the door had been open for approximately 3 hours and 22 minutes. This problem could have resulted in non-functionality of both trains of the chilled water system if a steam or feedwater line break (high energy line break, HELB) had occurred due to exposure of components rated for mild environmentally qualification (EQ) conditions to harsh (EQ) conditions. This would also render both trains of high head safety injection pumps inoperable since the chilled water system provides room cooling for the respective pumps. The licensee entered and exited TS 3.0.3 at 2030 and 2042 hours, respectively, on September 13, 2016, following closure of the door. The licensee contracted a vendor to perform a detailed HELB analysis to determine the impact on those vulnerable components not designed for harsh EQ conditions. The licensee entered the problem into their CAP as CR-16-04703. The NRC reviewed the vendor's completed analysis, and the enforcement aspects are discussed in section 4OA7 of this report. This LER is closed.

.4 (Closed) LER 05000395/2016-004-00: Steam Propagation Barrier Degraded Due to Missing Orifices

On September 14, 2016, during extent of condition reviews for the SPB problem discussed in Section 4OA3.3 above, the licensee determined that floor drain orifices, installed by a modification in late 2008 and early 2009 as SPBs to allow extended chiller work, were in locations not specified by the respective modification package. Specifically, orifices were not installed as designed in a floor drain between the 'A' chiller room and the room for chilled water pumps, and between the 'B' chiller room and the 'C' chiller room. The licensee contracted a vendor to perform a detailed HELB analysis to determine the impact on vulnerable components not designed for harsh EQ conditions. The NRC



reviewed the vendor's completed analysis, and the enforcement aspects are discussed in section 4OA7 of this report. The licensee entered this problem in their CAP as CR-16-04716. This LER is closed.

.5 (Closed) LER 05000395/2016-005-00: Steam Propagation Barrier Degraded Due to Removal of Ventilation Duct Access Panel for Surveillance Activities

During extent of condition reviews for the SPB problem discussed in Section 4OA3.3 above, the licensee discovered a SPB degradation involving missing fasteners on a ventilation access panel. On October 4, 2016, the licensee further discovered that the panel covers had been periodically removed to allow inspection of fire dampers internal to the ductwork. Furthermore, removal of the panels could allow steam from a HELB to enter areas with components rated for mild EQ conditions. The licensee contracted a vendor to perform a detailed HELB analysis to determine the impact on vulnerable components not designed for harsh EQ conditions. The NRC reviewed the vendor's completed analysis, and the enforcement aspects are discussed in section 4OA7 of this report. The licensee entered this problem in their CAP as CR-16-05696. This LER is closed.

4OA5 Other Activities

.1 (Closed) 2515/TI-192, "Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems

a. Inspection Scope

The objective of this performance based TI is to verify implementation of interim compensatory measures associated with an open phase condition (OPC) design vulnerability in electric power system for operating reactors. The inspectors conducted an inspection to determine if the licensee had implemented the following interim compensatory measures. These compensatory measures are to remain in place until permanent automatic detection and protection schemes are installed and declared operable for OPC design vulnerability. Documents reviewed are listed in the Attachment. The inspectors verified the following:

- The licensee had identified and discussed with plant staff the lessons-learned from the OPC events at the U.S. operating plants including the Byron station OPC event and its consequences. This includes conducting operator training for promptly diagnosing, recognizing consequences, and responding to an OPC event.
- The licensee had updated plant operating procedures to help operators promptly diagnose and respond to OPC events on offsite power sources credited for safe shutdown of the plant.
- The licensee had established and continue to implement periodic walkdown activities to inspect switchyard equipment such as insulators, disconnect switches, and transmission line and transformer connections associated with the offsite power circuits to detect a visible OPC.

- The licensee had ensured that routine maintenance and testing activities on switchyard components have been implemented and maintained. As part of the maintenance and testing activities, the licensee assessed and managed plant risk in accordance with 10 CFR 50.65(a) (4) requirements.

b. Findings

The inspectors verified the criteria were met and identified no findings.

.2 Failure to update FSAR to include new design function for the equipment and floor drain system

Introduction: The NRC identified a Severity Level (SL) IV non-cited violation (NCV) of 10 CFR 50.71(e), "Maintenance of Records, Making Reports," for the licensee's failure to update the final safety analysis report (FSAR) with the latest information developed, regarding the design functions of the equipment and floor drain system.

Description: The safety related chilled water system at V.C. Summer includes three safety related chillers and associated chilled water pumps, with one train normally in service, one in standby, and one which can be aligned in the place of either of the other two "credited" trains. Each of the chillers are located in a separate compartment, or room, to allow for physical separation of the trains. Inspectors reviewed ECR 50585, which the licensee implemented to replace the aging safety related chillers. This plant modification included installation of a new chiller, rerouting of the associated chilled water piping, and addition of high-energy line break (HELB) SPBs in the chiller rooms' floor drain system and ventilation system. The licensee installed the new SPBs in 2009 to allow the doors (also used as SPBs) into the chiller rooms to be propped open during replacement and maintenance activities performed on the chillers. The additional SPBs were needed because the design of the floor drain and ventilation systems allowed for communication between the chiller rooms, as the doors were normally relied upon to prevent the effects of HELBs outside of containment from affecting the chillers, prior to the installation of the new SPBs.

As part of ECR 50585, new floor drain orifices were installed to ensure the two credited chiller trains would be unaffected by a postulated HELB outside of containment while the doors were propped open. On approximately November 18, 2016, inspectors identified that the station's FSAR did not include the HELB SPB function in its description of the equipment and floor drain system. Specifically, the inspectors reviewed section 9.3.3 of the station's FSAR and noted that it discussed the equipment and floor drainage system, and that subsection 9.3.3.1, "Design Bases," included a description of the system's function for precluding back flooding. However, it did not discuss nor identify the SPB function of the floor drain system. Inspectors also noted that this created the potential for future changes to be made to the facility or the facility licensing bases without properly accounting for the required design function. The change performed in ECR 50585 included a change to the existing design bases and the description of the system described in the FSAR, however the licensee did not update the FSAR to include the change. The inspectors concluded that this was contrary to the requirements of 10 CFR 50.71(e).

Analysis: The inspectors treated the noncompliance with 10 CFR 50.71(e) as traditional enforcement because not having an updated FSAR hinders the licensee's ability to perform adequate 10 CFR 50.59 evaluations and impacts the NRC's ability to perform its regulatory function such as license amendment reviews and inspections. This was determined to be a SL-IV violation of 10 CFR 50.71(e) because it was similar to the NRC Enforcement Policy, Section 6.1.d.3, SL IV example of, "a licensee fails to update the FSAR as required by 10 CFR 50.71(e) but the lack of up-to-date information has not resulted in any unacceptable change to the facility or procedures." Cross-cutting aspects are not assigned to traditional enforcement violations.

Enforcement: Title 10 CFR 50.71(e) requires, in part, that, "Each person licensed to operate a nuclear power reactor under the provisions of § 50.21 or § 50.22, and each applicant for a combined license under Part 52 of this chapter, shall update periodically, as provided in paragraphs (e)(3) and (4) of this section, the FSAR originally submitted as part of the application for the license, to assure that the information included in the report contains the latest information developed." Contrary to the above, since 2009, the licensee failed to update the FSAR to assure that the information included in the report contained the latest information developed. Specifically, following installation of the floor drain orifices as SPBs in 2009, the licensee failed to update the FSAR to reflect the new SPB function of the floor drain system. The licensee entered this issue into their CAP as CR-16-06003. This violation is characterized as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy: NCV 05000395/2016004-04, "Failure to Update FSAR with a New Design Function for the Equipment and Floor Drain System"

#### 40A6 Meetings, Including Exit

On January 25, 2017, the resident inspectors presented the integrated inspection report results to Mr. G. Lippard and other members of the licensee staff. The licensee acknowledged the results of these inspections. The inspectors confirmed that inspection activities discussed in this report did not contain proprietary material.

#### 40A7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of Section 2.3.2 of the NRC Enforcement Policy for characterization as NCVs:

- V.C. Summer Operating License condition 2.c(18) states in part that the licensee shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(c), National Fire Protection Association (NFPA) 805 of which Chapter 3, Section 3.2.3, "Procedures," states, "Procedures shall be established for implementation of the fire protection program." Contrary to this, on September 14, 2016, the licensee failed to implement the requirements of procedure, Fire Protection Procedure, FPP-025, "Fire Containment," Rev. 4, to ensure that fire door and SPB, DRIB/107, did not remain open in excess of 1 hour. NRC IMC 0609.04 and NRC IMC 0609 Appendix A screening determined that the finding represented a loss of the short term heat removal safety function within the Mitigating Systems Cornerstone and required a detailed risk evaluation. A bounding analysis was performed by a regional SRA using the VC Summer SPAR model. The finding was modelled as a Steam Line Break Outside Containment (SLBOC) initiating event assessment. A 3 hours and 22 minutes bounding exposure was utilized. No

- recovery was assumed. Equipment impacts from potential HELBs were determined using the results from Gothic Analyses performed to assess the temperature, pressure and relative humidity increases in mild environment spaces in the Intermediate Building due to the various HELB boundary breaches associated with the finding. For non-Loss of Offsite Power (LOOP) conditions, HELB impacts in mild areas were minimal. For LOOP conditions, the HELB was assumed to impact the chilled water system such that one train of safety related equipment was assumed failed as a bounding impact. The dominant sequence was a SLBOC initiator with a failure to isolate the break and a failure of high pressure injection impacted by loss of chilled water leading to loss of core heat removal. The risk evaluation determined that the finding represented a risk increase of  $< 1.0E-6$ /year, a GREEN finding of very low safety significance. The licensee has documented this problem in their CAP as CR-16-04703.
- 10 CFR 50, Appendix B, Criterion V, requires in part that activities affecting quality shall be accomplished by documented instructions of a type appropriate to the circumstances. Contrary to this, on August 4, 2009, the licensee failed to accomplish documented work instructions contained in ECR50585 to install floor drain orifices to act as SPBs to protect SR components from the effect of a HELB. NRC IMC 0609.04 and NRC IMC 0609 Appendix A screening determined that the finding represented a loss of the short term heat removal safety function within the Mitigating Systems Cornerstone and required a detailed risk evaluation. A bounding analysis was performed by a regional SRA using the VC Summer SPAR model. The finding was modelled as a Steam Line Break Outside Containment (SLBOC) initiating event assessment. A forty five day bounding exposure was utilized. No recovery was assumed. Equipment impacts from potential HELBs were determined using the results from Gothic Analyses performed to assess the temperature, pressure and relative humidity increases in mild environment spaces in the Intermediate Building due to the various HELB boundary breaches associated with the finding. For non-Loss of Offsite Power (LOOP) conditions, HELB impacts in mild areas were minimal. For LOOP conditions, the HELB was assumed to impact the chilled water system such that one train of safety related equipment was assumed failed as a bounding impact. The dominant sequence was a SLBOC initiator with a failure to isolate the break and a failure of high pressure injection impacted by loss of chilled water leading to loss of core heat removal. The risk evaluation determined that the finding represented a risk increase of  $< 1.0E-6$ /year, a GREEN finding of very low safety significance. The licensee has documented this problem in their CAP as CR-16-04716.
  - TS 6.8.1, "Procedures and Programs," requires in part that written procedures be maintained covering the activities recommended in Appendix A of Regulatory Guide 1.33, Rev. 2, Section 9, "Procedures for Performing Maintenance." Contrary to this, on October 4, 2016, the licensee determined they had failed to establish station procedures to adequately remove ventilation access covers for fire damper inspections during plant modes that would not present a HELB challenge to those components qualified for mild EQ conditions. NRC IMC 0609.04 and NRC IMC 0609 Appendix A screening determined that the finding represented a loss of the short term heat removal safety function within the Mitigating Systems Cornerstone and required a detailed risk evaluation. A bounding analysis was performed by a regional SRA with the following major analysis assumptions: a fifty one minute exposure period, a

HELB frequency of  $7.7E-3$ /year from the NRC VC Summer SPAR model, and a conditional core damage probability given a HELB of 1.0. The risk increase due to the finding was  $<1.0E-6$ /year, a GREEN finding of very low safety significance. The risk was mitigated by the short exposure. The licensee has documented this problem in their CAP as CR-16-05696.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee Personnel

A. Barbee, Director, Nuclear Training  
C. Calvert, Manager, Design Engineering  
M. Coleman, Manager, Health Physics and Safety Services  
M. Constance, Manager, Nuclear Training  
G. Douglass, Manager, Nuclear Protection Services  
D. Edwards, Supervisor, Operations  
J. Garza, Supervisor, Nuclear Licensing  
T. Gatlin, Vice President, Nuclear Support Services  
L. Harris, Manager, Quality Systems  
R. Haselden, General Manager, Organizational / Development Effectiveness  
R. Justice, General Manager, Nuclear Plant Operations  
A. Ledbetter, Manager, Planning/Outage  
G. Lippard, Vice President, Nuclear Operations  
R. Mike, Manager, Chemistry Services  
M. Moore, Supervisor, Nuclear Licensing  
R. Ray, Manager, Maintenance Services  
S. Reese, Licensing Specialist  
D. Shue, Manager, Nuclear Operations  
W. Stuart, General Manager, Engineering Services  
T. Tharp, Supervisor, Emergency Preparedness  
B. Thompson, Manager, Nuclear Licensing  
J. Wasieczko, Manager, Organization Development and Performance  
D. Weir, Manager, Plant Support Engineering  
R. Williamson, Manager, Emergency Services  
S. Zarandi, General Manager, Nuclear Support Services

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened and Closed

05000395/2016004-01	NCV	Failure to Establish Procedures for Corrective Actions to Address Conditions Adverse to Fire Protection (1R05)
05000395/2016004-02	NCV	Failure to Promptly Identify and Correct a Condition Adverse to Quality for 'B' Emergency Diesel Generator Exhaust Manifold Weld Indications (1R15)
05000395/2016004-03	NCV	Failure to Accomplish Procedure for Foreign Material Exclusion Control Involving Failure of a Safety-Related Breaker (4OA3.2)
05000395/2016004-04	SLIV NCV	Failure to Update FSAR with a New Design Function for the Equipment and Floor Drain System (4OA5.2)

### Closed

LER 05000395/2016-001-01	Low Refrigerant Renders Chiller Non-Functional and 'A' Train of Charging System Inoperable
LER 05000395/2016-002-00	Pressurizer Heater Inoperable Longer Than Technical Specification Limiting Condition for Operation 3.4.3
LER 05000395/2016-003-00	Steam Propagation Door Discovered Propped Open
LER 05000395/2016-004-00	Steam Propagation Barrier Degraded Due to Missing Orifices
LER 05000395/2016-005-00	Steam Propagation Barrier Degraded Due to Removal of Ventilation Duct Access Panel for Surveillance Activities
2515/TI-192	Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power System

## LIST OF DOCUMENTS REVIEWED

### Section 1R06

- CR-16-04809, during diesel building sump inspection and operation check, XPP0146B is indicating 0# discharge pressure when operated in manual
- WO1613920, Inspect/replace pump coupling for XPP0146B
- WO1510221, PM's for diesel building sump pump, XPP0146A
- WO1510222, PM's for diesel building sump pump, XPP0146B

### Section 1R15

- OAP-113.1, "Operator Workarounds and Dark Board Program," Rev. 4B
- Operations Burden List, 3<sup>rd</sup> Quarter 2016, and 4<sup>th</sup> quarter 2016

### Section 1R18

- ICP-360.021, "Temporary Power to Radiation Monitors During A Train Outage, Rev. 5
- Radiation Monitoring System manual, 1MS-94B-800
- Drawings, B-208-004-245 and B-208-004-247
- XA Power Train Wiring Diagrams, 1MS-44-259-1 through 7

### Section 4OA5.1

- CR-12-00681
- INPO IER L2 12-14
- Work Order Step, WO Step: 1300346-009
- Training Request: TR-12-00078
- Training Screening Tool: TR-12-00079
- Operator Training Material:
- ES-4, "Grid Instabilities," Revision 5
- GS-1, "GS-1: Service Power System," Revision 27
- GS-2, "Safeguards Power," Revision 29

### Annunciator Response Procedure:

- ARP-001-XCP-601, Revision 6
- ARP-001-XCP-605, Revision 7
- ARP-001-XCP-609, Revision 8
- ARP-001-XCP-618, Revision 7
- ARP-001-XCP-627, Revision 12
- ARP-001-XCP-633, Revision 8
- ARP-003-XAM-0001, Revision 5
- ARP-003-XCA-0010, Revision 0
- ARP-018-XPN-7202, Revision 3
- ARP-016-XCP-6210-LCB1, Revision 1
- ARP-016-XCP-6210-LCB4, Revision 1
- ARP-016-XCP-6210-LCB7, Revision 2

### Abnormal Operating Procedure:

- AOP-304.1A, Revision 2
- AOP-304.1B, Revision 2
- AOP-304.4, Revision 4



System Operating Procedure:

- SOP-304, Revision 13
- SOP-306, Revision 19

Preventative Test Procedure:

- PTP-160.013, Revision 1

Operations Administrative Procedure:

- OAP-100.5, Revision 4
- OAP-106.1, Revision 17a

Calculations

- DC00020-144, High Energy Line Break Steam Generator Replacement Uprate, Rev. 3
- DC00020-142, Intermediate Building 412 Chiller Room Drain Lines Steam In Leakage, Rev. 5
- DC00020-217, High Energy Line Break- Maximum Soak Time, Rev. 0

Corrective Action Documents

- CR-16-04969, During performance of the RCA associated with CR-16-04801 (incorrect installation of SPB orifice plates in SR Chiller Rooms) the team could find no evidence the functional testing of the floor drains, required by ECR 50585 (base) section 4.0, was ever performed.
- RCA 16-04801, Inadequate Steam Pressure Isolation Boundaries between Chiller Rooms and Chilled Water Pump Room due to Improperly Located Steam Propagation Barriers (Orifice Plates), dated 11/1/16

Drawings

- S-201-018, Sheet 3-127, Virgil C. Summer Equipment Qualification Database Environmental Zone Information for: IB-01, Rev. 11
- S-201-018, Sheet 3-128, Virgil C. Summer Equipment Qualification Database Environmental Zone Information for: IB-01, Rev. 11
- SS-021-010, Environmental Zone Map Intermediate Building and Diesel Gen. Bldg.- Plan Above Basement Fl. El. 412', Rev. 2
- E-001-012, Plant Layout Final Intermediate Bldg & Diesel Generator Bldg Plan Above Basement Fl. El. 412'-0", Rev. 35
- E-911-106, Station Drainage Flow Diagram Intermediate Bldg, Rev. 8
- SK-D1, Structural Chiller Separation Side View Sump Drains, Rev. 0A
- SK-D2, Structural Chiller Elevation View Fabrication Diagram, Rev. AA
- E-921-506, Intermediate Building Sections and Details, Rev. 5A

Miscellaneous Documents

- EIR 82319, Provide design basis for elimination of high energy breaks and identify the remaining break locations. Provide design basis for 4" and above main steam pipe break sizes for mass and energy input, dated 10/5/16
- EIR 82320, Develop a HELB case matrix to assess the impact of CR-16-04703 and CR-16-04716, dated 10/15/16
- 0310-0017-RPT-002, V. C. Summer Steam Propagation with Floor Drain Orifices Misaligned, Rev. 0
- SA44166, Engineer's Technical Work Record Steam Break Flow Path Scenarios, dated 9/29/16
- MR82190, Technical Work Record Reverification ECR 50585, dated 1/26/06

Work Orders

- 0601943, dated 8/4/09
- 0601943-001, dated 3/2/09
- 0601943-002, dated 1/15/09

Corrective Action Program Documents generated as a result of the inspection

- CR-16-06003, The NRC 50.59 Plant Mods Inspection Team raised a question regarding the FSAR updates for Main Steam Line Breaks Outside of Containment.
- CR-16-06194, In review of ECR-50585, the NRC 50.59 Plant Mods inspection team questioned instructions provided for post modification testing for the floor drain system after the installation of the HELB orifice