



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-1200

August 26, 2021

EA-21-109

Mr. Michael Yox
Regulatory Affairs Director
Southern Nuclear Operating Company
7825 River Road, BIN 63031
Waynesboro, GA 30830

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 3 AND 4 – NRC SPECIAL INSPECTION REPORTS 05200025/2021010, 05200026/2021010 AND - PRELIMINARY WHITE AND GREATER THAN GREEN FINDINGS FOR UNIT 3

Dear Mr. Yox:

The Nuclear Regulatory Commission (NRC) conducted a special inspection from June 21 to July 2, 2021, at the Vogtle Electric Generating Plant (VEGP), Units 3 and 4. On July 12, 2021, NRC staff discussed the inspection results with Mr. Glen Chick, VEGP Units 3 and 4 Executive Vice President of Southern Nuclear Operating Company, Inc. (SNC), and other licensee and contractor staff members. The inspection results are documented in the enclosed inspection report.

In accordance with Appendix C, "Response to Significant Issues or Events," of Inspection Manual Chapter (IMC) 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs," dated December 15, 2020, a special inspection was performed to assess circumstances concerning apparent nonconformances associated with electrical cable separation and electrical raceway seismic/structural conditions.

The enclosed inspection report discusses two Unit 3 apparent violations (AVs); a preliminary White finding of low to moderate safety significance, and a preliminary Greater than Green finding of greater than very low safety significance. Additionally, the inspection report documents a finding of very low safety significance (Green). The Green finding involved a violation of an NRC requirement that is dispositioned as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy dated January 20, 2020.

The NRC identified a preliminary White construction finding and associated apparent violation of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion XVI, "Corrective Action," for SNC's failure to promptly identify and correct conditions adverse to quality associated with the installation of Class 1E cables and associated raceways.

Additionally, the NRC identified a preliminary Greater than Green construction finding and associated apparent violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for SNC's failure to maintain 1-inch vertical and horizontal cable separation between safety-related electrical divisions and non-safety-related electrical cables inside switchgear cabinets as specified in APP-G1-V8-01, "AP1000 Electrical Installation Specification."

The NRC has determined that the apparent nonconformances associated with the two AVs do not represent an immediate safety concern because VEGP Units 3 and 4 are currently under construction; there is no fuel in the reactor; and the cable separation issues implicating compliance with inspections, tests, analyses, and acceptance criteria (ITAACs) must be resolved prior to the 10 CFR 52.103(g) finding, after which the licensee is allowed to load nuclear fuel into the reactor.

The two apparent findings were assessed based on best available information using the applicable Significance Determination Process (SDP) in IMC 2519, "Construction Significance Determination Process," dated October 26, 2020. The basis for the NRC's preliminary significance determination is described in the enclosed report. These two findings resulted in AVs of NRC requirements and are being considered for escalated enforcement action in accordance with the Enforcement Policy, which can be found on the NRC's website at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>.

In accordance with IMC 2519, we intend to issue our final significance determination and enforcement decision, in writing, within 90 days from the date of this letter. The SDP encourages an open dialogue between the NRC staff and the licensee; however, the dialogue should not impact the timeliness of the staff's final determination.

Before we make a final decision on this matter, we are providing you with an opportunity to: (1) attend a Regulatory Conference where you can present to the NRC your perspective on the facts and assumptions the NRC used to arrive at the finding and assess its significance; or (2) submit your position on these findings to the NRC in writing. Written responses should reference the inspection report number and the enforcement action number (i.e. EA-21-109).

If you request a Regulatory Conference, it should be held within 40 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. The focus of the Regulatory Conference is to discuss the significance of the finding and not necessarily the root cause(s) or corrective action(s) associated with the finding. If a Regulatory Conference is held, it will be open for public observation. A public meeting notice will also be issued to announce the conference.

If you decide to submit only a written response, such submittal should be sent to the NRC within 40 days of your receipt of this letter.

If you decline to request a Regulatory Conference or submit a written response, you relinquish your right to appeal the final SDP determination; in that, by not doing either you fail to meet the appeal provisions stated in the Prerequisites and Limitations Sections of Attachment 2 of IMC 2519.

Please contact Nicole Coover (404) 997-4510, by phone or other means, within 10 days from the issue date of this letter, to notify the NRC of your intentions to request a Regulatory Conference, to respond with a written submittal, or to decline the opportunity to provide your perspective. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision. The final resolution of this matter will be conveyed in a separate correspondence.

Since the NRC has not made a final determination in this matter, a Notice of Violation is not being issued for the two apparent violations at this time. In addition, please be advised that the number and characterization of apparent violations may change as a result of further NRC review.

Concerning the previously mentioned Green NCV, if you contest the violation, its significance, or the cross-cutting aspect assignment, 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 II; the Director, Office of Enforcement; and the NRC Resident Inspector at the VEGP Units 3 and 4.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice and Procedure," a copy of this letter, its enclosure, and your response (if any), will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of the NRC's document system ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room). Should you have any questions concerning this letter, please contact us.

Sincerely,

Marissa G. Bailey

Digitally signed by Marissa G. Bailey
Date: 2021.08.26 10:19:19 -04'00'

Marissa Bailey, Director
Division of Construction Oversight

Enclosures:

1. NRC Inspection Report No. 05200025/2021010, 05200026/2021010
2. Special Inspection Team Charter

Attachment:

- A. Timeline

**U.S. Nuclear Regulatory Commission
Inspection Report**

Docket Numbers: 5200025
5200026

License Numbers: NPF-91
NPF-92

Report Numbers: 05200025/2021010
05200026/2021010

Licensee: Southern Nuclear Operating Company, Inc.

Facility: Vogtle Unit 3 and 4 Combined License

Location: Waynesboro, GA

Inspection Dates: June 21, 2021, through July 2, 2021

Inspectors: G. Crespo, Senior Construction Project Inspector, Division of
Construction Oversight (DCO)
T. Fredette, Reactor Operations Engineer, Office of Nuclear
Reactor Regulation (NRR)
A. Issa, Reactor Systems Engineer, NRR
G. Khouri, Senior Construction Project Manager, DCO (Team
Lead)
M. Riley, Senior Construction Inspector, DCO (Technical Team
Lead)
A. Ponko, Senior Construction Inspector, DCO

Supported by T. Fanelli, Senior Construction Inspector, DCO
B. Kemker, Senior Resident Inspector, DCO
J. Kent, Construction Inspector, DCO
D. Terry-Ward, Construction Inspector, DCO
J. Vasquez, Construction Inspector, DCO

Approved by: Marissa Bailey, Director
Division of Construction Oversight

SUMMARY OF FINDINGS

Inspection Report (IR) 05200025/2021010, 05200026/2021010; 06/21/2021 through 07/02/2021; Vogtle Unit 3 Combined License, Vogtle Unit 4 Combined License, Special Inspection Report.

This report covers a special inspection conducted by regional, resident, and headquarters inspectors. See List of Findings and Violations, in the tables below, for a summary. The significance of the findings is indicated by their color (i.e., Greater than Green, or Green, White, Yellow, Red), which is determined using Inspection Manual Chapter (IMC) 2519, "Construction Significance Determination Process." Cross-cutting aspects are determined using IMC 0613, Appendix F, "Construction Cross-Cutting Areas and Aspects." All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy. The NRC's program for overseeing the safe construction of commercial nuclear power reactors is described in IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document."

List of Findings and Violations

| Failure to Promptly Identify and Correct IEEE 384 Cable Separation and Seismic/Structural Nonconformances | | | |
|--|--|---|----------------------------|
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Preliminary White AV 05200025/2021010-01 Open EA-21-109 | [H.2] – Human Performance, Field Presence | 93812 - Special Inspection |
| The inspectors identified a preliminary White construction finding and associated apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee's failure to promptly identify and correct conditions adverse to quality associated with the installation of Class 1E cables and associated raceways. Specifically, the licensee failed to promptly identify that cable separation was not maintained in accordance with RG 1.75 and IEEE 384-1981, failed to promptly identify widespread deficiencies in installation of seismic supports and structural components, and failed to timely correct these issues. | | | |

| Failure to Accomplish Separation for Class 1E System Field Installations in Accordance with Applicable Instructions, Procedures, and Drawings | | | |
|--|---|---|----------------------------|
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Preliminary Greater than Green AV 05200025/2021010-02 Open EA-21-109 | [H.2] – Human Performance, Field Presence | 93812 - Special Inspection |
| The inspectors identified a preliminary Greater than Green construction finding and associated apparent violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to maintain 1-inch vertical and horizontal separation between Class 1E electrical divisions and non-Class 1E electrical cables inside switchgear cabinets as specified in safety class C (safety related) APP-G1-V8-01, "AP1000 Electrical Installation Specification." | | | |

| | | | |
|--|---|---|----------------------------------|
| Failure to Install Electrical Raceways and Connections in Accordance with Applicable Instructions, Procedures, and Drawings | | | |
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Green NCV 05200025/2021010-03 Open/Closed | [H.11] – Human Performance, Challenge the Unknown | 93812 - Special Inspection |
| The inspectors identified a Green construction finding and associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to install seismic Category I electrical raceways and connections in accordance with applicable instructions, procedures, and drawings. | | | |

Additional Tracking Items

| Type | Issue Number | Title | Inspection Procedure | Status |
|--------------------------------------|--|--|---|--------|
| Construction Deficiency Report (CDR) | 05200025/ND-21-0603 05200026/ND-21-0603 | Electrical Construction and Measuring & Test Equipment Control | 35007 Quality Assurance Program Implementation During Construction and Pre-Construction Activities | Open |

REPORT DETAILS

INSPECTION SCOPE

In accordance with Inspection Manual Chapter (IMC) 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs," Appendix C, "Response to Significant Issues or Events," deterministic criteria were used to evaluate the level of Nuclear Regulatory Commission (NRC) response to the construction event regarding cable separation and seismic/structural nonconformances of the safety-related (SR) electrical cable raceway systems at Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The following two criteria were met: (1) a stop work order was issued by the licensee on March 18, 2021, for which the underlying issues were not fully understood, and (2) it was a significant event that warranted additional inspection or oversight. Specifically, the circumstances which resulted in the electrical cable separation and seismic/structural nonconformances revealed several concerns regarding construction practices which warranted additional inspection.

On June 1, 2021, a special inspection (SI) was authorized to assess the circumstances surrounding the electrical cable separation nonconformances related to Institute of Electrical and Electronics Engineers (IEEE) Standard 384-1981 and the extent of condition (EOC) of seismic/structural issues which were first identified by the licensee in December 2020. The SI was a programmatic and fact-finding inspection focused on understanding how the licensee's construction and quality control practices resulted in the nonconformances; the actions taken by the licensee to understand and correct the nonconformances using their corrective action program (CAP); and the short-term corrective actions in place to prevent potential additional nonconformances while construction work was ongoing in Units 3 and 4. Refer to Enclosure 2, to this report, for the SI Charter for additional details.

Inspection activities related to inspections, tests, analyses, and acceptance criteria (ITAACs) were outside the scope of the SI. Specifically, ITAACs are identified in the combined license (COL) and if met by the licensee, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will operate in conformity with the license; the provisions of the Atomic Energy Act of 1954, as amended; and the Commission's rules and regulations. During ITAAC inspections, the NRC verifies if the inspections, tests, and analyses were performed as required, and determines whether the acceptance criteria are met. ITAAC inspections are documented in publicly available integrated inspection reports, which currently are issued on a quarterly basis. Future NRC inspections will include implementation of corrective actions associated with cable separation ITAACs and the respective raceways.

This special inspection was 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>. The procedures used during this inspection were IP 35007, "Quality Assurance Program Implementation During Construction and Pre-Construction Activities;" IP 36100.01, "Inspection of 10 CFR 50.55(e) Programs for Reporting Defects and Noncompliance During Construction;" IP 65001.09, "Inspection of ITAAC-Related Installation of Electric and Fiber Optic Cable;" and IP 93812, "Special Inspection Team." The inspectors reviewed selected Southern Nuclear Operating Company, Inc. (SNC) procedures and records, observed activities, and interviewed personnel to assess licensee performance and conformance with Commission rules and regulations, license conditions, site procedures, and standards.

INSPECTION ACTIVITIES

In accordance with IP 93812, "Special Inspection Team" and the attached Special Inspection Team Charter, the inspection team conducted a detailed review of the circumstances surrounding the electrical cable separation nonconformances related to IEEE Standard 384-1981 and the EOC of seismic/structural issues which were first identified by the licensee in December 2020. The italicized fonts for Sections .1 to .6 are the Charter items as described in Enclosure 2.

- .1 Develop a detailed sequence of events from the time of discovery of the IEEE 384 nonconformances until the licensee completed assessing extent of condition and the extent of the cause.*

On July 28, 2020, the licensee identified in condition report (CR) 50057411 that spring nuts on the Unit 3 24-hour, 72-hour, and spare Class 1E direct current (dc) and uninterruptible power supply system (IDS) battery racks (six in total) were improperly installed and did not seat properly on Unistrut channel sections, as prescribed by the vendor manual. On September 29, 2020, the licensee initiated CR 50064326 to capture and assess the impact of other structural issues affecting the Unit 3 IDS battery rack installations, which included torque seals being broken, loose threaded connections, and cross braces not being installed per manufacturer specifications. The licensee performed a root cause determination (RCD) to determine the cause of these issues with the battery racks. The licensee completed the RCD on December 11, 2020, and determined the root cause of the battery rack nonconformances was that the work planning phase was insufficient to construct and inspect the battery racks in accordance with the vendor design criteria. The licensee identified that work instructions for the installation of nuts, cross-bracing, corner brackets, and battery spacing were written at a high level without specific installation criteria. The licensee also identified that inspection documentation contained high level inspection attributes that contributed to the inadequate records needed to assure that all the battery rack components were inspected. The RCD stated that licensee staff witnessed several installation issues but did not generate CRs to evaluate and correct the repeated installation quality issues. Instead, they treated these issues as "work-in-progress" and corrected them outside of the CAP, which resulted in a missed opportunity for the licensee to identify these adverse battery rack installation trends sooner.

In November and December 2020, the licensee generated 57 CRs related to cable separation. On December 22, 2020, the licensee-initiated CR 50072803, "Electrical Installation Quality Adverse Trend," to initiate an investigation for not meeting IEEE 384 cable separation provisions. On January 25, 2021, as a result of increased walkdowns, the licensee identified other examples of SR and non-safety-related (NSR) cables not meeting cable separation provisions and initiated an RCD, documented in condition action record (CAR) 80004436, to further examine the causes of the nonconformances. The RCD focused on SR and seismic Category I/II electrical commodities that were installed but did not conform with design and installation provisions, such as cable tray fill and load limits, missing or damaged cable tray barriers, and limits on free air drop distance. The scope also included splice plate, conduit, and Unistrut installation issues.

On April 28, 2021, the licensee completed the RCD for CAR 80004436, and identified that several of the cable raceway installation nonconformances were missed during the quality control (QC) inspections. Specifically, QC inspections were performed however,

not all the cable separation and seismic/structural nonconformances were being identified during the QC inspections. The licensee concluded that “the root cause lay in a culture across the construction organization where standards were not being followed or enforced and leadership did not consistently correct improper worker behaviors in the area of electrical installations. This culture allowed electrical commodities to be installed, and in some cases, inspected and turned over while not meeting all applicable quality requirements.” Based on the work packages that the NRC inspectors reviewed during the SI, some examples of cable installation issues missed during QC inspections occurred in November and December 2019, as well as from August through December 2020.

On July 6, 2021, the licensee initiated CR 50099082 to document the need to expand the extent of condition on cable separation to include SR and NSR wiring located inside panels/cabinets. See Attachment A for more details regarding the timeline.

- .2 *Review and evaluate the licensee’s quality assurance (QA) process for the installation of electrical cables and raceways that led to work activities not being signed off as they were completed, work packages not including documented examples of in-process monitoring, conditions adverse to quality not being identified early in the corrective action program, and 26 examples where QC had reviewed the final installation and did not identify nonconformances. The results of this evaluation will inform future QA and CAP inspections, as applicable.*

To gain an understanding of the licensee’s work management process, which included the development, use, and closure of work packages (WPs), the NRC inspectors reviewed the procedures that would be used for work planning, from the start of the process to WP closeout. The inspectors reviewed the procedures to evaluate responsibilities for field oversight by supervisors (foremen); interactions with engineering, design, and field engineers (FEs); and QC sign-offs after installation inspections were completed. The inspectors also reviewed in-process work packages and performed walkdowns to evaluate the implementation of the procedures and process for the installation of electrical raceways in Units 3 and 4.

The NRC inspectors conducted interviews with planners, installers, FEs, and QC personnel to verify their roles were understood and met the procedural provisions. The inspectors reviewed the attributes in the QC inspection reports (QC IRs) that are used for the field inspections to verify QC procedures were being followed for electrical installations; to verify QC inspection steps were signed off as they were completed; and to determine if short-term corrective actions were being implemented.

The NRC inspectors reviewed several cable separation nonconformances to understand the methodology the licensee used to identify nonconformances and conducted walkdowns to observe repair work performed. The inspectors also reviewed CRs to verify the issues were captured in the CAP and, when necessary, designated as ITAAC related or associated with ITAAC per the CAP procedures. While the review of acceptance criteria for ITAACs were outside of the scope of this inspection, the inspectors did review two closure packages associated with ITAACs 3.3.00.07e (812) and 2.6.03.04b (602), for which the ITAAC closure notifications (ICNs) had been submitted, in order to evaluate the licensee’s effectiveness in identifying, tracking, and correcting open items needed as part of the ICN closure documentation.

The NRC inspectors reviewed procedure 26139-000-4MP-T81C-N7101, "Construction Quality Verification Program," and observed that Section 6.1.f states completion of quality verification activities and objective evidence shall be indicated on the QC IR, along with the initials and date of the quality control engineers performing the activity. The inspectors identified an example where the sign-off step to initial and date the QC IR sign-off sheet was not performed for in-process activities for work package SV3-1242-ERW-1034028, Attachment B-1. The inspectors did note that the WP contained the sign-offs for final activities. The NRC inspectors determined this was a minor violation of 10 CFR Part 50, Appendix B, Criterion V, "Instruction, Procedure, and Drawings, and the licensee placed this into their CAP as CR 50098526.

During the review of the licensee's QC IRs procedures, QC instruction No. 26139-000-2QI-Q07C-N3301 thru N3304, the inspectors identified two examples where the licensee did not have specific verification steps in the QC IRs. In the first example, the inspectors identified that a procedure step did not exist to direct that nonconformances identified during QC inspections be entered into the CAP for in-process FE and QC inspection activities. The NRC inspectors did note that other licensee procedures directed the use of the CAP to document nonconformances. In the second example, the inspectors identified that procedure steps did not exist for in-process activities to periodically verify cable separation was maintained. The NRC inspectors did note that there were procedural steps to verify cable separation was maintained for the final QC inspections. These observations represented a missed opportunity for the licensee to proceduralize verbally communicated expectations. This issue was documented in the licensee's CAP as CR 50098637.

The NRC inspectors evaluated the work control process and WP sign-offs to understand work sequencing of SR and NSR electrical cable installation activities. The inspectors reviewed the RCD for CAR 80004436 and QC instructions; interviewed personnel; and sampled SR and NSR work packages, including WP SV3-1232-ERW-1031841, titled "U3 AUX – Install Scheduled Lighting Conduit - EL 100'0", Area 2, Room 12303," which was closed on February 23, 2021, to verify the level of quality for SR and NSR cable separation verifications in accordance with IEEE 384-1981, "Standard Criteria for Independence of Class 1E Equipment and Circuits." The inspectors noted that to satisfy the ITAAC, the licensee plans to conduct final raceway separation walkdowns for all rooms in the nuclear island, which includes the containment and auxiliary buildings. The licensee is performing an extent of condition walkdown and associated cable separation repair work, as applicable, on SR and NSR wiring located inside cabinets, panels, consoles, etc., which is documented in CR 50099082.

On March 12, 2021, the licensee's QA organization issued a finding for NSR commodity installation practices that were impacting SR structures, systems, and components (SSCs). The inspectors reviewed the licensee's associated RCD, which was documented in CAR 80004896, "Safety-Related Systems, Structures, and Components Are Being Adversely Impact[ed] by Installation of Nonsafety-Related Commodities." The performance issues leading up to the QA finding had been previously identified, with some examples occurring earlier in the year (August and October 2020). Additionally, the licensee's QA organization documented the NSR commodity installation practices impacting SR SSCs as its top concern in its December 2020 Monthly Report. The inspectors noted that the QA organization did not characterize the problem as a finding until after multiple additional examples had occurred in January and February 2021. During the review of the RCD for CAR 80004896, the inspectors noted that the licensee

did not evaluate why the QA finding was not issued earlier based upon the number of issues and the time period; or why the licensee did not consider potential weaknesses in the independent oversight function of the SNC and Bechtel construction quality assurance processes. This observation was documented in the licensee's CAP as CR 50098040.

- .3 *Review and evaluate the licensee's corrective actions in accordance with the licensee's CAP procedures, including assessment of 10 CFR Part 50, Appendix B process resolution, as-built repairs to IEEE 384 nonconformances, and the extent of condition of seismic/structural issues.*

The inspectors reviewed the licensee's CAP to assess the licensee's criteria for generating and prioritizing corrective actions, and to assess the licensee's generation and significance determinations of CRs associated with as-built repairs. The inspectors reviewed several CRs to determine whether the issues were classified in accordance with the licensee's QA Program and CAP implementing procedures, and conform to 10 CFR Part 50, Appendix B, requirements. The inspectors also reviewed CAP entries to verify they were assigned appropriate trending codes that would allow the licensee the ability to identify adverse trends, as applicable, in accordance with the CAP. This review focused on cable separation and seismic/structural nonconformances that were identified in the RCD.

To assess the licensee's corrective actions taken to date, the inspectors conducted interviews to discuss how "in-process" issues are currently being identified and corrected in the CAP, and determined that the licensee's staff were aware of the need to place conditions adverse to quality (CAQs) into the CAP. The inspectors performed walkdowns of raceways in Unit 3 and Unit 4 to evaluate as-built repairs to the cable separation and seismic/structural nonconformances. The inspectors reviewed the licensee's process for identifying, tracking, and correcting these issues in accordance with the approved design documentation. While the inspectors noted that the identification and associated repair work was still in progress, the inspectors did witness that CAQs were being identified and corrected in accordance with the approved design documentation.

The NRC inspectors reviewed the licensee's extent of condition evaluation and corrective actions associated with the cable separation nonconformances and noted that the licensee has planned and implemented training enhancements for electrical craft and QC personnel. The inspectors observed portions of this enhanced training and confirmed that there was increased emphasis on topics related to electrical cable design basis provisions, IEEE 384 criteria, work package "sign-as-you-go" execution, and reinforcement of CAP use and expectations when nonconformances are identified. To address the specific IEEE 384 cable separation nonconformances for raceways and free air cabling, the licensee will be conducting inspections on each room inside the nuclear island, which includes the containment and auxiliary buildings, to ensure adequate separation exists between different divisions of SR cables and between SR and NSR cables. The licensee's room walkdowns and inspections also consist of verifying each SR cable is appropriately labeled and that the various seismic/structural issues identified in their extent of condition evaluation were resolved and corrected.

Once work was completed, QC inspectors would verify work was completed in accordance with design specifications, work packages, and procedures, as applicable.

NRC inspectors reviewed a sample of completed cable separation repair work to verify it was performed in accordance with the licensee's work process. To address the cable separation nonconformances in panels, the licensee generated CR 50099082 to track the completion of panel walkdowns and associated repair work activities. Additional corrective actions taken included revising QC procedures as needed; developing a plan to perform focused observations during QC inspections; developing a plan to ensure in-progress activities are monitored; and developing performance metrics to measure effectiveness of the corrective actions. The inspectors noted that the CAP will also be revised for Unit 3 and 4 to align with NEI 08-02, "Corrective Action Process for New Nuclear Power Plants During Construction," to make enhancements to the program.

The inspectors reviewed the EOC evaluation and proposed corrective actions for the seismic/structural nonconformances, as documented in the RCD. The inspectors noted that the EOC evaluation and associated repairs were still in progress; however, the inspectors were able to review the licensee's approach to identifying and addressing nonconforming conditions. Specifically, the licensee took a three-phased approach to identifying seismic/structural nonconformances in the Unit 3 nuclear island rooms based upon accessibility. The licensee completed the first phase of the extent of condition walkdowns, which was associated with nonconformances that were easily accessible, prior to the SI. The second and third phases were in progress at the time of the inspection. These two phases required additional activities to access nonconformances, such as installation of scaffoldings, lifting of cable tray covers, etc., to allow for visual inspections and to perform associated repair work activities, as applicable. Based on discussions with the licensee, this approach also included a thorough room by room inspection, by the licensee, to identify any seismic/structural nonconforming conditions, such as channel nuts and bracing associated with the installation of electrical raceways and components. Similar to cable separation corrective actions, once seismic/structural repair work was completed, QC inspectors would verify that work was performed in accordance with the applicable design specifications, work packages, and procedures.

NRC inspectors reviewed the proposed corrective actions to address human performance behaviors associated with the installation and inspection of electrical raceway and channel nuts used in structural connections and bracing of electrical raceways and components. These corrective actions included training construction personnel on Design Specification APP-G1-V8-001, "AP1000 Electrical Installation Specification;" focusing on installation provisions and inspection of seismic Category I/II electrical commodities; and developing and distributing a "What Excellence Looks Like (WELL)" template to clarify inspection provisions and improve inspection documentation.

NRC inspectors reviewed the licensee's corrective actions associated with transferring lessons learned from the installation and inspection of electrical raceway and channel nuts used in structural connections and bracing of electrical raceway and components from Unit 3 to Unit 4 construction personnel. The inspectors noted that the licensee has identified areas for improvement in transferring and assimilating lessons learned from Unit 3 to Unit 4 and developed corrective actions in their CAP to track and resolve them. Consistent with the licensee's self-assessment, the inspectors identified an example of incorrectly installed channel nuts in Unit 4. The NRC inspectors determined this was a minor violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings, and the licensee entered this issue into their CAP as CR 50098345.

- .4 *Review and evaluate the design changes that were implemented to restore compliance to IEEE 384 in order to verify compliance with the design change process in 10 CFR Part 52, Appendix D.*

To resolve some of the IEEE 384 cable separation and raceway seismic/structural nonconformances, the licensee developed and installed several design modifications. The inspectors reviewed the design documents and performed walkdowns to assess the design modifications that were made to restore conformance with IEEE 384 and current licensing bases provisions. The inspectors also verified design changes were completed in accordance with the design change process in 10 CFR Part 52, Appendix D. The inspectors reviewed two engineering and design coordination reports (E&DCRs) to verify that design changes made to the structural connections and bracing of electrical raceway and components were performed in accordance with 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the inspectors verified that the design changes were subject to control measures commensurate with those applied to the original design and were approved by the organization that performed the original design or the designated responsible organization. The inspectors also reviewed the E&DCRs to verify that an adequate technical justification was provided for the design change and the revised design was correctly translated into output documents.

The inspectors reviewed applicable design documents to determine whether field changes were performed in accordance with the approved licensee procedures. The inspectors reviewed the licensing impact determination screening associated with each of these field changes to determine if the changes were properly evaluated against the current licensing basis as described in the Vogtle Units 3 and 4 COLs and Updated Final Safety Analysis Report (UFSAR).

The inspectors reviewed the material and associated properties used in the field changes for cable-to-conduit and cable-to-cable separator clamp devices employed for free air separation of selected cables. This review included assessing the licensee's use of insulating tape, the conductivity of the materials used in the design changes, and the number of cable separators per distance of cable run. The inspectors also verified that the design evaluations considered applicable design inputs such as seismic, coatings, chemicals, and the environmental conditions. The inspectors noted that details for Nuke Tape (insulating tape) function were not adequately translated into installation details in drawing APP-ECS-E9-159. The NRC inspectors determined this was a minor violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings. In response to this violation, the licensee determined that the technical justification and drawing details in the E&DCRs should be revised to accurately reflect the application of Nuke Tape for the separator clamp devices. This issue was documented in the licensee's CAP as CR 50098482.

- .5 *Review and evaluate the licensee's root cause analysis, EOC (to the degree it is complete, recognizing that related EOC activities may be in progress), and extent of cause associated with the IEEE 384 nonconformances and seismic/structural issues, including if the root cause analysis meets the definition of significant condition adverse to quality. Results will inform future QA and CAP inspections, as applicable.*

The inspectors reviewed the licensee's CAP and requirements associated with investigating the event associated with cable separation and seismic/structural nonconformances, in order to verify that the licensee followed their CAP and to verify the

actions taken by the licensee were in accordance with 10 CFR Part 50, Appendix B requirements. Specifically, Criterion XVI, "Corrective Action," states:

"Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined, and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

The NRC's inspection of each of these activities – root cause determination, significant conditions adverse to quality (SCAQ) determination, extent of condition and extent of cause review, and use of construction operating experience – are discussed below.

Root Cause Determination (RCD)

The inspectors reviewed the licensee's procedures associated with their CAP, the provisions for performing investigation reports like an RCD and associated corrective action to prevent recurrence (CAPR), and the use of construction experience when considering lessons learned. The inspectors reviewed specific analysis products, including multiple RCDs, CRs, and corrective actions associated with cable separation and seismic/structural nonconformances for the construction of the SR cable raceway systems.

The inspectors reviewed procedure ND-AD-006, "Nuclear Development Cause Analysis," Version 15.0, which defined a root cause as "the most fundamental cause(s) for an event or condition, which if corrected or eliminated would prevent recurrence of the same or similar event." The inspectors reviewed the RCD for CAR 80004436 to determine if the licensee appropriately identified the cause of the issues and to determine if the scope of the RCD appropriately addressed the nonconformances associated with the installation of SR cables in raceways. The inspectors noted that there were several cable separation nonconformances identified in the RCD that had not been previously entered into the CAP, which was a missed opportunity to identify the adverse trends sooner.

The inspectors independently assessed the licensee's corrective actions for completeness, priority level, and adequacy in addressing the causes; verified corrective actions were completed as scheduled or extended per CAP procedure; and verified applicable preventive measures were being implemented for ongoing work. The inspectors also reviewed the CAPR to verify it met the definition and provisions as stated in the licensee's procedures. The inspectors reviewed procedure ND-AD-002, "Nuclear Development (ND) Corrective Action Program," Version 31.0, which defined a CAPR as "an action taken to correct Significant Conditions Adverse to Quality (SCAQ) or ND Quality Assurance Findings which are intended to correct the Root Cause of a SCAQ or cause(s) of a Finding to prevent recurrence of the event." Specifically, the CAPR was for SNC to develop and implement a recovery plan which included QC procedure and work package revisions to address process weaknesses identified in the RCD; and increased training including IEEE 384 cable separation training, Nuclear Safety Culture and Human Performance awareness training, as well as providing the expectations for

requirements of generating CRs into the CAP. The effectiveness of the recovery plan action would be tracked through metrics with weekly reports of progress to key stakeholders, including SNC. While the CAPR was not completed at the time of this inspection, the inspectors did review the proposed CAPR actions to prevent recurrence of the same issue in the future and did not identify a performance deficiency with the proposed actions.

Significant Condition Adverse to Quality (SCAQ)

The inspectors reviewed CAP procedures used by the licensee to determine if a condition represents a SCAQ. The inspectors reviewed procedure ND-AD-002, which defined a SCAQ as “a condition which, if uncorrected, could have a serious effect on safety or operability. The cause of the significant condition adverse to quality shall be determined and corrective action taken to preclude recurrence.” The inspector noted that the licensee classified CR 50075757 and the associated RCD for CAR 80004436, properly as a Severity Level 1 issue, which is a SCAQ.

During this review, the inspectors identified two observations pertaining to the licensee’s procedure for ensuring 10 CFR 50.55(e) reportability aspects were fully considered. In both procedure examples below, the procedure guidance on what is included as a SCAQ and what level of CAP processing is required has the potential to cause the licensee to miss the opportunity to identify and resolve significant issues sooner, or potentially miss an NRC reportability requirement.

The first example is related to ND-AD-002-025, “Issue Identification and Condition Report,” Version 4.0, which provides the screening guidance for condition reports. Note 1 of Attachment A of this procedure, “Categorization and Significance Matrix,” states that “the criteria and examples contained in this Matrix are guidelines for establishing Severity Levels and Causal Analysis Method. NEI 08-02 may also be referenced. The risk and significance of the issue must be considered when assigning a Severity Level.” NEI 08-02, Attachment 2, “Examples for Screening, Evaluating and Classifying Conditions in the Construction Corrective Action Processes,” states that a SCAQ is “a deviation, nonconformance, or failure to comply with regulations found to be reportable under 10 CFR Part 21 or 10 CFR 50.55(e).” However, Attachment A of the licensee’s procedure ND-AD-002 states that “Equipment affected by 10 CFR Part 21 or 10 CFR 50.55(e) issue” is a Severity Level (SL) 3/CAQ. The inspectors reviewed what constitutes a Severity Level 3/CAQ in procedure ND-AD-002-025, Version 4.0 and noted the licensee’s actions to investigate and resolve a SL3 are significantly less than those for a SL1. As a result, procedure ND-AD-002-25 could lead the licensee to classify the CR as an issue of lower significance, potentially leading to a less rigorous causal determination for a significant construction quality assurance breakdown.

For the second example, the inspectors noted that ND-AD-002 is a SNC fleet procedure that defines SCAQ in a more operational reactor context and does not consider the unique construction aspects of Vogtle Units 3 and 4 and the significance of a 10 CFR 50.55(e) report. This issue was documented in the licensee’s CAP as CR 50098202. Additionally, Section .6 of this report documents the 10 CFR 50.55(e) reportability aspect of the SCAQ.

Extent of Condition (EOC) / Extent of Cause (EOCa)

The NRC inspectors reviewed the licensee's EOC evaluation to determine whether the licensee's actions met the procedure and were broad enough to identify and resolve potential additional nonconformances associated with the construction of SR cable raceway systems. The specific EOC associated with as-built walkdowns and repairs is documented in Section .3.

NRC inspectors reviewed procedure ND-AD-002, which defined EOC as:

“An evaluation of the characteristics of a condition to determine if there are other identical or similar applications in which the condition or its causes could or do exist. The extent of condition is evaluated to address the degree to which the actual condition exists with other plant processes, equipment, or human performance.”

The inspectors reviewed the licensee's EOC evaluation and what had been completed at the time of the SI to confirm if the licensee had appropriately captured IEEE 384 cable separation and seismic/structural design provisions in the scope. For aspects of the EOC evaluation not completed at the time of the SI, the inspectors reviewed the EOC methodology to determine if it was adequate and inclusive and was being performed in accordance with the licensee's CAP procedures.

Based upon the associated inspection activities related to EOC documented in Section .3 and the review of the CAP procedural provisions, the inspectors concluded that the licensee's original extent of condition was too narrowly focused on cable separation ITAAC and did not consider the potential for non-ITAAC-related cable separation issues in panels, junction boxes, etc. and seismic/structural nonconformances. As a result, the licensee expanded both the seismic/structural and the IEEE-384 cable separation (non-ITAAC) EOC action plan and repair work strategy, which will be reviewed in future NRC inspections. The licensee generated CR 50099082, which documented the need to expand the extent of condition evaluation for cable separation to include inside panels and cabinets.

NRC inspectors reviewed procedure ND-AD-006 which defined extent of cause (EOCa) as “an evaluation performed in the Root Cause Determination process to which the root cause(s) of an identified problem have impacted other plant processes, equipment, or human.” For the RCD for CAR 80004436, the licensee's EOCa evaluation noted that the quality issues identified within the electrical discipline, were less likely to exist in other areas. The EOCa evaluation also documented that the conclusions of this RCD would be an input into the RCD for CAR 80004896.

The inspectors reviewed the RCD for CAR 80004896 and the EOCa of the RCD for CAR 80004436 and did not identify any performance deficiencies. However, the inspectors noted that the EOCa that was documented in the RCD for CAR 80004896 was limited in that it looked only at the programmatic issues associated with NSR and SR work interactions. For example, the scope did not identify the programmatic breakdowns associated with the measuring and test equipment control (M&TE) nonconformances that occurred under the same line organization and oversight structure that was included in the 10 CFR 50.55(e) reportability notification (see Section .6). The inspectors also reviewed additional audits and assessments that occurred during this same timeframe but outside of the EOCa evaluation. The

inspectors determined that the EOCa scope of the RCD for CAR 80004896 represented a missed opportunity to capture broader programmatic issues. This issue was documented in the licensee's CAP as CR 50098038.

Construction/Operating Experience (CE/OE)

The inspectors reviewed procedure ND-AD-006, which defined, in part, that Construction/Operating Experience (CE/OE) is:

“A summary of a construction or operating related event that represents an abnormal occurrence or condition. A review of historical data that may yield additional insight into the issue currently under evaluation. Historical data examples (Internal and/or External Operating Experience) include site-specific documents, SNC nuclear facility data and relevant industry documents.”

The inspectors reviewed procedure ND-AD-006-001, “Cause Analysis and Corrective Action Guideline,” Version 7.0 to verify the licensee conducted a review of CE and OE in accordance with their procedures. Specifically, Section 6.6.2, states in part, “search external CE/OE data for the previous 3 years.” NRC inspectors reviewed the RCD for CAR 80004436 and verified that the licensee conducted a review of domestic CE/OE for a five-year period, which exceeded the procedural provisions. However, the inspectors noted that a time frame of five years is limited, especially when considering that similar construction activities in the U.S. occurred in the 1980s. The inspectors noted that the licensee limited the external search keywords used for cable separation to “IEEE 384” which did not produce a complete list of related external OE/CE, especially events related to international experience. In addition to missing related generic communications, such as Information Notice 85-11, “Licensee Programs for Inspection of Electrical Raceway and Cable Installations,” which described several examples of cable separation nonconformances that occurred in the 1980s in U.S. nuclear plants under construction, the inspectors noted the licensee also missed a related electrical separation issue stemming from original construction activities discovered in 2015 at the Kashiwazaki Kariwa site in Japan. The inspectors determined that limited identification and subsequent use of CE/OE was a missed opportunity to capture and apply industry lessons learned to the SNC root cause determination. This issue was documented in the licensee's CAP as CR 50098201.

- .6 *Review and evaluate if there was a significant breakdown in any portion of the quality assurance program conducted under the requirements of 10 CFR Part 50, Appendix B which could have produced a defect in a basic component as discussed in 10 CFR Part 50.55, “Conditions of construction permits, early site permits, combined licenses, and manufacturing licenses.” Based on this review, verify that the licensee's reportability determination was in accordance with the notification criteria in 10 CFR 50.55(e).*

On June 25, 2021, the licensee made a 10 CFR 50.55(e) notification to the NRC's Headquarters Operations Center (Event Notification 55328) regarding electrical construction and M&TE control at Vogtle Units 3 and 4. The NRC was also notified in a letter, ND-21-0603, “Southern Nuclear Operating Company Vogtle Electric Generating Plant Units 3 and 4 Submittal of 10 CFR 50.55(e) Report Regarding Electrical Construction and Measuring & Test Equipment Control” (ADAMS Accession No. ML21176A200). The licensee determined that the nonconformances related to IEEE 384-1981 cable separation and seismic/structural provisions for the SR cable raceway

systems, including M&TE nonconformances, met the criteria of a significant breakdown in the quality assurance program.

For the cable separation issues, NRC inspectors reviewed the licensee's 10 CFR 50.55(e) notification for conformance with their procedure, ND-LI-001, "10 CFR Part 21 and 10 CFR 50.55(e) Evaluating and Reporting of Defects and Noncompliance for Nuclear Development," Version 13.0. The inspectors did not identify a performance deficiency with the reporting timeliness under 10 CFR 50.55(e).

In accordance with IMC 0613, "Power Reactor Construction Inspection Reports," dated November 4, 2020, Construction Deficiency Report (CDR) 05200025 and 05200026/ND-21-0603, was opened by the NRC, to track closure of SNC's 10 CFR 50.55(e) notification ND-21-0063 "Electrical Construction and Measuring & Test Equipment Control."

INSPECTION RESULTS

| Failure to Promptly Identify and Correct IEEE 384 Cable Separation and Seismic/Structural Nonconformances | | | |
|---|--|---|----------------------------|
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Preliminary White AV 05200025/2021010-01 Open EA-21-109 | [H.2] – Human Performance, Field Presence | 93812 - Special Inspection |

Introduction

The NRC identified a construction finding with a preliminary significance of White and an associated apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to promptly identify and correct conditions adverse to quality associated with the installation of Class 1E cables and associated raceways. Specifically, the licensee failed to promptly identify that cable separation was not maintained in accordance with RG 1.75 and IEEE 384-1981, failed to promptly identify widespread deficiencies in installation of seismic supports and structural components, and failed to timely correct these issues. This issue is considered preliminary pending a final significance and enforcement determination.

Description

The design function of the Class 1E cable raceway structure is to ensure physical separation between Class 1E divisions and between Class 1E divisions and non-Class 1E cables. UFSAR Section 8.3.2.4.2, “Raceway and Cable Routing,” states, in part, that separation between SR divisions, and between SR divisions and NSR cables are routed according to spatial separation stipulated in RG 1.75 and IEEE 384-1981. The purpose of IEEE 384 is to establish criteria for the independence and separation of SR and NSR cables/raceways, and RG 1.75 states that following IEEE 384 is an acceptable method for meeting the independence and separation requirements provided the provisions in the regulatory guide are met.

In November and December 2020, the licensee conducted Class 1E cable raceway walkdowns to verify cable separation provisions, as described above, were being met. The licensee’s walkdown resulted in 57 CRs where cable separation criteria were not met. This was identified as an adverse trend and documented in CR 50072803. On January 25, 2021, the licensee generated CR 50075757 to perform a RCD for these electrical cable separation nonconformances. The RCD identified approximately 600 discrepancies in 22 systems. Further, the RCD identified that 26 work packages associated with this work, dating back to 2019, had been inspected and approved by QC without identifying the existing nonconformances. The systems impacted included risk significant safety-related systems such as the IDS, the passive containment cooling system, the protection and monitoring system (PMS), and the passive core cooling system. The licensee’s RCD identified that, prior to November 2020, there were a minimal number of CRs written for known cable separation and seismic/structural nonconformances associated with the installation of Class 1E cables and raceways.

UFSAR Section 8.3.2.4.2, also states, in part, that “A raceway system is the complete assembly of raceways (e.g., conduit, cable tray, or wireway) and raceway supports.” The seismic/structural components like restraints, supports, and embedded plates, are considered

part of the Class 1E cable raceway structure to which they support the design function. NRC inspectors identified seismic/structural nonconformances associated with the installation of the Class 1E SR raceways, which included (1) bolts not being fully set on splice plates, (2) double nuts on expansion plates not being installed per design, (3) cable clamps not being installed per design, (4) improper thread engagement on splice plates and conduits, and (5) improperly installed Unistrut spring nuts. NRC inspectors observed in some of the cases, the Class 1E SR cable raceway issues had been previously identified in the licensee's CAP and not resolved in a timely manner. As a result, the NRC inspectors determined there was a significant amount of seismic/structural CAQs that were not promptly identified and corrected in accordance with the licensee's CAP procedures.

Section 5.1 of procedure ND-AD-002-025, "Issue Identification and Condition Report Screening," Version 2.0, states that "all personnel are required to promptly report conditions adverse to quality or to identify an event, condition, problem, or process that needs correcting." Due to the cumulative effects of the nonconformances, the inspectors determined that the licensee did not identify and correct these issues before they resulted in a SCAQ and that these nonconformances affected the Class 1E raceway structure and its ability to meet its design function to maintain physical separation between Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

During this inspection, the inspectors focused on the programmatic aspects that led to the nonconformances and not on the review and evaluation of each nonconformance for possible impacts on ITAAC. NRC review and evaluation of the repair work associated with the nonconformances and the final as-built Class 1E cable raceway configuration will be performed during follow-up NRC inspections when the licensee's associated construction and repair work is complete, and QC inspected.

Analysis

The licensee's failure to promptly identify and correct conditions adverse to quality associated with the installation of Class 1E cables and associated raceways was a performance deficiency (PD), and a violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Specifically, the licensee (1) failed to promptly identify that cable separation was not maintained in accordance with RG 1.75 and IEEE 384-1981, (2) failed to promptly identify widespread deficiencies in installation of seismic supports and structural components, and (3) failed to timely correct these issues. Per the guidance in IMC 0613, Appendix E, "Examples of Minor Construction Issues," the PD was determined to be more than minor because it represented an adverse condition that rendered the quality of the Class 1E raceway structure unacceptable and requires substantive corrective action. Specifically, the PD resulted in a SCAQ and resulted in a loss of separation between SR raceways and between SR and NSR raceways. This violation was determined to be a construction finding. Inspection activities related to ITAAC were outside the scope of the SI.

The inspectors determined the finding was associated with the Construction/Installation cornerstone of the Construction Reactor Safety strategic performance area. The inspectors assessed the finding using IMC 2519, Appendix A, "AP1000 Significance Determination Process," dated October 26, 2020, and determined this finding was not associated with a security program; it was not associated with an IMC 2504 operational/construction program; and it was not associated with a repetitive, NRC-identified omission of a program critical attribute. The inspectors determined the finding was a PD with a preliminary significance of White, which is defined as low to moderate safety significance, pending a final significance determination.

This finding was determined to be preliminary White because it was associated with the Class 1E raceway structure which is assigned to the intermediate risk column of the “AP1000 Construction Significance Determination Matrix” and because the finding was associated with structures such that reasonable assurance is not provided that the structure can meet its design function. The inspectors determined this finding was of low to moderate safety significance because it was determined to adversely affect the intermediate risk Class 1E Cable Raceway structure and its function of maintaining physical separation between Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of “Field Presence” in the area of Human Performance, in accordance with IMC 0613, Appendix F, “Construction Cross-Cutting Areas and Aspects,” dated November 4, 2020. The proximate cause of the PD was attributed to leaders not reinforcing standards, behaviors, and expectations for performing work in accordance with design standards and procedures for placing issues into the CAP. [H.2]

Enforcement

10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” requires, in part, that “Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.”

Contrary to the above, since 2019, the licensee failed to promptly identify and correct conditions adverse to quality associated with the installation of Class 1E cables and associated raceways. Specifically, the licensee failed to promptly identify that cable separation was not maintained in accordance with RG 1.75 and IEEE 384-1981 as specified in UFSAR Section 8.3.2.4.2, “Raceway and Cable Routing,” failed to promptly identify widespread deficiencies in installation of seismic supports and structural components, and failed to timely correct these issues. The licensee entered this issue into their CAP as CR 50098564. Corrective actions are currently underway to identify and repair IEEE 384 cable separation and seismic/structural nonconformances associated with the installation of Class 1E cables and associated raceways. This issue does not represent an immediate safety concern since Vogtle Units 3 and 4 are currently in the construction phase, there is no fuel in the reactor, and cable separation ITAAC must be satisfied prior to the 10 CFR 52.103(g) finding, after which the licensee may load nuclear fuel into the reactor. This violation is being treated as an apparent violation with a preliminary significance of White pending a final significance and enforcement determination. [AV 05200025/2020010-01, “Failure to Promptly Identify and Correct IEEE 384 Cable Separation and Seismic/Structural Nonconformances”]

| Failure to Accomplish Separation for Class 1E System Field Installations in Accordance with Applicable Instructions, Procedures, and Drawings | | | |
|---|---|---|----------------------------|
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Preliminary Greater than Green AV 05200025/2021010-02 Open EA-21-109 | [H.2] – Human Performance, Field Presence | 93812 - Special Inspection |

Introduction

The NRC inspectors identified a construction finding with a preliminary significance of Greater than Green (GTG) and an associated apparent violation of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to maintain 1-inch vertical and horizontal separation between Class 1E electrical divisions and non-Class 1E electrical divisions inside switchgear cabinets as specified in safety class C (safety related) installation specification APP-G1-V8-01, “AP1000 Electrical Installation Specification.” This issue is considered preliminary pending a final significance and enforcement determination.

Description

The Unit 3 COL, Appendix C, Section 2, “System Based Design Descriptions ,” states, in part, for the various systems described, “Separation is provided between [*the system*] Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.” The UFSAR Section 8.3.2.4.2, “Raceway and Cable Routing,” states, in part, that “within panels and control switchboards, the minimum horizontal separation between components or cables of different separation groups (both field-routed and vendor-supplied internal wiring) is one inch, and the minimum vertical separation is one inch.” The above provisions were translated into safety related installation specification APP-G1-V8-01, which was referenced in electrical installation work packages reviewed by the inspectors.

On April 20, 2021, NRC inspectors identified that the licensee tied together two Class 1E division cables from the PMS and the Class 1E IDS to non-Class 1E cables inside switchgear cabinets. The cables were inside the reactor coolant pump (RCP) switchgear cabinets, SV3-ECS-ES-41 (PMS and IDS Division C) and SV3-ECS-ES-42 (PMS and IDS Division B). By having the Class 1E and non-Class 1E cables tied together, the prescribed cable separation distance of one inch (both vertical and horizontal) was not maintained within the cabinets.

As a result, the licensee inspected the RCP switchgear cabinets and reactor trip system (RTS) switchgear cabinets to assess whether the one-inch separation distance had been maintained. The licensee’s review identified separation discrepancies within all eight RCP switchgear cabinets and all eight RTS switchgear cabinets. The Class 1E PMS and IDS divisions A, B, C, and D and non-Class 1E components were not properly separated by the specified distance of one inch. Inadequate cable separation within the RTS and RCP switchgear cabinets could allow electrical disturbances in the non-Class 1E systems to impact the RTS safety function of shutting down the reactor, and adversely impact the ability of PMS to trip the RCP when required to mitigate accidents as an engineered safety feature (ESF). Specifically, the energies developed from electrical disturbances (e.g., arcing, flashover, or magnetic, etc.) in the non-Class 1E systems could cause undesirable responses in safety-related equipment, both locally and downstream. Because the condition exists in multiple cabinets affecting all four divisions of PMS and IDS, the PD is considered a potential common mode failure event.

The sixteen switchgear cabinets identified as having separation discrepancies included:

| RTS Switchgear | RCP Switchgear |
|-------------------|----------------|
| SV3-PMS-JD-RTSA01 | SV3-ECS-ES-31 |
| SV3-PMS-JD-RTSA02 | SV3-ECS-ES-32 |
| SV3-PMS-JD-RTSB01 | SV3-ECS-ES-41 |
| SV3-PMS-JD-RTSB02 | SV3-ECS-ES-42 |
| SV3-PMS-JD-RTSC01 | SV3-ECS-ES-51 |
| SV3-PMS-JD-RTSC02 | SV3-ECS-ES-52 |
| SV3-PMS-JD-RTSD01 | SV3-ECS-ES-61 |
| SV3-PMS-JD-RTSD02 | SV3-ECS-ES-62 |

The licensee captured these nonconformances in their CAP as CR 50088883 and CR 50090119. In addition, the licensee generated CR 50099082 to perform additional visual extent of condition inspections for separation nonconformances in other Class 1E cabinets.

Analysis

The inspectors determined that the licensee’s failure to maintain one-inch vertical and horizontal separation between Class 1E electrical divisions and non-Class 1E electrical divisions within switchgear cabinets as specified in safety related installation specification APP-G1-V8-01, was a PD and constituted a failure to comply with 10 CFR Part 50, Appendix B, Criterion V. Per the guidance in IMC 0613, Appendix E, “Examples of Minor Construction Issues,” the PD was determined to be more than minor because it represented an adverse condition that rendered the quality of an SSC unacceptable or indeterminate and required substantive corrective action. Specifically, the licensee failed to install Class 1E cabling in the RTS and RCP switchgear cabinets per APP-G1-V8-01, as prescribed by work instructions, which could have adversely impacted PMS, IDS, RTS, and ESF functions. The PD did not impact an ITAAC, and therefore was determined to be a construction finding.

The inspectors determined the finding was associated with the Construction/Installation cornerstone of the Construction Reactor Safety strategic performance area. The inspectors assessed the finding using IMC 2519, Appendix A, “AP1000 Significance Determination Process,” dated October 26, 2020, and determined this finding was not associated with a security program; it was not associated with an IMC 2504 operational/construction program; and it was not associated with a repetitive, NRC-identified omission of a program critical attribute.

The inspectors determined the finding was a PD with a preliminary significance greater than very low safety significance, GTG, pending the completion of an extent of condition survey and a final significance determination. This finding was preliminarily determined to be GTG because it was associated with the PMS, IDS, and reactor coolant system (RCS), which are assigned to the high-risk importance column of the “AP1000 Construction Significance Determination Matrix.” Because the finding could reasonably be expected to impair a design function of all trains of the associated systems, the inspectors determined the PD could fall above Row 1 of the High Risk Importance column because it has the potential to affect all divisions of the PMS and IDS for reactor trip and ESF functions for the RCP trip. The design functions associated with the systems that could be impacted, include, but are not limited to: 1) the PMS initiates an automatic reactor trip, as identified in COL Table 2.5.2-2, when plant process signals reach specified limits; 2) the PMS initiates automatic actuation of engineered safety features, as

identified in COL Table 2.5.2-3, when plant process signals reach specified limits; and 3) the PMS provides manual initiation of reactor trip and selected engineered safety features as identified in COL Table 2.5.2-4.

The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of "Field Presence" in the area of Human Performance, in accordance with IMC 0613, Appendix F, "Construction Cross-Cutting Areas and Aspects," dated November 4, 2020. The proximate cause of the PD was attributed to leaders not providing oversight of work activities, including contractors and supplemental personnel installing Class 1E components adjacent to non-Class 1E components [H.2].

Enforcement

Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that "[a]ctivities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings."

The Unit 3 COL, Appendix C, Section 2, "System Based Design Descriptions," states, in part, for the various systems described, "Separation is provided between [*the systems*] Class 1E divisions, and between Class 1E divisions and non-Class 1E cable."

The UFSAR Section 8.3.2.4.2, "Raceway and Cable Routing," states, in part, that "within panels and control switchboards, the minimum horizontal separation between components or cables of different separation groups (both field-routed and vendor-supplied internal wiring) is one inch, and the minimum vertical separation is one inch."

Safety related specification APP-G1-V8-01, Section B2, "Separation and Segregation Spacing Requirements," states, in part, "within panels and control switchboards, the minimum horizontal separation between components or cables of different separation groups (both field-routed and vendor supplied internal wiring) is 1 inch, and the minimum vertical separation is 1 inch."

Contrary to the above, on or before April 20, 2021, the licensee failed to accomplish activities affecting quality using prescribed documented instructions, procedures, or drawings, of a type appropriate to the circumstances. Specifically, for the sixteen RTS and RCP switchgear cabinets, the licensee failed to provide separation between Class 1E divisions and non-Class 1E cables within panels as specified by safety related specification APP-G1-V8-01, Section B2. The licensee entered these issues into their CAP as CR 50088883, CR 50090119, and CR 50099082. The licensee has begun corrective actions to assess separation between Class 1E and non-Class 1E components inside other cabinets and evaluate if identified. This issue does not represent an immediate safety concern since Vogtle Units 3 and 4 are currently in construction phase and there is no fuel in the reactor. This violation is being treated as an apparent violation with a preliminary significance of GTG pending a final significance enforcement determination. [AV 05200025/2021010-02, Failure to Accomplish Separation for Class 1E System Field Installations in Accordance with Applicable Instructions, Procedures, and Drawings].

| Failure to Install Electrical Raceways and Connections in Accordance with Applicable Instructions, Procedures, and Drawings | | | |
|---|---|---|----------------------------------|
| Cornerstone | Significance | Cross-cutting Aspect | Inspection Procedure |
| Construction/Installation | Green NCV 05200025/2021010-03 Open/Closed | [H.11] – Human Performance, Challenge the Unknown | 93812 - Special Inspection |

Introduction

The inspectors identified a construction finding of very low safety significance (Green) and associated non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to install seismic Category I electrical raceways and connections in accordance with applicable instructions, procedures, and drawings.

Description

During the electrical inspections conducted between June 21 and July 2, 2021, NRC inspectors identified multiple examples where the licensee failed to install seismic Category I raceways and connections in accordance with instructions, procedures, and drawings. Some of these examples had previously been documented as unresolved items (URIs) 05200025/2021001-01, 05200025/2021001-02, and 05200025/2021001-03 (ADAMS ML21133A292).

The inspectors reviewed design specifications, work management process, CAP documents, and procedure documents associated with URIs 05200025/2021001-01, 05200025/2021001-02, and 05200025/2021001-03 and other nonconforming as-built construction activities associated with the installation of seismic Category I raceways and connections. The inspectors noted that safety-related design specification APP-G1-V8-001, “AP1000 Electrical Installation Specification,” Revision 9, Section 3.2.1 states, in part, that where raceways are required as a part of the equipment installation or to supplement equipment installation, such work shall be done in accordance with the applicable sections of this specification and any applicable approved drawings.

For URI 05200025/2021001-01, the inspectors reviewed the typical details of seismic Category I cable tray splice plates for HDGAF metal (B-Line) cable trays that are provided in details T21, T22, T22A, and T22B on design drawing SV3-ECS-E9-012-R8. These details provide that nuts of the bolts used in the connections be tightened to 19 ft.-lbs. and do not specify a permissible gap between the bolt head and the cable tray side rail or the plies of the connection. Not all the bolts used in the connections of cable trays SV3-1242-ER-AZT04B, SV3-1212-ER-AYT01D, and SV3-1212-ER- AYT01F were fully seated and in firm contact with the cable tray in accordance with the details. Additionally, these details do not provide leeway to tighten the bolts more than the specified value. Standard practices for the installation of structural bolted connections are to tighten the bolts to bring the faying surfaces into contact with one another prior to applying any required pre-tensioning. Failure to follow these practices may result in some bolts in the connection not achieving the required torque. The inspectors also reviewed the Westinghouse technical evaluation of the nonconforming conditions.

For URI 05200025/2021001-02, the inspectors reviewed the typical connection notes and details depicted on drawings SV3-ECS-E9-062-R2 and SV3-ECS-E9-064-R0 and pictures of the connections at the locations where the nonconformances were identified. Based on this review, the inspectors determined that a cable tray hold down clamp specified for horizontal cable trays was used for vertical cable tray section SV3-1232-ER-CZT02A at support SV3-1232-SH-E1403. The inspectors also determined that two nuts used in a bolted angle connection between cable tray section SV3-1232-SH-E1404 and a support lacked proper thread engagement as defined in Note 2.8 (B) on drawing SV3-ECS-E9-062-R2 and the angle was deformed plastically during installation.

For URI 05200025/2021001-03, the inspectors reviewed the applicable design drawings. Note 3.3 on drawing SV3-ECS-E9-030 states, in part, that bolts shall be installed and torqued pursuant to the manufacturer's requirements for the type of fitting and bolt size. Furthermore, SV3-ECS-E9-033 shows details for several typical raceway installations and depicts the installation of channel nuts used in the connections to Unistrut supports. The inspectors concluded that the instructions and details referenced above provide that the channel nuts be fully seated within the Unistrut. However, some of the spring nuts connecting junction boxes SV3-1232-ER-CZP04 and SV3-1232-ER-CZP08 to the supports were not properly seated in accordance with the applicable instructions and details.

A typical detail of a z-shaped cable tray hold down/expansion clamp/guide is provided in detail T03 on SV3-ECS-E9-011-R7. This detail depicts the hold down/expansion clamp/guide to be installed flush against the cable tray side rail. Additionally, at a location where a splice plate interferes with installation of the z-shaped cable tray hold down/expansion clamp/guide, Section 2-2 on the same drawing provides an allowance for trimming the end of the splice plates. However, the inspectors determined that z-shaped cable tray hold down/expansion clamp/guides in Room 12412 at cable tray SV3-1242-ER-AXT02AB were installed directly over the splice plate bolts at this location. As a result, the inspectors concluded that the as-built construction at this location did not conform with the applicable details and sections on the design drawing referenced above.

Note 3.6 on SV3-ECS-E9-062-R2 states, in part, that cable trays shall be anchored midway between expansion points consistent with the tray manufacturer's direction and the guidance provided in the APP-ECS-E9 series of drawings. Furthermore, Note 3.7 on the same drawing states, in part, that cable tray hold down clips that allow the tray to thermally expand/contract are to be installed between expansion connections and the anchor points consistent with the tray manufacturer's directions and the guidance provided in the APP-ECS-E9 series of drawings. However, the inspector determined that there were multiple instances in which the seismic Category I connections between NSR cable tray sections SV3-1232-ER-NZT01B, -NZT01D, -NZT01E, -NZT12B, and -NZT12C and supports in Room 12302 were not installed in accordance with the provisions referenced above.

Note 7.25 on SV3-ECS-E9-030-R13 states, in part, that a shim plate may be used in case of construction misalignments to accommodate conduit and Table 8 on drawing SV3-ECS-E9-101 is referenced for the shim plate dimensions and detail. The inspectors noted that the detail provided for Table 8 on drawing SV3-ECS-E9-101 requires a one piece shim plate dimensioned in accordance with the table. However, the inspectors determined that the shim plate used for conduit clamp on support SV3-1232-SH-E2126 was not one single continuous piece connecting to both ends of the clamp, but two pieces of shim plates. Additionally, the shim plates were not dimensioned in accordance with Table 8 on drawing SV3-ECS-E9-101-R1.

The inspectors also noted that in all the examples discussed above, the nonconforming conditions had been inspected and accepted by the QC organization.

Analysis

The failure to install seismic Category I electrical raceways and connections in accordance with applicable instructions, procedures, and drawings was a PD, and a violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." Per the guidance in IMC 0613, Appendix E, "Examples of Minor Construction Issues," the PD was determined to be more than minor because it represented a substantive failure to adequately implement an adequate program, process, procedure, or quality oversight function, and this failure appeared to be programmatic in nature given the number of examples of nonconforming construction that affected multiple raceways and connections. The inspectors determined that the finding represented a construction finding because it was not material to the acceptance criteria of an ITAAC.

The inspectors determined the finding was associated with the Construction/Installation cornerstone of the Construction Reactor Safety strategic performance area. The inspectors assessed the finding using IMC 2519, Appendix A, "AP1000 Significance Determination Process," dated October 26, 2020, and determined this finding was not associated with a security program; it was not associated with an IMC 2504 operational/construction program; and it was not associated with a repetitive, NRC-identified omission of a program critical attribute. The inspectors determined the finding was of very low safety significance (Green) because the as-built SSCs potentially affected by the nonconforming construction, would have been able to perform their SR functions based on analysis performed by the licensee and taking into account conservatism and redundancy in the design.

The inspectors reviewed the finding for a possible cross-cutting aspect in accordance with IMC 0613 Appendix F, "Construction Cross-Cutting Areas and Aspects," and determined the finding has a cross-cutting aspect in the Human Performance area because leaders did not emphasize that individuals take the time to do the job right the first time, seek guidance when unsure, and stop if an unexpected condition is encountered. [H.11].

Enforcement

10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" states, in part, that "[a]ctivities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings."

Safety related design specification, APP-G1-V8-001, "AP1000 Electrical Installation Specification," Revision 9, Section 3.2.1, states, in part, that where raceways are required as a part of the equipment installation or to supplement equipment installation, such work shall be done in accordance with the applicable sections of this specification and any applicable approved drawings.

Contrary to the above, prior to June 21, 2021, installation of seismic Category I raceways and connections were not accomplished in accordance with instructions, procedures, or drawings, as evidenced by the following examples:

1. Connections between cable tray sections and supports were not accomplished in accordance with the applicable drawings.
2. Connections between junction boxes and supports were not accomplished in accordance with the applicable instructions and drawings.
3. Connections between conduit and supports were not accomplished in accordance with the applicable drawings

In all the examples provided above, the as-built construction had been inspected and accepted by the QC organization. The licensee is implementing ongoing corrective actions which includes a thorough room by room inspection of the as-built construction to identify and correct nonconforming conditions associated with the installation of electrical raceways and channel nuts used in structural connections and bracing of electrical components. The licensee is implementing long-term corrective actions to address less than adequate human performance behaviors associated with the installation and inspection of electrical raceways channel nuts used in structural connections and bracing of electrical components. The corrective actions are also meant to ensure that lessons learned with the installation and inspection of electrical raceway and channel nuts used in structural connections and bracing of electrical raceway and components are transferred from Unit 3 to Unit 4 construction personnel.

Because this violation was of very low safety significance (Green) and was entered into the licensee's CAP as SNC Condition Report (CR) 50098382, it is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the Enforcement Policy. [NCV 05200025/2021010-03, Failure to Install Electrical Raceways in Accordance with Applicable Instructions, Procedures, and Drawings]. This NCV closes URIs 05200025/2021001-01, 05200025/2021001-02, and 05200025/2021001-03.

4. OTHER INSPECTION RESULTS

4OA6 Meetings, Including Exit

.1 Exit Meeting.

On July 12, 2021, the inspectors presented the inspection results to Mr. G. Chick, VEGP Units 3 and 4 Executive Vice President of SNC, and other licensee and contractor staff members. Proprietary information was reviewed during the inspection period but was not included in the inspection report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee and Contractor Personnel

C. Castell, SNC Licensing Engineer
D. Kettering, SNC Engineering Support
S. Leighty, SNC Licensing Manager
K. Roberts, SNC, ITAAC Manager
M. Yox, SNC Regulatory Affairs Director
J. Carlson, Bechtel Electrical Construction Manager
J. Boykin, Bechtel QC Manager
V. Floyd, SNC QC Manager
M. Patel, SNC Electrical Engineer
N. Kasner, SNC Organizational Effectiveness Director

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

| <u>Item Number</u> | <u>Type</u> | <u>Status</u> | <u>Description</u> |
|---------------------|--|---------------|---|
| 05200025/2021010-01 | AV Preliminary White | Open | Failure to Promptly Identify and Correct IEEE 384 Cable Separation and Seismic/Structural Nonconformances |
| 05200025/2021010-02 | AV Preliminary Greater than Green | Open | Failure to Install Electrical Raceways and Connections in Accordance with Applicable Instructions, Procedures, and Drawings |
| 05200025/2021010-03 | NCV | Open/Closed | Failure to Install Electrical Raceways and Connections in Accordance with Applicable Instructions, Procedures, and Drawings |
| 05200025/2021001-01 | URI | Closed | Raceway Splice Plates Not Installed in Accordance with Instructions |
| 05200025/2021001-02 | URI | Closed | Cable Tray Connection to Supports Not Installed in Accordance with Instructions |
| 05200025/2021001-03 | URI | Closed | Misaligned Spring Nuts in Junction Box |

05200025/ND-21-0603
05200026/ND-21-0603

CDR

Open

Electrical Construction and
Measuring & Test Equipment
Control

LIST OF DOCUMENTS REVIEWED

Root Cause Determinations

1. Vogtle 3 & 4 Root Cause Determination for CR 50075757 CAR 80004436, Dated 4/28/21
2. Vogtle 3 & 4 Root Cause Determination for CR 50064326 CAR 80003772, Dated 12/11/20
3. Vogtle 3 & 4 Root Cause Determination for CR 50082591 CAR 80004896, Dated 5/28/21

Current Licensing Bases Documents

1. VEGP 3 & 4 UFSAR, Revision 10
2. Institute of Electrical and Electronic Engineers (IEEE) 384-1981; IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits,"

Condition Reports

| | | |
|----------|----------|----------|
| 50057411 | 786479 | 50088713 |
| 50072803 | 50018051 | 50090489 |
| 5009908 | 50055012 | 50090539 |
| 50069546 | 50087289 | 50090553 |
| 50069644 | 50087290 | 50090565 |
| 50070956 | 50087293 | 50090568 |
| 50071013 | 50087477 | 50091331 |
| 50071218 | 50087502 | 50098382 |
| 50080406 | 50087519 | |
| 50095003 | 50087533 | |
| 50087706 | 50088163 | |
| 554439 | 50088556 | |

Corrective Action Records

80003772
80002184
80003772
80004313
80004403

SNC Procedures

1. ND-AD-002, "Nuclear Development Corrective Action Program," Version 31.0
2. ND-AD-002-025, "Issue Identification and Condition Report," Version 4.0
3. Procedure ND-LI-001, "10 CFR Part 21 and 10 CFR 50.55(e) Evaluating and Reporting of Defects and Noncompliance for Nuclear Development"; Version 13.0
4. ND-EN-VNP-024, "Engineering Service Request," Version 3.1
5. ND-AD-006-001, "Nuclear Development Cause Analysis," Version 15.0
6. ND-RA-001-005, "Screening, Evaluating, and Reporting Conditions Related to ITAAC," Version 7.1
7. ND-AD-002-004, "Management Review Committee (MRC) Charter," Version 13.0
8. ND-AD-002-010, "Performance Monitoring and Trending," Version 6.0
9. ND-AD-002-001, "Corrective Action Program Training and Qualification Program," Version 12.0

WEC Procedures

1. APP-GW-GAP-420, "Engineering Design & Coordination Report," Revision 20
2. APP-GW-GAP-140, "AP1000 Licensing Applicability Determination and 10 CFR 50.59/10 CFR 52 Appendix D Section VIII Screening," Revision 1

Bechtel Procedures

1. 26139-000-2QI-Q07C-N3303, "Cable Installation," Revision 4
2. 26139-000-4MP-T81C-N7101, Construction Quality Verification Program, Rev. 5
3. 26139-000-4MP-T81C-N1204, Rev. 19 – Construction Implementation and Closing of Work Packages
4. 26139-000-4MP-T81C-N8401, Rev. 9 – Quantity Reporting
5. 26139-000-4MP-T81C-N7101, Rev. 6 – Construction Quality Verification Program

QC Instructions

1. 26139-000-2QI-Q07C-N3301, Electrical Equipment Installation, Rev. 2
2. 26139-000-2QI-Q07C-N3302, Raceway and Accessories, Rev. 7
3. 26139-000-2QI-Q07C-N3303, Cable Installation, Rev. 4
4. 26139-000-2QI-Q07C-N3304, Cable Terminations, Rev. 6
5. 26139-000-4MP-T81C-N1204, Construction Implementation and Closing of Work Packages, Rev. 20

WEC Specifications

1. APP-G1-V8-001, "AP1000 Electrical Installation Specification," Revision 9
2. APP-GW-S1-008, "AP1000 Design Guide for Raceway Systems," Revision 4
3. APP-G1-E1-003, Design Specification, "Raceway Design Criteria," Revision 4
4. APP-ER01-Z0-003, Design Specification, "Class 1E Cable Tray and Fittings," Revision 1

E&DCRs

1. APP-G1-GEF-850177, "IEEE-384 Compliance Inspection Guide," Revision 0
2. APP-ECS-GEF-850899, "Incorporation of Drawing Detail – Multi-Cable Separator Installation," Revision 0
3. APP-ECS-GEF-850728, "Separation of Flex Conduit," Revision 0
4. APP-ECS-GEF-850904, "Raceway and Cable Separation Details," Revision 0
5. APP-EA03-GEF-010, Rev. 0 - EA03 Fuse Changes and Inverter Source Panels
6. APP-FSAR-GEF-089, "Cable Tray Reclassification (NL-1385)," Revision 0
7. APP-SH25-GEF-100003, "SC-I and SC-II Cable Tray Optimization of Support Locations, Revision 0
8. APP-SH25-GEF-850011, "SC-I and SC-II Cable Tray Raceway Capacity," Revision 0
9. APP-ECS-GEF-850637, "Clarification of Cable Tray Splice Plate Installation Notes," Revision 0
10. APP-ECS-GEF-850896, "Conduit Clamp Edge Distance (ESR 50072877)," Revision 0
11. APP-ECS-GEF-850909, "(ESR 50080890) Note 3.24 of APP-ECS-E9-063 Drawing," Revision 0
12. SV0-ECS-GEF-000171, "Minimum Distance between the Unistrut Edge and the End of the Conduit Clamp (ESR 50036168)," Revision 0

Drawings

1. SV3-SH25-E9-100-R1, "Tray Support Selection Guidelines"
2. SV3-SH25-E9-101-R0, "Tray Support Location and Identifications"
3. SV3-ECS-E9-011-R7, "Cable Tray Notes and Details Sheet 2"

4. SV3-ECS-E9-012-R9, "Cable Tray Notes and Details Sheet 3"
5. SV3-ECS-E9-013-R6, "Cable Tray Notes and Details Sheet 4"
6. SV3-ECS-E9-014-R5, "Cable Tray Notes and Details Sheet 5"
7. SV3-ECS-E9-015-R2, "Cable Tray Notes and Details Sheet 6"
8. SV3-ECS-E9-016-R2, "Cable Tray Notes and Details Sheet 7"
9. SV3-ECS-E9-017-R2, "Cable Tray Notes and Details Sheet 8"
10. SV3-ECS-E9-018-R1, "Cable Tray Notes and Details Sheet 9"
11. SV3-ECS-E9-019-R0, "Cable Tray Notes and Details Sheet 10"
12. SV3-ECS-E9-062-R2, "Cable Tray Notes and Details Sheet 1"
13. SV3-ECS-E9-063-R2, "Cable Tray Notes and Details Sheet 12"
14. SV3-ECS-E9-064-R0, "Cable Tray Notes and Details Sheet 13"
15. SV3-ECS-E9-065-R0, "Cable Tray Notes and Details Sheet 11"
16. SV3-ECS-E9-066-R0, "Cable Tray Notes and Details Sheet 14"

Technical Evaluations

| | | | | | |
|----------|----------|----------|----------|----------|----------|
| 60023893 | 60023893 | 60023857 | 60023859 | 60023877 | 60023896 |
| 60023896 | 60023896 | 556231 | 60023862 | 60023880 | 60024672 |
| 60023868 | 60023868 | 556234 | 60023863 | 60023883 | 60026112 |
| 60023884 | 60023884 | 558593 | 60023864 | 60023884 | |
| 60023893 | 60023893 | 787827 | 60023866 | 60023885 | |
| 60023864 | 60023864 | 60023713 | 60023867 | 60023886 | |
| 60023866 | 60023866 | 60004939 | 60023868 | 60023887 | |
| 60023873 | 60023873 | 60019223 | 60023873 | 60023888 | |
| 60023880 | 60023880 | 60023138 | 60023875 | 60023892 | |
| 60023887 | 60023887 | 60023857 | 60023876 | 60023894 | |

Work Packages

1. SV3-IDSC-EWW-1052607, U3, CT- Bulk Cable Pull (IRC-0069, IRC-0185, IRC-0192) to EPA P27Z – El. 107'-2" – Room 11300, Rev. 0
2. SV3-1224-ERW-1017188, U3, Install Schedule Conduit, AUX. Elevation 82'-6", Area 4, Room 12251, 12256, Rev. 0
3. SV3-1153-ERW-1018431, U3, CT, Install 1E Cable Tray, Elevation 135'-3", Room 11500, Area 3, Rev. 0
4. SV3-1211-RCS-EWW-1037979, U3, CT, Pull SYS RCS-1E Cables from SV3-IDSD-EY-P16Y-IRC, Rev. 0,
5. SV3-IDSD-EWW-1053720, U3 – CT- Bulk Cable Pull to EPA P16Y (IRC-0104, 0160, & 0175) - El. 107'-2" – Area 0 – Room 11306, Rev. 0
6. SV4-1143-SHW-1049105, U4 – CT – Install Cable Tray Supports – El. 118'-6" Rev. 0
7. SV4-1231-SHW-800020, U4 – Install Cable Tray Supports, AUX, El. 100'-0", Area 1 Room 12304, Rev. 0
8. SV4-1162-SHW-800013, U4-Install and Label Welded Cable Tray Supports, Containment, SP-L26 El. 163'-1", Area 2, Rev. 0,
9. SV3-RCS-EWW-1037979, U3, CT Pull SYS RCS-1E Cables from SV3-IDSD-EY-P16Y-IRC and associated equipment, Rev. 0
10. SV3-1211-ERW-EL1619, Install Design Routed Raceway and Supports for Division "B" Battery Room El. 66'-6, Rev. 0,
11. SV3-1153-ERW-1005985, U3 Install and Label Class 1E Conduits-Containment, Elev. 135'3" to 180'0", Area 3, Room 11306, Rev. 0
12. SV3-1232-ERW-1002821, Install Cable Tray SV3-1232-ER-CZT27A, Elev. 100'-0", Area 2, Room 12313, dated 8/25/20
13. SV3-1232-ER2-1009221, Att. B, SV3-1232-ER-DZC03/Conduit, dated 1/24/20

14. SV3-1242-ERW-1015834, U3-Aux-Install 1E Conduit – Room 12401 – EL 117’6” – Area 2, Ver. 1.0
15. SV3-1242-ERW-1034028, Att. B, U3-Aux-Install Cable tray (Below Raised Floor) (Lines I-K), dated 12/11/19
16. SV3-1242-ERW-1049567, Att. B, U3-Aux Install-Label Non-1E Conduits and Pull Boxes – Elev. 117’6”-Room 12401 – Area 2, dated 3/20/20
17. SV3-1242-ERW-1049568, U3-Aux Install-Label Non-1E Conduits and Pull Boxes – Elev. 117’6” – Room 12401 – Area 2, Rev. 0
18. SV3-1242-ERW-1059188, U3-Aux Install-Label Non-1E Conduits – Elev. 117’6”-Room 12401 – Area 2, Rev. 0
19. SV3-1277-SHW-1135572, U3-Aux/Shield-Fabricate/Install Field Routed Typical Welded/Non-Welded Raceway Supports – EL 226’6” and Above – Area 7, Rev. 0
20. SV3-1222-SHW-1055467, U3 Aux – Fabricate and Install Cable Tray Supports, Elev. 82’-6”, Area 2, Room 12202, Rev. 0
21. SV3-1153-SHW-1002827, U3 -CT -Fabricate Scheduled Conduit Supports -EL 153’-RM 11500 -Area 3 -WP -1, Rev. 0
22. SV3-1153-ERW-1018431, U3, CT, Install 1E Cable Tray, EL. 135’-3”, ROOM 11500, Area 3, Rev. 0
23. SV3-1130-EJW-101 9577, U3 - CT - Install and Label Non -1E VLS JBOXES & Supports, EL 107’-2”, RM 11300, Area 3,4, Rev. 0
24. SV4-1242-SHV-1003541, U4 - AUX - Install Cable Tray Supports (Below Raised Floor) (Lines K -I) - EL 117’6 - Room 12401 - Area 2, Rev. 0
25. SV4-1241-EYW-800003, Install Electrical Floor Penetrations in the U4 Aux Area 1 EL 117’-6” RM 12404/405/406, Rev. 0
26. SV4-1222-SHW-800020, U4 Fabricate and Install Cable Tray Supports Aux, Elev. 82’-6”, Area 2, ROOM 12213, Rev. 0
27. SV4-1164-SHW-800007, U4 Fabricate and Install Raceway Supports, Containment, EL. 162’-1”, Area 4, SP -L33, PKG 8, Rev. 0
28. SV3-SJS-EJW-1029875, U3 - AUX - Install- Label (SJS) Junction Boxes and Supports - Room 12412- Elev. 117 ’6” - Area 2, Rev. 0
29. SV3-1212-ERW-800000, Fabricate & Install Non -Safety Field Routed Conduit in Unit 3 Auxiliary Building, Room 12103, Elevation 66’ 6”, Area 2, Rev. 0
30. SV3-1212-ERW-800013, U3 Install Plant Security System Conduits AREA 2 66’-6” AUX Building, Rev. 0
31. SV3-1212-ERW-800019, U3 Install Conduits in AUX BLDG, EL 66’6”, Area 2, ROOM 12103 (Spare Battery Room), Rev. 0
32. SV3-1212-ERW-1089637, U3 - AUX - Install NSR Conduits and Pull Boxes in Spare Battery Room, 12103 - EL 66’6” - AREA 2, Rev. 0
33. SV3-1212-SHW-800017, U3 Fabricate/Install Conduit Supports AUX Building AREA 2 EL 66 6” Room 12103, Rev. 0
34. SV3-IDS-EVW-1047350, U3 AUX Terminate IDS -1 Cables in SV3-IDSS-DB-1B and Associated EQP, Rev. 0

Miscellaneous

1. 10 CFR 50.55(e) notification ND-21-0063, “Electrical Construction and Measuring & Test Equipment Control” dated June 25, 2021
2. Electrical Training Module 1, “Work Package & Introduction to IEEE-384 and Raceways,” Version 001
3. Electrical Work Package Assessment Report – June 2021
4. SV3-EY20-VOM-850000-R0, “Nuke Tape Application,” Revision 2

5. General Cable data sheet for S-6Y4CS-14
6. ITAAC Closure Notification on Completion of ITAAC 2.6.03.04b (Index Number 602), Dated: 01/30/2021
7. ITAAC Closure Notification on Completion of ITAAC 3.3.00.07e. [Index Number 812), Dated: 12/14/2020
8. ESR50049190, Changing fuse type from AJTs to ATMRs and associated fuse holders for 6 IDS EA panels (Total 30 fuses); Dated: 08/20/2020
9. DCP_DCP_010502, "Unistrut Conduit Strap Edge Distance Evaluation for ESR 50072877," March 12, 2021

Calculations

1. APP-GW-EWC-004, "Maximum Design for Raceway Weights and Cable Fuel Loading for W, X(A), X(B), Y, and Z Cable Trays and Conduits," Revision 1
2. APP-SH25-S3C-001, "AP1000 Seismic Category I Standard Cable Tray Supports," Revision 1

LIST OF ACRONYMS


| | |
|-------|---|
| AV | Apparent Violation |
| CAP | Corrective Action Program |
| CAPR | Corrective Action to Prevent Recurrence |
| CAQ | Conditions Adverse to Quality |
| CAR | Corrective Action Record |
| CDR | Construction Deficiency Report |
| CFR | Code of Federal Regulations |
| CE | Construction Experience |
| COL | Combined License |
| CR | Condition Report |
| E&DCR | Engineering & Design Coordination Report |
| EOC | Extent of Condition |
| EOCa | Extent of Cause |
| FE | Field Engineer |
| ICN | ITAAC Closure Notice |
| IDS | Class 1E Direct Current and Uninterruptible Power Supply System |
| IEEE | Institute of Electrical and Electronic Engineers |
| IMC | Inspection Manual Chapter |
| IP | Inspection Procedure |
| IR | Inspection Report |
| ITAAC | Inspections, Tests, Analysis, and Inspection Criteria |
| M&TE | Measuring and Test Equipment Control |
| NCV | Non-Cited Violation |
| ND | Nuclear Development |
| NRC | Nuclear Regulatory Commission |
| NSR | Nonsafety-Related |
| OE | Operating Experience |
| PMS | Protection and Safety Monitoring System |
| RCD | Root Cause Determination |
| RCP | Reactor Coolant Pump |
| RCS | Reactor Coolant System |
| RTS | Reactor Trip System |
| QA | Quality Assurance |
| QC | Quality Control |
| SCAQ | Significant Condition Adverse to Quality |
| SDP | Significance Determination Process |
| SI | Special Inspection |
| SNC | Southern Nuclear Operating Company |
| SR | Safety-Related |
| SSC | Structure, System, and Component |
| UFSAR | Updated Final Safety Analysis Report |
| URI | Unresolved Item |
| VEGP | Vogtle Electric Generating Plant |
| WEC | Westinghouse Electric Company |
| WP | Work Package |



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303-1200

June 1, 2021

MEMORANDUM TO: George Khouri, Construction Project Manager
Construction Inspection Branch 1
Division of Construction

FROM: Laura A. Dudes  Signed by Dudes, Laura
Regional Administrator on 06/01/21

SUBJECT: SPECIAL INSPECTION CHARTER TO EVALUATE THE
ELECTRICAL CABLE SEPARATION AND
STRUCTURAL NONCONFORMANCES AT VOGTLE
UNITS 3 AND 4

You have been selected to lead a Special Inspection (SI) to assess the circumstances surrounding the electrical cable separation nonconformances related to Institute of Electrical and Electronics Engineers (IEEE) Standard 384-1981 and the extent of condition (EOC) of structural/seismic issues which was first identified by the licensee in December 2020. The in-office inspection will start on June 21, 2021, followed by the onsite inspection occurring the week of June 28th. Marcus Riley (technical electrical team lead), Guillermo Crespo, and Tony Ponko from Region II, and Tom Fredette and Al Issa from the Office of Nuclear Reactor Regulation (NRR) will assist you in this inspection. Additionally, the SI will use existing and/or completed inspection information related to ongoing inspections, tests, analysis, and acceptance criteria (ITAAC), quality assurance (QA), and corrective action program (CAP) inspections, when applicable, to complete the SI charter items. As a result, additional regional and resident inspectors will be assisting the SI.

A. Basis

In December 2020, Southern Nuclear Company (SNC) identified a trend in nonconformances for electrical raceway system construction activities. The licensee performed an EOC review which identified approximately 600 nonconformances within 64 rooms related to IEEE 384 requirements for cable separation and additional nonconformances for seismic category I and II requirements. The IEEE 384 nonconformances include: lack of separation between safety-related divisions, lack of separation between safety and non-safety related cables, and cables failing to fit inside their cable trays, thereby preventing them from being enclosed. The licensee also performed an EOC for seismic category I and II requirements and identified nonconformances including: bolts not being fully seated, failure to calculate the weight of cables exiting cable trays, and improperly installed spring nuts. If left uncorrected, these nonconformances could potentially affect 24 cable separation ITAACs and 10 CFR Part 50, Appendix B requirements for raceway construction activities.

CONTACT: Nicole Covert, RII/DCO
404-997-4510

In accordance with Inspection Manual Chapter (IMC) 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs," Appendix C, "Response to Significant Issues or Events," deterministic criteria were used to evaluate the level of NRC response to this construction event. Region II management determined that the circumstances surrounding the cable separation nonconformances met the criteria for: (1) a stop work order being issued by the licensee on March 18, 2021, for which the underlying issues are not fully understood, and (2) a significant event that warrants additional inspection or oversight. Specifically, the circumstances which resulted in the electrical cable separation nonconformances revealed several concerns regarding construction practices which warrant additional inspection. The aggregate of the issues was also compared with the deterministic criteria in Management Directive (MD) 8.3, "NRC Incident Investigation Program," and determined to represent a "major deficiency in design, construction, or operation having a potential generic safety implication."

In consultation with NRR, Region II determined that the appropriate level of NRC response is a SI.

This SI is chartered to identify the circumstances surrounding the aggregate of the issues associated with IEEE 384 cable separation nonconformances and other structural/seismic issues related to safety related raceway construction activities; review the licensee's actions following discovery of the condition; review the root cause, and review the licensee's determination of reportability requirements. Additionally, although the actual nonconformances were identified in Unit 3, as part of the inspection scope, for people, process(es), procedure(s) that would be common to both Unit 3 and 4 safety related electrical raceway construction activities, it will be necessary to understand the generic implications that could affect Unit 4 construction.

B. Scope

The inspection is expected to perform data gathering and fact-finding in order to address the following:

1. Develop a detailed sequence of events from the time of discovery of the IEEE 384 nonconformances until the licensee completed assessing extent of condition and the extent of the cause.
2. Review and evaluate the licensee's quality assurance process for the installation of electrical cables and raceways that led to work activities not being signed off as they were completed, work packages not including documented examples of in-process monitoring, conditions adverse to quality not being identified early in the corrective action program, and 26 examples where quality control (QC) had reviewed and accepted the nonconformances. Results will inform future QA and CAP inspections, as applicable.
3. Review and evaluate the licensee's corrective actions in accordance with the licensee's CAP procedures, including assessment of 10 CFR Part 50 Appendix B process resolution, as-built repairs to IEEE 384 nonconformances, and the extent of condition structural/seismic issues.

4. Review and evaluate the design changes that were implemented to restore compliance to IEEE 384 in order to verify compliance with the design change process in 10 CFR Part 52 Appendix D.
5. Review and evaluate the licensee's root cause analysis, EOC (to the degree it is complete, recognizing that related EOC activities may be in progress), and extent of cause associated with the IEEE 384 nonconformances and structural/seismic issues, including if the root cause analysis meets the definition of significant condition adverse to quality. Results will inform future QA and CAP inspections, as applicable.
6. Review and evaluate if there was a significant breakdown in any portion of the quality assurance program conducted under the requirements of 10 CFR Part 50 Appendix B which could have produced a defect in a basic component as discussed in 10 CFR Part 50.55, "Conditions of construction permits, early site permits, combined licenses, and manufacturing licenses." Based on this review, verify the licensee's reportability determination was in accordance with the notification criteria in 10 CFR 50.55(e).

C. Guidance

Inspection Procedure (IP) 93812, "Special Inspection," provides additional guidance to be used during the conduct of the SI. Your duties will be as described in IP 93812. The inspection should emphasize fact-finding in its review of the circumstances surrounding the event. Construction inspection procedures for ITAAC, QA, and CAP related inspection activities provides specific guidance when conducting scope activities. Safety or security concerns identified that are not directly related to the event should be reported to the Region II office for appropriate action.

You will conduct a remote entrance meeting no later than June 21, 2021, followed by a one week in-office inspection. You will report to the site and begin the inspection no later than June 28, 2021. It is anticipated that the on-site portion of the inspection will be completed during this week. Additionally, the SI will use existing and/or completed inspection information related to ongoing ITAAC, QA, and CAP inspections, when applicable, to complete the SI charter items.

A daily status briefing of Region II management will be provided beginning the second day on-site at approximately 4:00 PM. In accordance with IP 93812, you should promptly recommend a change in inspection scope or escalation if information indicates that the deterministic criteria and assumptions used in the IMC 2504 Appendix C and MD 8.3 analysis were not accurate. A report documenting the results of the inspection should be issued within 45 days of the completion of the inspection. The report should be documented in accordance with section 3.02 of IP 93812, IMC 2504, "Construction Inspection Program: Inspections of Construction and Operational Programs," and IMC 0613, "Power Reactor Construction Inspection Reports."

At the completion of the inspection, you should provide recommendations for improving the Construction Reactor Oversight Process inspection procedures and the Special Inspection process based on any lessons learned.

This Charter may be modified should you develop significant new information that warrants review. Should you have any questions concerning this charter, contact Nicole Coovert at 404-997-4510.

Docket Numbers: 5200025, 5200026

License Numbers: NPF-91, NPF-92

Attachment A – Timeline

| Date | Events |
|--------------------------|---|
| May 2019 | Cable raceways were in early stages of installation |
| November - December 2019 | Licensee failed to identify separation nonconformances between different divisions of safety-related (SR) cables and between SR and nonsafety-related (NSR) cables during inspection of various cable raceway installations. |
| July 28, 2020 | Condition Report (CR) 50057411 was generated identifying improperly installed spring nuts in the Unit 3 auxiliary building battery racks |
| August – December 2020 | Licensee, including Quality Control (QC) personnel, missed opportunities to identify separation nonconformances between different divisions of SR cables and between SR and NSR cables during inspection of various cable raceway installations. |
| September 29, 2020 | CR 50064326 was generated to capture and assess the aggregate impact and significance of the structural issues affecting the Unit 3 Class 1E Direct Current and Uninterruptible Power Supply System (IDS) battery rack installations. These issues included torque seals being broken, loose threaded connections, and cross braces not being installed per manufacturer specifications. Condition Action Record (CAR) 80003772 was initiated to perform a root cause determination (RCD) to determine the cause of these issues. |
| December 11, 2020 | CAR 80003772 was completed and determined the root cause of the U3 battery rack installation issues was that the work planning phase was insufficient to construct and inspect the Unit 3 IDS battery racks in accordance with the vendor design criteria. |
| December 22, 2020 | CR 50072803, “Electrical Installation Quality Adverse Trend,” was generated which identified 57 CRs that had been generated in November and December 2020 pertaining to both SR and NSR cables not meeting cable separation provisions. As a result, a common cause analysis was initiated to investigate the nonconformances. |
| January 25, 2021 | Additional issues related to electrical installations were captured in CR 50075757, which resulted in the licensee initiating a RCD in CAR 80004436. The common cause analysis initiated from CR 50072803 for the cable separation nonconformances were stopped and encompassed in this root cause determination. The scope of the RCD focused on separation in accordance with IEEE 384, cable tray fill provisions, cable tray load limits, missing/damaged cable tray barriers, and free air drop distance. The scope also included splice plate, conduit, and Unistrut installation issues. |

| | |
|----------------|---|
| March 12, 2021 | CR 50082591 was generated identifying that NSR commodity installation practices were impacting SR structures, systems, and components. This included NSR field-run components interfering with design routed American Society of Mechanical Engineers tubing installations, NSR component separation not being maintained from SR components, and work performed under NSR work packages affecting SR structures. CAR 80004896 was generated to initiate another root cause determination to determine the cause of these issues. This RCD was reviewed as part of the SI and extent of cause evaluation. |
| April 28, 2021 | RCD in CAR 80004436 was completed and determined that inadequate enforcement of construction standards and behaviors related to electrical installations was the root cause for the cable separation nonconformances. |
| May 28, 2021 | RCD determination for CAR 80004896 was completed and determined the root cause of the issues was that construction leadership failed to provide adequate controls and oversight. |
| July 6, 2021 | CR 50099082 was generated documenting the need to expand the extent of condition on cable separation to include SR and NSR panels/cabinets |