



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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March 12, 2019

MEMORANDUM TO: Jennifer L. Dixon-Herrity, Chief  
Licensing Branch 2  
Division of Licensing, Siting,  
and Environmental Analysis  
Office of New Reactors

FROM: William (Billy) Gleaves, Senior Project Manager */RA/*  
Licensing Branch 2  
Division of Licensing, Siting,  
and Environmental Analysis  
Office of New Reactors

SUBJECT: US NRC AUDIT REPORT RELATED TO LICENSE AMENDMENT  
REQUEST (LAR) 18-021 – POWER OPERATED RELIEF VALVE  
NOISE MITIGATION

The U.S. Nuclear Regulatory Commission staff conducted an audit of documents related to the Vogtle Electric Generating Plant Units 3 and 4 proposed license amendment request (LAR) 18-021, "Power Operated Relief Valve (PORV) Noise Mitigation." The audit was conducted at various dates and times, as planned, between November 8, 2018, and January 31, 2019, at the virtual Southern Nuclear/Westinghouse Electric Company's Electronic Reading Room. A summary report of the audit is enclosed.

Docket Nos: 52-025 and 52-026

Enclosure:  
As stated above

cc:  
T. Scarbrough, NRO  
Y. Li, NRO  
Y. Wong, NRO  
A. Tsirigotis, NRO

CONTACT: Billy Gleaves, NRO/DLSE/LB2  
301-415-5848

SUBJECT: US NRC AUDIT REPORT RELATED TO LICENSE AMENDMENT REQUEST  
(LAR) 18-021 – POWER OPERATED RELIEF VALVE NOISE MITIGATION  
DATED MARCH 12, 2019

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NAME	WGleaves	RButler	TLupold*	JDixon-Herrity	WGleaves (s)
DATE	3/11/19	3/7/19	3/7/19	3/11/19	3/12/19

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**U.S. NUCLEAR REGULATORY COMMISSION  
SUMMARY REPORT OF REGULATORY AUDIT OF  
VOGTLE UNITS 3 AND 4, LICENSE AMENDMENT REQUEST LAR-18-021  
POWER OPERATED RELIEF VALVE NOISE MITIGATION**

**Docket Nos. 52-025 and 52-026**

**I. INTRODUCTION AND BACKGROUND**

By letter dated August 10, 2018 (Reference 1), Southern Nuclear Operating Company (SNC) submitted License Amendment Request LAR-18-021, "Power Operated Relief Valve (PORV) Noise Mitigation," including a regulatory exemption request, for the combined licenses (COLs) for the Vogtle Electric Generating Plant (VEGP) Units 3 and 4 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18222A599). By letter dated October 11, 2018 (Reference 2), SNC submitted Revision 1 to LAR-18-021 (ADAMS Accession No. ML18284A447).

In LAR-18-021, SNC describes a proposed change to revise the VEGP Units 3 and 4 COLs by relocating the PORV branch lines upstream of the main steam safety valves (MSSVs) in Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Figure 2.2.4-1 of COL Appendix C. Additionally, SNC proposes changing the PORV block valves from gate valves to globe valves in the Updated Final Safety Analysis Report (UFSAR) and increasing the line and valve size to 12 inches from 6 inches. SNC also proposes changes to plant-specific Design Control Document (DCD) Tier 2 information in the UFSAR that involve changes to COL Appendix C, and corresponding changes to plant-specific Tier 1 information. SNC requests the exemption necessary to implement the involved changes to the plant-specific Tier 1 information.

To facilitate the evaluation of LAR-18-021, the NRC staff conducted an audit of the SNC documentation supporting LAR-18-021 from November 5, 2018 to January 31, 2019, including:

- Review of applicable documents provided by SNC in its electronic reading room (eRR) in support of the proposed changes described in LAR-18-021. The NRC staff conducted telephone conferences with SNC to discuss the specific documents.
- Determination of the need for any requests for additional information (RAIs) to modify or clarify the information provided in LAR-18-021.

**II. PURPOSE AND REGULATORY AUDIT BASES**

The purpose of this audit was for the NRC staff to examine and evaluate non-docketed SNC information as follows:

- Verify that the decoupling of the proposed revised PORV branch line from the main steam header meets UFSAR design-basis decoupling criteria.
- Verify the design satisfies the UFSAR and applicable American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code), Section III, design stress criteria.

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- Verify the calculated stresses meet the criteria for break exclusion.
- Understand SNC's intent when stating that no changes are made to the valve motor operator.
- Verify that no new acoustic vibration phenomena are introduced by increasing the size of the line or through use of a globe valve in the PORV branch line.
- Confirm the design specifications for the PORV block valve qualification invoke ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," (Reference 3) as accepted in NRC Regulatory Guide (RG) 1.100, Revision 3, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants" (Reference 4).

The NRC regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix D, Section VIII.A.4, state that exemptions from Tier 1 information are governed by the requirements in 10 CFR 52.63(b)(1) and 52.98(f). In particular, 10 CFR 52.63(b)(1) allows a licensee who references a design certification rule to request an exemption from Tier 1 information. Further, 10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a COL. The SNC requests in LAR-18-021 involve changes to COL Appendix C, with corresponding changes to Tier 1 information in the plant-specific DCD for VEGP Units 3 and 4. Therefore, NRC approval is required prior to making the proposed plant-specific changes in LAR-18-021.

The NRC regulations in 10 CFR Part 52, Appendix D, Section VIII.B.5.a, allow a licensee who references Appendix D to depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to or departure from Tier 1 information, Tier 2\* information, or the Technical Specifications, or requires a license amendment under paragraphs B.5.b or B.5.c of Section VIII. The proposed changes in LAR-18-021 to UFSAR Figure 10.3.2-1 and Table 6.2.3-1 involve changes to Tier 1 information. Therefore, LAR-18-021 includes an exemption request.

The NRC regulations in 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1, "Quality standards and records," require that structures, systems, and components (SSCs) important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. A quality assurance program shall be established and implemented in order to provide adequate assurance that these SSCs will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of SSCs important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit. Therefore, SNC needs to demonstrate that the requirements and limits in the ASME BPV Code, Section III, as incorporated by 10 CFR 50.55a, have been satisfied by the proposed changes in LAR-18-021.

The NRC regulations in 10 CFR Part 50, Appendix A, GDC 4, "Environmental and dynamic effects design bases," require that SSCs important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These SSCs shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from

events and conditions outside the nuclear power unit. However, dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping. Therefore, SNC needs to demonstrate that the UFSAR break exclusion pipe stress criteria have been satisfied.

The NRC staff conducted this audit in accordance with the guidance provided in the NRC Office of New Reactors (NRO) Office Instruction NRO-REG-108, "Regulatory Audits" (Reference 5).

### **III. NRC AUDIT TEAM**

Thomas G. Scarbrough, Senior Mechanical Engineer, NRC  
Yueh-Li Li, Senior Mechanical Engineer, NRC  
Yuken Wong, Senior Mechanical Engineer, NRC  
Alexander Tsirigotis, Mechanical Engineer, NRC  
Billy Gleaves, Senior Project Manager, NRC

### **IV. AUDIT PREPARATION**

The NRC staff prepared an audit plan (Reference 6) that identified the information needed for this audit. The audit plan requested that specific documentation to address NRC staff questions on LAR-18-021 be provided for review. SNC made available specific documents in its eRR and arranged telephone conferences to discuss those documents.

### **V. AUDIT SCOPE**

The primary scope of this audit was the review of the SNC documentation to resolve the NRC staff questions on the design modification proposed in LAR-18-021.

### **VI. AUDIT PERFORMANCE**

The NRC staff conducted an entrance meeting by telephone conference on November 5, 2018, to discuss the performance of its audit of the SNC documentation supporting LAR-18-021. The staff conducted an exit meeting by telephone conference on January 31, 2019, to discuss the results of the audit. The topics addressed during the audit and the results of the NRC staff review are as follows:

#### **A. Stress Analysis of PORV Modification**

ASME BPV Code, Section III, incorporated by reference in 10 CFR 50.55a, requires that piping analysis consider combinations of various loadings, including deadweight, pressure, seismic, thermal expansion and transient loads. In LAR-18-021, SNC proposes changes to the main steam (MS) branch line containing the PORV, including relocating where the PORV branch line connects to the MS line, increasing the size of the PORV branch line, reducing the PORV branch line length, and changing the PORV block valve size and type. To evaluate whether the structural integrity of the applicable SSCs will be maintained within acceptable design-basis limits as a result of the proposed changes in LAR-18-021, the NRC staff reviewed the following information:

1. The MS PORV branch line had been decoupled from the MS line for the purpose of pipe stress analysis and is also decoupled from the MS line in the revised pipe stress analysis, which accounts for the LAR-18-021 proposed changes. The PORV branch line connection to the MS header is proposed to be changed from 6-inches to 12-inches nominal pipe size. The NRC staff reviewed applicable piping data and observed it meets the UFSAR decoupling criteria.
2. The NRC staff reviewed the effects of the proposed changes in LAR-18-021 on the structural integrity of the MS line and PORV line. The NRC staff observed the MS line and the PORV branch line pipe stresses remained within UFSAR and applicable ASME BPV Code, Section III, design limits.
3. The NRC staff reviewed the Westinghouse Electric Company's (Westinghouse) documentation listed in Section IX, "DOCUMENTS REVIEWED," of this audit report to determine whether the proposed design changes would impact the conclusions of SNC's pipe rupture hazard analysis (PRHA). The NRC staff observed that the revised PRHA for the affected piping has been performed in accordance with the reviewed and approved criteria described in UFSAR Subsection 3.6.2.1.1, "High-Energy Break Locations," and Subsection 3.6.2.1.1.2, "ASME Code, Section III – Class 2 and Class 3 Piping Systems," for break exclusion piping and for postulating pipe break for ASME Class 2 and 3 piping systems. In addition, the revised calculations show that the subject piping meets the applicable UFSAR break exclusion criteria and the proposed changes do not result in any new postulated break locations. Therefore, the applicant concluded that there is no impact to the conclusions of the PRHA resulting from the proposed design changes included in this LAR.

#### B. Vibration and Valve Performance for PORV Modification

During the audit, the NRC staff reviewed the SNC documentation in support of LAR-18-021 with respect to potential vibration effects from the proposed PORV modification, and the performance of the valves to be installed as part of the proposed modification. Specific aspects of the audit review are described below:

1. The NRC staff reviewed Westinghouse Datasheet APP-PV01-Z0D-208 to determine whether the proposed plant modification will be evaluated to provide assurance that the allowable vibration levels from the PORV block valve and branch line will not be exceeded. The staff found that APP-PV01-Z0D-208 specifies the performance requirements for the new PORV block valves to be installed in the plant modification. The staff discussed the provisions in APP-PV01-Z0D-208 for flow-induced vibration effects with SNC and Westinghouse personnel during a telephone conference on November 14, 2018. Based on its review, the staff determined that APP-PV01-Z0D-208 includes provisions for the valve supplier to provide documentation to support that adverse flow-induced vibration effects and excessive noise will not result during operation of the PORV block valve. During the telephone conference on November 14, 2018, SNC confirmed that piping system vibration will be monitored for the MS system and its PORV branch lines during plant startup in accordance with UFSAR Section 14.2.9.1.7, "Expansion, Vibration and Dynamic Effects Testing." The piping vibration test will verify that vibrations caused by steady-state or dynamic effects do not result in excessive stress or fatigue on safety-related plant systems and

equipment. The NRC staff has determined that this information resolves the questions on potential adverse flow effects for the proposed plant modification.

2. The NRC staff reviewed the SNC plans to satisfy the provisions in ASME Standard QME-1-2007 for the dynamic, environmental, and functional qualification of the new PORV block valves consistent with the VEGP Units 3 and 4 UFSAR. The staff reviewed Westinghouse Qualification Document APP-GW-VP-010 for the equipment qualification methodology and documentation requirements for the new PORV block valves to be installed in the proposed plant modification. The staff found that APP-GW-VP-010 requires that safety-related valves are to be qualified in accordance with ASME Standard QME-1-2007. As noted in NUREG-2124 (Reference 7), "Final Safety Evaluation Report Related to the Combined Licenses for Vogtle Electric Generating Plant, Units 3 and 4," Section 3.9.6.4, "Technical Evaluation," the NRC accepts the use of ASME Standard QME-1-2007 for the functional qualification of valves in RG 1.100 (Revision 3). The NRC staff has determined that this information resolves the questions on the qualification of the PORV block valves for the proposed plant modification.
3. The NRC staff reviewed APP-PV01-Z0D-208 specifying the minimum and maximum stroke-time requirements for the PORV block valves. In LAR-18-021, SNC states that there will be "no change to the valve motor operator" and "no change to the valve stroke time" with the planned replacement of the original 6-inch gate valve with a new 12-inch globe valve for the PORV block valve application. On November 14, 2018, the staff discussed the minimum and maximum stroke-time provisions for the new 12-inch globe valves during a telephone conference with SNC personnel. During the telephone conference, SNC clarified that the intent of its statement in LAR-18-021 was that the range of the allowable stroke time for the PORV block valves will not be changed by the proposed PORV modification. The NRC staff has determined that this information resolves the questions on the stroke time of the PORV block valves for the proposed plant modification.

## **VII. CONCLUSIONS**

Based on its review of the SNC documentation, the NRC staff concludes that all staff questions have been resolved for VEGP Units 3 and 4 LAR-18-021. The staff has determined that no RAIs are necessary to complete its safety evaluation. Therefore, no open items remain regarding the NRC staff review of LAR-18-021.

## **VIII. SNC AND ASSOCIATED PERSONNEL INTERVIEWED**

### SNC

Mark Wilson  
Adam Quarles  
Amy Aughtman

### Westinghouse

Paul Wick  
Brad Koogle  
John Durfee  
Ed Drake  
Medhur Paharia

## **IX. DOCUMENTS REVIEWED**

Westinghouse Datasheet APP-PV01-Z0D-208 (Revision 0), "PV01 Datasheet 2008," dated February 23, 2018.

Westinghouse Design Specification APP-PV01-Z0-001 (Revision 9), "3" and Larger Motor Operated Gate and Globe Valves, ASME Boiler and Pressure Vessel Code Section III, Class 1, 2, and 3," dated May 10, 2016.

Westinghouse Qualification Requirement APP-GW-VP-010 (Revision 3), "Equipment Qualification Methodology and Documentation Requirements for AP1000 Safety-Related Valves and Valve Appurtenances," dated August 25, 2016.

APP-SGS-PLR-050 (Revision 3), "Piping Stress Analysis Report for Main Steam PORV Discharge Line A to Silencer SGS-MY-Y01A/N01," dated June 8, 2018.

APP-SGS-PLR-060 (Revision 3), "Piping Stress Analysis Report for Main Steam PORV Discharge Line B to Silencer SGS-MY-Y01B/N01," dated June 8, 2018.

APP-SGS-PLR-030 (Revision 4), "Piping Stress Analysis Report for Main Steam Line A from Steam Generator (RCS-MB-01) to Wall 11," dated August 26, 2016

APP-PL02-Z0-102 (Revision 4), "AP1000 Class 2, 3, Piping and B31.1 Extensions Design Specification," dated August 23, 2016.

APP-GW-N1-001 (Revision 5), "Pipe Rupture Protection Design Criteria for AP1000," dated April 21, 2015.

APP-MB01-Z0C-126 (Revision 0), "Identification and Evaluation of Branch and Standpipe Frequencies for the AP1000 Steam Lines," no date specified.

APP-SGS-PLW-050 (Revision 5), "Steam Generator System Auxiliary Building Rooms 12406/12691 Main Steam PORV Disch. Ln A to Silencer," dated April 26, 2018.

APP-SGS-PLW-131 (Revision 5), "Steam Generator System Auxiliary Building Rooms 12406/12506 Main Steam PORV Disch. Ln A to Silencer," dated April 20, 2018.

APP-SGS-PLW-141 (Revision 4), "Steam Generator System Auxiliary Building Rooms 12404/12504 Main Steam PORV Disch. Ln B to Silencer," dated April 20, 2018.

APP-SGS-PLW-031 (Revision 6), "Steam Generator System Auxiliary Building Room 12406 Main Steam Line A," dated April 26, 2018.

APP-SGS-PLW-030 (Revision 4), "Steam Generator System Containment Building Room 11500 Main Steam Line A," dated June 3, 2014.

E&DCR No: APP-SGS-GEF-514 (Revision 0), "SGS-050 and SGS-060 Decoupling Mass and Stiffness," dated December 20, 2018.



**X. REFERENCES**

1. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment and Exemption LAR-18-021, "Power Operated Relief Valve (PORV) Noise Mitigation," dated August 10, 2018 (ADAMS Accession No. ML18222A599).
2. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment and Exemption LAR-18-021, Revision 1, "Power Operated Relief Valve (PORV) Noise Mitigation," dated October 11, 2018 (ADAMS Accession No. ML18284A447).
3. ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants."
4. NRC Regulatory Guide 1.100, Revision 3, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," dated September 2009 (ADAMS Accession No. ML091320468).
5. NRO-REG-108, "Regulatory Audits," dated April 2, 2009 (ADAMS Accession No. ML081910260).
6. NRC Plan for Regulatory Audit of Vogtle Units 3 and 4 License Amendment Request LAR-18-021, Power Operated Relief Valve Noise Mitigation, dated November 9, 2018 (ADAMS Accession No. ML18313A005).
7. NRC NUREG-2124, "Final Safety Evaluation Report related to the Combined Licenses for Vogtle Electric Generating Plant, Units 3 and 4," dated September 2012 (ADAMS Accession No. ML12271A045).