

Charles R. Pierce
Regulatory Affairs Director

Southern Nuclear
Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Tel 205.992.7872
Fax 205.992.7601



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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555-0001

Vogtle Electric Generating Plant
Proposed Path to Closure of Generic Safety Issue-191,
"Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance"

- References:
- (1) Generic Letter (GL) 2004-02: Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors.
 - (2) December 23, 2010, Staff Requirements – SECY-10-0113 – Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance.
 - (3) October 12, 2011, Pressurized Water Reactor Owners Group (PWROG), Topical Report (TR) WCAP-16793-NP, Revision 2, "Evaluation of Long-Term Core Cooling Considering Particulate Fibrous and Chemical Debris in the Recirculating Fluid".
 - (4) May 4, 2012, Nuclear Energy Institute (NEI) to the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation, Director, Division of Safety Systems – Subject: GSI-191 - Current Status and Recommended Actions for Closure.
 - (5) July 9, 2012, SECY-12-0093 – Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance.
 - (6) November 15, 2012, Nuclear Energy Institute (NEI) to the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation, Director, Division of Safety Systems – Subject: GSI-191 – Revised Schedule for Licensee Submittal of Resolution Path.
 - (7) November 21, 2012, Nuclear Regulatory Commission Review of Generic Safety Issue-191 Nuclear Energy Institute revised Schedule for Licensee Submittal of Resolution Path.
 - (8) December 14, 2012, Staff Requirements – SECY-12-0093 – Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance.
 - (9) April 8, 2013, Final Safety Evaluation for Pressurized Water reactor Owners Group Topical Report WCAP-16793-NP, Revision 2, "Evaluation of Long-Term Cooling Considering Particulate Fibrous and Chemical Debris in the Recirculating Fluid."

Ladies and Gentlemen:

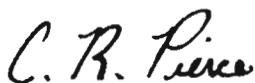
In Reference (4) NEI highlighted the current industry status and recommended actions for closure of Generic Safety Issue (GSI)-191 based on licensees providing a docketed submittal to the NRC by December 31, 2012, outlining a GSI-191 resolution path and schedule pursuant to the Commission direction in Reference (2). By Reference (6), NEI recommended to NRC that licensees delay submittal of GSI-191 resolution path and schedule until January 31, 2013, or 30 days following placement of both the Commission's response to Reference (5) and the NRC staff safety evaluation (SE) on Reference (3) into the public record. In Reference (8), the Commission approved the staff's recommendation in Reference (5) to allow licensees the flexibility to choose any of the three options discussed in the paper to resolve GSI-191. Further the Commission encouraged the staff to remain open to staggering licensee submittals and the associated NRC reviews to accommodate the availability of staff and licensee resources. The SE Reference (9) for Reference (3) was made publicly available by NRC on April 16, 2013.

An industry template was developed by NEI for the identification of a resolution path and schedule, and to describe defense-in-depth and mitigation measures to support the proposed resolution schedule. The NEI template was used for the development of Enclosure 1 for Vogtle Electric Generating Plant (VEGP) Units 1 and 2, and provides a resolution path forward and schedule for resolution, summary of actions completed for GL 2004-02, and defense-in-depth and mitigation measures which will be established and maintained throughout the resolution period.

The NRC commitments contained in this letter are provided as a table in Enclosure 2. If you have any questions, please contact Ken McElroy at (205) 992-7369.

Mr. C. R. Pierce states he is Regulatory Affairs Director of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and, to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

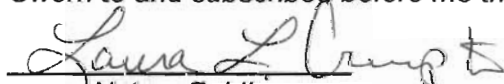


C. R. Pierce
Regulatory Affairs Director

CRP/RMJ



Sworn to and subscribed before me this 16th day of May, 2013.



Notary Public

My commission expires: 11-2-13

Enclosures: 1. Path Forward and Schedule for Resolution of GSI-191
2. List of Regulatory Commitments

cc: Southern Nuclear Operating Company

Mr. S. E. Kuczynski, Chairman, President & CEO

Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer

Mr. T. E. Tynan, Vice President – Vogtle

Mr. B. L. Ivey, Vice President – Regulatory Affairs

Mr. B. J. Adams, Vice President – Fleet Operations

RType: CVC7000

U. S. Nuclear Regulatory Commission

Mr. V. M. McCree, Regional Administrator

Mr. R. E. Martin, NRR Senior Project Manager - Vogtle

Mr. L. M. Cain, Senior Resident Inspector – Vogtle

State of Georgia

Mr. J. H. Turner, Environmental Director Protection Division

**Vogtle Electric Generating Plant
Proposed Path to Closure of Generic Safety Issue -191, "Assessment of
Debris Accumulation on Pressurized-Water Reactor Sump Performance"**

Enclosure 1

Path Forward and Schedule for Resolution of GSI-191

Introduction

Southern Nuclear Operating Company (SNC) selected Option 2, Full Risk-Informed Resolution Path, and intends to perform a risk-informed evaluation of the potential for recirculation sump(s) strainer blockage and in-vessel blockage (South Texas Project (STP) approach) to resolve GSI-191, as identified in SECY-12-0093, for Vogtle Electric Generating Plant (VEGP), Units 1 and 2.

To support use of this path, and continued operation for the period required to complete the necessary analysis and testing, SNC has evaluated the design and procedural capabilities that exist to identify and mitigate sump strainer and in-vessel blockage. A description of these detection and mitigative measures are provided later in this document. Additionally, a summary of the existing margins and conservatisms that exist for VEGP Units 1 and 2 are also included in this document.

Characterization of Current Containment Fiber Status

As documented in Reference 1, the fibrous debris of VEGP, Units 1 and 2 containments is comprised of almost 100% NUKON insulation, approximately 20 ft³ of Interam fire barrier within the zone of influence (ZOI), and 120 lbs of latent debris (2x sampled amount). Strainer head loss and in-vessel issues remain open. The original 2007 fiber bypass testing and analysis resulted in more than 40 lbs of fiber downstream of the strainers which could potentially result in significantly more than 15 grams of fiber per fuel assembly specified in WCAP-16793-NP, revision 2.

Characterization of In-Vessel Effects

SNC intends to establish plant-specific in-vessel debris limits for the type of plant design that exists at VEGP, Units 1 and 2 through extensive modeling involving a risk-informed framework or through the efforts currently being undertaken by the Pressurized Water Reactor Owners Group (PWROG), or through a combination of both.

Licensing Basis Commitments

SNC currently has open Requests for Additional Information (RAIs) from the NRC associated with the closure of GSI-191 and the completion of GL 2004-02 for VEGP Units 1 and 2. The RAIs will remain open until the completion of the programmatic actions described in this document. The programmatic actions are described in the Resolution Schedule below.

Resolution Schedule

SNC will achieve closure of GSI-191 and address GL 2004-02 per the following schedule.

- SNC will meet with the NRC, after submittal of this letter to discuss this proposed resolution path and schedule. SNC is currently in the process of scheduling a meeting with the NRC to discuss this proposed resolution path.
- The risk-informed resolution path activities will be completed to support submittal of a licensing action within 12 months following issuance of the safety evaluation (SE) for STP.
- The key testing and analysis milestones, as currently expected, are provided in the table below.

Enclosure 1 to NL-13-0953
 Path Forward and Schedule for Resolution of GSI-191

MILESTONE	EXPECTED COMPLETION DATE
Develop containment CAD model to include pipe welds	Complete
Conduct meeting with NRC	3 rd Quarter 2013
Modify probabilistic risk assessment (PRA) to include Strainer and Core Blockage events	4 th Quarter 2013
**Perform Chemical Effects testing	1 st Quarter 2014
**Perform thermal and hydraulic modeling of RCS, Core, and Containment conditions	1 st Quarter 2014
**Perform Strainer Head Loss and Bypass testing to establish correlation for range of break sizes	2 nd Quarter 2014
Assemble base inputs for CASA Grande	2 nd Quarter 2014
**Evaluate Boric Acid Precipitation impacts	3 rd Quarter 2015
Finalize inputs to CASA Grande	3 rd Quarter 2015
Complete Sensitivity Analyses in/for CASA Grande	4 th Quarter 2015
Integrate CASA Grande results into PRA to determine Δ CDF and Δ LERF	1 st Quarter 2016
Licensing Submittal for VEGP	To be established through discussions with NRC – tentatively September 2016

** Denotes those milestone activities that will determine the viability of this resolution strategy approach.

- SNC is nearing completion of a RELAP5-3D/MELCOR model similar to the STP model.
- SNC will complete any PRA justified necessary insulation replacements, remediation, or other identified plant or procedure changes in two phases. The first phase involves those plant changes determined to be required by the analyses supporting submittal of the licensing action for NRC review and approval for the risk-informed approach. These plant changes will be completed during the next refueling outage, following issuance of an SE for the risk-informed resolution LAR for VEGP, Units 1 and 2 (anticipated to be the 2017 outages). The second phase are those plant changes determined to be necessary through any re-analysis associated with the NRC review of the licensing action leading up to issuance of a SE for VEGP, Units 1 and 2. These plant changes will be completed by the end of 2020. This schedule provides sufficient time to perform the engineering and planning necessary to implement any changes.
- Within six months of receipt of the VEGP SE, SNC will submit a final updated supplemental response to support closure of GL 2004-02 for VEGP, Units 1 and 2.
- SNC will update the current licensing basis (UFSAR) per 10 CFR 50.71(e) and complete any identified removal or modification of insulation debris sources in containment per plant modification procedures and processes within 18 months following receipt of the NRC SE that approves the risk-informed resolution approach.
- If it is determined during the risk-informed process that this option is not viable, SNC will complete a deterministic resolution path for VEGP Units 1 and 2 by the end of 2020.

Summary of Actions Completed For GL 2004-02

In response to GL 2004-02, SNC has completed the following actions for VEGP, Units 1 and 2:

- SNC has completed detailed laser scans of the VEGP containments, which provides measurements for contingency insulation replacement for VEGP, Units 1 and 2. The laser scans of both units were completed before January 1, 2013.
- SNC has completed a 3D-CAD model of VEGP Unit 1 containment that will be utilized for both containments similar to the STP CAD model, since the Vogtle units are virtually identical.
- Installation of new sump strainers that will increase the available screen area from approximately 54 sq ft to 765 sq ft for each of the residual heat removal (RHR) strainers, an approximate 1400% increase, and from approximately 54 sq ft to 590 sq ft for each of the Containment Spray strainers, an approximate 1075% increase. The holes in the strainer surface were reduced to a nominal 3/32 inch from the 1/8 inch hole in the original strainers. Thus, the potential for debris passing through the strainer and causing plugging of the downstream Emergency Core Cooling System (ECCS) equipment is minimized.
- Installation of new ECCS flow orifices in the Intermediate and High Head ECCS lines allowed for the ECCS throttle valves to be opened greater than the maximum expected strainer bypass debris size while maintaining the capability to ensure ECCS flow balance, mitigating downstream effects.
- Completed inspection of containment per NEI 02-01, "Condition Assessment Guidelines: Debris Sources Inside PWR Containment"
- Performed latent debris sampling and characterization, including other debris sources, e.g., labels, etc.
- Developed a detailed debris generation and debris transport analyses, including a CFD model.
- Developed a hydraulic model of the ECCS System.
- Detailed core spray (CS) and RHR net positive suction head (NPSH) analysis performed.
- Preliminary head loss testing (without chemical effects) performed for VEGP yielded that removal of Min-K insulation resulted in a significant reduction in head loss across a loaded strainer. Based on this testing, Min-K insulation that was in the original ZOI analyzed for GL 2004-02 was removed from VEGP's containments.
- Downstream wear and blockage analysis to June 2005 revision of WCAP-16406-P.
- Participation in the PWR Owners Group program to evaluate downstream effects related to in-vessel long-term cooling. The results of the PWROG program are documented in WCAP-16793-NP.
- Detailed structural analysis of new strainers.
- Programmatic and procedural changes established to maintain acceptable configuration and protect the newly established design and licensing basis.

Summary of Margins and Conservatisms for Completed Actions for GL 2004-02

The following provides a summary description of the margins and conservatisms associated with the resolution actions taken to date. These margins and conservatisms provide support for the extension of time required to address GL 2004-02 for VEGP, Units 1 and 2.

- No credit for leak-before-break was taken in the VEGP sump analysis scenario.

- A single pump failure is assumed for CS and RHR such that all debris is assumed to accumulate on a single train of screens. If both trains of RHR and CS are in service the debris load to an individual screen will decrease by 50%. Testing indicates that a 50% reduction in the debris load will decrease the head loss by about 75%.
- All insulation debris, coatings and foreign material generated is conservatively placed on the floor immediately.
- Conservatively, no inactive pools are credited at VEGP. All debris on the floor prior to pool fill-up remains on the floor in the active pool after pool fill-up.
- All unqualified coatings are assumed to fail as particulate and transport to the strainers. In reality, all the unqualified coatings would not fail. In addition, some of the unqualified coatings which fail would be chips instead of particulate and thus would not transport to the strainers. The unqualified coating debris volume is based on 15,000 square feet of unqualified coating area. This value includes sufficient margin to allow future increase in unqualified coating area at both units without necessitating reanalysis of sump strainer design margin.
- To prevent the potential for plugging and creating a hold-up volume, the refueling cavity drain covers are removed during modes requiring ECCS operability. This assures that water which is routed into the refueling cavity will drain into the ECCS sump, thus increasing sump level.
- VEGP does not credit containment pressure above pre-accident pressure for Net Positive Suction Head available (NPSHa) calculations.
- Screen head loss testing was performed under highly stirred conditions, which to the extent practicable, prevented settling of debris in the vicinity of the strainers.
- Non-qualified containment labels are assumed to detach and transport to the containment sump. In reality, many of these labels are tightly adhered or are protected from direct containment spray. Even in the event of detachment, many of these labels would not be transported to the sump strainers due to torturous paths between the label and the strainers. In addition, the amount of labels assumed in the strainer head loss tests was increased by a factor of two above the inventoried values. This additional area is intended to address any incidental debris that may be located in the containment.
- The containment sump level calculations were performed using maximum reduction in refueling water storage tank (RWST) mass due to instrument uncertainty. In addition, the switchover is assumed to occur instantaneously at the RWST alarm setpoints which has the effect of reducing calculated sump level. In reality, there is some time required for the operator to manually perform the switchover from injection to recirculation mode.
- The latent debris value assumed for screen hydraulic head loss testing corresponds to approximately a 100% higher value than was measured.

Summary of Defense-In-Depth (DID) Measures

The following describes the plant specific design features and procedural capabilities that exist for detecting and mitigating a strainer blockage or fuel blockage condition.

- Bulletin 2003-01 training and procedural guidance to expedite plant cooldown in response to a small break LOCA are incorporated into plant emergency response procedures.
- Procedures E-1, *Loss of Reactor or Secondary Coolant*, ES-1.3, *Transfer to Cold Leg Recirculation*, and ECA-1.1, *Loss of Emergency Cooling Recirculation* all provide guidance on monitoring for sump blockage. If sump blockage is detected, ECA-1.3 *Recirculation Sump Blockage* provides actions to respond to containment sump blockage.

- Procedural guidance exists regarding containment foreign material exclusion (FME) controls. This helps ensure that the strainers are not subjected to undue loading from foreign material.
- Inspections of the protective coatings in containment are part of a protective coatings program complying with Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Plants," dated June 1973, and ANSI N101.4-1972, "Quality Assurance for Protective Coatings Applied to Nuclear Facilities," dated November 28, 1972, to ensure that coatings do not adversely affect safety-related systems, structures or components.
- VEGP has a formal program for positively controlling potential debris sources in the containments. The program includes periodic inspections and assessment of containment materiel conditions and control of materials temporarily brought into or permanently installed in containment. In MODE 1 through MODE 4, the containment is a special foreign material exclusion zone requiring strict controls on the types and quantities of materials that may be taken into or left inside of the containment buildings.
- The RWST high level was increased and the low-low level (initiation of semi-automatic switchover to recirculation) decreased to ensure adequate submergence of the new sump strainers while maintaining adequate NPSH for the ECCS and Containment Spray pumps and allowing sufficient time for completion of operator actions for switchover to recirculation.

Although these measures are not expected to be required based on the very low probability of an event that would challenge either the capability of the strainer to provide the necessary flow to the ECC and CS systems, or result in significant quantities of debris being transported to the reactor vessel that would inhibit the necessary cooling of the fuel, they do provide additional assurance that the health and safety of the public would be maintained. These measures provide support for the extension of time required to completely address GL 2004-02 for VEGP, Units 1 and 2.

In addition to the defense in depth measures listed above, SNC is currently evaluating the recommendations made by Westinghouse in DW-12-013, and will also evaluate any other recommendations made for mitigative strategies. After these evaluations are complete, revisions to EOPs or Operations training will be made if necessary.

Conclusion

SNC expects that the GSI-191 resolution path for VEGP, Units 1 and 2 is acceptable, based on the information provided in this document. The execution of the actions identified in this document will result in successful resolution of GSI-191 and closure of GL 2004-02.

References

1. SNC letter NL-08-0670 from D. H. Jones to NRC, "Vogtle Electric Generating Plant Supplemental Response to NRC Generic Letter 2004-02," May 21, 2008.
2. SNC letter NL-08-1228 from M. J. Ajluni to NRC, "Vogtle Electric Generating Plant Supplemental Response to NRC Generic Letter 2004-02," August 22, 2008.
3. SNC letter NL-08-1155 from M. J. Ajluni to NRC, "Vogtle Electric Generating Plant Supplemental Response to NRC Generic Letter 2004-02," July 31, 2008.
4. SNC letter NL-08-1583 from M. J. Ajluni to NRC, "Vogtle Electric Generating Plant Generic Letter 2004-02 Extension Request for Completion of Chemical Effects and Closeout of GL 2004-02," November 7, 2008.

**Vogtle Electric Generating Plant
Proposed Path to Closure of Generic Safety Issue -191, "Assessment of Debris
Accumulation on Pressurized-Water Reactor Sump Performance"**

Enclosure 2

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies the regulatory commitments in this document. Any other statements in this submittal represent intended or planned actions. Such statements are provided for information purposes and are not considered to be regulatory commitments.

Commitment	Expected Completion Date
Submit a licensing amendment for risk-informed resolution path activities	Within 12 months following issuance of STP SE
Complete necessary plant changes determined to be required by the analyses supporting submittal of the licensing action for NRC review and approval for the risk-informed approach	During the next refueling outage, following issuance of an SE for the risk-informed resolution LAR for VEGP, Units 1 and 2
Complete plant changes determined to be necessary through any re-analysis associated with the NRC review of the licensing action leading up to issuance of a SE for VEGP, Units 1 and 2	By the end of 2020
Submit a final updated supplemental response to support closure of GL 2004-02 for VEGP, Units 1 and 2	Within six months of receipt of the VEGP SE
Update the current licensing basis (UFSAR) per 10 CFR 50.71(e) and complete any identified removal or modification of insulation debris sources in containment per plant modification procedures and processes	Within 18 months following receipt of the NRC SE that approves the risk-informed resolution approach
If it is determined during the risk-informed process that this option is not viable, SNC will complete a deterministic resolution path for VEGP Units 1 and 2	By the end of 2020