July 14, 2017

MEMORANDUM TO: Jennifer Dixon-Herrity, Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

FROM: Donald Habib, Project Manager ***/RA/***
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF WESTINGHOUSE AP1000 WCAP-17938, REVISION 2, SUPPORTING CALCULATIONS

On June 7, 2017, Westinghouse Electric Company, LLC (WEC) submitted Revision 2 of the AP1000 Topical Report, "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment," to the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System Accession No. ML17163A296).

The NRC staff has identified a need to conduct a regulatory audit related to changes in the document since the Revision 1 version of the document. The purpose of the audit is to evaluate documentation supporting the changes that resulted in Revision 2 of the topical report.

The audit will take place at WEC's office in Rockville, Maryland, and online via WEC's electronic reading room. The content of the audit plan is provided as an enclosure.

Docket No.: 52-00006, PROJ0811

Enclosure:
Audit Plan

CONTACT: Donald Habib, NRO/DNRL
301-415-1035

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF WESTINGHOUSE AP1000 WCAP-17938, REVISION 2, SUPPORTING CALCULATIONS DATED JULY 14, 2017

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Plan for the Regulatory Audit of Westinghouse AP1000 Topical Report, WCAP-17938, Revision 2, "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment," Supporting Calculations
Docket No. 52-006, Project 0811

APPLICANT:	Westinghouse Electric Company
APPLICANT CONTACTS:	Shayan Sinha Zach Harper
DURATION:	40 days July 17, 2017 through August 25, 2017
LOCATIONS:	Westinghouse Electric Company, LLC (Rockville Office) 11333 Woodglen Drive, Suite 202 Rockville, Maryland 20852 Westinghouse Electronic Reading Room
AUDIT TEAM:	Greg Makar (NRO/DEIA/MCB Materials Engineer, Audit Lead) Boyce Travis (NRO/DSRA/SCVB Reactor Systems Engineer) Clinton Ashley (NRO/DSRA/SCVB Reactor Systems Engineer) Matthew Mitchell (NRO/DEIA/MCB Branch Chief) Don Habib (NRO/DNRL/LB4 Project Manager) Supporting staff (as needed)

A. Background

In September 2004, the staff issued NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design" (the Final Safety Evaluation Report (FSER)). The staff issued Supplement 1 to the FSER in December 2005 to address details related to rulemaking, and Supplement 2 to the FSER in September 2011 to address modifications proposed in the design certification amendment.

NUREG-1793 Supplement 2 contains the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of how the AP1000 design addresses Generic Safety Issue 191, "Assessment of Debris Accumulation on Pressurized-Water Sump Performance" (GSI-191), and Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design-Basis Accidents at Pressurized-Water Reactors" (GL 2004-02).

WCAP-17938, "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment," re-evaluates the AP1000 GSI-191 and GL 2004-02 debris assessment described in Revision 19 of the Design Control Document. Specifically, WCAP-17938 assesses the potential for generation of debris from non-metallic insulation and materials in the reactor cavity (e.g., neutron shield blocks) and electrical cables in the containment.

As discussed in WCAP-17938, the AP1000 GSI-191 and GL 2004-02 debris evaluation result is that no fibrous debris is generated in a loss-of-coolant accident (LOCA). This is documented in APP-GW-GL-700 (Revision 19), "AP1000 Design Control Document," Subsection 6.3.2.2.7.1, which states "a LOCA in the AP1000 does not generate fibrous debris due to damage to insulation or other materials included in the AP1000 design." This is based on the use of metal reflective insulation or a suitable equivalent and the lack of fibrous insulation and other sources of fiber located in the LOCA jet impingement zones.

As discussed in WCAP-17938, the AP1000 plant design includes non-metallic insulation and materials in the reactor cavity that are designed to be a suitable equivalent to metal reflective insulation. Additionally, the AP1000 plant design includes in-containment electrical cabling that may contain fibrous and other materials (jackets, wrappings, and filler materials), which may be directly impinged upon by a jet of water from a loss-of-coolant accident LOCA. Neither of these items (i.e., encapsulated non-metallic insulation and cabling) were considered in the applicant evaluation addressing GSI-191 and GL 2004-02 or the NRC staff's FSER (NUREG-1793, Supplement 2).

To address these items, Westinghouse Electric Company (WEC) developed a program to evaluate any potential impacts to the current licensing basis from the exposure of cables to direct jet impingement by water from a LOCA and to qualify encapsulated non-metallic insulation and materials as a suitable equivalent to metal reflective insulation. The purpose of the program was to define a cable zone of influence and to confirm that the encapsulated non-metallic insulation and materials meet the requirements of suitable equivalency and may be used in place of metal reflective insulation at discrete locations in the reactor cavity. The program included jet impingement testing of neutron shield blocks (e.g., encapsulated non-metallic insulation and materials) and cabling, and submergence testing of neutron shield blocks.

NRC staff determined it would be necessary to audit documents that support WCAP-17938 Revision 2 evaluations and conclusions.

B. Audit Bases

This regulatory audit is based on the following:

- Title 10 *Code of Federal Regulations* (10 CFR), Appendix D to Part 52, "Design Certification Rule for the AP1000 Design"
- 10 CFR 50.46(b)(5), "Long-term cooling"
- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 35, "Emergency core cooling"
- 10 CFR Part 50, Appendix A, GDC 38, "Containment heat removal"
- NUREG-0800, Standard Review Plan (SRP) Section 6.2.2 "Containment Heat Removal System"
- NUREG-0800, SRP Section 6.3, "Emergency Core Cooling System"
- Regulatory Guide 1.82, Revision 4, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident"

C. Audit Scope

The audit will focus on documents associated with achieving the stated purpose of WCAP-17938, especially those that support the changes leading to Revision 2. The purpose of the topical report, as discussed in the WCAP-17938 introduction section, is to obtain NRC approval for the following:

- defining the zone of influence for water jet impingement on cabling in terms of the diameter of the postulated pipe break
- establishing that lower neutron shielding and water inlet doors of the reactor vessel insulation system as well as neutron shield blocks of the CA31 module are equivalent to metal reflective insulation
- using an alternative methodology for defining debris generation break size for postulated accidents per NEI 04-07 [1]

The staff will conduct this audit in accordance with the guidance provided in NRO-REG-108, "Regulatory Audits" (Reference 1).

D. Information and Other Material Necessary for the Audit

The staff requires access to calculations and design information as well as knowledgeable personnel regarding the review of areas identified under Section D above, pertaining to WCAP-17938, Revision 2. The staff has identified the following specific documents for audit:

- APP-GW-GER-201, "Test Report: [ ] Settling Analysis," April 2017.
- TR-CCOE-17-1, "Test Report: [ ] Properties," January 2017.
- DCP-DCP-008462, "MN20 Neutron Shield Block Thermal Testing."
- DCP-DCP-008711, "[ ] Neutron Shield Block Thermal Testing."
- APP-VCS-M3C-011, "Thermal Analysis for MN20 Lower Neutron Shield Blocks."

Other documents may be added as the need arises

E. Logistics

This audit takes place July 17 through August 25, 2017, and may be extended as necessary. The audit will be conducted through the WEC electronic reading room or at the WEC facility in Rockville, Maryland.

The NRC Project Manager will coordinate any changes to the audit schedule and agenda with the WEC point of contact.

F. Special Requests

The audit team requires the following support from WEC:

[1] NEI 04-07, Revision 0, "PWR Sump Performance Evaluation Methodology," Nuclear Energy Institute, Washington, DC, dated December 2004 (Agencywide Documents Access and Management System Accession No. ML050550138).

1. document access through an electronic reading room
2. the following provisions during audit activities at the Westinghouse office
   a. a conference room for the NRC staff use
   b. telephones to support teleconferencing (i.e., with microphone and speaker)
   c. telephone access to Westinghouse technical staff to answer questions related to the audit (with reasonable notice)
   d. access to a secure Wi-Fi network or Ethernet

G. Deliverables

Once the regulatory audit is completed, the audit team will issue an audit summary within 90 days. If information evaluated during the audit is needed to support a regulatory decision, the staff will identify it in a Request for Additional Information.

H. References

1. NRO-REG-108, “Regulatory Audits,” ADAMS Accession No. ML081910260, dated April 2, 2009.
2. WCAP-17938-P, “AP1000 In-Containment Cables and Non-metallic Insulation Debris Integrated Assessment,” Revision 2, June 2017.

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