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Your Reference: NRC Vendor Inspection Report Number 99901467/2016-201

Subject: Reply to Notice of Nonconformance Cited in NRC Inspection Report No. 99901467/2016-201 Dated February 2, 2017

Westinghouse acknowledges receipt of NRC Inspection Report Number 99901467/2016-201 dated February 2, 2017 and the following Notice of Nonconformance: 99901467/2016-201-01. Westinghouse takes any Notice of Nonconformance received from the NRC seriously, is taking appropriate actions to resolve these issues, and is committed to comply with the provisions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocess Plants," to Title 10 of the Code of Federal Regulations (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities" and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

As requested, details of the corrective actions associated with these nonconformance issues are described in the attachment to this letter.

Very truly yours,

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AP1000 ITAAC & Inspection Support

IE09
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Nonconformance 99901467/2016-20101

Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the Code of Federal Regulations (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states in part that, "Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions for the structures, systems and components."

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) 2.6.03.08 from Appendix C of the Combined License for Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3, states, "Circuit breakers and fuses installed in IDS battery, battery charger, dc distribution panel, and MCC circuits are rated to interrupt fault currents." The acceptance criteria for this ITAAC states, "Analyses for the as-built IDS dc electrical distribution system exist and conclude that the analyzed fault currents do not exceed the interrupt capacity of circuit breakers and fuses in the battery, battery charger, dc distribution panel, and MCC circuits, as determined by their nameplate ratings."

Contrary to the above, prior to November 18, 2016, Westinghouse failed to ensure the suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions for certain components supplied to the nuclear industry. Specifically, Westinghouse failed to identify and verify the adequacy of circuit breaker and fuse interrupting current ratings as a critical characteristic, as part of its commercial grade dedication process. The associated circuit breakers and fuses are being supplied to Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3, as part of the AP1000 new reactor construction. The issue is material to ITAAC 2.6.03.08 because if the interrupting ratings (nameplate ratings) for the circuit breakers and fuses cannot be verified, the analyses which compares the available fault currents to those ratings would be invalid.

Response:

1) The reason for the noncompliance or, if contested, the basis for disputing the noncompliance:

Westinghouse acknowledges the nonconformance where faults are initiated by failures of non-Class 1E equipment that interface with Class 1E equipment. However, Westinghouse would like to provide additional information regarding Class 1E equipment failures and the determination of critical characteristics for commercial dedication instructions related to this equipment. Westinghouse initiated a Level 2 Corrective action, CAPAL 100430258, within our corrective action program and conducted an apparent cause analysis (ACA). The ACA describes the following causes:

- Westinghouse failed to clearly communicate during the NRC inspection why ITAAC requirements do not flow down to Westinghouse Class 1E dc and Uninterruptible Power Supply System (IDS) Commercial Dedication Instructions (CDIs) if the requirements are not specific to a safety function.
- Westinghouse failed to clearly communicate during the NRC inspection that Westinghouse does not consider interrupt rating to be a critical characteristic for 1E equipment with only safety-related interfaces.
- There is no clear tracking activity to ensure IEEE-384 isolation requirements are incorporated into IDS CDI updates.

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) 2.6.03.08 from Appendix C of the Combined License for Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3, which states,

> *Circuit breakers and fuses installed in IDS battery, battery charger, dc distribution panel, and MCC circuits are rated to interrupt fault currents.*

The acceptance criteria for this ITAAC states,

> *Analyses for the as-built IDS dc electrical distribution system exist and conclude that the analyzed fault currents do not exceed the interrupt capacity of circuit breakers and fuses in the battery, battery charger, dc distribution panel, and MCC circuits, as determined by their nameplate ratings.*

The Notice of Non-conformance asserts that the ITAAC 2.6.03.08 cannot be completed, in part, because Westinghouse failed to verify the adequacy of the circuit breaker and fuse interrupting current rating during the commercial dedication process as a critical characteristic. While the interrupt rating is not a critical characteristic for hardware included in this ITAAC because there are no Class 1E/non-Class 1E isolation devices included in the ITAAC, it is a required equipment design parameter. In order to satisfy the ITAAC, the interrupting rating of the electrical distribution equipment identified in the ITAAC will be inspected and verified against nameplate ratings on the device (fuse and/or breaker). For the ITAAC to be completed, calculations were performed to determine the minimum required capacity rating of the circuit breakers and fuses in the battery, battery charger, dc distribution panel and MCC circuits. The as-built configuration will be verified during installation to verify the nameplate rating on each device. Therefore, a combination of inspection and analysis is used for completion of the ITAAC and is completed in the as-built configuration.

Westinghouse would also like to provide additional information regarding determination of critical characteristics and analysis of the credible failures for these particular devices that could prevent the item from performing a safety function.

In order for Class 1E electrical protective devices (breakers or fuses) to see short circuit current, a fault has to occur on the output side of the protective device (downstream). Interruption of this fault current is analyzed for two different scenarios as detailed below:

1. Non-1E equipment failures

In this scenario, faults are initiated by failures of non-Class 1E equipment that interface with Class 1E equipment. Devices used in this application are classified as Isolation Devices in accordance with IEEE 384-1981.

Isolation devices are required to prevent maximum credible voltage/current transients, shorts, opens and grounds that are applied to the Non-Class 1E side of the device from degrading the operation of the circuit on the Class 1E side below an acceptable level. Westinghouse has considered these maximum transients for AP1000 in APP-GW-GE-005, *"AP1000 Standard Methodology for Fault Testing of Instrumentation and Controls Isolation Barriers"*. The isolation devices identified in this document are qualified in accordance with this methodology utilizing a commercially dedicated lab.

For these isolation devices, interruption of the maximum credible voltage and current is considered to be a critical characteristic to ensure the system can perform its safety function. Westinghouse acknowledges

the nonconformance for commercial grade dedication of IEEE 384-1981 isolation devices. These instructions currently do not address interruption of maximum credible voltage and current as a critical characteristic, regardless of the fact that the testing has been or will be completed in support IEEE 384 compliance.

2. Class 1E equipment failures (Non - IEEE 384 Isolation Barriers)

In this scenario everything downstream (on the load side) of the breaker and/or fuse is a Class 1E device. The Class 1E equipment failure initiating the fault current would therefore be considered the single failure event, in accordance with IEEE 603-1991, Section 5.1

> *The safety systems shall perform all safety functions required for a design basis event in the presence of: (1) any single detectable failure within the safety systems concurrent with all identifiable but non-detectable failures; (2) all failures caused by the single failure; and (3) all failures and spurious system actions that cause or are caused by the design basis event requiring the safety functions.*

If the single failure initiates a fault at the most upstream portion of the distribution system, the successful non-destructive interruption of the associated protective device results in the loss of the entire division. An example of this on AP1000 would be the opening of a main fuse in the Class 1E Fused Transfer Switchbox (DF01, e.g. IDS(A)-DF-1). Alternatively, if the single failure resulted in damage to the associated protective device that either destructively interrupted the fault and/or failed to interrupt the fault, then the division would also be considered inoperable. Therefore loss of the entire division is considered a failure caused by this type of single failure regardless of fault interrupting capabilities.

Accepting this single active Class 1E failure, the remaining operable divisions retain the ability to establish and maintain safe shutdown.

Additionally IEEE 603-1991, Section 5.6.1 requires that redundant portions of a safety system be independent and physically separated.

> *Redundant portions of a safety system provided for a safety function shall be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function.*

The independence and physical separation of redundant portions of safety systems ensure that if a destructive failure associated with this single failure were to occur it will not result in loss of function of the redundant safety function.

For Class 1E equipment, interruption rating is not considered to be a critical characteristic as systems designed in accordance with IEEE 603 can perform their safety function in the presence the Class 1E single failures that initiate fault current. It should be noted that while the interrupt rating is not a critical characteristic, it is still a required equipment design parameter which is identified in the associated design specifications.

In summary, Westinghouse believes that ITAAC 2.6.03.08 can be completed as described without any modifications to the commercial dedication instructions to include interrupt rating as a critical

characteristic for equipment associated with that ITAAC. The ITAAC can be completed by simple inspection of the nameplate rating of the equipment in the as-built configuration. However, Westinghouse does acknowledge that interrupt rating should be a critical characteristic for Class 1E/non-Class 1E isolation barriers and will update the individual CDIs for that equipment.

2) The corrective steps that have been taken and the results achieved:

- AP1000 Isolation Barrier Maximum Credible Fault Testing Report, EMPE-EV-97-APP Revision 0, dated December 2016 was archived documenting supplementary testing performed on 1E to non-1E isolation interfaces from September 2016 through November 2016. This confirmed that the interrupt capability of isolation devices was validated independently by Westinghouse.
- Westinghouse CAPAL 100430258 was generated and an Apparent Cause Analysis (ACA) has been completed. The causes and actions identified in the ACA are described within this response.
- Westinghouse Level 2 Procedure, Design Specifications, W2-8.2-199, has been updated to include a requirement that design specifications contain "Any design or safety analysis input assumptions that are part of a plant's Current Licensing Basis that may not already be considered as: design conditions, functional/performance requirements, or qualification/testing requirements."

3) The corrective steps that will be taken to avoid noncompliance:

a. Design specifications for DF01 (Class 1E Fused Transfer Switch Box – implied fuse of the battery), DC01 (Class 1E Battery Charger), DD01 (Class 1E DC Distribution Panel), and DK01 (Class 1E Motor Control Center) will be revised to require breaker and/or fuses to clearly identify their interrupt ratings on each devices nameplate.

b. Revise the Commercial Dedication Instructions for isolation devices as tested in EMPE-EV-97 to address interrupt rating as a critical characteristic.

c. Perform an extent of condition analysis on other systems that include 1E/non-1E isolation devices.

4) The date when the corrective action will be completed:

The Action identified above in item 3 will be updated as follows:

a. Design Specifications updated – 5/31/2017

b. Update impacted Commercial Dedication Instructions – 5/31/2017

c. Extent of Condition activities completed – 5/31/2017