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Your Reference: NRC Vendor Inspection Report Number 99900404/2016-204

Subject: Reply to Notice of Nonconformance Cited in NRC Inspection Report No. 99900404/2016-204  
Dated Nov 14, 2016

Westinghouse acknowledges receipt of NRC Inspection Report Number 99900404/2016-204 dated Nov 14, 2016 and the following Notices of Nonconformance: 99900404/2016-204-01 and 99900404/2016-204-02. Westinghouse takes any Notice of Nonconformance received from the NRC seriously. Westinghouse is taking appropriate actions to resolve these issues; further we are 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,

A handwritten signature in black ink, appearing to read "Steve K. Hamilton".

Steve K. Hamilton, Senior Vice President & Chief  
Quality Officer  
Quality, Environment, Health & Safety

IED 9  
NRD

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**Nonconformance 99900404/2016-204-01**

Criterion XVI, "Corrective Action," 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 be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected."

WEC procedure WEC 16.2, "Corrective Action Process," states, in part, that "Corrective Action Process (CAP) Issue Reports should be created promptly whenever a Westinghouse employee or contract employee becomes aware of an event or condition that could potentially affect regulatory compliance and/or nuclear safety."

Contrary to the above, as of February 18, 2016, WEC failed to ensure that a condition adverse to quality was promptly identified and corrected that could potentially affect regulatory compliance and/or nuclear safety. Specifically, WEC determined that the design of a population of safety-related AP1000 valves procured for Vogtle and V.C. Summer construction sites were not designed so that access is provided to perform the examinations required by American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." The AP1000 valves impacted by this issue were procured between June 2009 and December 2010. However, despite identifying this inspectability issue as early as January 2011, WEC did not enter the issue into its corrective action program until February 2016.

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

Westinghouse acknowledges the nonconformance and initiated a Level 2 corrective action, CAPAL 100412765, within our corrective action program prior to the inspection. This issue was modified during the inspection week to further address the Notice of Nonconformance 99900404/2016-204-01. The apparent cause analysis (ACA) describes the following causes:

- At the time the issue was discovered and design documentation was being created, there was no formal process for reviewing design documents against the licensing basis. Although the team was aware that there were ASME Section XI requirements for inspectability, there was a lack of understanding that a non-compliance existed with the licensing basis requirements for a subset of ASME Section III valves that were manufactured using cast austenitic stainless steel. As a result, there was no early action CAPAL entered to document the required change to the licensing basis.
- PSI/ISI Design team did not implement conservative decision making with respect to capturing issues within the CAPAL program. The design team identified that this was a known industry issue that Westinghouse was providing support to solve. However, as late as 2011, Westinghouse was aware that this was a concern for the AP1000 program and that the requirements for valve inspectability would not be able to be met. Westinghouse was aware that an exception would need to be taken either through relief or alternative request. Westinghouse corrective action procedures that were in effect at the time of the initial identification required prompt identification. Because this was a known issue, the team did

not understand the need to implement conservative decision making to capture this issue within the Westinghouse corrective action program and track completion of activities.

- The PSI Project Plan does not have requirements for formal communication with the licensee for alternative or relief requests. There is no requirement for Westinghouse on when and how to send an alternative request to the NRC for the PSI/ISI program (as a contractor for the licensee). As a result, the informal communication went on for years with Westinghouse assuming that there was an acceptance by the NRC of the plan for an alternative request.

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

A corrective action was initiated to perform an ACA and assign appropriate corrective actions in response to the nonconformance. In addition, a separate corrective action was identified to capture the licensing changes that will be necessary for the Vogtle and V.C. Summer UFSARs as a result of the identified issue.

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

Prior to the identification of this issue, several other Root Cause Analyses also identified programmatic and cultural issues with respect to performing licensing basis reviews and lack of identification of CAPALs in the same timeframe as when the ASME Section XI inspectability issues were identified by Westinghouse in 2011. As a result of those root cause analyses, the following corrective actions that have been taken since 2011 are captured for consideration for how Westinghouse is avoiding noncompliance at present and in the future:

- Establishment of APP-GW-GAP-147 “AP1000® Current Licensing Basis Review” which captures the responsibilities and requirements for performing and documenting Current Licensing Basis impact reviews. This also includes the requirement for “power-users” that have specific qualifications to be verifiers on each licensing basis review.
- Implementation of the Nuclear Safety Culture Advocate where the role is assigned to a meeting participant with the objective of increasing the sensitivity and awareness to nuclear safety topics being discussed by all other meeting participants.
- Requirement that all Westinghouse employees sign the Nuclear Safety Culture Pledge.
- Providing monthly Nuclear Safety Culture Presentations for the organization to use for safety briefs that have specific questions and talking points for the meeting participants to consider.
- An internal Nuclear Safety Culture Executive Committee has been commissioned to advise Westinghouse leadership on the health of Westinghouse Nuclear Safety Culture, review various data and results, and drive for results of actions related to Nuclear Safety Culture. The focus is to address Nuclear Safety Culture trends or emerging gaps through a broad and critical review of key Nuclear Safety Culture related information.
- An external Nuclear Culture Safety Review Board (NSRB) has been commissioned by Westinghouse; this group provides independent, subject matter expertise related to the health of our safety culture.
- Implementation of the Employee Concerns Program (ECP) for employees to have an additional avenue to raising Nuclear Safety concerns.
- Implementation of the Differing Professional Opinions Program and Procedure, W2-5.3-101, to ensure that Westinghouse maintains a working environment that encourages employees to

make known their best professional judgments and offers an additional process for raising concerns.

- WECTEC Confirmatory order EA-12-189/EA-13-196 requirement B.3. requires that instructor-led training be conducted for nuclear safety culture and safety conscious work environment. The required training is being extended beyond WECTEC to Westinghouse management that supports AP1000 projects in the Engineering Center of Excellence.
- Implementation of a specialized Nuclear Safety Culture training program for “New to Nuclear” executive leadership.

Additional corrective actions identified in the apparent cause analysis that are in process include:

- Conducting a lessons learned session with all engineering organizations to discuss the issues identified. The stand-down will reinforce the need to identify known licensing and code issues into the corrective action program.
- Establishing a process for correspondence between Westinghouse and the owners for requesting alternative and relief requests related to ASME Section III or Section XI requirements.

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

The remaining two pending corrective actions described above will be completed by March 31, 2017.

**Nonconformance 99900404/2016-204-02**

December 13, 2016

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Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "Design control measures shall be applied to items such as the following (...) accessibility for inservice inspection, maintenance, and repair."

WEC design specifications APP-PV01-Z0-001, APP-PV03-Z0-001, APP-PV14-Z0-001, APP-PV20-Z0-001, and APP-PV63-Z0-001 require that safety-related valves supplied for service in the AP1000 plant be designed for inspection in accordance with the ASME Section XI.

Contrary to the above, as of September 30, 2016, WEC failed to apply adequate design control measures to ensure that accessibility for inservice inspection was provided for safety-related valves procured and shipped to the Vogtle and V.C. Summer construction sites. Specifically, WEC AP1000 design specifications permit the applicable safety-related valves to be designed and fabricated in a manner that does not provide access to perform the examinations as required by ASME Section XI. The AP1000 valve designs result in valve-to-pipe weld configurations in which the achievable ultrasonic examination volume is significantly less than the required examination volume as required by the ASME Code.

**Response:**

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

Westinghouse acknowledges the nonconformance and initiated a Level 2 corrective action, CAPAL 100417162, within our corrective action during the inspection to address the Notice of Nonconformance 99900404/2016-204-02.

An apparent cause analysis (ACA) was conducted as a result of the Nonconformance and describes the following causes:

The apparent cause identified that various assumptions were made but were not validated or documented throughout the evolution of this issue. The assumptions are summarized as follows:

- The design specifications identified in the Notice of Nonconformance were originated in the 2007-2009 timeframe. When these specifications were created, there were assumptions among the writers and reviewers that the specifications were adequate and appropriate due to several contributing factors:
  - The design specifications were based on proven industry technology and were consistent with identical valves installed in the operating fleet.
  - The design specifications are fully compliant with ASME Section III and ASME B16 series of standards for valve design.
  - The materials that are identified in the design specifications as acceptable for use are acceptable grades based on ASME Section II.
  - The design specifications contain guidance requiring the designer to meet ASME Section XI NDE requirements.
  - Westinghouse AP1000 weld end configuration drawing, APP-GW-VFY-001, "AP1000 Weld End Configuration for Stainless Steel, Carbon Steel, and Alloy Steel Auxiliary Piping Components" is consistent with previous Westinghouse design and actually more restrictive than the maximum allowable contour angle of the ASME Code. This drawing also requires a weld surface which is flush with the adjacent

base material; an existing weld crown has been mentioned as a contributor to the dual sided qualification limitation for austenitic stainless steel welds.

Although the design specification writers were aware that there were ASME Section XI requirements for inspectability, the adverse impact of using cast austenitic stainless steel material for the valve body on performing the required ultrasonic examinations on the valve to pipe welds was not fully understood. Therefore, there was no restriction placed on the use of cast austenitic materials.

- When the inspectability issues were first identified in 2011, there was an assumption that the qualification limitation that required dual sided access for full examination coverage credit of austenitic stainless steel welds would have been resolved. This is a limitation that has been challenged within the industry for years. One of the primary reasons this limitation has been challenged is the adequacy of single sided examination requirements for dissimilar metal welds. Because only single sided examinations are required for dissimilar metal welds with flush weld surfaces, Westinghouse assumed that requirement would also apply to austenitic stainless steel welds with flush weld surfaces.
- When the inspectability issues were first identified in 2011, there was also an assumption that qualification requirements for cast austenitic stainless steel materials would have been included in ASME Code Section XI, Appendix VIII to support the AP1000 plant construction. Supplement 9 – Qualification Requirements for Cast Austenitic Piping Welds in ASME Code Section XI, Appendix VIII has been in the course of preparation since 1992.
- In the early development stages of the AP1000 PSI program (2012-2014 timeframe), the key stakeholders working on the program within Westinghouse assumed there was alignment between Westinghouse, the domestic AP1000 Licensees, and the NRC that the alternative path was a viable and acceptable option to address this issue. That assumption was not documented until the first AP1000 PSI program plan was issued in June of 2015.

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

- A corrective action was initiated to perform an apparent cause analysis and assign appropriate corrective actions in response to the nonconformance.
- Westinghouse has provided input and the basis for a proposed alternative request for the current domestic AP1000 plants in accordance with 10CFR50.55(z)(1) to be submitted by the licensees of AP1000 plants under construction at Vogtle and VC Summer. The alternative request presents the case that the valve material can be excluded from the ASME Section XI examination volume. Instead, an array of 'best effort' ultrasonic examination techniques including spatially encoded low frequency phased array ultrasonic examinations will be applied from the forged pipe side of the weld, from the flush weld surface and where practical from the valve side of the weld.
- Westinghouse has placed appropriate construction and licensing holds for the Vogtle and V.C. Summer projects for valves affected by this issue including valves that are currently installed.
- Westinghouse is participating in an ASME Code Task Group focused on the issue of inspectability and had a kick off meeting on November 8, 2016 at the fall ASME Code

Meetings. The Task Group and the potential actions coming from it have been added to the ASME Section XI Top Ten actions list. The draft charter for the task group is as follows:

*The Task Group has responsibility for developing and proposing Code revisions and Code Cases concerning the examination of items that do not allow the code required examination coverage, based on either material type or configuration. Those configurations being addressed shall include but not limited to 1) pipe-to-valve, 2) pipe-to-pump, and 3) pipe-to-fitting. The material to be addressed is austenitic material, either cast or forged, that currently does not allow single sided examinations. Another issue is cast stainless steel, where no Appendix VIII examination qualification exists at present. The Task Group shall refer potential Code actions to the appropriate Subgroups as needed. This Task Group shall report directly to the BPV XI Executive Committee.*

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

- Westinghouse will conduct a lessons learned session for all of the equipment design groups within both the Systems and Components Engineering (SCE) and the Architectural Engineering and Plant Design (AEPD) organizations to reinforce the importance of validating and documenting assumptions and open items.
- Westinghouse will determine the potential for using more advanced ultrasonic examination techniques to achieve the required inspection volume for the impacted welds. This action will include evaluation of the possibility of using a combination of full matrix capture phased array UT with beam steering software to adapt to the design constrained taper configuration in order to increase the credited inspection coverage.
- Westinghouse will evaluate potential design modifications for future AP1000 plants to resolve the inspectability challenges for the impacted welds. If viable design modifications are identified, Westinghouse will issue the appropriate documentation to initiate the changes.
- Westinghouse will add design controls to restrict the nonconforming valve design specifications to apply only to the current China and Domestic AP1000 units. This may take on the form of a "hold E&DCR" that is not applicable to the China plants and the current domestic plants.
- Westinghouse will take an active role in the new ASME Task Group focused on the inspectability of the valve to pipe welds.

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

The lessons learned session and design control corrective actions will be completed by April 15, 2017.

The remaining corrective actions identified are longer term solutions and include evaluation of more advanced examination techniques, evaluation of potential design changes and working with the ASME Task group and these actions will extend through May 1, 2018.