

August 30, 2016

Sarah DiTommaso, Manager  
AP1000 Instrumentation & Control Licensing  
Westinghouse Electric Company  
5000 Ericsson Dr.  
Warrendale, PA 15086

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE  
ELECTRIC COMPANY REPORT NO. 99900404/2016-202

Dear Ms. DiTommaso:

On July 18 to July 22, 2016, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Westinghouse Electric Company (WEC) facility in Warrendale, PA. The purpose of the limited-scope inspection was to assess WEC's compliance with the provisions of selected portions 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," 10 CFR Part 21, Reporting of Defects and Noncompliance."

This inspection evaluated aspects of WEC's programs for the design, implementation, and testing of the Protection and Safety Monitoring System (PMS) systems for the Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3 currently under construction. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance or 10 CFR Part 21 programs.

During this inspection, the NRC staff evaluated aspects of WEC's design and testing of the PMS, review of corrective action (CA) implementation for previous NRC-identified nonconformances associated with the PMS system. These activities were associated with inspections, tests, analyses, and acceptance criteria (ITAAC) from Appendix C from the Combined License for Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3. Specifically, these activities were associated with ITAACs 2.5.02.03 and 2.5.02.11.

With respect to the previously identified non-conformances, the NRC inspectors reviewed implementation of CAs associated with two findings that are material to the ITAAC acceptance criteria and determined those actions were sufficient to close those findings. The CAs were specific to ITAAC 2.5.02.03 that identified a failure to demonstrate that PMS equipment can withstand electromagnetic interference, radio frequency interference, and electrostatic discharge conditions that would exist before, during, and following a design basis accident without loss of safety function.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's Rules of Practice, a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System, which is accessible from the NRC Web site at <http://www.nrc.gov/readingrm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

*/RA/*

Terry W. Jackson, Chief  
Quality Assurance Vendor Inspection Branch-1  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

Docket No.: 99900404

Enclosure:  
Inspection Report No. 99900404/2016-202  
and Attachment

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's Rules of Practice, a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System, which is accessible from the NRC Web site at <http://www.nrc.gov/readingrm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

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Terry W. Jackson, Chief  
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and Attachment

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<b>NAME</b>	GGalletti	LCastelli*	WRoggenbrodt*	MJunge	TJackson
<b>DATE</b>	08/25/2016	08/23/2016	08/24/2016	08/25/2016	08/26/2016

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**U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NEW REACTORS  
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS  
VENDOR INSPECTION REPORT**

Docket No.: 99900404

Report No.: 99900404/2016-202

Vendor: Westinghouse Electric Company  
5000 Ericsson Dr.  
Warrendale, PA 15086

Vendor Contact: Sarah DiTommaso, Manager  
AP1000 Instrumentation & Control Licensing  
Westinghouse Electric Company  
5000 Ericsson Dr.  
Warrendale, PA 15086  
Email: ditomms@westinghouse.com

Nuclear Industry Activity: Westinghouse Electric Company, LLC, located at 5000 Ericsson Drive, Suite 517, Warrendale, PA 15086, whose scope of supply includes but not limited to safety-related design, fabrication, testing, and delivery of the Protection and Safety Monitoring System and the non-safety Diverse Actuation System instruments and controls products to the current U.S. AP1000 plants under construction.

Inspection Dates: July 18-22, 2016

Inspection Team Leader: Greg Galletti NRO/DCIP/QVIB-1

Inspectors: Lisa Castelli R-II/DCI/CIB1  
William Roggenbrodt NRO/DEIA/ICE

Approved by: Terry W. Jackson, Chief  
Quality Assurance Vendor Inspection Branch-1  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

Enclosure

## **EXECUTIVE SUMMARY**

Westinghouse Electric Company  
99900404/2016-202

The U.S. Nuclear Regulatory Commission (NRC) staff conducted this vendor inspection to verify that Westinghouse Electric Company, LLC (hereafter referred to as WEC), implemented an adequate quality assurance program that complies with the requirements 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, and "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 21, "Reporting of Defects and Noncompliance." The inspectors conducted this inspection at the WEC facility in Warrendale, Pennsylvania, on July 18-22, 2016.

This inspection evaluated aspects of WEC's programs for the design, implementation, and testing of the Protection and Safety Monitoring System (PMS) systems for the Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3 currently under construction. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

During this inspection, the NRC staff evaluated aspects of WEC's design and testing of the PMS, reviewed corrective action (CA) implementation for previous NRC-identified non-conformances associated with the PMS system. These activities were associated with inspections, tests, analyses, and acceptance criteria (ITAAC) from Appendix C from the Combined License for Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3. Specifically, these activities were associated with ITAACs 2.5.02.03 and 2.5.02.11.

The following regulations served as the bases for this NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21
- 10 CFR 50.55a

The inspectors used Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013, and IP 65001.22, "Inspection of Digital Instrumentation and Control (DI&C) System/Software Design Acceptance Criteria (DAC)-Related ITAAC," dated December 19, 2011.

The information below summarizes the results of this inspection.

### **Component Interface Module (CIM)/Advent-Ovation Interface (AOI) Engineering Evaluation (ITAAC 2.5.02.11c)**

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing associated with the CIM/AOI design engineering analysis satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

#### PMS Maximum Central Processing Unit (CPU) Engineering Evaluation (ITAAC 2.5.02.11c)

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing associated with the PMS Maximum CPU Engineering Evaluation completed at the time of the inspection was consistent with the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Additional activities in support of closure of the ITAAC acceptance criteria will be evaluated during future inspection of system integration testing at WEC. No findings of significance were identified.

#### PMS Design Change Process Review - Seismic Analysis (ITAAC 2.5.02.11c)

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing associated with the PMS Design Change Process Review – Seismic Analysis satisfy the regulatory requirements set forth in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

#### PMS Corrective Action Program Implementation Review (ITAAC 2.5.02.03)

With respect to the previously identified non-conformances, the NRC inspectors reviewed implementation of CAs associated with two findings that are material to the ITAAC acceptance criteria and determined those actions were sufficient to close those two findings. The CAs were specific to ITAAC 2.5.02.03 identified for the failure to demonstrate that PMS equipment can withstand electromagnetic interference (EMI), radio frequency interference (RFI), and electrostatic discharge (ESD) conditions that would exist before, during, and following a design basis accident without loss of safety function.

## REPORT DETAILS

### 1. CIM/AOI Engineering Evaluation (ITAAC 2.5.02.11c)

#### a. Inspection Scope

In December 2015, the inspectors observed ongoing design engineering analysis integration testing of the PMS with the Distributed Control and Information System (DCIS). This test activity was performed to provide risk reduction for future site ITAAC testing and was not validating interface requirements or addressing any associated ITAAC. The testing was being performed to demonstrate functionality of the unidirectional network datalink gateway between the safety to non-safety control interface. This gateway transfers data from the safety PMS CIM to the non-safety (Ovation) portion of the Instrumentation and control (I&C) system.

Specifically, the inspectors observed portions of APP-ISIP-T1P-422, "AP1000 CIM/AOI Functional Integration Test Procedure." The inspectors witnessed the execution of several tests cases and the use of the standard input/output simulator (SIOS) test tool to ensure testing was conducted in accordance with the prescribed test plan. In addition the inspectors reviewed the test configuration record and test log to verify that anomalies from testing were properly identified.

In July 2016, the inspector reviewed the results of the CIM/AOI design engineering testing as documented in APP-ISIP-T2R-422, "AP1000 CIM/AOI Functional Integration Test Report," Revision 0. The inspectors interviewed WEC personnel to assess the adequacy of the testing and review the test results. The inspectors reviewed the list of test anomalies that resulted in the generation of a Repair Replacement and Automation Service (RRAS) Issue Tracking System (RITS) or a Corrective Action Prevention and Learning (CAPAL). The inspectors selected several anomalies that required a change to the PMS software to assess the adequacy of the evaluation and resolution. The inspectors noted that regression testing would be performed with future software baseline Release 8.4. The inspectors reviewed the associated change drivers; Engineering and Design Change Report (E&DCR's), Software Design Description, Software Requirement Specification and Software Release Record for each of the selected anomalies (RITS 49832, 454447 and CAPAL 100301483) to verify the implementation of the resolution was incorporated.

#### b. Observations and Findings

No findings of significance were identified.

#### c. Conclusion

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing of associated with the CIM/AOI design engineering analysis satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

## 2. PMS Maximum CPU Engineering Evaluation (ITAAC 2.5.02.11c)

### a. Inspection Scope

The inspectors reviewed APP-PMS-GER-004, "AP1000 Protection and Safety Monitoring System AC160 Application CPU Load/Performance Analysis," Revision 1, and WNA-AR-00438-GEN, AC160, "Load and Performance Analysis," Revision 1. APP-PMS-GER-004 serves as the AP1000 application specific analysis to provide reasonable assurance that each processor module utilized in the AP1000 PMS will not exceed the established 70 percent CPU load while under worst case execution conditions and WNA-AR-00438-GEN serves as the generic technical basis to evaluate performance capabilities of application tasks installed in an AC160.

The inspectors noted that the description of the tested system differs in several ways from a production level system. Therefore, to determine the validity and comprehensive nature of the analysis to verify that the acceptance criteria associated with ITAAC 2.5.2.11d are satisfied, the inspectors plan to evaluate the IV&V Summary Reports and supporting documentation when they are completed, as well as, on-going PMS SIT relevant to the PMS maximum CPU engineering evaluation during a future inspection.

### b. Observations and Findings

No findings of significance were identified.

### c. Conclusion

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing of associated with the PMS Maximum CPU Engineering Evaluation completed at the time of the inspection was consistent with the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Additional activities in support of closure of the ITAAC acceptance criteria will be evaluated during future inspection of system integration testing at WEC. No findings of significance were identified.

## 3. PMS Design Change Process Review - Seismic Analysis (ITAAC 2.5.02.11c)

### a. Inspection Scope

The inspectors reviewed several reports related to seismic testing to verify that the vendor had performed an adequate assessment of the PMS cabinet design changes to ensure the as-built production system was bounded by the seismic analysis. The inspectors also reviewed how the vendor accounted for additional components being added to the production system and how that potentially impacted the prior seismic analysis and qualification. Additionally, the inspectors determined if the test accounted accurately for the functionality of the PMS cabinets during a seismic event along with their seismic durability.

The inspector reviewed Westinghouse Document APP-PMS-VBR-003 (EQ-QR-205-APP), "Equipment Qualification Summary Report for PMS Cabinets and NIS Auxiliary Panels for Use in the AP1000 Plant," Revision 5, and APP-PMS-VPC-001,



“The Weight Zone Similarity Evaluation for Seismic Qualification of PMS Cabinets for AP1000 Nuclear Plants,” Revision 1. The inspectors confirmed that APP-PMS-VPC-001 describes the additional weight added to selected PMS cabinets due to design changes and its impact upon the seismic test case and any impact to the seismic calculation related to that additional weight. The inspectors reviewed Design Change Proposal (DCP) APP-GW-GEE-473, “Main Control Room Habitability System (VES) Changes to Satisfy Post-Accident Performance Requirements,” and associated calculation (Calculation Note Number CN-EQT-12-28 / APP-PMS-VPC-001) and confirmed that environmental qualification (EQ) changes were considered.

Based upon a review of the information contained in the referenced reports and the related test logs, the inspectors determined the cabinets under test were shown to be tested as functional under test conditions. Additionally, the inspectors determined the production level cabinet with the additional components added due to design changes was still bounded by the calculation.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The inspectors concluded that WEC’s implementation of their policy and procedures for control of design and testing of associated with the PMS design change/seismic design analysis satisfy the regulatory requirements set forth in Criterion III, “Design Control,” of Appendix B to 10 CFR Part 50. No findings of significance were identified.

4. PMS Corrective Action Program Implementation Review (ITAAC 2.5.02.03)

(1) NON 99900404/2015-204-02

Background

In NRC Inspection Report 99900404/2015204, the NRC inspection team documented that WEC failed to meet the prescribed acceptance criteria defined in EQ-EV-75-GEN, “Alternate Cabinet Shielding Effectiveness Acceptance Criteria Development,” to demonstrate that cabinets (Pentair) used for the U.S. AP1000 PMS were bounded by the EMC EQ testing performed on an alternate cabinet design (Corry) which formed the basis of WEC’s acceptance of the Pentair cabinet design.

This issue had been identified as Nonconformance (NON) 99900404/2015-204-02.

By letter dated June 10, 2015 (ML15163A020), WEC provided a response to that NON. In their response, WEC indicated that CAPAL 100171240 was issued to document the NON finding, perform an initial apparent cause analysis (ACA), and identify corrective actions. As a result, an extent of condition was performed and all users of the Pentair cabinet were identified from the Westinghouse purchasing system. WEC contracted the test lab to perform the required post-processing of test data and provide an updated test report for the Pentair cabinet design. That test report data was then reviewed for applicability to the WEC Qualification Summary Report results.

Additionally, the applicable WEC EQ work instructions and procedures were reviewed to ensure that the process for approving test reports requires that any deviations must include a disposition of that deviation before the report is approved.

a. Inspection Scope

The inspectors reviewed the WEC ACA and a limited cause analysis (LCA) and confirmed that the apparent causes of the nonconformance were identified. The inspectors reviewed the corrective actions to address the issues which included: (1) revising the Qualification Summary Report for Standard Pentair Seismic Cabinet to incorporate the updated Keystone Compliance EMC testing report, (2) develop an evaluation of the AP1000 PMS EMC testing to assess the impacts of the use of the Pentair cabinets, review and revise the procedures/work practices guidance for test report review to address any anomalies or deviations prior to acceptance of the report and to ensure mechanisms are in place to identify any restrictions or limitations on the hardware being qualified.

For each of the corrective action activities, the inspectors reviewed the revised EMC evaluations and qualification summary reports to verify that the updated EMC testing results were adequately incorporated into the detailed design documentation and the effects of those updates were adequately evaluated.

The team reviewed purchase order (PO) #450066940 Keystone Compliance, dated April 2015, and confirmed that the scope of supply included a revision to the Cabinet Shielding Effectiveness Evaluation to incorporate smoothing of the measured data using the required 3 point rolling average. Smoothing was determined to be required per EQ-EV-75-GEN, Revision 1, to approximate the damping of resonances and reduce very local peak and valley amplitudes resulting from differences in cabinet geometry and measurement repeatability. The revised EMC evaluation incorporated data smoothing using a three-point simple average. The smoothing was performed on the raw measurement data for both the Corry and Pentair cabinets. It was not performed on the reference, floor noise, or dynamic range data. The smoothed data was then subtracted from the reference data to obtain the smoothed shielding effectiveness values. Based on this, three frequencies were determined to be beyond the specified Pentair alternate shielding minimum requirements. An equipment-specific evaluation of PMS components was performed to verify that the EMC qualification results remained valid for installation of the equipment into either the Corry or Pentair cabinets.

The inspectors confirmed the revised results from the Keystone testing were adequately incorporated into the WEC Qualification Summary Report for Standard Pentair Seismic Cabinet EQ-QR-126, and the need to perform additional equipment-specific evaluations to justify EMC compliance with the original qualification test results. The acceptance of the Pentair cabinets was based on either: (1) exceeding the shielding requirements of the previously tested (Corry Cabinets); (2) the Pentair cabinets must exceed the alternate Pentair minimum shielding requirements documented in EQ-EV-75-GEN and EQ-TP-138-GEN; or (3) the equipment to be installed in the PMS cabinets must be shown to not have excessive emissions or susceptibility and those three frequencies where the Pentair cabinets did not demonstrate the minimum shielding requirement or shielding effectiveness of the previously tested cabinet (Corry).

The inspectors reviewed APP-PMS-VPY-009 to confirm that the evaluation method encompassed the specific range of frequencies that were identified in the Keystone report as being of concern. The inspectors confirmed that PMS equipment that was originally tested as documented in APP-PMS-VBR-003 was identified and evaluated to assure each component was not susceptible to EMI/RFI at those frequencies where the Pentair cabinets did not meet the minimum alternate shielding requirements. Both radiated emissions test result evaluations and radiated susceptibility test result evaluations were performed. A review of all test data associated with the subassemblies and components was performed, which confirmed that none of the equipment was susceptible at the frequency ranges on concern.

Additionally, the inspectors reviewed the revised work instructions to verify that the vendor had implemented the identified enhancements to preclude recurrence of the condition adverse to quality.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and corrective actions of associated with previous NRC-identified NONs satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XVI, "Corrective Actions," of Appendix B to 10 CFR Part 50. The Inspectors verified that WEC adequately implemented corrective actions to address the findings associated with NON 99900404/2015-204-02, and this NON is, therefore, closed.

(2) NON 99900404/2015-204-03

Background

In NRC Inspection Report 99900404/2015204, the NRC inspection team documented that WEC failed to establish adequate measures for the selection and review for suitability of criteria to verify the critical characteristic for calibration of measuring and test equipment used for EMC testing services for the U.S. AP1000 PMS. Specifically, for CDI-4064, EMC testing services that were performed by Keystone Compliance, LLC, WEC failed to identify appropriate acceptance criteria, such as scope of the calibration lab's current certification and any technical requirements, such as accuracies, tolerances, and ranges of measuring and test equipment to be used, in order to verify the equipment used for the EMC testing of PMS was appropriately calibrated. This issue had been identified as Nonconformance 99900404/2015-204-03.

By letter dated June 10, 2015 (ML15163A020), WEC provided a response to that NON. In their response, WEC indicated that CAPAL 100221830 was issued to document the NON finding, perform an initial ACA, and identify corrective actions. As a result, WEC revised their commercial dedication instructions (CDIs) for laboratory services, and also performed additional surveys of the Keystone laboratory. In addition, WEC reviewed all certificates of calibration (CoCs) for the measurement and test equipment (M&TE) that were used for the project to verify they documented the ISO-17025 laboratory and technical requirements adequately.

a. Inspection Scope

The inspectors reviewed the WEC ACA and a LCA issue numbers, and confirmed that the apparent causes of the nonconformance were identified. The inspectors confirmed that the ACA and LCA identified lack of specific guidance in the CDI necessary to confirm adequate acceptance criteria and technical requirements including, but not limited to, M&TE accuracy, range, and uncertainty. The inspectors reviewed and confirmed the CDIs were adequately revised to incorporate the requirements to verify necessary technical requirements including the current accreditation and covered scope of supply, as well as necessary technical requirements for each M&TE. In addition the CDIs were revised to incorporate additional guidance to verify the supplier maintains adequate oversight of sub-contacted services to ensure PO requirements are maintained throughout the supply chain.

The inspectors reviewed a sample of the CoC's for the M&TE used for the project and confirmed that the technical requirements including: accuracies, tolerances, and ranges were documented on the CoCs and that WEC had adequately reviewed, verified, and documented those technical requirements as part of the CA activities.

The inspectors also reviewed the commercial grade survey conducted by WEC of Keystone Laboratory using the revised CDI and confirmed that the revised acceptance criteria and technical requirements were adequately reviewed and documented in the survey report.

As part of the extent of condition review, WEC identified additional M&TE used for testing of other non-PMS safety system components by both Keystone and Washington Labs. Three additional CAPALS were issued to document those items and the corrective actions planned for resolution. Those CAPALS will remain open until all of the evaluations are completed. The evaluation shall confirm that all M&TE used for other non-PMS safety system component testing met the acceptance criteria and associated technical requirements.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and corrective actions of associated with previous NRC-identified NONs satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XVI, "Corrective Actions," of Appendix B to 10 CFR Part 50. The inspectors verified that WEC had adequately implemented corrective actions to address the findings associated with NON 99900404/2015-204-03, and this NON is, therefore, closed.

5. Entrance and Exit Meetings

On July 18, 2016, the inspectors presented the inspection scope during an entrance meeting with Mr. Jan Dudiak, Director, Automation and Field Services, of WEC, and other WEC personnel. On July 22, 2016, the inspectors presented the inspection results during an exit meeting with Mr. Jan Dudiak, Director, Automation and Field Services, and other WEC personnel.

## ATTACHMENT

### 1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

<b>Name</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
Jan Dudiak	WEC	X	X	
Stephen Packard	WEC	X	X	
Dale Harmon	WEC	X		
Gregory Glenn	WEC	X	X	X
Sarah DiTomasso	WEC	X	X	X
Bob Hirmanpour	SNC	X	X	X
Pietro Porco	WEC	X	X	X
Suresh Channarasappa	WEC	X	X	X
Ron Wessel	WEC	X	X	X
Roger Costantino	WEC			X
Brian Domitrovich	WEC			X
Darryl Muetzel	WEC	X	X	X
Craig Watson	WEC	X	X	
Randolph Copeland	SCE&G	X	X	X
Ken Lunz	WEC	X		
John Wiessmann	WEC	X	X	
Greg Cesare	WEC	X	X	
Jerry Money	SCE&G	X		X
Stanley Cheyne	WEC	X	X	X
Louis Jesso	WEC	X	X	X
Rob Lane	WEC		X	
Matt Shakun	WEC		X	
Robin Nydes	WEC		X	
Mark Stofko	WEC	X		
Kasey Corbin	WEC			X
Jason Zielinski	WEC			X
David Tyler	WEC			X
Mike Vallarta	WEC			X
Ed Schindheim	WEC			X
Dave Malarik	WEC			X
Tom McLaughlin	WEC			X
Jim Rozum	WEC			X
Greg Galletti	NRC	X	X	
Lisa Castelli	NRC	X	X	
William Roggenbrodt	NRC	X	X	

2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013

IP 60001.22, "Inspection of Digital Instrumentation and Control (DI&C) System/Software Design Acceptance Criteria (DAC)-Related ITAAC," dated December 19, 2011

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED:

<b>Item Number</b>	<b>Status</b>	<b>Type</b>	<b>Description</b>	<b>Applicable ITAAC</b>
99900404/2015-204-02	closed	NON	Criterion III	2.5.02.03
99900404/2015-204-03	closed	NON	Criterion III	2.5.02.03

4. INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA:

The U.S. NRC inspectors identified the following ITAAC related to components being designed, manufactured, and tested at WEC. For the ITAAC listed below, the inspectors reviewed WEC's QA controls in the areas of design control, test control, inspection, nonconforming materials parts and components, and corrective actions. The ITAAC design commitments referenced below are for future use by the NRC staff during the ITAAC closure process; the listing of these ITAAC design commitments does not constitute that they have been met and/or closed.

This section of the inspection report focuses on the vendor's implementation of aspects of their QA program for the activities affecting quality associated with the design and testing of the aspects of the AP1000 PMS. This included a review of completed Generic AP1000 Baseline (BL) 8.0 PMS software and hardware design and testing documentation and review of corrective actions associated with previous NRC-identified NONs. These activities are associated with ITAAC 2.5.02.03 and 2.5.02.11c.

INDEX#	SECTION#	Design Commitment	Component/Activity
525	2.5.02.03	The Class 1E equipment identified in Table 2.5.2-1, has electrical surge withstand capability (SWC), and can withstand the electromagnetic interference (EMI), radio frequency interference (RFI), and electrostatic discharge (ESD) conditions that would exist before, during, and following a design basis accident without loss of function for the time required to perform the safety function.	Summer 2&3, Vogtle 3&4 – Reviewed the corrective actions associated with NONs 99900404/2015204-02, 03 including cabinet EMC test report results, revised EMC evaluations and qualification summary reports, CGD instructions, test procedures, M&TE CoCs, and CG surveys.
550	2.5.02.11	The PMS hardware and software is developed using a planned design process which provides for specific design documentation and reviews during the following life cycle stages: (subtask [c] hardware and software development phase, consisting of hardware and software design and implementation)	Summer 2&3, Vogtle 3&4 – Reviewed CIM/AIO Engineering Evaluation; PMS Maximum CPU Engineering Analysis, PMS Cabinet Design Change Seismic Evaluation, and Equipment Qualification summary and test reports.

5. DOCUMENTS REVIEWED:

CIM/AOI

APP-ISIP-T1-422, “AP1000 Function Integration Test Specification,” Revision 0, dated October 2015

APP-ISIP-T1P-422, “AP1000 CIM/AOI Function Integration Test Procedure,” Revision 0, dated November 2015

APP-ISIP-T2R-422, “AP1000 Function Integration Test Report,” Revision 0, dated March 2016

Drawing APP-PMS-J0-002, AP1000 PMS Architecture Division A,” Revision 7, dated October 21, 2015

RITS 49832, “Discrepancy between Division B and D PMS Logic (valve SGS-V040A),” dated December 20, 2015

RITS 45447, “HSL Data Stream Quality,” dated May 21, 2015, closed

CAPAL 100301483, “Non-MOV-Configured CIM Response to Opening CIN3, CIN4 Inputs,” dated May 19, 2015



### CPU Maximum Load

APP-PMS-GER-004, "AP1000 Protection and Safety Monitoring System AC160 Application CPU Load/Performance Analysis," Revision 1, dated January 8, 2016

WNA-AR-00438-GEN, AC160, "Load and Performance Analysis," Revision 1, dated June 1, 2014

### Seismic Evaluation

APP-PMS-VBR-003 (EQ-QR-205-APP), "Equipment Qualification Summary Report for PMS Cabinets and NIS Auxiliary Panels for Use in the AP1000 Plant," Revision 5, dated January 8, 2016

APP-PMS-VPC-001, "The Weight Zone Similarity Evaluation for Seismic Qualification of PMS Cabinets for AP1000 Nuclear Plants," Revision 1, dated May 15, 2014

Calculation Note Number CN-EQT-12-28 / APP-PMS-VPC-001

Design Change Proposal (DCP) APP-GW-GEE-473, "Main Control Room Habitability System (VES) Changes to Satisfy Post-Accident Performance Requirements."

### Notice of Nonconformance/Corrective Action Review

APP-PMS-VYP-008, "Environmental and EMC Evaluation of Design Changes Baseline 7.8 and Baseline 8.2 and their Effect on AP1000 PMS Equipment qualification Basis," Revision 0, dated July 31, 2015

APP-PMS-VBR-003, "Equipment qualification Summary Report for PMS Cabinets and NIS Auxiliary Panels for Use in the AP1000 Plant," Revision 5, dated March 31, 2016

APP-PMS-VPR-003, "AP1000 Plant Protection and Safety Monitoring System Electromagnetic Compatibility Qualification Report," Revision 2, dated March 31, 2016

APP-PMS-VYP-009, "Pentair Shielding Effectiveness Evaluation for the Plant Protection and Safety Monitoring System," Revision 0, dated January 30, 2016

EQ-QR-126, "Qualification Summary Report for Standard Pentair Seismic Cabinet," Revision 1, dated June 2015

EQ-TP-138, "Electromagnetic Compatibility Test Plan and Procedure for Cabinet Shielding Effectiveness Evaluations," Revision 1, dated June 2011

Qualification Summary Report for Standard Pentair Seismic Cabinet," Revision 1, dated June 2015

EQ-EV-75-GEN, "Alternate Cabinet Shielding Effectiveness Acceptance Criteria Development," Revision 1, dated April 2015

Qualification Summary Report for Standard Pentair Seismic Cabinet," Revision 1, dated June 2015

Keystone Compliance Report No. 101229EC, "Cabinet Shielding Effectiveness Evaluations," Revision C, dated May 5, 2015

Commercial Dedication Instruction – CDI-4064, "Keystone Compliance LLC – EMC and Product Safety Test Service," Revision 05, dated October 16, 2014

Commercial Dedication Instruction – CDI-4064, "Keystone Compliance LLC – EMC and Product Safety Test Service," Revision 06, dated August 25, 2015

Commercial Dedication Instruction – CDI-3865, "Washington Laboratory, Limited. – EMC and Product Safety Test Service," Revision 05, dated October 16, 2014

Commercial Dedication Instruction – CDI-3865, "Washington Laboratory, Limited. – EMC and Product Safety Test Service," Revision 06, dated March 29, 2016

Westinghouse Letter LTR-EQ-16-69, "EMC Testing – Verification of Washington Laboratory LLC Calibration Services Providers Certificate of Calibration," dated July 16, 2016

Westinghouse Letter – LTR-EQ-16-63, "EMC Testing – Verification of Keystone Compliance Calibration Services Providers Certificate of Calibration," dated July 17, 2016

WES-2015-081-R, "Supplier Commercial Grade Survey Report," dated October 5, 2015

WES-2015-081-C, "Supplier Commercial Grade Survey (Satisfactory Closure of SCAR)," dated October 5, 2015

#### Calibration Records

Tektronix CoC #6080656 – Microwave Spectrum Analyzer dated April 2012

Tektronix CoC #4886021 – Power Sensor dated February 2011

Liberty Labs CoC #2011020817 – Antenna DRG 1-18GHz, dated February 2011

Liberty Labs CoC #2012041929 – EMCO Antenna, dated February 2011

Cal Tee Labs CoC #231141 – Fluke Meter, dated April 2012

Techmaster Electronics CoC #372892 ESD Simulator, dated August 2012

Keystone Compliance CoC #EG024 – Pre-Amplifier, dated January 2013

## 6. ACRONYMS:

ACA	Apparent Cause Analysis
AOI	Advent/Ovation Interface
BL	Baseline
CA	Corrective Action
CAPAL	Corrective Action Program and Learning system
CDI	commercial grade dedication instruction
CFR	<i>Code of Federal Regulations</i>
CIM	Component Interface Module
CoC	Certificate of Calibration
CPU	central processing unit
DAC	design acceptance criteria
DCD	Design Control Document
DCIP	Division of Construction Inspection and Operational Programs
DCIS	Distributed Control and Information System
DI&C	digital instrumentation and control
E&DCR	Engineering & Design Change Report
EMC	electromagnetic compatibility
EMI	electromagnetic interference
ESD	electrostatic discharge
EQ	equipment qualification
QVIB	Quality Vendor Inspection Branch
I&C	instrumentation and control
IP	inspection procedure
ITAAC	Inspections, tests, analyses, and acceptance criteria
M&TE	measuring and test equipment
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PMS	Protection and Safety Monitoring System
PO	Purchase Orders
QA	quality assurance
RFI	radio frequency interference
RITS	Repair Replacement and Automation Services Issue Tracking System
RRAS	Repair Replacement and Automation Service
SIOS	standard input/output simulator
SCE&G	South Carolina Electric and Gas Company
SNC	Southern Nuclear Company
U.S.	United States (of America)
WEC	Westinghouse Electric Company