May 12, 2017

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. 99900404/2015-209

Dear Ms. DiTommaso:

From June 21-23, 2016, July 18-22, 2016, August 30, 2016, September 7-9, 2016, October 11-14, 2016, January 9-13, 2017, and February 6-9, 2017, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Westinghouse Electric Company (WEC) facilities in New Stanton, PA, and Warrendale, PA, and at KEMA Labs, Chalfonte, PA. The purpose of this 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) 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 a previous NRC-identified nonconformance associated with the PMS, observed on-going system integration testing for the PMS, and reviewed the vendors plans and procedures associated with cyber security. 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 ITAAC Section Numbers 2.5.02.07a, 2.5.02.07d, 2.5.02.07e, 2.6.03.04b, and 2.5.02.11.

The NRC inspectors reviewed implementation of CAs associated with a finding that are material to the acceptance criteria of the ITAAC, and determined that those actions were sufficient to close that finding. The CAs were specific to ITAAC 2.5.02.07a and ITAAC 2.5.02.07e and identified that WEC had failed to adequately evaluate and test isolation barriers between the PMS and non-safety (NSR) related systems to ensure those NSR systems could not negatively impact the functions of the PMS.

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. While no response is required to this report, should you choose to provide one, 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 Jeffrey Jacobson Acting for/

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. 99900404/2015-209
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE ELECTRIC COMPANY REPORT NO. 99900404/2015-209
Dated: May 12, 2017

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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.:	99900404/2015-209
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 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 related Diverse Actuation System instrumentation and control products to the current US AP1000 plants under construction.
Inspection Dates:	June 21-23, 2016; July 18-22, 2016; August 30, 2016; September 7-9, 2016; October 11-14, 2016; January 9-13, 2017; and February 6-9, 2017
Inspection Team Leader:	Greg Galletti, NRO/DCIP/QVIB-1
Inspectors:	Lisa Castelli R-II/DCO/IB2 Robert Mathis III R-II/DCO/IB2 Phil Natividad NRO/DCIP/QVIB-1 William Roggenbrodt NRO/DEIA/ICE Calvin Cheung R-II/DCO/IB2 Stacy Smith NRO/DCIP/QVIB-1 Michael Brown NSIR/DPCP/CSB Kim Jenkins-Lawson NSIR/DPCP/CSB
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
99900404/2015-209

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 facilities in Warrendale and New Stanton, Pennsylvania, and at the KEMA Laboratories in Chalfonte, Pennsylvania from June 21-23, 2016; July 18-22, 2016; August 30, 2016; September 7-9, 2016; October 11-14, 2016; January 9-13, 2017; and February 6-9, 2017.

This inspection evaluated aspects of WEC's programs for the design, implementation, and testing of the Protection and Safety Monitoring System (PMS) 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, and observed on-going system integration testing for the PMS. 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 ITAAC 2.5.02.07a, 2.5.02.07d, 2.5.02.07e, 2.6.03.04b, 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.

PMS Corrective Action Program Implementation Review – Plant Control System (PLS) to PMS Isolation Review (NON 99900404/2015-204-01) (ITAAC 2.5.02.07a and 2.5.02.07e)

With respect to the previously identified non-conformance, 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 2.5.02.07a and 2.5.02.07e, that identified where WEC failed to determine the maximum current transients in the non-Class 1E side of PMS isolation devices, and failed to

demonstrate by qualification test that the maximum levels and duration of credible currents at the isolation devices (as specified by IEEE 384-1981, Section 7.2.2.1 “Isolation Devices” subsection “General”) would not degrade the operation of the Class 1E side of the device.

Additionally, the inspectors reviewed the isolation barrier test result report APP-PMS-VBR-015 and associated test result reports: APP-PMS-VPR-002, APP-PMS-VPR-018, and APP-PMS-VPR-019, and determined the results were consistent with the inspector’s observations of in-process testing and provided sufficient rationale to conclude that the results for the various isolation barriers was acceptable. Therefore, NON 99900404/2015-204-01 is considered closed.

Component Interface Module (CIM) Priority Logic Testing (ITAAC 2.5.02.07d)

The inspectors observed CIM priority logic dry-run testing of the PMS in the priority logic configuration, reviewed the CIM priority logic engineering evaluation, and observed portions of the actual PMS priority logic testing activities during the inspection period.

The inspectors concluded that WEC‘s implementation of their policy and procedures for control of design and testing associated with the CIM priority logic testing 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 and Test Control (ITAAC 2.5.02.11)

During the February 6-9, 2017, inspection period, the inspectors reviewed the engineering evaluations developed by the vendor in support of ITAAC 2.5.02.11c; reviewed the test plans and procedures developed for the Maximum CPU PMS time response testing; and observed a portion of the PMS Time Response System Integration Testing conducted on the V.C. Summer Unit 3 PMS system, to verify that testing activities were accomplished consistent with regulatory requirements, the current design basis, and in accordance with the WEC quality assurance program.

Based on the inspection of the PMS Maximum CPU design engineering analysis, that was partially performed using the China-Sanmen software (Baseline 7.11.5), the team concluded that further inspection activity may be required to confirm that the final production level software used for the Maximum CPU Analysis is identical to the software utilized on the U.S. domestic AP1000 PMS.

In addition, the inspectors concluded that the vendor‘s implementation of their policy and procedures for control of design and testing of associated with the PMS time Response testing satisfy the regulatory requirements Criterion XI, “Test Control,” of Appendix B to 10 CFR Part 50. No findings of significance were identified.

PMS On-Going System Integration Testing Review (ITAAC 2.5.02.11)

During the July 18-22, 2016, inspection period, the inspection team reviewed the test procedure and associated test logs used for a Level 2 test of the Engineered Safety Features Actuation System (ESFAS) associated with the local coincident logic (LCL) modules. The inspectors reviewed the test configuration and noted a minor issue regarding testing leads connected to the PMS that were not adequately documented in test procedures or the test log. The vendor

issued CAPAL 100398086 to document and evaluate the apparent lack of configuration information. The inspectors did not identify any additional examples of configuration management concerns regarding PMS testing, and will consider reviewing the results of the CAPAL evaluation during a future PMS inspection. No findings of significance were identified.

PMS Test Control – Automated Record Gatherer and Operator Simulator (ARGOS) Test Tool Development (ITAAC 2.5.02.11)

During the February 6-9, 2017, inspection period, the inspectors' evaluated compliance of the ARGOS tool to regulatory requirements by the independent verification and validation (IVV) tasks performed by the IVV team for the ARGOS software and configuration management records.

The inspectors determined that the activities related to development of the ARGOS tool had been adequately performed. The inspector's determined that WEC'S implementation of its policies and procedures that govern IV&V software tool development were consistent with the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Cyber Security Program Review – Procedural Development

During the February 6-9, 2017, inspection period, the inspectors reviewed the purchase orders issued to WEC by Southern Nuclear Operating Company (Southern) and SCE&G for work associated with 10 CFR 73.54, "Protection of digital computer and communication systems and networks." The inspectors reviewed Westinghouse's (WEC's) governing documents that had been approved for use to determine if the documents and organization met the requirements of the Cyber Security Plans of Vogtle Units 3 and 4 and Summer Units 2 and 3. The inspectors also reviewed the WEC procedures developed to guide the WEC Staff with performing cyber security related activities. The NRC concluded that WEC's implementation of cyber security-related items are an unresolved item pending review of purchase order documents.

REPORT DETAILS

1. PMS Corrective Action Program Implementation Review – PLS to PMS Isolation Review (NON 99900404/2015-204-01) (ITAAC 2.5.02.07a and 2.5.02.07e)

   Background

   In NRC Inspection Report 99900404/2015204 (ADAMS Accession No. ML15113B277), the NRC inspection team documented that WEC failed to determine the maximum potential current transients in the non-Class 1E side of PMS isolation devices, and failed to demonstrate by qualification test that the maximum levels and duration of credible currents transients at the isolation devices (as specified by IEEE 384-1981, Section 7.2.2.1 "Isolation Devices" subsection "General") would not degrade the operation of the Class 1E side of the device.

   This issue was identified as Notice of Nonconformance (NON) 99900404/2015-204-01.

   By letter dated June 10, 2015 (ML15163A020), WEC provided a response to that NON. In their response WEC acknowledged the NON finding, performed an initial apparent cause analysis (ACA), and identified corrective action plans. Corrective Action Program and Learning (CAPAL) 100170963 also documents WEC's actions to hold a Technical Engineering Team Review (TETR) during June 2015. The specific corrective actions in the WEC NON response are evaluated below.

   a. Inspection Scope

      During the October 11-14, 2016, and the January 9-13, 2017, inspection periods, NRC inspectors reviewed the WEC ACA, as well as documentation of additional testing and the corrective actions planned in CAPALs 100170963 and 100421435. WEC's corrective actions included:

      - Establishing a standardized methodology for isolation barrier fault testing in accordance with IEEE Std. 384-1981 considering the guidance related to low voltage fuses given in IEEE Std. 141-1993.
      - Defining the maximum credible fault currents for each AP1000 PMS isolation barrier circuit.
      - Performing further testing to provide objective evidence of the AP1000 PMS isolation barrier capability with regard to the maximum credible fault current.
      - Revising the Fault Testing Report for AP1000 Isolation Barriers incorporating the objective evidence of the AP1000 PMS isolation barrier capability with regard to the maximum credible fault current.

      Regarding the corrective actions for "establishing a standardized methodology" and "defining the maximum credible fault currents", the inspection team interviewed design personnel and reviewed documentation associated with the prescribed corrective actions. The inspectors reviewed APP-GW-GE-005, "AP1000 Standard Methodology for Fault Testing of Instrumentation and Controls Isolation Barriers," Revision 0, dated June 2016 to determine the adequacy of the established standardized methodology for isolation barrier fault testing and to ensure that the maximum credible fault current was determined for each AP1000 PMS isolation barrier in accordance with the applicable

guidance in IEEE Std. 384-1981 and IEEE Std. 141-1993. The inspectors noted that APP-GW-GE-005 identified three credible fault modes for which corresponding testing would be required. These fault modes were identified as common mode, transverse mode, and short-circuit/open-circuit/ground-circuit.

The inspection team reviewed APP-PMS-T5-006, "AP1000 Protection and Safety Monitoring System Isolation Barrier IEEE Standard 384-1981 Fault Test Plan," Revision 1, dated June 2016 to determine whether the test plan included requirements from APP-GW-GE-005 and APP-PMS-J4-020 and to verify whether the test plan prescribed testing that would demonstrate the isolation barriers' ability to sustain/interrupt the analyzed faults. The inspectors also verified the test plan included acceptance criteria and addressing test anomalies. The inspectors noted that test procedures for each credible fault mode were referenced in the test plan.

Regarding the corrective action for "performing further testing," the inspection team interviewed test personnel and reviewed test reports for the transverse mode fault testing (performed by WEC at KEMA Labs in June 2016) and the short-circuit/open-circuit/ground-circuit testing (performed at WEC New Stanton facilities in August and September 2016) to ensure testing was conducted in accordance with test procedures, the acceptance criteria was met, and identified test anomalies were analyzed and dispositioned appropriately. Specifically, the inspectors reviewed APP-PMS-VPR-018, "AP1000 PMS Isolation Barrier Maximum Credible Fault Test Report," Revision 0, dated August 2016 and APP-PMS-VPR-019, "AP1000 PMS Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Report," Revision 0, dated September 2016 and Revision 1, dated October 2016. The corresponding test procedures reviewed included APP-PMS-T1P-038, "AP1000 Protection and Safety Monitoring System Isolation Barrier Maximum Credible Fault Test Procedure," Revision 1, dated June 2016 and APP-PMS-T1P-039, "AP1000 Protection and Safety Monitoring System Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Procedure," Revision 0, dated April 2016, respectively. Inspectors noted that WEC initiated a new CAPAL 100421435 on October 13, 2016, to address a potential non-conservatism in testing two rather than three distinct grounding configurations during the performance of the August and September 2016 ground-circuit testing; then re-performed that testing to correctly include all three grounding configurations, during October 20-21, 2016.

The inspectors reviewed CDI-4784, "Current Limiting Fuses for use in Class 1E to Non-Class1E Isolation Barriers," Revision 3, dated September 15, 2016 and noted that the current Revision updated the critical characteristics for fuses used in isolation barrier assemblies. The inspectors also noted that fuses currently installed in isolation barrier assemblies would have to be replaced with fuses that are dedicated with the current Revision of CDI-4784. The inspection team reviewed quality notifications and engineering change orders that governed follow on fuse replacement rework for isolation barrier assemblies to ensure that requirements to replace fuses were planned and/or implemented in accordance with identified corrective actions.

Regarding the corrective action for "revising the fault testing report," NRC inspectors reviewed the summary report APP-PMS-VBR-015, "AP1000 Protection and Safety Monitoring System Isolation Summary Report for Use in the AP1000 Plant." Inspectors noted that some of the technical bases for conclusions were initially found spread between both the summary report APP-PMS-VBR-015 and the individual mode test

reports APP-PMS-VPR-018 and APP-PMS-VPR-019 prior to Revision 1 of VBR-015, Revision 1 of VPR-018, and Revision 1 of VPR-019.

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 associated with previous NRC-identified NON satisfied 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 99900404/2015-204-01, and this NON is, therefore, closed.

2. PMS Fault Tolerance In-Process Testing Inspection (ITAAC 2.5.02.07a and 2.5.02.07e)

a. Inspection Scope

During the June 21-23, 2016, and August 30, 2016 inspection period, the inspectors conducted direct observations at KEMA Laboratories in Chalfont, PA, of fault testing of protection and safety monitoring system (PMS) isolation barrier devices listed below. WEC used test procedure APP-PMS-T1P-038, in accordance with test methodology APP-GW-GE-005, Section 3.4, and APP-PMS-T1P-038, Section 3.1 WEC indicated that this testing combined with additional testing performed under APP-PMS-T1P-039 (New Stanton) would provide new test data to revise or supersede the prior PMS isolation testing as previously described in Summary Report APP-PMS-VPR-002, Revision 2. The revised test data report is APP-PMS-VPR-018, Revision 0 and provides objective evidence of isolating maximum credible fault current.

The June 21-23, 2016, and August 30, 2016, observations of test activities were performed to verify that testing was conducted in accordance with WEC procedures APP-PMS-T1P-038 and APP-PMS-T1P-039, AP1000 Protection and Safety Monitoring System Isolation Barrier Maximum Credible Fault Test Procedures. A review of the procedure was performed to verify it included test objectives, test requirements, applicable prerequisites, and acceptance criteria. The review also determined whether it incorporated the requirements of the WEC Test Plan, the WEC standard methodology for testing of isolation barriers, committed industry standards, and applicable regulatory requirements.

The inspectors also verified that test results were documented and that test records identified the item tested, date of test, tester or data recorder, type of observation, instruments used and the validity of their calibration, and results and acceptability. In addition, the inspectors observed the oversight of testing as performed by WEC to determine whether the level of oversight was sufficient to assure test requirements were satisfactorily implemented.

The activities were evaluated to determine whether testing was sufficient to demonstrate that the maximum analyzed electrical faults which could occur on the non-Class 1E circuits would not propagate into the Class 1E circuits. The inspection team reviewed testing associated with the following components:

- Component Control Barrier Assembly (2B10299G01)
- Digital Input Barrier Assembly (2B10299G03)
- Current/current Analog Output Assembly (2B10299G05)
- Voltage/current Analog Output Assembly (2B10299G07)
- Digital Output Assembly (2B10299G08)
- Turbine Trip Barrier Assembly (2B10376G02)

The NRC inspection team also reviewed Commercial Dedication Instruction CDI-4815 and Purchase Order 4500696137. The purchase order included appropriate requirements to verify KEMA's accreditation per ISO-17025 in accordance with NEI 14-05 (ML14245A392). WEC's commercial-grade dedication per CDI-4815 specified WEC as responsible for Method 1 (Special Inspection and Test) for performance of testing, and using Alternate Method (ISO-17025) accreditation for KEMA's facilities and measurement and test equipment.

As accredited by A2LA, the scope of KEMA accreditation Certificate 0553.01 included "AC & DC Short Circuit Withstand" up to at least 240 kA (i.e., 240,000 amperes). The certificate was reviewed to verify the scope of accreditation included testing of components for AC and DC electrical short circuit withstand. NRC inspectors observed KEMA activities on June 22, 2016, including calibration of the associated test equipment at levels up to 20kA, as well as lower currents observed during the actual fault testing. The testing approach per APP-PMS-T1P-038 and APP-PMS-T1P-039 was to provide fault current to the non-1E side of each PMS isolation barrier equipment under test (EUT), and verify sufficient isolation on the 1E side of the barrier.

During the subsequent inspection periods from October 11-14, 2016, and January 9-13, 2017, the inspectors reviewed the isolation barrier test result report APP-PMS-VBR-015 and associated test result reports: APP-PMS-VPR-002, APP-PMS-VPR-018, and APP-PMS-VPR-019, for the isolation barrier assemblies identified above, and determined the results were consistent with the inspection observations and provided sufficient rationale to conclude that the results for the various isolation barriers was acceptable.

b. Observations and Findings

No deviations from acceptance criteria were identified during the fault tests. No findings of significance were identified.

c. Conclusion

The inspectors concluded that the in-process testing performed at KEMA labs was being controlled and implemented consistent with regulatory requirements. No findings of significance were identified.

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing associated with fault testing 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.

3. Class 1E DC and Uninterruptible Power Supply System (IDS) Fault Tolerance (ITAAC 2.6.03.04b)

   a. Inspection Scope

      During the September 6-9, 2016, inspection period, the inspectors conducted direct observations at KEMA laboratories in Chalfont, PA, of fault testing of IDS isolation barrier devices listed below. This testing was conducted as a result of the extent of condition as specified in the corrective actions associated with NON 99900404/2015-204-01 (ML15113B277).

      The observations of test activities were performed to verify that testing was conducted in accordance with WEC procedure EMPE-ATP-43, "Isolation Barrier Maximum Credible Fault Test Procedure." A review of the procedure was performed to verify it included test objectives, test requirements, applicable prerequisites, and acceptance criteria. The review also determined whether it incorporated the requirements of the WEC Test Plan, the WEC standard methodology for testing of isolation barriers, committed industry standards, and applicable regulatory requirements.

      The inspectors also verified that test data was documented and that test data records identified the item tested, date of test, tester or data recorder, type of observation, instruments used and the validity of their calibration, and results and acceptability. In addition, the inspectors observed the oversight of testing as performed by WEC to determine whether the level of oversight was sufficient to assure test requirements were satisfactorily implemented.

      The inspectors observed testing activities to determine whether testing was sufficient to demonstrate that the maximum analyzed electrical faults which could occur on the non-Class 1E circuits would not propagate into the Class 1E circuits. The testing activities reviewed included test setup, test equipment capability, calibration tags, testing prerequisites, and initial conditions. The test procedure detailed instructions for the alternating current voltage (VAC) and direct current (DC) faults subjected to fault isolation circuits including the following:

      - Relay-Fuse Isolation Circuit (10149D53G01)
      - Current Transducer Isolation Circuit (10149D53G02)
      - Double Fuse Isolation Circuit (10149D53G08, 10149D53G17)
      - Undervoltage Relay-Fuse Isolation Circuit (10149D53G04)
      - Shunt Isolation Circuit (10149D53G22)
      - Fused Relay Isolation Circuit (10149D53G28)

The NRC inspection team also reviewed calibration records for the following equipment used for data capture to assure integrity of test data.

- Calibration Certificate Number IS71-0716, HBM Inc. Receiver ISOBE5600, IES0800138
- Calibration Certificate Number IS69-0716, HBM Inc. Transmitter ISOBE5600, IET0800137
- Calibration Certificate Number CTX168-0416, Pearson pulse current transformer Model 110, Serial Number 111060
- Calibration Certificate Number CTX152-0516, Flexible current transformer Model ACF-3000AK, Serial Number 9050005
- Calibration Certificate Number CAL45-1215, Biddle kelvin bridge Model 72-439, Serial Number 47592
- Calibration Certificate Number CAL106-1115, Fluke multifunction calibrator model 9100, Serial Number 124360761

During the subsequent inspection periods from October 11-14, 2016, and January 9-13, 2017, the inspectors reviewed the isolation barrier test result report APP-PMS-VBR-015 and associated test result reports: APP-PMS-VPR-002, APP-PMS-VPR-018, and APP-PMS-VPR-019, and determined the results were consistent with the inspection observations and provided sufficient rationale to conclude that the results for the various isolation barriers was acceptable.

b. Observations and Findings

No deviations from acceptance criteria were identified during the fault tests. No findings of significance were identified.

c. Conclusion

The inspectors concluded that the in-process testing performed at KEMA labs was being controlled and implemented consistent with regulatory requirements. No findings of significance were identified.

The inspectors concluded that WEC's implementation of their policy and procedures for control of design and testing associated with fault testing 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.

4. Component Interface Module (CIM) Priority Logic Testing (ITAAC 2.5.02.07d)

a. Inspection Scope

Dry-Run Testing

During the October 11-14, 2016, inspection period, the NRC inspectors observed dry run testing of the AP1000 CIM used in the PMS priority logic test conducted by WEC test engineers. The NRC inspectors observed test conduct, including test personnel communication and interaction during the simulated test runs.

Test Equipment Setup

During the October 11-14, 2016, and January 9-13, 2017, inspection periods, the inspectors reviewed APP-PMS-T1D-037, "Protection and Safety Monitoring System (PMS) to PLS Hardware Interface Channel Integration Test Data Sheets," Appendix B, Revision 5, that describes how to install the Advent/Ovation Interface bus communication simulator (suitcase) interface tool. The PLS suitcase, along with the laptop that serves as the user interface, acts as the Ovation simulator during the testing of the PLS to the PMS interface when PLS signals are required to provide control signals to the CIM.

The inspectors noted that the Standard Input/Output Simulator (SIOS) tool was also used to provide plant data to the PMS and the ARGOS test tool was used to validate the data display outputs based upon display indication and validation.

System Testing

During the January 9-13, 2017, inspection period, the inspectors interviewed WEC personnel and observed in-process type testing in support of ITAAC 537 (2.5.2.7.d). The testing was being conducted to verify the automatic safety function and the Class 1E manual controls both have priority over the non-Class 1E software-based controls. The testing was performed to evaluate the CIM priority firmware logic in an integrated system configuration. The testing was conducted on VC Summer Unit 3 software baseline 8.2.1 and hardware baseline 8.2.3. The inspectors interviewed the responsible test engineers and reviewed the test procedure, APP-PMS-TIP-080, "Protection and Safety Monitoring System, System Integration Test CIM Priority Test Procedure," Revision 0, January 2017.

The inspectors reviewed the test requirements to verify the test requirements and specifications were based on design/technical documents and established a baseline set of requirements that had been formally reviewed. The inspectors noted that the testing was conducted by the IVV test organization in accordance with PMS Test Plan, APP-PMS-T5-001, "AP1000 Protection and Safety Monitoring System Test Plan." The inspector's also reviewed a portion of CIM priority logic specification with the vendor's staff to confirm the test case adequately executed the CIM priority logic.

The inspectors reviewed the test prerequisites and verified the test configuration record (TCR) was completed, archived and defined the hardware and software configurations. In addition, the inspector's verified additional test wiring identified on the TCR had been installed. The inspectors reviewed the documentation for the software loading and software loading validation records to verify they were in accordance with the TCR.

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 associated with the CIM priority logic testing 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.

5. PMS Maximum CPU Engineering Evaluation and Test Control (ITAAC 2.5.02.11)

a. Inspection Scope

PMS Load/Performance Engineering Analysis (ITAAC 2.5.02.11)

During the February 6-9, 2017, inspection period, the inspectors reviewed APP-PMS-GER-004, “AP1000 Protection and Safety Monitoring System AC160 Application CPU Load/Performance Analysis,” Revision 1, dated May 2016, and Revision 2, dated January 2017, that provided an evaluation of the performance of the PMS system under maximum load conditions. The analysis focused on the AC160 microprocessors and Common Q platform portion of the PMS system that performs bistable logic, reactor trip, fan out relay, and test functions.

The inspectors noted that Revision 2 of APP-PMS-GER-004 specified use of the China Sanmen software configuration rather than the U.S. domestic software which had been used in earlier versions of the analysis. The inspectors questioned whether the Sanmen version was identical to the application software utilized in the U.S. domestic AP1000 PMS. In response, WEC personnel noted that Corrective Action Prevention and Learning (CAPAL) document 100015670 was created as an outcome of the software hazards analysis (SHA) for the U.S. domestic AP1000 PMS to ensure that the Sanmen software (Baseline 7.11.5) used in Revision 2 of APP-PMS-GER-004 was nearly identical to the current U.S. domestic software (Baseline 8.4). Further inspection activity may be required to review the results of the CAPAL implementation to confirm that the final production level software used for the Maximum CPU Analysis is identical to the software utilized on the U.S. domestic AP1000 PMS.

PMS Time Response Test Procedure Review (ITAAC 2.5.02.11)

During the February 6-9, 2017, inspection period, the inspection team conducted interviews and reviewed documentation for the PMS time response testing to verify that testing activities were accomplished consistent with regulatory requirements, the current design basis, and in accordance with the WEC quality assurance program. Specifically, the inspection team reviewed APP-PMS-T1P-012, “AP1000 PMS System Integration Test for Time Response Test Procedure” to verify that the test procedure and referenced documentation contained detailed information for the test scope, test setup, input data requirements, and output data expectations. The inspection team noted that the scope of this testing addresses the rack time response, from the point where a signal connects to a PMS rack input to the point where a signal is transmitted from the PMS to another plant system or device.

The inspection team reviewed APP-PMS-J4-020, “AP1000 System Design Specification for the Protection and Safety Monitoring System” and APP-PMS-J1-001, “AP1000 Protection and Safety Monitoring System Functional Requirements” to verify that design specifications and functional requirements relating to time response were addressed in corresponding test cases. The test cases were reviewed to determine if design requirements were either fully or partially addressed with the PMS time response testing procedure. For those requirements that were partially addressed, the inspectors verified

that measures were in place to ensure that those requirements would be fully addressed with additional testing. The inspection team also reviewed WNA-CN-00162-WAPP, "AP1000 Protection and Safety Monitoring System Time Response Calculations" to ensure that time response testing acceptance criteria was established in accordance with requirements imposed on the PMS for the calculated response times for reactor trips, engineered safety features (ESF) actuations, and manual actuations, and taking into account propagation delay of input/output (I/O) cards, communications, and worst-case cycle times.

PMS Time Response Test Performance (ITAAC 2.5.02.11)

The inspectors observed on-going PMS time response testing during the week of February 6-9, 2017. For the on-going testing the PMS was in normal operating status, connected to SIOS, and initial plant conditions at 100 percent rated thermal power. The inspectors observed testing in progress for the automatic reactor trip function for over temperature/delta temperature on channels A and D.

The inspectors reviewed test equipment logs for the three SIOS cabinets in use, the PLS suitcase, and the nuclear instrumentation (NI) signal generators and verified that the equipment was adequately identified and within defined calibration cycles. The inspectors also verified that environmental logs (i.e., temperature and humidity) were appropriately documented.

The inspectors observed the test technicians performing a series of test steps in accordance with the test procedure and verified the technicians were observing and recording relevant test data in the test logs. Communication and coordination between the test technicians was adequate and no anomalies were identified.

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 associated with the PMS Maximum CPU design engineering analysis thus far 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, however, as noted above, further inspection activity may be required to review the results of the CAPAL implementation to confirm that the final production level software used for the Maximum CPU Analysis is identical to the software utilized on the U.S. domestic AP1000 PMS.

6. PMS On-Going System Integration Testing Review (ITAAC 2.5.02.11)

a. Inspection Scope

During the July 18-22, 2016, inspection period, the inspection team reviewed the test procedure and associated test logs used for a Level 2 test of the ESFAS associated with the LCL modules. The inspectors reviewed the test setup and noted the function enable switch on the front of the maintenance and test panel (MTP) was not in the "Enable"

state, which allowed test functions and algorithms to be inserted into the LCL microprocessors. The inspector noted several test leads connected to the PMS equipment and requested configuration documentation that documented this specific test configuration. The inspectors reviewed drawing, SKCH-RES-13-8, and determined it did not depict all of the test leads added to the system in the test configuration, nor was there any specific entry in the lifted lead log related to the observed PMS cabinet configuration. As a result, the vendor initiated CAPAL 100398086 to document and evaluate the apparent lack of configuration information. The inspectors did not identify any additional examples of configuration management concerns regarding PMS testing. This was considered a minor issue that was documented to track the CAPAL implementation. The inspectors will consider reviewing the results of the CAPAL evaluation during a future PMS inspection.

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 testing associated with the system satisfy the regulatory requirements set forth in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified, however, one minor issue as noted above, was documented. The NRC may review the results of the CAPAL evaluation related to test configuration control during a future inspection.

7. PMS Test Control – ARGOS Test Tool Development (ITAAC 2.5.02.11)

a. Inspection Scope

During the February 6-9, 2017, inspection period, the inspectors' evaluated the ARGOS tool to confirm compliance with WEC test tool design requirements and software quality assurance practices. Specifically, the inspectors evaluated the IVV tasks performed by the IVV team for the ARGOS software and verified configuration management records for the system were adequately maintained. The IVV tasks were performed to verify the ARGOS software meets the functional requirements and to validate the software through testing. The ARGOS (software and hardware) is a non-safety related tool used to perform IVV testing of the PMS MTP displays and safety displays. The ARGOS tool automatically operates the Human-System Interface (HSI), captures HSI screen images, and compares those images to the expected results providing a pass or fail status.

The inspectors reviewed work instruction, WNA-WI-00376-GEN, "IVV Software Tool Development Process Work Instructions," Revision 5, which provides the instructions for the development of software used for IVV. The inspectors confirmed that the ARGOS tool was categorized correctly as a "Verification Tool" since its outputs are used as verification records.

The inspectors reviewed the Configuration Management Release Report (CMRR) to assess whether the software tool was controlled under configuration management. In addition, the inspectors reviewed the verified CMRR for the ARGOS issued by the IVV group and verified that the IVV task for assessing configuration management had been

completed. The report includes verification records developed and evaluated by the IVV group in support of reaching IVV's acceptance of the associated software release.

The inspectors reviewed the following records that contain the associated IVV technical review of the ARGOS test tool:

- WNA-TR-03831-GEN, "Software Validation Test Procedure of ARGOS", Revision 3, June 26, 2015
- WNA-TR-03831-GEN, "Software Validation Test Procedure of ARGOS", Revision 4, February 22, 2016
- WNA-VR-00442-GEN, "ARGOS Software Verification and Validation Report", Revision 3, April 26, 2015
- WNA-VT-00426-GEN, "IVV Task Report for Verification of Change Drivers During Maintenance Phase of ARGOS," Revision 0, February 24, 2016

The inspectors noted that WNA-VR-00442-GEN discussed the IVV team's recommendation to construct a User's Guide for the ARGOS and an appropriate level of training be implemented due to the complexity of the ARGOS test tool. Although a User's Guide was located, there was no indication that any formal or informal training to operate and/or maintain the ARGOS had been implemented. As a result of this observation, the vendor issued a CAPAL for this issue. This was considered a minor issue by the inspectors, and was documented to track the completion of the CAPAL. The NRC may review the results of the CAPAL evaluation related to ARGOS user guide training during a future inspection.

In addition, the inspectors sampled the ARGOS requirements specification, software requirements specification (SRS) and the Software Design Description for the ARGOS simulator to ensure that system requirements were uniquely identifiable and traceable. The inspector's reviewed the IVV ARGOS Software Verification and Validation Report to verify the IVV verification tasks for these documents were performed and reported.

b. Observations and Findings

No findings of significance Identified

c. Conclusions

The inspectors determined that the activities related to development of the ARGOS tool had been adequately performed. The inspector's determined that WEC'S implementation of its policies and procedures that govern IV&V software tool development were consistent with the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

8. Cyber Security Program Review – Procedural Development

a. Inspection Scope

During the February 6-9, 2017, inspection period, the inspectors reviewed the purchase orders issued to WEC by Southern Nuclear Operating Company (Southern) and SCE&G for work associated with 10 CFR 73.54, "Protection of digital computer and

communication systems and networks." As noted in inspection report (IR) 99900404/2015-207 (ML15231A229), no purchase orders had been issued to WEC to implement the cyber security requirements as of August 2015. After that NRC inspection, Change Order #1, "Cyber Security," dated December 31, 2015, for Southern Company (Vogtle AP1000 Nuclear Units 3&4) and Change Order #29, "Cyber Security," dated August 24, 2016, for SCE&G (Virgil C. Summer AP1000 Nuclear Units 2&3) were issued to WEC to implement cyber security requirements. A technical description, documented in November 2014, lists those activities to be completed for the remainder of the cyber project. The technical description is referenced in both change orders.

The inspectors reviewed Westinghouse's (WEC's) governing documents that had been approved for use to determine if the documents and organization met the requirements of the Cyber Security Plans of Vogtle Units 3 and 4 and Summer Units 2 and 3. Specifically, the following documents were reviewed:

- APP-GW-Y0-0004, Rev. 1, AP1000 Cyber Security Team,
- APP-GW-Y6-001, Rev. 2, AP1000 Cyber Security Scoping Criteria,
- APP-GW-Y6P-001, Rev. 2, AP1000 Cyber Security Assessment Procedure,
- APP-GW-Y5R-001, Rev. 2, AP1000 Critical System Digital Assets and CDA Report,
- APP-GW-Y4-001, Rev. 0, AP1000 Cyber Security Network Diagram, and
- Purchase Orders for the purchase of Portable Media Mobile Device security equipment for Vogtle and Summer.

The NRC requested information related to the digital components that have been delivered to warehouses onsite. WEC considers these items scoped digital assets (SDAs). WEC defines a SDA as a, "a digital component, assembly or system that has been identified and assessed as a CDA by the procedures established in the APP-GW-Y6H-001, "AP1000 Cyber Security Assessment Plan," but either not yet installed in the construction plant, or installed but not required to perform a critical function or support a critical system function." APP-GW-Y5-001, "AP1000 Cyber Security Integrity Requirements," Revision 0, dated September 2016, establishes the requirements that shall be used to achieve a high assurance, by providing requirements for physical access, that SDAs will be physically protected and controlled during warehouse storage. In accordance with this procedure, SDAs require protection from receipt and storage (Stage 2) to testing and turnover (Stage 4). While the majority of SDAs have been shipped to warehouse storage; procedures specifically addressing how SDAs are required to be stored have not been developed or implemented to address the requirements identified in APP-GW-Y5-001. WEC is currently working on the development of implementing procedures and is utilizing WECTEC procedure NPP 10-01, "Material, Receipt, Storage, and Control" for the storage and control of current SDAs. The NRC will verify these controls when implemented.

The technical report listed six known design changes to incorporate cyber security activities through the project. These include:

- Level 4 to Level 2 data diode implementation
- Cyber Security Monitoring System (CYS) implementation
- Final selection of antivirus product

- Update of commodity design specifications and/or purchase order requirements to show the cyber security requirements flow down
- Creation of CYS as a stand-alone system (4858)
- Update of I&C criteria documents to define acceptable interfaces.

During this inspection, one design change proposal (DCP) that had been completed, DCP 4858, "Introduction of Cyber Security Monitoring System (CYS) system designator," Revision 0, dated September 5, 2014. The team reviewed this DCP and found it adequate.

b. Observation and Findings

One issue was identified with the implementation of APP-GW-Y0-004, "AP1000 Cyber Security Team." Specifically, Section 2.1 states "The individuals on the Cyber Security Team must possess a strong knowledge of one or more areas listed in this section. Collectively, the team must possess knowledge in all of the areas listed in this section."

Section 2.1.3 lists Physical Security and Emergency Preparedness as areas that require individuals with a strong knowledge of physical security and emergency preparedness systems and programs.

The inspectors requested a list of individuals who were fulfilling the knowledge requirements of Section 2.1 and were initially provided a list that only contained a single individual as fulfilling the knowledge requirements of both Physical Security and Emergency Preparedness. The inspectors acknowledged that the individual possessed strong knowledge in Physical Security, however, they questioned his emergency preparedness knowledge. This list was then revised to include several more individuals, however, when the inspectors reviewed their resumes and emergency preparedness qualifications, none of the individuals had ever worked in an emergency preparedness department at an operating nuclear power plant, had a degree in either emergency preparedness or a related field (e.g. health physics, etc.) or had any experience in emergency preparedness outside of setting up the communications systems for communicating between the site and offsite authorities. There was no indication that any of the individuals on the Cyber Security Team had what could be considered a strong knowledge of emergency preparedness systems and programs.

There is a Purchase Order from both Vogtle and Summer that states "Cyber security controls provided in Regulatory Guide 5.71, Revision 0, guidance must be addressed for every critical digital system/critical digital asset (CDA) in the plant, and as such, making it compliant with the new regulation."

RG 5.71, Appendix A, Section 3.1.2, "Cyber Security Team," (CST) states that the roles and responsibilities of the cyber security team includes, "performing or overseeing each stage of cyber security management processes." This section also requires that a CST consist of individuals with a broad knowledge in multiple areas, including, emergency preparedness systems and programs. Furthermore, Section A.3.1.3, "Identification of Critical Digital Assets," states that to identify CDA's the CST, "Identified and documented plant systems, equipment, communication systems, and networks that are associated with the safety security and emergency preparedness (SSEP) functions described in 10 CFR 73.54(a)(1), as well as the support systems associated with these SSEP functions."

APP-GW-Y0-004, “AP1000 Cyber Security Team,” Revision 1, dated June 2016, Section 2.1, “Knowledge-Base Requirements,” states that individuals on the cyber security team must possess a strong knowledge of one or more areas listed in this section. Collectively, the team must possess knowledge of all areas listed in this section.” Section 2.1.3, “Physical Security and Emergency Preparedness,” states that this “includes the site’s physical security and emergency preparedness systems and programs.”

WEC staff stated that although they are performing work in accordance with purchase orders from Vogtle and Summer, that work is not being performed to explicitly satisfy the licensee’s requirements for compliance to 10 CFR 73.54, “Protection of digital computer and communication systems and networks.” Specially, the CST necessary to comply with aspects of 10 CFR 73.54 and RG 5.71 are Vogtle and Summer’s CST, and not the CST discussed by WEC in their governing procedures. The NRC inspection team is requesting internal legal guidance on the purchase order requirements passed down from Vogtle and Summer to WEC to determine 10 CFR 73.54 applicability to the vendor.

The NRC concluded that WEC’s implementation of cyber security-related requirements is an unresolved item 99900404/2015-209-01 pending review of purchase order documents.

c. Conclusions

During the February 6-9, 2017, inspection period, the inspectors reviewed the purchase orders issued to WEC by Southern Nuclear Operating Company (Southern) and SCE&G for work associated with 10 CFR 73.54, “Protection of digital computer and communication systems and networks.” The inspectors reviewed Westinghouse’s (WEC’s) governing documents that had been approved for use to determine if the documents and organization met the requirements of the Cyber Security Plans of Vogtle Units 3 and 4 and Summer Units 2 and 3. The inspectors also reviewed the WEC procedures developed to guide the WEC Staff with performing cyber security related activities. The NRC concluded that WEC’s implementation of cyber security-related items are an unresolved item 99900404/2015-209-01 pending review of purchase order documents.

9. 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 February 9, 2017, the inspectors presented a debrief of the inspection activities to Mr. Gary Brassart, Vice-President, New Plant Automation, and other WEC personnel. On March 30, 2017, the inspectors conducted a formal exit meeting to convey the overall inspection results via conference call with Mr. Gary Brassart, Vice-President, New Plant Automation, and other WEC personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

Name	Affiliation	07/18/16 Entrance	02/09/17 Debrief	03/30/17 Exit	Interviewed
Gary Brassart	WEC		X	X	
Jan Dudiak	WEC	X		X	
Stephen Packard	WEC	X		X	
Dale Harmon	WEC	X	X		
Gregory Glenn	WEC	X	X	X	X
Sarah DiTomasso	WEC	X	X	X	X
Bob Hirmanpour	SNC	X		X	X
Pietro Porco	WEC	X			X
Suresh Channarasappa	WEC	X			X
Ron Wessel	WEC	X			X
Roger Costantino	WEC		X		X
Brian Domitrovich	WEC		X		X
Darryl Muetzel	WEC	X			X
Rick Paese	WEC		X		
Craig Watson	WEC	X			
Randolf Copeland	SCE&G	X			X
Chris Crefeld	WEC		X	X	
Mike Stam	WEC			X	
John Wiessmann	WEC	X			
Greg Cesare	WEC	X			
Don Durkosh	WEC			X	
Jerry Money	SCE&G	X			X
Stanley Cheyne	WEC	X			X
Louis Jesso	WEC	X			X
Mark Stofko	WEC	X			
Paul Russ	WEC			X	X
Matt Shakun	WEC			X	
Maryna Tyrpak	WEC		X		
Gary Osborn	WEC		X		
Mark Mamo	SNC		X		
Ken Lunz	WEC	X	X		
Kevin McNulty	WEC				X
Jason Zielinski	WEC				X
David Tyler	WEC				X
Mike Vallarta	WEC				X
Chris Srock	WEC		X		
Dave Malarik	WEC			X	
Brandon Neff	WEC				X
Dave Jarosh	WEC			X	
Miguel Vallaria	WEC				X
James Vandzura	WEC				X

Name	Affiliation	07/18/16 Entrance	02/09/17 Debrief	03/30/17 Exit	Interviewed
Chris Schiebel	WEC				X
David Lucas	WEC				X
Aaron Taylor	WEC				X
Kresimir Starcevic	KEMA				X
Luiz Almada	KEMA				X
Sergio Iacovella	KEMA				X
Sean Cox	KEMA				X
Thoai Le	KEMA				X
Aung Lwin	SCANA				X
Zee Sultan	SNC				X
Jim Hughes	SNC			X	
Helen Agha	SNC			X	
Joni Falascino	WEC			X	
Brian McIntyre	WEC			X	
Andrew Rahn	SCANA			X	
Mike Shaffer	WEC			X	
Catherine Sejvar	WEC			X	
Jonathan Golndski	WEC			X	
Frank Purdy	SCANA	X			
Greg Downs	SCANA	X			
Jason Weathersby	SCANA				
Michael Brown	NRC			X	
Kim Lawson-Jenkins	NRC			X	
Stacy Smith	NRC				
Calvin Cheung	NRC			X	
Robert Mathis III	NRC		X	X	
Greg Galletti	NRC	X	X	X	
Lisa Castelli	NRC	X		X	
William Roggenbrodt	NRC	X	X	X	
Tim McGinty	NRC		X		
Terry Jackson	NRC		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:

Item Number	Status	Type	Description	Applicable ITAAC
99900404/2015-204-01	closed	NON	Criterion III	2.5.02.07a and 2.5.02.07e
99900404/2015-209-01	opened	URI	10 CFR 73.54	none

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

The U.S. Nuclear Regulatory Commission (NRC) inspectors identified the following ITAAC related to components being designed, manufactured, and tested at Westinghouse Electric Company (WEC). For the ITAAC listed below, the inspectors reviewed WEC's quality assurance (QA) controls in the areas of design control, test control, inspection, 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 lists the ITAAC that are applicable to the inspector's scope of review during this inspection period. These activities are associated with ITAAC 2.5.02.07a, 2.5.02.07d, 2.5.02.07e, 2.6.3.4b, and 2.5.02.11.

ITAAC Index No.	ITAAC Section No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
534	2.5.02.07a	7a The PMS provides process to the PLS through isolation devices.	Type tests, analyses, or a combination of type tests and analyses of the isolation devices will be performed.	A report exists and concludes that the isolation devices prevent credible faults from propagating into the PMS
537	2.5.02.07d	7d The PMS ensures that the automatic safety function and the Class 1E manual controls both have priority over the non-Class 1E soft controls.	Type tests, analyses, or a combination of type tests and analyses of the PMS manual control circuits and algorithms will be performed.	A report exists and concludes that the automatic safety function and the Class 1E manual controls both have priority over the non-Class 1E soft controls.
538	2.5.02.07e	7e The PMS receives signals from non-safety equipment that provides interlocks for PMS test functions through isolation devices.	Type tests, analyses, or a combination of type tests and analyses of the isolation devices will be performed.	A report exists and concludes that the isolation devices prevent credible faults from propagating into the PMS.

602	2.6.03.04b	4b The IDS provides electrical isolation between the non-Class 1E ac power system and the non-Class 1E lighting in the MCR.	Type tests, analyses, or a combination of type tests and analyses of the isolation devices will be performed.	A report exists and concludes that the battery chargers, Regulating transformers, and isolation fuses prevent credible faults from propagating into the IDS.
550	2.5.02.11	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: a) Not used b) System definition phase c) Hardware and software development phase, consisting of hardware and software design and implementation d) System integration and test phase e) Installation phase	Inspection will be performed of the process used to design the hardware and software.	A report exists and concludes that the process defines the organizational responsibilities, activities, and configuration management controls for the following: a) Not used. b) Specification of functional requirements. c) Documentation and review of hardware and software. d) Performance of system tests and the documentation of system test results, including a response time test performed under maximum CPU loading to demonstrate that the PMS can fulfill its response time criteria. e) Performance of installation tests and inspections.

DOCUMENTS REVIEWED:

AP1000 PMS Shift Status Test Report, TS31-078, dated July 20, 2016.

AP100-PMS-T5-001, AP1000 Protection and Safety Monitoring System Test Plan," Revision 5, dated July 2015.

APP-GW-GE-005, "AP1000 Standard Methodology for Fault Testing of Instrumentation and Controls Isolation Barriers", Revision 0, dated March 2016.

APP-GW-GE-005, "AP1000 Standard Methodology for Fault Testing of Instrumentation and Controls Isolation Barriers," Revision 1, dated June 2016.

APP-PMS-VPY-004, "Evaluation of Impact of Components Added to AP1000 PSMS Isolation Barrier on Existing Equipment Qualification Documentation," Revision 0, dated May 2013.

APP-PMS-VPR-002, "Class 1E/Non-Class 1E Test Report for Fault Testing of AP1000 PMS Isolation Barriers," Revision 2, dated July 2014.

APP-PMS-T1P-038, "AP1000 Protection and Safety Monitoring System Isolation Barrier Maximum Credible Fault Test Procedure," Revision 1, dated June 9, 2016.

APP-PMS-T1P-039, "AP1000 Protection and Safety Monitoring System Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Procedure," Revision 1, dated April 14, 2016.

APP-PMS-T5-006, "AP1000 Protection and Safety Monitoring System Isolation Barrier IEEE Standard 384-1981 Fault Test Plan," Revision 1, dated June 2016.

APP-PMS-T1P-039, "AP1000 Protection and Safety Monitoring System Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Procedure," Revision 0, dated April 2016.

APP-PMS-VPR-019, "AP1000 PMS Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Report," Revision 0, dated September 2016.

APP-PMS-VPR-019, "AP1000 PMS Isolation Barrier Short Circuit/Open Circuit/Grounded Circuit Test Report," Revision 1, dated October 2016.

APP-PMS-VBR-015, "AP1000 Protection and Safety Monitoring System Isolation Summary Report for Use in the AP1000 Plant," Revision 0, dated September 2016.

APP-PMS-VBR-015, "AP1000 Protection and Safety Monitoring System Isolation Summary Report for Use in the AP1000 Plant," Revision 1

APP-PMS-GEF-156, "PMS Updates to Address RITS, CAPAL, and DCP Incorporations," Revision 0, dated March 21, 2016.

APP-GW-GEF-1512, "AP1000 Standard Methodology for Fault Testing of Instrumentation and Controls Isolation Barriers," Revision 0.

APP-PMS-VPR-018, “AP1000 PMS Isolation Barrier Maximum Credible Fault Test Report,” Revision 0, dated August 2016.

APP-PMS-TIP-031, “AP100 Protection and Safety Monitoring System Maintenance and Test Panel Level 2 Engineered Safeguards Features Injection Test Procedure,” Revision 0, dated December 2015.

APP-PMS-J0R-001, “AP1000 Protection and Monitoring System Requirements Traceability Matrix,” Revision 3.

APP-PMS-J1-001, “Protection and Safety Monitoring System Functional Requirements,” Revision 9.

APP-PMS-J4-102, “Protection and Safety Monitoring System Software Requirements Specification,” Revision 13.

APP-PMS-GHY-002, “Protection and Monitoring System Software Design Description for Bistable Processor Logic,” Revision 12.

APP-PMS-J0R-001, “AP1000 Protection and Monitoring System Requirements Traceability Matrix,” Revision 2.

APP-PMS-TIP-080, “Protection and Safety Monitoring System – System Integration Test CIM Priority Test Procedure,” Revision 0, dated January 2017.

APP-PMS-T1P-012, “AP1000 Protection and Safety Monitoring System – System Integration Test for Time Response Test Procedure,” Revision 2, dated January 2017.

APP-PMS-J4-020, “AP1000 System Design Specification for the Protection and Safety Monitoring System,” Revision 13, dated August 2016.

APP-PMS-J1-001, “AP1000 Protection and Safety Monitoring System Functional Requirements,” Revision 12, dated June 2016.

AFS-CQHW-15-04, “TETR 1-15-004 Interim Report: Establishment of Requirements for Maximum Credible Fault Current and Fault Testing for AP1000 PMS,” Revision 0, dated June 18, 2015.

American Association for Laboratory Accreditation (A2LA) ISO/IEC-17025 Certificate Number 0553.01, “KEMA-POWERTEST LLC Electrical Accreditation,” dated December 16, 2015.

Apparent Cause Analysis Issue Number 100170963, “NRC Inspection Issue Identified related to Fault Isolation Testing.”

Corrective Action, Prevention and Learning (CAPAL) 100004111, dated April 15, 2014.

CAPAL 100421435, dated October 13, 2016.

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ACRONYMS:

ACA	Apparent Cause Analysis
ARGOS	Automated Record Gatherer and Operator Simulator
CA	Corrective Action
CAPAL	Corrective Action Program and Learning system
CDA	Critical Digital Asset
CDI	Commercial Grade Dedication Instruction
CFR	*Code of Federal Regulations*
CIM	Component Interface Module
CMRR	Change Management Release Record
CPU	Central Processing Unit
CST	Cyber Security Team
CYS	Cyber Security Monitoring System
DC	Direct Current
DCP	Design Change Proposal
ECO	Engineering Change Order
ESF	Engineered Safety Features
ESFAS	Engineered Safety Features Actuation System
IDS	Class 1E DC and Uninterruptible Power Supply System
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input/Output
IP	Inspection Procedure
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
IVV	Independent Verification and Validation
LCL	Local Coincident Logic
MTP	Maintenance and Test Panel
NI	Nuclear Instrumentation
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
PLS	Plant Control System
PMS	Protection and Safety Monitoring System
QA	Quality Assurance
QN	Quality Notification
SDA	Scoped Digital Assets
SHA	Software Hazard Analysis
SIOS	Standard Input/Output Simulator
Southern	Southern Nuclear Operating Company
SRS	Software Requirements Specification
SSEP	Safety Security and Emergency Preparedness
TCR	Test Configuration Record
TETR	Technical Engineering Team Review
VAC	Voltage Alternating Current
WEC	Westinghouse Electric Company