August 31, 2015

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. 99900404/2015-207

Dear Ms. DiTommaso:

On July 6 to July 17, 2015, 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) for 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
safety-related components of the PMS, and observed on-going cabinet hardware testing and
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 ITAACs 2.5.02.11, and 2.5.02.12.

Within the scope of this inspection, no violations or nonconformances were identified and no
response is necessary.

S. DiTommaso   - 2 -

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 (if applicable) 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/

                                        Richard A. Rasmussen, Chief
                                        Electrical Vendor Inspection Branch
                                        Division of Construction Inspection
                                          and Operational Programs
                                        Office of New Reactors

Docket No.: 99900404

Enclosure:
Inspection Report No. 99900404/2015-207
and Attachment

S. DiTommaso   - 2 -

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Sincerely,

/RA/

Richard A. Rasmussen, Chief
Electrical Vendor Inspection Branch
Division of Construction Inspection
 and Operational Programs
Office of New Reactors

Docket No.: 99900404

Enclosure:
Inspection Report No. 99900404/2015-207
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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.:	99900404/2015-207
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 US AP1000 plants under construction.
Inspection Dates:	July 6 - 17, 2015
Inspection Team Leader:	Greg Galletti, NRO/DCIP/EVIB

Inspectors:		
	Lisa Castelli	R-II/DCI/CIB1
	Robert Mathis	R-II/DCI/CIB1
	Hyung Je	R-II/DCI/CIB1
	Philip Natividad	NRO/DCIP/EVIB
	Stacy Smith	NRO/DCIP/EVIB
	Wendell Morton	NRO/DE/ICE1
	Thomas Fredette	NRO/DCIP/CIPB
	Ashley Thomas	NRO/DCIP/QVIB

Approved by:	Richard A. Rasmussen, Chief Electrical Vendor Inspection Branch Division of Construction Inspection and Operational Programs Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

Westinghouse Electric Company
99900404/2015-204

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 6-17, 2015.

This inspection specifically evaluated aspects of WEC's design and testing of safety-related components of the Protection and Safety Monitoring System (PMS) for new construction commercial nuclear plants in the US. This included a review of completed Generic AP1000 baseline 7.8.2 PMS software and hardware design and testing documentation as well as currently on-going Cabinet Hardware Testing for the V.C. Summer Unit 2 build. These activities are associated with ITAAC 2.5.02.11c and 2.5.02.11d as well as ITAAC 2.5.02.12.

With respect to ITAAC 2.5.02.12, which focusses on a graded approach to software design and software program management, the inspectors observed attributes and elements associated with implementation of the PMS software management plan, software configuration management plan, and software verification & validation plan. These attributes are typically observed and assessed for each inspection involving PMS design and testing activities.

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 Software Design and Implementation (ITAAC 2.5.02.11c, 2.5.02.12)

The inspectors determined that WEC's implementation of their policy and procedures for control of the design and implementation of the PMS software 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 Hardware Design and Implementation (ITAAC 2.5.02.11c)

The inspectors determined that WEC's implementation of their policy and procedures for control of design and implementation of the PMS hardware satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

PMS Channel Hardware Testing and System Integration Testing (ITAAC2.5.02.11d, 2.5.02.12)

The inspectors determined that WEC's implementation of their policy and procedures for on-going and completed Cabinet Hardware Testing and System Integration Testing of the PMS 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 Baseline Regression Activities (ITAAC 2.5.02.11c, 2.5.02.11d, 2.5.02.12)

The inspectors determined that WEC's implementation of its policies and procedures that govern Independent Verification and Validation (IV&V) and Independent System Test regression analysis and testing activities were consistent with the requirements of Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR part 50. No findings of significance were identified.

PMS Cyber Security Controls

The inspectors reviewed the status of cyber security controls and found that there has been no purchase order issued to WEC for the implementation of procedures or requirements associated with 10 CFR 73.54, "Protection of digital computer and communication systems and networks." No findings of significance were identified.

PMS Corrective Action Program Implementation Review (ITAAC 2.5.02.11.c, 2.5.02.12)

The inspectors determined that WEC had adequately accounted for and addressed Reusable Software Element Descriptions throughout the PMS development process. Issues associated with Reusable Software Element Descriptions were captured, tracked, and adequately resolved through the Replacement and Automation Services Issue Tracking System (RITS) process. The inspectors also reviewed the status of the implementation of corrective actions to address the three nonconformances issued as a result of the March 2015 NRC inspection associated with ITAACs 2.5.02.03 and 2.5.02.07. Based on the sample reviewed the inspectors determined that WEC was adequately implementing processes and procedures associated with the corrective action program consistent with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

<u>PMS Design Phase Software Management, Configuration Management and Verification & Validation Processes (ITAAC, 2.5.02.12)</u>

The inspectors determined that WEC's implementation of its policies and procedures that govern the PMS software design phase lifecycle activities were consistent with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. PMS development was adequately controlled through processes for Configuration Management, V&V, quality assurance and software safety in accordance with WEC's management plan. No findings of significance were identified.

REPORT DETAILS

1. PMS Software Design and Implementation (ITAAC 2.5.02.11c)

    a. Inspection Scope

    The inspectors interviewed Westinghouse (WEC) software design personnel and reviewed Protection Safety and Monitoring System (PMS) requirements to verify that the design and implementation processes were executed in accordance with the licensing basis. The inspectors assessed the WEC design processes for the PMS software through detailed requirements tracing of selected Reactor Trip and Engineered Safety Feature Actuation System functions. This requirements tracing (traceability) begins with identification of the highest level plant requirements and maps (or traces) the decomposition of those requirements through the various stages of system and sub-system requirements development, and ultimately to the implementation of functional and software requirements in the PMS design. The inspectors evaluated the traceability of the selected design elements from the functional and software requirements to the software design descriptions mapped to the PMS Bistable Processor Logic and the Local Coincidence Logic subsystems. Additional samples included further traceability from the Local Coincidence Logic subsystem mapped to the Integrated Logic Processor software coding.

    Based on a previous risk assessment conducted during the PMS System Definition (Requirements) phase, the inspectors selected functions associated with Overpower Delta Temperature reactor trip and the In-Containment Refueling Water Storage Tank actuation signals. The inspectors verified a sample of design elements associated with the functions listed below, including requirements traceability through the functional logic, a selection of applicable reusable software elements[1], functional logic mapping to software functional modules, and functional module replication within the Software Design Description.

    Overpower Delta T Reactor Trip software design elements reviewed:
    *   Core Thermal Power and Temperature Differential
    *   Second Order Lead/Lag Compensation
    *   TCold Redundant Signal Algorithm
    *   TCold Redundant Signal Algorithm Inputs
    *   Bistable Comparator
    *   Two-Out-of-Four Logic Coincidence Logic

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[1] Reusable common software elements can be created for the Advant® AC 160 product line in the form of Type Circuits and Custom PC Elements. A Type Circuit is a prearranged group of the smaller pre-existing commercially available software units (PC Elements) into a larger, more complex software entity. Type Circuits are not compiled code, but more like macro definitions that can be saved individually and reused throughout one or more projects. Custom PC Elements are compiled from source code and added to the library of standard PC elements available for programming. Common software elements that are Type Circuits or general purpose Custom PC Elements (new PC elements intended for common use in many different safety systems) are documented with a composite document referred to as a Reusable Software Element Document (RSED).

In-Containment Refueling Water Storage Tank actuation software design elements reviewed:
- Bistable Comparator
- Bistable Processing Reusable Software Element
- ESF Two-Out-of-Four Type Circuit
- Component Interface Module-Command Type Circuit

Additionally, the inspectors reviewed the WEC software hazards analyses developed for the PMS design and implementation software life cycle phase activities. The inspectors determined that the software hazards analysis had been performed using the WEC methodology and work instructions, and adequately captured and identified potential hazards from the design and implementation activities that could impact the analysis performed during the PMS system definition phase. The inspectors verified that selected design statements associated with the Bistable Processor Logic were adequately documented and tabulated in the appropriate software hazards analysis output matrix.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that the PMS software design and implementation activities had been adequately performed. Traceability from higher level system and functional requirements through software detailed design and coding was verifiable. Software hazards emanating from design and implementation phase activities were identified, documented and addressed. The inspectors determined that WEC's implementation of its policies and procedures that govern PMS software design activities were consistent with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR part 50. No findings of significance were identified.

2. PMS Hardware Design and Implementation (ITAAC 2.5.02.11c)

a. Inspection Scope

The inspectors reviewed a sample of hardware requirements and verified through hardware requirements tracing, that the vendor had adequately captured and implemented system design requirements into hardware specifications and detailed design drawings. Specific hardware requirements evaluated included:

- APP-SyRS-41315 [The I&C System shall monitor temperature in PMS cabinets]

- APP-SyRS-41313 [The I&C System shall have smoke detectors in PMS cabinets]

- APP-SyRS-38908 [The I&C System PMS shall de-energize the reactor trip breaker under voltage trip attachments on divisional loss of power]

- APP-SyRS-39008 [The I&C System shall implement a PMS that de-energizes the Nuclear Instrumentation System source range high voltage power supply when sufficient overlap with IR has been established and prior to exceeding the source range detector upper limit]

For each hardware requirement, the inspectors verified that the requirement was captured in the relevant system design specification, sub-system design specification, Software Design Description, detailed design drawings, as well as Appendix K of the AP1000 Requirements Traceability Matrix which specified all hardware requirements fulfilled through hardware implementation.

The inspectors reviewed WNA-DS-01070-GEN Table 2.4-1, "AC160 Hardware Related Restrictions," which identified the generic restrictions that shall be applied to all projects, as applicable, and provides a means for projects to specify where these restrictions are implemented. The generic restrictions in the document are requirements for application software, hardware configuration, analysis testing, and administrative routines. Restriction basis, reference, and additional guidance are captured for each restriction. The inspectors sampled the hardware processor module restrictions and confirmed none of the sampled modules (AC410, DP640, and AI636) listed as not allowable for Common Q applications were incorporated into the bill of materials for the PMS build.

The inspectors also discussed the restrictions on various material and torqueing requirements for fasteners used in certain PMS applications based on equipment qualification requirements in accordance with WCAP-16166-P, "Equipment Qualification Report," and various supplements. The Team confirmed by a review of drawings and shop work records, that such requirements are conveyed to the cabinet assembler through controlled detailed design drawings, and verified through review of completed shop work orders within the quality build packages during quality receipt inspection and review activities.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that WEC's implementation of its policies and procedures that govern PMS hardware design activities were consistent with the requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR part 50. No findings of significance were identified.

3. PMS Baseline Regression Activities (ITAAC 2.5.02.11c, 2.5.02.11d)

    a. Scope

        The inspectors assessed WEC's IV&V process for evaluating software modifications to determine whether the extent of IV&V analysis and testing resulting from software changes was adequate. Through interviews, a walk-through of the process, and a review of documentation (an IV&V software regression completed for baseline 7.4 to baseline 7.8.2), the inspectors assessed whether the IV&V regression activities were adequate. Additionally, the inspectors reviewed the major IV&V process activities that WEC re-performs during the IV&V software regression process, including: (1) identifying and evaluating change drivers, (2) functional logic tracing, (3) source code change evaluation, (4) software regression testing, (5) software hazards analysis, (6) requirements traceability analysis, and (6) interface data analysis.

        The inspectors also assessed WEC's regression activities performed by the Independent System Test group in accordance with WNA-WI-00452-GEN, "Regression Testing Work Instruction," and WNA-PD-00136-Gen, "Standard Regression Analysis Strategy for Common Q Safety Systems." The Independent System Test group is responsible for performing regression testing, including Cabinet Hardware Testing, Channel Integration Testing, and System Integration Testing. The inspectors noted that the Independent System Test group receives a regression analysis change report from the design group, which identifies the changes and associated change drivers between software and hardware revisions. The inspectors also noted that the Independent System Test group assesses the Regression Analysis Change Report for the impact of the changes to previously completed test. The inspectors interviewed WEC staff to verify that the independence of the regression analysis process between the Independent System Test group and the design group was adequate and that the use of the Regression Analysis Change Report process as the sole input to the development of regression test procedures was appropriate.

        Additionally, the NRC inspectors discussed with WEC personnel, the regression activities associated with Replacement and Automation Services Issue Tracking System (RITS) issue identified in the most recent AP1000 PMS Regression Analysis Change Report (WNA-AR-00363-WAPP). The inspectors verified that the actions taken by WEC to develop and execute the regression tests to address the changes incorporated as result of the RITS issues were in accordance with documented procedures.

        The inspectors reviewed the V.C. Summer Unit 2 AP1000 PMS Cabinet Hardware Test Regression Test Procedure (VS2-PMS-T1P-054) to verify that the changes and change drivers listed in the AP1000 PMS Hardware Regression Analysis Change Report (WNA-AR-00379-WAPP) were adequately incorporated. The inspectors also observed on-going cabinet hardware regression testing for hardware changes from PMS baseline 7.8 hardware to PMS baseline 8 hardware on V.C Summer Unit 2.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that WEC's implementation of its policies and procedures that govern IV&V and Independent System Test regression analysis and testing activities were consistent with the requirements of Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR part 50. No findings of significance were identified.

4. PMS Test Control

PMS Cabinet Hardware Testing and System Integration Testing (ITAAC 2.5.02.11d, 2.5.02.12)

a. Inspection Scope

System Integration Testing

The NRC inspectors assessed the WEC processes to verify acceptance and traceability, security analysis, hazard risk, and regression analysis for PMS System Integration Testing to verify regulatory compliance. The team reviewed samples of test plans, test procedures, test reports, work instructions, RITS, Corrective Action Program and Learning System issues, and interviewed WEC personnel to determine the adequacy of the in-process and completed design and testing activities.

Specifically, the NRC inspectors reviewed the testing for PMS System Integration Testing in accordance with APP-PMS-T5-001, "AP1000 Protection and Safety Monitoring System Test Plan," Revision 3. The testing verifies and validates that the PMS can perform its required functions within the specified performance envelope and that it does not exhibit any undesirable behaviors.

The team sampled two of the system integration tests for the PMS: (1) SIT-01, system interface and response time testing; and, (2) SIT-02, abnormal conditions testing. At the time of the inspection, WEC had completed the testing report for V.C Summer Unit 2 system interfaces and response time test, as documented in test report VS2-PMS-T2R-012, "V.C. Summer Unit 2 AP1000 Protection and Safety Monitoring System - System Interfaces and Response Time - System Integration Test Report," Revision 0, and was still in the process of writing the test report for the abnormal conditions tests, as documented in test procedure APP-PMS-T1P-014, "AP1000 Protection and Safety Monitoring System - System Integration Test Abnormal Conditions Test Procedure," Revision 1.

For the abnormal conditions System Integration Testing, the NRC mapped the system requirements to ensure the test procedure included appropriate acceptance criteria to verify that the equipment under test executes the required functions correctly within the

requirement performance constraints. Specially, the team verified that the abnormal tests required in the test plan (APP-PMS-T5-001) were translated to test procedure (APP-PMS-T1P-014). The test cases identified in the test plan were populated from the APP-PMS-J4-102, "Protection and Safety Monitoring System Software Requirements Specification" and APP-PMS-J4-020, "AP1000 System Design Specification for the Protection and Safety Monitoring System." Specifically, the team mapped the following abnormal test cases to the software requirements and design specifications:

- Cabinet Power Interrupt
- Calibration data retention after loss of power
- Functionality of AF1000
- High Speed Link (HSL) Faults

In addition, the team verified that interface software requirements were met for PMS subsystems as described in in checklist A2, "BPL – Subsystem Software Requirements Verification Checklist," in procedure WNA-VT-00004-SV0, "IV&V Task Report for Subsystem Software Requirements Evaluation," Revision 1. Specifically, the team performed a code level review to verify the algorithm programmed for an abnormal condition related to the AF100 and Bistable Processor Logic subsystem.

The inspectors discussed the appropriateness of not running test cases, during System Integration Testing abnormal testing, regarding data storms as described in NRC IN 2007-15, "Effects of Ethernet-Based, Non-Safety Related Controls on the Safe and Continued Operation of Nuclear Power Stations" and verified that the design and functionality of the three potential communication pathways (HSL, AF100, and Advent/Ovation Interface) as well as potential sources of data storms (e.g. Ovation platform) were appropriately considered.

For the system interface and response time test, the NRC inspectors reviewed the calculation note (WNA-CN-00162-WAPP) used to verify the system design meets time response requirements specified in the AP1000 Protection and Safety Monitoring System Functional Requirements Specifications (APP-PMS-J1-001). The calculation note calculates the slowest rack time response for reactor trip functions, permissive generation, ESF Actuations Functions, displays, and system interfaces. The calculated slowest response time values are used as the acceptance criteria for the system interface and response time test. The team reviewed the completed test package for the system interface and response time test, which included the test procedure, test report, test configuration report, test data sheet, and test data record. While reviewing that test data sheet (VS2-PMS-T7D-012), the inspectors noted that the acceptance criteria was not specifically stated in 4 out of 9 test sections, which include the Manual Reactor Trip, Manual ESF, Display, and Advent-Ovation Interface system interface tests. Additionally the test report (VS2-PMS-T2R-012), referenced Revision 2 of the APP-PMS-T1D-012 test data sheet instead of the "as tested" Revision 3. WEC opened Corrective Action Program and Learning System item 100313180 to address these issues.

The inspectors also noted that for three sequence of events test cases (TPS12-SOE-22, TPS12-SOE-33, and TPS12-SOE-42), the system did not meet the time response requirements imposed for generation of sequence of events points, as documenting in RITS 25988. The WEC system design team explained that RITS 25988 resulted in the development of an additional requirement for sequence of events time response that will be implemented in the baseline 8 release of the PMS software.

Cabinet Hardware Testing for V.C Summer 2 (Baseline 8.2 Hardware)

The inspectors observed ongoing testing for the PMS Cabinet Hardware Regression activities for V.C. Summer 2. This testing assessed the changes from WNA-RL-02578-VS2, "V.C. Summer Unit 2 AP1000 Protection and Safety Monitoring System Hardware Configuration Management Release Report," Revision 2 to Revision 3. The regression testing assessed the resolution of the change drivers identified in WNA-AR-00379-WAPP, "AP1000 Protection and Safety Monitoring System Hardware Regression Analysis Change Report" which included testing for 10 PMS cabinets.

The inspectors reviewed the test procedure VS2-PMS-T1P-054, "Protection and Monitoring System Cabinet Hardware Regression Test Procedure," Revision 1, and observed portions of testing activities for two bi-stable coincidental logic cabinets (VS2-PMS-JD-BCCA01 and VS2-PMS-JD-BCCC01). During the observed portions of the testing no test anomalies were identified. In addition, the NRC verified measuring and test equipment was appropriately calibrated, including the digital multimeter and fluke power quality analyzer.

Component Interface Module/Advent-Ovation Interface Testing

The inspectors discussed WEC's process for validating the Component Interface Module/Advent-Ovation Interface Functional Integration Test Procedure, APP-ISIP-T1P-422, Revision A (Draft) and the status Component Interface Module/Advent-Ovation Interface testing with WEC personnel. APP-ISIP-T1P-422 is a level 4 test (e.g., a test that integrates the PMS and the non safety-related Plant Control System [PLS] which is a sub-system of the Plant Digital I&C architecture) that focuses on verifying the PMS and PLS interface for component control at the component interface module. During procedure validation, WEC identified anomalies regarding unexpected component behavior, including indication errors, when the Component Interface Module was placed in local control. WEC generated three Corrective Action Program and Learning System items (Issue ID's 100013105, 100118957, and 100301483) regarding these anomalies, which required software changes implemented in baseline 8.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that WEC's implementation of their policy and procedures for on-going and completed System Integration Testing of the PMS satisfy the regulatory requirements of Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

PMS Channel Integration Testing/System Integration Testing Results Reports Review (ITAAC 2.5.02.11d, 2.5.02.12)

a. Inspection Scope

The inspectors reviewed a sample of test reports from VC Summer Unit 2 Channel Integration Testing for ESF logic and Integrated Logic Processor component-level logic. The team reviewed RITS items generated from these tests and interviewed personnel involved in this testing to determine if the items had been addressed through corrective actions and retesting. The inspectors identified that the issues stemming from test anomalies, documented in RITS 16308 and 36303, would be resolved through functional change or software revision. The inspectors confirmed that resolution for these RITS items were in progress.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that WEC was adequately implementing processes and procedures for capturing test results from PMS Channel Integration Testing and resolving through appropriate changes and retesting consistent with the requirements of Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

5. PMS Cyber Security Controls

a. Inspection Scope

The NRC inspectors reviewed the status of cyber security requirements passed down to WEC from Southern Nuclear Operating Company for work associated with 10 CFR 73.54, "Protection of Digital Computer and Communication Systems and Networks," as documented in March 2014 NRC inspection report 99900404/2014-201 (ADAMS Accession Number ML14058A995). WEC had implemented purchase order requirements for the creation of procedures for the AP1000 Standard Plan Cyber Security for Vogtle Units 3 and 4 and was in the process of outlining implementation of

procedures and requirements. The NRC noted that through discussion with WEC personnel during this inspection, no implementation requirements have been passed down to WEC through purchase orders from AP1000 licensees; therefore, no cyber security requirements for PMS have been implemented by WEC.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors reviewed the status of cyber security controls and found that there has been no purchase order issued to WEC for the implementation of procedures or requirements associated with 10 CFR 73.54, "Protection of digital computer and communication systems and networks." No findings of significance were identified.

6. PMS Corrective Action Program Implementation Review (ITAAC 2.5.02.11.c)

a. Inspection Scope

The inspectors reviewed WEC's approach, methodology, and progress with incorporating Reusable Software Element (custom software and type circuit) documents into the PMS software development process. The inspectors noted that approximately 80 Reusable Software Element Descriptions used in the PMS were addressed in IV&V task reports, software requirements, Software Design Descriptions, and the PMS design phase software hazards analysis. The inspectors also reviewed the completed corrective actions for Reusable Software Element Description issues as identified in the April 2012 NRC inspection report and Notice of Violation (ML12171A058). These actions are documented in Corrective Action Program and Learning System item 100215249 (previously tracked as Commitment 12-101-M060).

The RITS system was routinely used to address Reusable Software Element Description issues from identification through resolution. The NRC team reviewed a sampling of: (1) RITS initiated since 2013 related to Reusable Software Elements; (2) Reusable Software Element code and code requirements tracing; (3) Reusable Software Element Descriptions; and (4) technical & programmatic aspects of design and implementation including Reusable Software Element Descriptions as described in sections of this inspection report.

March 2015 Notice of Nonconformance (NON)

The NRC inspection team discussed the ongoing activities regarding Nonconformances 99900404/2015-204-1, 99900404/2015-204-2 and 99900404/2015-204-3, issued in March 2015, with WEC management and technical staff. At the time of inspection, WEC was in the processes of completing a technical engineering team review regarding Nonconformance 99900404/2015-204-1, which was issued for WECs failure to establish comprehensive qualification testing associated with the credible peak currents for PMS isolation devices. WEC personnel informed NRC

staff that the results of the technical engineering team review would be documented in a report that will address the AP1000 fault testing strategy moving forward. For Nonconformances 99900404/2015-204-2 and 99900404/2015-204-3, WEC had completed apparent cause analyses (ACAs) and was in the process of completing additional evaluations and reviews identified as a result of the ACAs. Nonconformances 99900404/2015-204-2 and 99900404/2015-204-3 were issued for WECs failure to demonstrate U.S. AP1000 PMS equipment was bounded by the electromagnetic compatibility equipment qualification testing performed on alternative cabinet design and WECs failure to identify appropriate acceptance criteria to verify the equipment used for electromagnetic compatibility testing of PMS was appropriately calibrated, respectively. WEC staff also provided the estimated time of completion for the corrective actions they plan to implement.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors determined that WEC had adequately accounted for and addressed Reusable Software Element Descriptions throughout the PMS development process. Issues associated with Reusable Software Element Descriptions were captured, tracked, and adequately resolved through the RITS process. The inspectors also reviewed the status of the implementation of corrective actions to address the three nonconformances issued as a result of the March 2015 NRC inspection. Based on the sample reviewed the inspectors determined that WEC was adequately implementing processes and procedures associated with the corrective action program consistent with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

PMS Design Phase Software Management, Configuration Management and Verification & Validation Processes (ITAAC, 2.5.02.12)

a. Scope

The NRC inspectors assessed WEC's software program management, configuration management, and IV&V processes, specifically implementation of those processes throughout the PMS design life cycle phase. The inspectors selected and verified a representative sample of lifecycle phase-specific attributes to determine the effectiveness of the processes in complying with commitments outlined in ITAAC 2.5.2.12 and the AP1000 licensing basis.

Software Management

The inspectors reviewed the PMS project plan, software development plan, and software program manual, all of which contains elements of software management for safety-related I&C applications. The inspectors verified that these high level documents promulgated processes for key digital system and software development, including

configuration management, IV&V, quality assurance, and software safety. Additionally, the inspectors confirmed that issues identified as part of the PMS development were captured and addressed through WEC corrective action processes.

<u>Software Configuration Management</u>

The inspectors evaluated various WEC documents related to software configuration management to verify compliance with the Software Program Manual for Common Q Systems and the PMS Software Configuration Management Plan. Through interviews, review of configuration management documents, and a walk-through of processes, the inspectors determined that WEC's process for release of configuration items against a software baseline was adequate. Additionally, WEC demonstrated key process attributes for the inspectors, including: (1) how each I&C functional group releases their configuration item's against a baseline via configuration management release records; (2) the conduct of readiness reviews that are performed prior to issuing a configuration management release record to confirm the correctness of the contents of the release; and (3) activities initiated for evaluating issues impacting the released configuration items (open issues review, impact assessment, and documenting review and configuration item limitations) in the configuration management release record.

<u>Software Verification & Validation</u>

The inspectors evaluated various WEC verification and validation documents to verify compliance with the Software Program Manual for Common Q Systems and the PMS Software Verification and Validation Plan. Various IV&V output documents and task reports developed throughout the PMS design and implementation phase were sampled to verify alignment with the higher level process requirements. The inspectors selected a sample of attributes from the required IV&V phase activities and interviewed IV&V personnel to assess whether the IV&V effort adequately performed the required tasks. Specifically, the inspectors reviewed WEC's IV&V documentation to verify completion of the Common Q security controls assessment, application code review, IV&V configuration management release records, risk analysis, and traceability, and the IV&V baseline configuration management assessment.

The inspectors verified that the process developed and actions taken by WEC IV&V to review open items for the design phase was adequate and in accordance with documented reports. In addition, the inspectors verified IV&V team independence from the design organization in their reviews of the safety related software as required by procedures and regulatory requirements.

b. <u>Observation and Findings</u>

No findings of significance were identified.

c. <u>Conclusion</u>

The inspectors determined that WEC's implementation of its policies and procedures that govern the PMS software design phase lifecycle activities were consistent with the

requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. PMS development was adequately controlled through processes for configuration management, verification and validation, quality assurance, and software safety in accordance with WEC's management plan. No findings of significance were identified.

7. Entrance and Exit Meetings

On July 6, 2015, the inspectors presented the inspection scope during an entrance meeting with Mr. David Howell, Senior Vice President, Automation and Field Services, of WEC, and other WEC personnel.

On July 17, 2015, 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. <u>PERSONS CONTACTED AND NRC STAFF INVOLVED:</u>

Name	Affiliation	Entrance	Exit	Interviewed
David Howell	WEC	X		
John Wiesemann	WEC	X	X	X
Dale Harmon	WEC	X		
Guy Guerrier	SCANA	X		
Mike Shaffer	WEC	X	X	X
Pietro Porco	WEC	X	X	X
Wes Vaughn	SNC	X	X	
Greg Glenn	WEC	X	X	X
Ken Lunz	WEC	X	X	
Chris Srock	WEC	X		
Jan Dudiak	WEC	X	X	
Murat Uzman	WEC	X		X
Greg Cesare	WEC	X		X
Jason Weathersby	SCANA	X	X	
Bob Hirmanpour	SNC	X	X	
Steven Packard	WEC	X	X	X
Brian Cusick	WEC	X		X
Miguel Vallarta	WEC	X	X	
Doug McConahy	WEC	X		X
Tom McLaughlin	WEC	X	X	X
Dino Copetas	WEC	X	X	X
David Jarosh	WEC	X	X	X
Rick Paese	WEC	X	X	X
John Faulkner	WEC	X		X
Matt Shakun	WEC		X	X
Dave Tyler	WEC		X	X
Mark Stofko	WEC		X	X
Marie Blanc	WEC		X	
Sue Mullen	WEC		X	
Steve Rodomski	WEC		X	
Ronnie Gardner	WEC		X	
Kris Saxon	SNC		X	
Warren Odess-Gillett	WEC			X
Jason Zielinski	WEC			X
Darin Orendi	WEC			X
Alayna Anquilli	WEC			X
Nic Moore	WEC			X
Blaise Macioce	WEC			X
Kasey Corbin	WEC			X
Bob Cortese	WEC			X
Ed Schindhelm	WEC			X

Name	Affiliation	Entrance	Exit	Interviewed
Darryl Muetzel	WEC			X
Bob Phillips	WEC			X
Lou Jesso	WEC			X
Suresh Channarasappa	WEC			X
Mark Kibby	WEC			X
Alex Lutz	WEC			X
Ryan Carl	WEC			X
Brandon Taylor	WEC			X
Dave Malarik	WEC			X
Bob Lane	WEC			X
Lewis Clack	WEC			X
William Miller	WEC			X
Steve Adams	WEC			X
Nicole Stadelman	WEC			X
Greg Galletti	NRC	X	X	
Lisa Castelli	NRC	X	X	
Robert Mathis III	NRC	X	X	
Philip Natividad	NRC	X	X	
Thomas Fredette	NRC	X	X	
Ashley Thomas	NRC	X	X	
Wendell Morton	NRC	X	X	
Hyung Je	NRC		X	
Stacy Smith	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:

Item Number	Status	Type	Description	Applicable ITAAC
99900404/2015-204-01	discussed	NON	Criterion III	2.5.02.07
99900404/2015-204-02	discussed	NON	Criterion III	2.5.02.03
99900404/2015-204-03	discussed	NON	Criterion III	2.5.02.03

4. <u>INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA:</u>

The U.S. Nuclear Regulatory Commission (NRC) inspectors identified the following ITAAC related to components being designed, manufactured, and tested at WEC. At the time of the inspection, WEC was involved in certain testing activities including PMS Cabinet Hardware testing for the V.C. Summer Unit 2 AP1000 reactor design. For the ITAAC listed below, the inspectors reviewed WEC's quality assurance 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. The inspectors identified three findings associated with these ITAAC during this inspection.

This section of the inspection report focuses on the vendor's implementation of aspects of their quality assurance 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 7.8.2 PMS software and hardware design and testing documentation as well as currently on-going Cabinet Hardware Testing for the Summer 2 build. These activities are associated with ITAAC 2.5.02.11c and 2.5.02.11d as well as ITAAC 2.5.02.12.

With respect to ITAAC 2.5.02.12, the inspectors observed attributes and elements associated with implementation of the PMS Software Management Plan, Software Configuration Management Plan, and the Software IV&V Plan. These attributes are observed and assessed for each inspection involving ITAACs 2.5.02.11 and 2.5.02.14.

COL#	DCD#	Design Commitment	Component/Activity
550	2.5.02.11	The PMS hardware and software are developed using a planned design process during hardware and software development phase, consisting of hardware and software design and implementation (subtask [c] of design commitment – system design and implementation)	The inspectors assessed the WEC design processes for the PMS software through detailed traceability of selected Reactor Trip and Engineered Safety Feature Actuation System functions. The inspectors evaluated the traceability of the selected design elements from the functional and software requirements to the software design descriptions mapped to the PMS Bistable Processor Logic and the Local Coincidence Logic subsystems. The inspectors reviewed a sample of hardware requirements and verified through hardware requirements tracing, that the vendor had adequately captured and implemented system design requirements into hardware specifications and detailed design drawings.

COL#	DCD#	Design Commitment	Component/Activity
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 [d] of design commitment – system integration and test phase)	Summer Unit 2 - Observed in-process Cabinet Hardware Regression Testing to baseline 8.2 hardware. Reviewed policies, procedures, and a sample of test reports from VC Summer Unit 2 Channel Integration Testing for ESF logic and Integrated Logic Processor component-level logic and various System Integration Testing test plans. Reviewed RITS and corrective action's associated with testing. The inspectors reviewed the major IV&V process activities that WEC re-performs during the IV&V software regression process, including: (1) identifying and evaluating change drivers, (2) functional logic tracing, (3) source code change evaluation, (4) software regression testing, (5) software hazards analysis, (6) requirements traceability analysis, and (7) interface data analysis.

551	2.5.02.12	The PMS software is designed, tested, installed, and maintained using a process which incorporates a graded approach according to the relative importance of the software to safety and specifies requirements for:
		  a) Software management including documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action.
		  b) Software configuration management including historical records of software and control of software changes.
		  c) Verification and validation including requirements for reviewer independence.
			Observed attributes and elements associated with implementation of the PMS Software Management Plan, Software Configuration Management Plan, and software Verification and Validation Plan. These attributes are observed and assessed for each inspection involving ITAACs 2.5.02.11 and 2.5.02.14.

6. DOCUMENTS REVIEWED:

   Specifications, Requirements, Functional Drawings, Plans, Reports

   - APP-PMS-GHY-002, "AP1000 Protection & Safety Monitoring System Software Design Description for Bistable Processor Logic," Revision 11
   - APP-PMS-GHY-003, "AP1000 Protection and Safety Monitoring System Software Design Description for the Local Coincidence Logic Processor," Revision 11, dated October 2013
   - APP-GW-J1-010, "AP1000 I&C System Requirements Specification," Revision 10, dated January 2013
   - APP-PMS-J1-001, "AP1000 Protection and Safety Monitoring System Functional Requirements," Revision 8, dated September 2013
   - APP-PMS-J1-105, "Ap1000 Functional Diagram Core Heat Removal Protection and Reactor Coolant Pump Trip," Revision 7, dated 5/2/2011
   - APP-PMS-J1-116, "AP1000 Functional Diagram IRWST Actuations," Revision 9, dated August, 2013
   - APP-PMS-J3-304 "AP1000 Detailed Functional Diagram Reactor Trip Division B", Revision 4, dated November 2011
   - APP-PMS-J3-316, "AP1000 Detailed Functional diagram Overtemperature/Overpower Reactor Trips Division B," Revision 7, dated September 2013
   - APP-PMS-J3-372, "AP1000 Detailed Functional Diagram IRWST Level", Revision 6, dated September 2013
   - APP-GW-J4-001, "AP1000 I&C System Design Specification," Revision 10, dated February 2013
   - APP-PMS-J4-102, "AP1000 Protection and Safety Monitoring System Software Requirements Specification," Revision 12, dated October 2013
   - APP-PMS-J4-003, "Protection and Safety Monitoring System AP1000 Subsystem Requirements Specification," Revision 7, dated September 2013
   - APP-PMS-J4-020, "AP1000 System Design Specification for the Protection and Safety Monitoring System," Revision 8, dated October 2013
   - APP-PMS-J0R-001, "AP1000 Protection and Safety Monitoring System Requirements Traceability Matrix," Revision 2, dated January 2013
   - WNA-DT-00071-WAPP, "MAF Database Release Record for the System Design Specification for the Protection and Safety Monitoring System," Revision 3
   - WNA-PT-00058, "Testing Process for Common Q Safety Systems," Revision 4
   - WCAP-16438-P, "FMEA of AP1000 Protection and Safety Monitoring System," Revision 6, dated April 2014
   - WCAP-16675-P, "AP1000 Protection and Safety Monitoring System Architecture Technical Report," Revision 6, dated June 2013
   - GBRA 073475, "Functional analysis of the AF100 Communication, CI631 firmware incl. EPLDs and ASICs," dated July 19, 2006
   - WNA-CN-00162-WAPP, "AP1000 Protection and Safety Monitoring System Time Response Calculations," Revision 4
   - SV0-PMS-J0R-001, "Vogtle AP1000 Protection & Safety Monitoring System Requirements Traceability Matrix," Rev. 2, dated January 2013

- WNA-VT-00004-SV0, "IV&V Task Report for Subsystem Software Requirements Evaluation," Revision 1, dated June 2014
- SV0-IVV-JQR-021, "Vogtle AP1000 Protection & Safety Monitoring System IV&V Summary Report," Rev. 2, dated May 2015
- WNA-RL-03778-WAPP, "IV&V Task Report for Open items Readiness Review at PMS Requirements Phase," Rev. 0, dated June 2013
- WNA-PV-00009-GEN, "Software Verification & Validation Process for the Common Q Safety Systems", Revision 9, dated June 2013
- WNA-VT-00046-SV0, "IV&V Task Report for Vogtle AP1000 Baseline 7.4 Configuration Management Assessment," Revision 2, dated May 2014
- WNA-VT-00012-GEN, "IV&V Task Report for Software Configuration Management Plan Assessment," Revision 1, dated June 2014
- WNA-WI-0390-GEN, "IV&V Open Issues Reporting Work Instruction," Revision 1, dated May 2013
- WNA-WI-00497-GEN, "Common Q Regressions Analysis Preparation Work Instruction," Revision 2, dated April 2015
- WNA-RL-04707-SVO, " Vogtle AP1000 Protection and Safety Monitoring system IV&V Configuration Management Release Report," Revision 1, dated June 2015
- APP-GW-J0R-012, " IV&V Task report for the Evaluation of the AP1000 Protection and Safety Monitoring system Computer Security Plan," Revision 2, dated April 2015
- APP-IVV-JQR-006, "AP1000 Protection and Monitoring System Integrated Logic-Component Code Review Report," Revision 2, dated May 2014
- WNA-WI-00333-GEN, "Common Q Application Software Hazards Analysis Work Instruction," Revision 4, dated April 2015
- WNA-PC-00032-WAPP, "AP1000 I&C Domestic Projects Configuration Management Plan," Revision 1, dated August 2013
- WNA-PV-00054-WAPP, "AP1000 Protection & Safety Monitoring System Software Verification & Validation Plan," Revision 6, dated May 2015
- NABU-DP-00014-GEN, "Design Process for Common Q Safety Systems." Revision 3, dated April 2011
- WCAP-16096-P-A, "Software Program Manual for Common Q Systems," Revision 4, dated February 2013
- SV0-IVV-JQR-021, "Vogtle AP1000 Protection & Safety Monitoring System IV&V Summary Report," Revision 2, dated May 2015
- WNA-RL-03778-WAPP, "IV&V Task Report for Open items Readiness Review at PMS
- WCAP-16592-P, "Software Hazards Analysis of AP1000 Protection & Safety Monitoring System," Revision 3, dated May 2013
- APP-PMS-GER-003, "Software Hazards Analysis Report of AP1000 Protection & Safety Monitoring System," Revision 2, dated February 2014
- APP-PMS-GER-021, "Protection & Safety Monitoring System IV&V Phase Summary Report," Revision 3, dated August 2013
- VS2-PMS-T2R-008, "Protection & Safety Monitoring System – ESF Channel Integration Test Report," Revision 1, dated September 2014
- VS2-PMS-T2R-009, "Protection & Safety Monitoring System - Integrated Logic Processor Channel Integrated Test Report," Revision 1, dated October 2014

Test Plans and Reports

- APP-PMS-T5-001, "AP1000 Protection and Safety Monitoring System Test Plan," Revision 3, dated April 2013
- VS2-PMS-T2R-012," V.C Summer Unit 2 AP1000 Protection and Safety Monitoring System – System Interface and Response Time –System integration Test Report," Revision 0, dated March 27, 2015
- APP-PMS- T1D-012, "AP1000 Protection and Safety Monitoring System – System Interface and Response Time – System Integration Test Data Sheets," Revision 2, dated May 23, 2014
- APP-PMS- T1D-012, "AP1000 Protection and Safety Monitoring System – System Interface and Response Time – System Integration Test Data Sheets," Revision 3, dated July 25, 2014
- APP-PMS-T1P-014, "AP1000 Protection and Safety Monitoring System Integration Test Abnormal Conditions Test Procedure," Revision 1, dated September 2013
- APP-PMS-T1P-014, "AP1000 Protection and Safety Monitoring System-System Integration Test Abnormal Conditions Test Procedure," Revision 2, dated February 2015
- VS2-PMS-T1P-054, "Protection and Monitoring System Cabinet Hardware Test Regression Test Procedure," Revision 1, July 2015
- APP-PMS-T1P-012, "AP1000 Protection and Safety Monitoring System-System Integration Test for Time Response Test Procedure," Revision 1, dated June 10, 2013
- APP-ISIP- T1P-422, "CIM/AOI Functional Integration Test Procedure, " Rev. A (Draft), dated April 2015
- WNA-WI-00452-GEN, "Regression Testing Work Instruction," Revision 0, dated February 2014

Configuration Management Release Report (CMMRs)

- WNA-RL-02578-VS2, "V.C. Summer Unit 2 AP1000 Protection and Safety Monitoring System Hardware Configuration Management Release Report," Revision 3
- WNA-RL-02578-VS2, "V.C. Summer Unit 2 AP1000 Protection and Safety Monitoring System Hardware Configuration Management Release Report," Revision 2
- WNA-PC-00005-WAPP, "AP1000 I&C Projects Configuration Management Plan," Revision 3, dated August 2013
- APP-PMS-J8R-001, "AP1000 Protection and Monitoring System Functional Design Documents Configuration Management Release Report," Revision 9, dated September 2013
- APP-PMS-J8R-004, "AP1000 Protection and Monitoring System Design Documents Configuration Management Release Report," Revision 6, dated November 2013
- WNA-RL-02532-SV3, "Vogtle Unit 3 AP1000 Protection and Monitoring System Hardware Configuration Management Release Report," Revision 2, dated February 2014
- WNA-RL-03189-SV0, "Vogtle AP1000 Protection and Monitoring System Software Documents Configuration Management Release Report," Revision 11, dated April 2014
- WNA-RL-04434-SV3, "Vogtle Unit 3 AP1000 Protection and Monitoring System Software Documents Configuration Management Release Report," Revision 2, dated August 2014

- WNA-WI-00223-WAPP, "Integrated Systems Engineering Release Process Work Instruction for AP1000," Revision 0, December 2011

Measuring and Test Equipment

- Fluke ID 30014261, calibrated March 16, 2015, calibration due March 16, 2016
- Fluke ID 30014247, calibrated April 9, 2015, calibration due March 9, 2016
- Fluke Power Quality Analyzer ID 106524, calibrated October 25, 2014, calibration due October 25, 2015

Corrective Action Reports

- Issue ID 100313180, "July 2015 NRC ITAAC Inspection Issue- Time Response Test Document Errors," dated July 14, 2015
- Issue ID RITS25988, "PIMS-SIT-Tp012-SOE-2-BL2: Time Response is greater than the 250 msec specified in the System Specification", dated January 4, 2013
- CAPAL Issue ID 100312576, dated July 9, 2015
- CAPAL Discrete Issue 100105724 "Reusable Software Element Documentation," dated April 23, 2013
- Issue ID: 100313517, "RTM Tracing Error", dated July 17, 2015

Drawings

- AP1000, "BPLA1_10FCBDIAG," Revision 7.2.1 for Division A, Cabinet BCC1, Sheets 18, 32, 38, 44, 45, and 66 dated January 16, 2014
- AP1000, "BPLA1_10FCBDIAG," Revision 7.2.1 for Division A, Cabinet BCC1, dated January 16, 2014
- APP-PMS-J1-105 "Functional Diagram Core Heat Removal Protection and Reactor Coolant Pump Trip," Rev. 7
- APP-PMS-J3-316 "Detailed Functional Diagram Overpower Delta T/Over-temperature Delta T Reactor Trip Division B," Rev. 7

Miscellaneous Documents

- Training documented in minutes for "AP1000 PMS Software Weekly Meeting" dated October 9, 2012, for CAPAL 100215249 Activity 8000001322812
- WNA-PD-00136-GEN, "Standard Regression Analysis Strategy for Common Q Safety Systems," Rev. 0, dated April 2010
- WNA-AR-00379-WAPP, "AP1000 PMS Hardware Regression Analysis Change Report," Rev 0, dated April 2015
- WNA-AR-00363-WAPP, "AP1000 Protection and Safety Monitoring System Regression Analysis Change Report," Revision 4, dated April 2014
- WNA-RL-02393-WAPP, "PMS Software Database Release Record for AP1000 Standard Plant Divisions A, B, C, and D", Revision 6, dated, November 21, 2013
- WNA-DS-01663-GEN, "Standard Reusable Software Element Document for Q-Delta T Type Circuit," Revision 1, dated October 2010
- NA-RPS-AP1000 U.S.-13-0001, "MAF TO FUNCM", Revision 5

6. <u>ACRONYMS:</u>

ADAMS	Agencywide Documents Access and Management System
CFR	*Code of Federal Regulations*
DAC	design acceptance criteria
DCD	Design Control Document
DCIP	Division of Construction Inspection and Operational Programs
DI&C	Digital Instrumentation and Control
EVIB	Electrical Vendor Inspection Branch
IEEE	Institute of Electrical and Electronics Engineers
IP	inspection procedure
ITAAC	Inspections, tests, analyses, and acceptance criteria
IV&V	independent verification and validation
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PMS	Protection and Safety Monitoring System
RITS	Replacement and Automation Services Issue Tracking System
SSC	Systems, Structures, and Components
U.S.	United States (of America)
WEC	Westinghouse Electric Company