UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 22, 2018

Michael Corletti, Director
New Plant Technologies & Licensing
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE ELECTRIC COMPANY REPORT NO. 99900404/2017-201

Dear Mr. Corletti:

On December 11-15, 2017, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Westinghouse Electric Company (WEC) facility in Cranberry Township, PA. The purpose of the limited-scope inspection was to assess WEC's compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 21, Reporting of Defects and Noncompliance."

This inspection evaluated aspects of WEC's programs for the design, implementation, and testing of the Protection and Safety Monitoring System (PMS) systems for the Vogtle Units 3 and 4 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 the vendors setpoint calculation notes methodology and implementation, and the results of the engineering effort associated with the maximum Central Processing Unit (CPU) analyses of the Advant Controller, Model 160 (AC160) microprocessor used in 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. Specifically, these activities were associated with ITAACs 2.5.02.10 and 2.5.02.11.

With respect to a previously identified unresolved issue regarding implementation of aspects of the cyber security program, the NRC inspectors documented the basis for closure of the issue.

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/

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. 99900404/2017-201
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE ELECTRIC COMPANY REPORT NO. 99900404/2017-201

Dated: January 22, 2018

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DATE	01/22/2018	01/18/2018	01/19/2018	01/22/2018

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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.:	99900404/2017-201	
Vendor:	Westinghouse Electric Company 1000 Westinghouse Drive Cranberry Township, PA 16066	
Vendor Contact:	Michael Corletti, Director New Plant Technologies & Licensing 1000 Westinghouse Drive Cranberry Township, PA 16066 Email: corletmm@westinghouse.com	
	Nuclear Industry Activity: Westinghouse Electric Company, LLC, located at 1000 Westinghouse Drive, Cranberry Township, PA 16066, whose scope of supply includes but not limited to safety-related design, fabrication, testing, and delivery of the Protection and Safety Monitoring System and the non-safety Diverse Actuation System instruments and controls products to the current U.S. AP1000 plants under construction.	
Inspection Dates:	December 11-15, 2017	
Inspection Team Leader:	Greg Galletti	NRO/DCIP/QVIB-1
Inspectors:	Joseph Ashcraft William Roggenbrodt	NRO/DEI/ICE NRO/DEI/ICE
Approved by:	Terry W. Jackson, Chief Quality Assurance Vendor Inspection Branch-1 Division of Construction Inspection and Operational Programs Office of New Reactors	

Enclosure

EXECUTIVE SUMMARY

Westinghouse Electric Company
99900404/2017-201

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, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance." The inspectors conducted this inspection at the WEC facility in Cranberry Township, Pennsylvania, on December 11-15, 2017.

This inspection evaluated aspects of WEC's programs for the design, implementation, and testing of the Protection and Safety Monitoring System (PMS) systems for the Vogtle Units 3 and 4 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 the vendors setpoint calculation methodology and implementation, and engineering results associated with the maximum Central Processing Unit (CPU) analyses. 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. Specifically, these activities were associated with ITAACs 2.5.02.10 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 Setpoint Methodology and Implementation (ITAAC 2.5.02.10)

The inspectors concluded that WEC's implementation of the design calculation notes were developed in accordance with the approved setpoint methodology. Each of the calculations reviewed reflected a positive margin, thus signifying that the previously established setpoints are adequate to ensure that the protective functions would occur before the analytical limit established by the plant safety analysis is reached. No findings of significance were identified.

PMS Maximum CPU Engineering Evaluation (ITAAC 2.5.02.11c)

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

PMS Channel Integration Test (CIT) Results Report Review (ITAAC 2.5.02.11d)

The inspectors concluded that WEC's implementation of their policy and procedures for control testing of associated with the PMS CIT 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.

Inspection Report 99900404/2015209 Unresolved Issue (URI) Follow-up

The NRC performed an evaluation to determine if the URI represented a non-conformance to contractual requirements. Based on this review, the NRC staff concluded that a NON may be used when a contractor fails to meet contract requirements related to 10 CFR § 73.54, but did not identify a specific requirement failure to include an individual with strong knowledge in emergency management systems on its Cyber Security Team. Therefore the staff determined that a non-conformance is not warranted. This issue is resolved.

REPORT DETAILS

1. PMS Setpoint Methodology and Implementation (ITAAC 2.5.02.10)

   a. Inspection Scope

   The Inspectors reviewed the following design calculation notes: APP-PMS-M3C-100, "Pressurizer Pressure RTS/ESAS Setpoints, and EOP Uncertainty calculations for AP1000 Plant," Revision 1; APP-PMS-M3C-101, "Main Steam Line Pressure ESFAS Setpoint and EOP Uncertainty Calculations for the AP1000 Plant," Revision 2, APP-PMS-M3C-103, "Reactor Coolant Pump Speed Reactor Trip Setpoint Calculations for the AP1000 Plant," Revision 1; and APP-PMS-M3C-104, "Spent Fuel Pool Level PMS Uncertainty Calculations for the AP1000 Plants," Revision 2. The inspectors used APP-PMS-JEP-001, (WCAP-16361-P), "Westinghouse Setpoint Methodology for Protection Systems-AP1000," Revision 1, to determine if the design calculation notes were developed according to the NRC-approved setpoint methodology.

   The inspectors confirmed that the uncertainties and assumptions used in calculation were taken from the referenced documentation provided in each calculation and properly implemented in the calculation notes and that a positive margin had been obtained. A positive margin assures that the established setpoint adequately protects the plant safety limits. Tap and transmitter elevations were not addressed in the calculation notes and there was no reference to scaling calculations used to account for any head correction due to tap and transmitter elevations. The calculations would be updated once the as-built plant configuration is completed and the tap and transmitter elevations are known. The inspectors interviewed WEC personnel on topics of precision of decimals used in calculations, rounding of numbers, tap and transmitter elevations used for head correction, scaling calculations, assumptions, and methods used by the calculation verifiers.

   The inspectors confirmed that Section 4.3 of the setpoint methodology describes the process of how plant-specific information, such as process scaling calculations and other types of as-built information that support the calculation notes, will be confirmed, validated, and updated to calculation notes, as necessary, prior to fuel load.

   b. Observations and Findings

   No findings of significance were identified.

   c. Conclusion

   The inspectors concluded that WEC's implementation of the design calculation notes were developed in accordance with the approved setpoint methodology. Each of the calculations reviewed reflected a positive margin, thus signifying that the previously established setpoints are adequate to ensure that the protective functions would occur before the analytical limit established by the plant safety analysis is reached. The inspectors concluded that WEC's implementation of their policy and procedures for control of the setpoint methodology and implementation 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.

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

a. Inspection Scope

The inspectors reviewed APP-PMS-GER-004, "AP1000 Protection and Safety Monitoring System AC160 Application CPU Load / Performance Analysis", Revision 3, dated November 2017, which documented the re-performed analysis for Software Baseline 8.4 (BL 8.4) US release, to confirm that the system utilized in production software will not exceed 70 percent maximum load for the Processor Module of the Advant Controller Model 160 (AC160).

The inspectors confirmed the methodology:

1. Adds additional tasks to the software routines, so that the software under test executes at a CPU utilization rate, or CPU "load", slightly higher than the production software;

2. Adds a task related to performing a run-time analysis or counter task at the end of the executable software that captures and lists the maximum CPU utilization rate experienced by the microprocessor during its execution cycle;

3. Accounts for the backplane traffic potentially experienced by lower priority tasks by conducting a synchronization analysis in which the different software control modules (CONTRMs) with different priorities and execution times are driven to "synchronization." This ensures that all CONTRMs are requesting use of the backplane input/output bus at the same moment, thus providing the longest system time required to execute all critical tasks within on execution cycle;

4. Includes a "Delta Runtime Analysis" to account for the changes made (additional load experienced by the microprocessor) to the BL 8.4 production level software.

The inspectors reviewed the change process applied to the AC160 Processors Modules for three engineering change packages that implemented a variety of PMS software and hardware design changes, including one that added new Class 1E level sensors and transmitters processed within the PMS. The inspectors confirmed the changes made to the system addressed and accounted for additional application tasks presented to the system micro-processors. The inspectors also reviewed various design and requirement specification documents, to confirm that those documents adequately reflected the design changes in BL 8.4.

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 PMS Maximum CPU Engineering Evaluation was consistent with the regulatory requirements set forth in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. PMS Channel Integration Test (CIT) Results Report Review (ITAAC 2.5.02.11d)

CIT testing is used to isolate the PMS to a single division in order to facilitate performance of reactor trip and Emergency Safeguards Actuation System (ESFAS) features, integrated logic processor component logic, qualified data display and nuclear instrumentation operation, channel accuracy, cabinet indications and status, and plant control system hardware interface functionality testing. The functionality of all intra-cabinet and inter-divisional cabling and communications is also verified.

a. Inspection Scope

The inspectors reviewed APP-PMS-T2R-050, "AP1000 Protection and Safety Monitoring System Channel Integration Test Integrated System Validation Test Report," Revision 0, dated November 2017, and APP-PMS-T1P-050, "AP1000 Protection and Safety Monitoring System Fuel Load Regression Test Procedure," Revision 2, to confirm the testing was performed in accordance with the applicable PMS testing procedures.

The inspectors reviewed a sample of the test data sheets APP-PMS-T1D-018,"AP1000 Protection and Safety Monitoring system I/O Channel Accuracy Channel Integration Test Data Sheets," Revision 6, to confirm that the recorded test data was within the expected response range, and where anomalies were documented, appropriate corrective actions were developed to identify and correct the causes, and appropriate evaluation, including retesting, if needed, was performed.

The inspectors reviewed Table A1-1, "CIT Environmental Conditions Log," and confirmed environmental conditions were documented per the requirements of NABU-DS-00092-GEN, "Safety Platform System Design Requirements," Revision 2, on environmental test log and those parameters of temperature and humidity were within the bounds specified for such tests in accordance with those requirements.

The inspectors reviewed the CIT Test Equipment Log Table D-1 and sampled the entries to confirm that the equipment used was adequately evaluated and within calibration prior to installation in the test configuration. The report also included a component log indicating where each test tool was located in the test configuration and duration of use of that item in that location.

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 test control regarding the PMS CIT 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.

4. Inspection Report 99900404/2015209 Unresolved Issue (URI) 99900404/2015-209-01 Follow-up

During the February 6-9, 2017, NRC inspection of the PMS design and implementation, the inspectors reviewed activities related to on-going cybersecurity-related implementation. The results of that inspection were documented in NRC issued Inspection Report Number 99900404/2015-209, issued on May 12, 2017.

Based on that review, the inspectors identified a URI (99900404/2015-209-01) associated with aspects of WEC's implementation of the cybersecurity-related activities concerning the need for inclusion of an individual with knowledge of emergency management on the Cyber Security Team. This issue was further evaluated by the NRC and included a review of contractual documentation.

The NRC evaluation included an analysis of whether a Notice of Nonconformance (NON) can be issued in the 10 CFR § 73.54 context and whether the issuance of a NON would be appropriate for the apparent deficiency observed during the inspection. Specifically, the staff looked for the existence of a contractual basis in the Vogtle purchase orders and subsequent change orders to identify failure to include an individual with strong knowledge in emergency management systems on its Cyber Security Team.

Based on this review, the NRC staff concluded that a NON may be used when a contractor fails to meet contract requirements related to 10 CFR § 73.54, but did not identify a specific requirement failure to include an individual with strong knowledge in emergency management systems on its Cyber Security Team. Therefore the staff determined that a non-conformance is not warranted. This issue is resolved.

5. Entrance and Exit Meetings

On December 11, 2017, the inspectors presented the inspection scope during an entrance meeting with Mr. Gary Brassart, Vice-President, Global Instrumentation and Controls, of WEC, and other WEC personnel. On December 15, 2017, the inspectors presented the inspection results during an exit meeting with Mr. Michael Corletti, Director, New Plant Licensing, of WEC and other WEC personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

Name	Affiliation	Entrance	Exit	Interviewed
Gary Brassart	WEC	X		
Stephen Packard	WEC	X	X	
Dale Harmon	WEC	X		
Gregory Glenn	WEC	X	X	X
Sarah DiTomasso	WEC	X	X	X
Bob Hirmanpour	SNC	X	X	
Michael Corletti	WEC		X	
Joseph Reagan	WEC	X	X	X
Terry Williams	WEC	X	X	X
Mike Drudy	WEC	X	X	X
Quang Nguyen	WEC	X		
Mark Mamo	SNC	X		
Kasey Corbin	WEC	X	X	X
Amanda Pugh	SNC	X		
Terry Tuite	WEC	X		
John Wiessmann	WEC	X	X	
Pavel Tyrpak	WEC	X		
Dan Mikinac	SNC	X	X	
Duong Nguyen	SNC	X	X	
Dave Malarik	WEC	X	X	
Brian Domitrovich	WEC	X	X	X
Eric Pitschke	WEC	X	X	
Steve Radomski	WEC	X		
Ron Wessel	WEC			X
Martin Washington	SNC		X	X
Aleksey Popalehov	WEC		X	X
Mark Humphrey	SNC		X	X
Brad LeDonne	WEC		X	X
Cherie Paugh	WEC			X
Jonathan Durfee	WEC			X
Murat Uzman	WEC			X
Vasilii Savtchouk	WEC			X
Jason Zielinski	WEC			X
Darin Orendi	WEC			X
Cynthia Taylor	NRC	X	X	
Carl Jones	NRC	X	X	
Ken Mott	NRC	X		
Joseph Ashcraft	NRC	X	X	
Greg Galletti	NRC	X	X	
Lisa Castelli	NRC	X	X	
William Roggenbrodt	NRC	X	X	

2. INSPECTION PROCEDURES USED:

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

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

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

Item Number	Status	Type	Description	Applicable ITAAC
99900404/2015-209-01	Closed	URI	Cyber	NA

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

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

This section of the inspection report focuses on the vendor’s implementation of aspects of their QA program for the activities affecting quality associated with the design and testing of the aspects of the AP1000 PMS. This included a review of completed Generic AP1000 Baseline (BL) 8.4 PMS software and hardware design and testing documentation and review of setpoint calculation notes. These activities are associated with ITAAC 2.5.02.11 (Index No. 550) and 2.5.02.10 (Index No. 549), respectively. The goal of these inspection activities is to examine the governing documents and samples of engineering activities that demonstrate the implementation of the design commitments and design attributes as stated in the ITAAC design commitments.

ITAAC Index No.	ITAAC Section No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
549	2.5.02.10	10. Setpoints are determined using a methodology which accounts for loop inaccuracies, response testing, and maintenance or replacement of instrumentation.	Inspection will be performed for a document that describes the methodology and input parameters used to determine the PMS setpoints.	A report exists and concludes that the PMS setpoints are determined using a methodology which accounts for loop inaccuracies, response testing, and maintenance or replacement of instrumentation.
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.

5. DOCUMENTS REVIEWED:

Setpoint Calculation Notebook Evaluation

APP-PMS-JEP-001, (WCAP-16361-P), "Westinghouse Setpoint Methodology for Protection Systems-AP1000," Revision 1, dated February 2011

APP-PMS-M3C-100, "Pressurizer Pressure RTS/ESAS Setpoints, and EOP Uncertainty calculations for AP1000 Plant," Revision 1, dated March 28, 2017

APP-RCS-M3C-101, "RCS Instrumentation and Packaged Mechanical System Interface Requirements,'" Revision 11, dated September 2016

SV0-JE52-J0M-002, "Vogtle AP1000 Class 1E Pressure and Differential Pressure Transmitters Suppliers B - Technical Manual," Revision 1, dated September 19, 2016

APP-JE52-Z0R-001, “AP1000 Class 1E Pressure and Differential Pressure Transmitters Data Sheet Report,” Revision 3, dated June 29, 2015

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

APP-PMS-VPR-001, “Environmental Test Report for the AP1000 Protection and Safety Monitoring System and Nuclear Instrumentation System Auxiliary Panels,” Revision 0, dated November 2012

APP-GW-VP-030, “AP1000® Environmental Conditions,” Revision 6, dated October 2016

APP-GW-M3C-022, “AP1000 Reactor Trip and Engineered Safety Feature Instrumentation,” Revision 1, dated October 2016

APP-PMS-M3C-135, “Insulation Resistance Degradation Uncertainties for the Domestic AP1000 Plants,” Revision 0, dated November 2016

APP-PMS-M3C-101, “Main Steam Line Pressure ESFAS Setpoint and EOP Uncertainty Calculations for the AP1000 Plant,” Revision 2, dated April 17, 2017

APP-SGS-M3C-101, “SGS Instrumentation and Packaged Mechanical System Interface Requirements,” Revision 9, dated March 2016

APP-PMS-M3C-103, “Reactor Coolant Pump Speed Reactor Trip Setpoint Calculations for the AP1000 Plant,” Revision 1, dated April 25, 2017

APP-JE62-Z0D-101, “AP1000 Specification Data Sheet for Reactor Coolant Pump Speed Sensor,” Revision 0, dated October 12, 2010

APP-SSAR-GSC-135, “Advanced First Core LOFTRAN Base Deck,” Revision 1, dated December 16, 2014

APP-JY62-VNM-101, “Instruction Manual for the 46C1-01 and 46C1-02 AP1000 Reactor Coolant Pump Speed Sensor Preamplifier Assemblies,” Revision 0, dated June 27, 2014

APP-JE62-Z0-001, “JE62/JE40 RCP Speed/ Phase Reference Sensor,” Revision 4, dated September 8, 2016

APP-JY62-Z0-002, “Class 1E RCP Speed Sensor Preamplifier Specification,” Revision 4, dated January 14, 2014

APP-PMS-M3C-104, “Spent Fuel Pool Level PMS Uncertainty Calculations for the AP1000 Plants,” Revision 2, dated April 3, 2017

APP-SFS-M3C-101, “SFS Instrumentation and Packaged Mechanical System Interface Requirements,” Revision 13, dated August 4, 2016

APP-SFS-M3-001, “AP1000® Spent Fuel Pool Cooling System – System Specification Document,” Revision 10, dated September 27, 2016

APP-SFS-M3-001, “AP1000® Spent Fuel Pool Cooling System – System,” Revision 10

APP-SFS-M3C-012, “AP1000 Spent Fuel Pool Heatup, Boiloff, and Emergency Makeup on,” Revision 6

APP-RXS-M8-020, “AP1000 NSSS / Core Design Interface Document,” Revision 3

APP-JE04-ZOR-001, “AP1000 Non-Class IE Orifice-Type and Venturi-Type Flow Elements Data Sheet Report,” Revision 0, dated May 15, 2014

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

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

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

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

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

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

<u>CPU Maximum Load</u>

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

APP-J1-001, “AP1000 PMS Functional Requirements, Revision 09, dated September 2014

APP-PMS-J3-388, “AP1000 Detailed Functional Diagram Auxiliary Building Flood-up Level,” Revision 00, dated September 2014

APP-PMS-J4-020, ”AP1000 System Design Specification for the Protection and Safety Monitoring System,” Revision 09, dated October 2014

APP-PMS-J4-102, “AP1000 Protection and Safety Monitoring System Software Requirements Specification,” Revision 13, dated January 2015

APP-PMS-GHY-001, “AP1000 Protection and Safety Monitoring System Software Design Description,” Revision 12

APP-PMS-J4V-001, “Safety Display Functional Specification,” Revision 08, dated September 2014

WNA-RL-05234-WAPP, “AP1000 PMS Software Configuration Management Release Report (for Baseline 8.2),” Revision 00, dated June 2015

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

Engineering and Design Change Report, EDCR-162

Engineering and Design Change Report EDCR-181

RITS 62648 dated December 15, 2017

CIT Testing

APP-PMS-T2R-050, “AP1000 Protection and Safety Monitoring System Channel Integration Test Integrated System Validation Test Report,” Revision 0, dated November 2017

APP-PMS-T1P-050, “AP1000 Protection and Safety Monitoring System Fuel Load Regression Test Procedure,” Revision 2

APP-PMS-T1D-018,”AP1000 Protection and Safety Monitoring system I/O Channel Accuracy Channel Integration Test Data Sheets,” Revision 6

NABU-DS-00092-GEN, “Safety Platform System Design Requirements,” Revision 2, dated September 2007.

RITS58466 dated June 19, 2017

RITS58378 dated June 12, 2017

RITS58377 dated June 13, 2017

URI 99900404/2015-209-01

APP-GW-Y0-004, “AP1000 Cyber Security Team,” Revision 1, dated June 2016

Vogtle AP1000 Nuclear Units 3&4 Change Order #1 Cyber Security, dated December 31, 2015

Virgil C. Summer AP1000 Nuclear Unit(s Change Order #14 Cyber Security Phase 1, dated February 28, 2012

Virgil C. Summer AP1000 Nuclear Units 2 & 3 Change Order #29 Cyber Security, dated August 24, 2016

Engineering, Procurement and Construction Agreement between South Carolina Electric & Gas Company, For Itself and as Agent for The South Carolina Public Service Authority, as Owner and a Consortium Consisting of Westinghouse Electric Company LLC and Stone & Webster, Inc., as Contractor for AP1000 Nuclear Power Plants, dated May 23, 2008

6. ACRONYMS:

AC160	Advant Controller Model 160
BL	Baseline
CAPAL	Corrective Action Program and Learning System
CFR	*Code of Federal Regulations*
CIM	Component Interface Module
CIT	channel integration test
CONTRM	software control module
CPU	central processing unit
DCD	Design Control Document
DCIP	Division of Construction Inspection and Operational Programs
DCIS	Distributed Control and Information System
DI&C	digital instrumentation and control
E&DCR	Engineering & Design Change Report
QVIB	Quality Vendor Inspection Branch
I&C	instrumentation and control
IP	inspection procedure
ITAAC	Inspections, tests, analyses, and acceptance criteria
CPU	Central Processing Unit
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PMS	Protection and Safety Monitoring System
QA	quality assurance
RITS	Repair Replacement and Automation Services Issue Tracking System
SNC	Southern Nuclear Company
U.S.	United States (of America)
WEC	Westinghouse Electric Company