

March 25, 2014

Thomas J. Ray, Manager,  
US Licensing and Regulatory Support  
Westinghouse Electric Company  
5000 Ericsson Dr.  
Warrendale, PA 15086

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF WESTINGHOUSE  
ELECTRIC COMPANY REPORT NO. 99900404/2014-201 AND NOTICE OF  
NONCONFORMANCE

Dear Mr. Ray:

On January 13, to January 17, 2014, 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," and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

This inspection specifically evaluated WEC's testing of safety-related components for the Vogtle and Summer new plant builds. 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 the Component Interface Module (CIM) planning phase documentation associated with the CIM software lifecycle model, and inspected on-going cabinet hardware testing, and channel integration testing for the Protection and Safety Monitoring System as well as factory acceptance testing for the Diverse Actuation System. These activities were associated with inspections, tests, analyses, and acceptance criteria (ITAAC) from Appendix C from the Combined License for Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3. Specifically, these activities were associated with ITAACs 2.5.01.04, 2.5.02.11, 2.5.02.12, and 2.5.02.14. This report contains two ITAAC findings associated with ITAAC 2.5.02.14. Nonconformances 99900404/2014-201-01 and 99900404/2014-201-02 are material to ITAAC 2.5.02.14 because the findings concern the adequacy of the development and implementation of the CIM planning phase activities which are an integral portion of the CIM software design lifecycle model.

Based on the results of this inspection, the inspectors found that the implementation of your QA program did not adequately meet certain NRC requirements imposed on you by your customers. Specifically, the inspectors determined that the WEC design process did not adequately identify, document, or implement certain technical and administrative requirements associated with the CIM planning phase of the CIM software design lifecycle model. The

specific findings and references to the pertinent requirements are identified in the enclosures to this letter.

Please provide a written statement or explanation within 30 days from the date of this letter in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you show good cause for us to do so.

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/reading-rm/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

Enclosures:

1. Notice of Nonconformance
2. Inspection Report No. 99900404/2014-201  
and Attachment

specific findings and references to the pertinent requirements are identified in the enclosures to this letter.

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Docket No.: 99900404

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1. Notice of Nonconformance
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and Attachment

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NRO-002

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## NOTICE OF NONCONFORMANCE

Westinghouse Electric Company  
5000 Ericsson Dr.  
Warrendale, PA 15086

Docket No 99900404  
Report No. 2014-201

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted at the Westinghouse Electric Company LLC (WEC) facility in Warrendale, PA, on January 13 -17, 2014, NRC inspectors determined that certain activities were not conducted in accordance with NRC requirements contractually imposed upon WEC by NRC licensees:

- A. Criterion III, "Design Control," of Appendix B to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, states, in part, that, "applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions."

WEC's Procedure WNA-PD-00050-GEN, "Project Plan, Component Interface Module (CIM) and Safety Remote Node Controller (SRNC) Development," Revision 10, dated May 20, 2013, Section 4.12, states, in part, that, "CS Innovations [WEC] shall map the Life Cycle Stages defined in [Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)] 2.5.2-8 #14a to their Life Cycle Model." and "will be designed in accordance with guidance provided in IEEE 1074-1995." In addition, Section 4.12, identifies the Standards and methodologies needed to manage and execute the project, in part, as, IEEE 1074-1995, IEEE 1012-1998, and IEEE 828-1990.

Contrary to the above, as of January 17, 2014, WEC did not apply appropriate design control measures to correctly translate applicable regulatory requirements and the design basis into specifications, drawings, procedures, and instructions. Specifically:

- (1) The WEC CIM-SRNC management processes did not ensure that the requirements for all mandatory lifecycle activities were adequately translated in chronological relationship into WEC's chosen lifecycle model identified in Westinghouse Design Certification Document, Tier 1 Table [ITAAC] 2.5.2-8 #14a, including lifecycle activities specified by IEEE 1074-1995, IEEE 1012-1998, and IEEE 828-1990;
- (2) The WEC CIM-SRNC independent verification and validation (IV&V) process did not adequately translate the requirements specified by IEEE 1012-1998, for the IV&V effort to comply with the minimum set of V&V tasks described;
- (3) The WEC IV&V plan did not translate the requirement to verify that the integration and test plan was developed using the required design documents including: the Software Requirements Specification, Interface Requirements Specification, Software Design Description, and the Interface Design Document Description; and
- (4) The WEC SCM plan did not adequately identify all Configuration Items (CIs) and did not translate the requirement to verify the configuration audit of the software transfer procedure, 9006-0021 or to verify that 9006-0021 as a CI was listed in the SCM Plan.

This issue is identified as Nonconformance 99900404/2014-201-01

Enclosure

- B. Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 states, in part, that, "design control measures shall provide for verifying or checking the adequacy of design."

WEC procedure 6105-00013, "CIM SRNC IV&V Plan," Revision 6, Section 3.3.1, "Concept Phase Tasks," identifies the concept phase task requirement for Hardware/Software/User Requirements Allocation evaluations. Appendix C, "Software Hazard Analysis Guidance," states, in part, that, "Execution of this guidance and preparation of possible error reports and capturing of these Software Hazard Analysis (SHA) activities reports is sufficient evidence of conforming to the SHA practices set forth in the standards and guidelines. The analysis shall identify the potential system hazards or hazardous system states, assess the severity of each hazard, assess the probability of each hazard, and identify mitigation strategies for each hazard."

Contrary to the above, as of January 17, 2014, WEC did not apply appropriate design control measures to verify the adequacy of design associated with the performance of safety analyses, system requirements review, and concept documentation evaluation. Specifically:

- (1) The WEC IV&V team did not verify that Hardware/Software/User System Requirements allocation was performed or that the safety analyses identified and analyzed the risk factors that may impair, prevent, or require technical trade-offs for accomplishing the technical objectives; and
- (2) The WEC IV&V team also did not identify or adequately address the two highest priority CIM-SRNC control ports that presented potential hazards as part of the Safety Hazard Analysis.

This issue is identified as Nonconformance 99900404/2014-201-02.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Electrical Vendor Inspection Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid noncompliance; and (4) the date when your corrective action will be completed. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it 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 be withheld, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted

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Dated this the 25<sup>th</sup> day of March, 2014

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

Docket No.: 99900404

Report No.: 99900404/2014-201

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

Vendor Contact: Thomas J. Ray, Manager  
US Licensing and Regulatory Support  
(412) 374-5309  
Email: raytj@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 Diverse Actuation System digital instruments and controls products to the current US AP1000 plants under construction.

Inspection Dates: January 13-17, 2014

Inspection Team Leader: Greg Galletti, NRO/DCIP/EVIB

Inspectors:

Lisa Castelli	R-II/DCI/CIB1
Theodore Fanelli	R-II/DRS/EB1
Thomas Fredette	NRO/DCIP/CIPB
Robert Mathis III	R-II/DCI/CIB1
William Roggenbrodt	NRO/DE/ICE1
Stacy Smith	NRO/DCIP/EVIB
Shavon Edmonds	NRO/DCIP/EVIB
Stella Opara	NSIR/CSD

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

## EXECUTIVE SUMMARY

Westinghouse Electric Company  
99900404/2014-201

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 (QA) 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."

This inspection specifically evaluated WEC's inspection and testing of safety-related components for new construction commercial nuclear plants in the US. The inspectors reviewed the aspects of the vendor's inspection and testing of safety-related components, as well as WEC's corrective action program. In addition the inspection focused on evaluating the vendor's design control planning processes associated with the development of the Component Interface Module (CIM) as specifically required as part of the system level design acceptance criteria. The NRC conducted this inspection at WEC's facility in Warrendale, PA.

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

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

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.

### Design

The inspectors identified multiple examples of weaknesses associated with the development and implementation of the planning phase requirements and documentation for the CIM-SRNC subsystem of the protection and safety monitoring system (PMS). These issues are related to inspections, tests, analyses, and acceptance criteria (ITAAC) 2.5.02.14 (subtask [a]) as specified in Section 1.0 of the report and Section 4 of the Attachment.

These issues included: (1) deficiencies associated with the translation of lifecycle requirements, and (2) deficiencies associated with the translation of independent verification and validation (IV&V) requirements, including deficiencies associated with the implementation of adequate procedural requirements and performance of IV&V activities. These issues are identified as NONs 99900404/2014-201-01 and 99900404/2014-201-02, respectively.

### Inspection

The inspectors determined that WEC's implementation of their policy and procedures for control of inspection satisfy the regulatory requirements set forth in Criterion X, "Inspection," Appendix B to 10 CFR Part 50. No findings of significance were identified.



### Test Control

The inspectors determined that WEC's implementation of their policy and procedures for control of testing satisfy the regulatory requirements set forth in Criterion XI, "Test Control," Appendix B to 10 CFR Part 50. No findings of significance were identified.

### Nonconformance Reports and Corrective Action Documents

The inspectors determined that the implementation of WEC's program for control of nonconforming material, parts, or components and corrective actions were consistent with the regulatory requirements in Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

### Review Previous NRC Inspection Report Corrective Action Implementation

The NRC staff reviewed documentation to verify closure of previous nonconformances and confirmed closure of the NOV and several NONs associated with the inspection as specified in Section 3 of the Attachment to this report. The NRC determined that due to WEC's ongoing assessment of the CIM product quality, actions completed to achieve full compliance submitted by WEC in April 2011 (Agencywide Document Access and Management System Accession No. ML11234A271) may not have been incorporated and/or reflected in the current design of the CIM.

### Cyber Security

The inspectors concluded that the requirements committed to in the project plan were implemented, and specifically, that the CIM and SRNC Field Programmable Gate Array development environment was assessed and documented. No findings of significance were identified.

## REPORT DETAILS

### 1. Design Control

#### Software Management and Safety Plans

##### a. Inspection Scope

For the component interface module and the safety remote node controller (CIM-SRNC) software management planning phase inspection, the inspectors evaluated the translation of the AP1000 design control document (DCD) requirements into the lower tier implementation plans and procedures and WEC's validation that those plans and procedures adequately reflected and implemented those requirements.

The inspectors reviewed the mandatory processes prescribed by Institute of Electrical and Electronics Engineers (IEEE) 1074-1995 (IEEE 1074) and the associated Regulatory Guide 1.173 (RG 1.173) identified in the AP1000 DCD requirements as governing the development of safety related components used in the PMS. The inspectors assessed the adequacy of translation and implementation of the four process groups (Pre-Development, Development, Post Development, and Integral process groups), which specify the 17 distinct processes consisting of 65 mandatory activities that are essential to the development of a high-quality software life cycle. The inspectors interviewed the WEC personnel responsible for the design control measures established to translate and address these requirements in the CIM-SRNC development plans, and reviewed the following WEC plans in order to assess their compliance with these requirements. The CIM-SRNC Project Plan (WNA-PD-00050-GEN, Revision 10), CIM-SRNC Management Plan (6105-00000, Revision. 7), CIM-SRNC Field Programmable Gate Array (FPGA) Development Plan (6105-00014, Revision 1), and the CIM-SRNC Software Program Manual (SPM) (6105-00015, Revision 2), CIM-SRNC FPGA Development Plan (6105-00014, Revision 1), and associated procedures. For the safety plan and safety analyses, the inspectors reviewed CIM Software Hazard Analysis (SHA) (6105-20019, Revision 1), CIM Mean Time between Failure (MTBF) Analysis (6105-20018 Revision 0), CIM Reliability Analysis (6105-20008, Revision 5), SRNC SHA (6105-10019, Revision 1), SRNC MTBF Analysis (6105-10018 Revision 0), SRNC Reliability Analysis (6105-10008, Revision 4).

Additionally, the inspectors reviewed a sample of other AP1000 DCD commitments, which supplemented the processes established in IEEE 1074. For example, the integral processes established in IEEE 1074 Clause 7.1 "Verification and Validation" are supplemented by the commitments prescribed by IEEE 1012-1998 (IEEE 1012) and its associated RG 1.168, which specify the essential activities required to maintain the software integrity level prescribed by the project. The integral processes established in IEEE 1074 Clause 7.2, "Software Configuration Management" (SCM) are supplemented by the commitments prescribed by IEEE 828-1990 (IEEE 828), IEEE 1042-1987 (IEEE 1042), and their associated RG 1.169, which stipulate additional planning and implementation requirements for the WEC SCM activities. Finally, the inspectors reviewed the software safety analyses in order to validate the evaluations performed by the design and independent verification and validation (IV&V) groups. The inspectors evaluated the following individual analyses: the reliability analysis, software hazard analysis, software risk analysis, and software criticality analysis.

b. Observations and Findings (Software Management and Safety Plans)

The inspectors determined that the WEC CIM-SRNC project committed to complying with IEEE 1074, RG 1.173, and additional supplemental requirements described in the scope of this section. The inspectors noted that these processes are specified as essential to the development and maintenance of high quality software, which were necessary to meet the software integrity level 4, designated by WEC as required for safety related systems in nuclear power plants.

The NRC inspectors review determined that the WEC CIM-SRNC project management plan and project plan did not translate the AP1000 DCD commitment to RG 1.173, which required the implementation of all the mandatory activities identified in IEEE 1074-1995 along with the inputs, outputs, pre-conditions, and post-conditions mentioned by IEEE 1074-1995. In addition, the inspectors determined that WEC did not fully translate many of these mandatory activities specified by IEEE 1074 Clause 3, "Project Management Processes," which along with Clause 4, "Pre-development Processes" and Clause 7, "Integral Processes" create and maintain the project framework. The processes ensure the appropriate level of project management and compliance with the mandated activities, and include those processes that are necessary to ensure the successful completion of a project.

The inspectors determined that WEC did not translate several fundamental project management activities including mapping of required activities to the life cycle model. IEEE 1074, Clause 3.1.3, "Map Activities to Software Life Cycle Model," required the chronological mapping of 65 mandatory activities defined within the 17 processes specified in IEEE 1074. This activity defines the framework used to unify the specialized activities, which were complementary to IEEE 1074 such as IEEE 1012, IEEE 828, and IEEE 1042. The result of this activity as specified by IEEE 1074 is a well-defined and methodical software life cycle (SLC), which is essential to a high-quality software development program.

In addition, the inspectors determined that the WEC project management and project plans did not define portions of Clauses 3.1.5, "Project Initiation," and 4.1.7, "Concept Exploration." These portions are required to identify and evaluate approaches to modeling and prototyping methodologies, and the project requirements defined in the Statement of Need so they can be analyzed as part of the safety analyses. The inspectors also determined that, Clause 4.2, "System Allocation Process," was not translated as a required input to project management Clause 3.1.4, "Allocate Resources." Clause 4.2 is intended to develop the architecture of the system to derive the system functions from system requirements, and identify the hardware, software, and operational requirements. As a result, the inspectors confirmed that, WEC did not perform these activities and did not develop the system architecture and functional requirements for the system consistent with these requirements. These issues are identified as examples of Nonconformance 99900404/2014-201-01.

The inspectors determined that WEC did not translate or implement the portions of the integral processes specified by IEEE 1074 for the Clause 7.1, "Verification and Validation," Clause 7.2, "Software Configuration Management," and Clause 7.3, "Documentation Development." These issues are identified as additional examples of Nonconformance 99900404/2014-201-01.

The inspectors determined that the WEC design process did not translate the required analytical criteria for the concept-phase safety analyses into the WEC software safety plan as described in the CIM-SRNC SPM, Section 11. The analytical criteria specified by IEEE 1074 Clause 3.2.3 is an iterative activity for analyzing risk. The WEC safety plan did not include reference to this requirement from IEEE 1074 nor did it contain the mandatory activities that the External, Project Initiation, and Concept Exploration Processes shall be analyzed for hazardous effects. IEEE 1074 Clause 3.2.3 specifies that the outputs of these processes shall be analyzed to determine the: “Operational and support requirements such as interoperability, security, performance, install-ability, and maintainability shall be considered,” and that “Factors that may impair, prevent, or require technical tradeoffs for accomplishing the technical objectives of the project or product shall be identified and analyzed. Technical factors may include such items as real-time performance, safety considerations, security considerations, implementation considerations, testability, and maintainability.” “Analytical approaches for technical risk assessment may include static and dynamic modeling and simulation, prototyping, independent reviews, and audits.” Further, the inspectors determined that the WEC safety analyses did not analyze the two highest priority and potentially hazardous ports, the “Local Port and Z Port,” as hazards. These issues are identified as examples of Nonconformance 99900404/2014-201-02.

In addition, the inspectors determined that the processes to evaluate the software hazard analysis were specified in the WEC plans and procedures but WEC did not identify the inadequacies in the software hazard analysis. IEEE 1074 outlined the integral processes specified to evaluate the adequacy for the Clause 7.1 Verification and Validation Process, Clause 7.2 Software Configuration Management Process, and Clause 7.3 Documentation Development Process. These processes were also supplemented by IEEE 1012 and IEEE 828. These issues are identified as examples of Nonconformance 99900404/2014-201-02.

## Software Configuration Management Plans

### a. Inspection Scope

The inspectors interviewed WEC personnel and reviewed the CIM–SRNC software configuration management plan to determine the project specific configuration management activities related to configuration identification, configuration control and change authorization, configuration status, and configuration audits. The inspectors assessed the process of identifying configuration items, controlling the change and release of configuration items, auditing configuration items (CI) and the independent verification of these items.

### Configuration Identification

The inspectors reviewed the document control procedures to verify that a process was in place to uniquely identify CI and subsequent revisions. The inspectors compared the CIM software version identified in the configuration status report to the software version identification on a CIM in the test field to verify the software version labeling was identical.

The inspectors interviewed personnel to determine the process for physically controlling software. The inspectors reviewed the procedure for software transfer to manufacturing

to determine if the process was identified and controlled. The inspectors reviewed the IV&V plan to determine what IV&V activities were identified for the software transfer to manufacturing process.

The inspectors conducted interviews to determine the process for identifying CIs and to determine if the CIs were audited prior to release in accordance with the requirements of IEEE 828-1990, "IEEE Standard for Software Configuration Management Plans" (IEEE-828) as endorsed by Regulatory Guide 1.169, dated September 1997, "Configuration Management Plans for digital Computer Software used in Safety Systems of Nuclear Power Plants," (RG 1.169).

#### Configuration Control and Change Authorization

The inspectors reviewed change control procedures to verify that the change process provided formal evaluation and approval by the responsible organization. The inspector sampled engineering change notices to verify the documentation contained a description of the change, rationale for the change and identification of the affected CIs and notification to other affected groups. The inspectors sampled on-time tickets to assess the change control process prior to the manufacturing stage.

#### Configuration Status

The inspectors reviewed CIM-SRNC configuration status accounting documentation, to verify a baseline was established for the planning phase of the CIM SLC. The inspectors reviewed the status accounting documentation to assess whether the CIM-SRNC design tools were identified as configuration items. The inspectors assessed if the configuration status controls included a process for maintaining the status of changes that were approved but not yet implemented. The inspectors reviewed a report of approved changes to the baseline not yet incorporated to assess whether change accounting process controls were in place for maintaining the status of changes. The inspectors reviewed the IV&V planning phase summary report to assess whether the IV&V team reviewed the CIM-SRNC Configuration Status Accounting document.

#### Configuration Audits

The inspectors reviewed the Software Configuration Management Plans (SCMP), software quality assurance (QA) plan (SQAP) and IEEE 828 to assess the audit requirements and commitments. The inspectors reviewed the planning documents to determine if both functional and physical configuration audits were addressed. The inspectors reviewed documentation to assess whether a managerial review was conducted at the completion of CIM-SRNC planning phase in accordance with the SCMP.

#### b. Observations and Findings (Software Configuration Management Plans)

The inspectors concluded that WEC did not adequately identify all CI's in the SCMP and lower tier configuration management implementing procedures and associated audit activities. Specifically, the SCMP did not identify the software transfer procedure, 9006-0021, "Software Transfer to Manufacturing," revision 0, associated with the physical transfer of the field programmable gate array software image from the engineering/development phase to the manufacturing process and did not identify WEC

procedure 9006-0021 in implementing procedure 6105-00053, "CIM-SNRC Configuration Status Accounting," revision 12, as a CI. Additionally, the SCMP did not identify that audits shall be conducted on CIs prior to release of the CI and as a result an audit of WEC procedure 9006-0021 was not performed. The inspectors received Issue Report (#14-016-M057) and Issue Report (#4-05-W005) to address the procedure omission. These issues are identified as examples of Nonconformance 99900404/2014-201-01.

The inspectors also confirmed that an audit of the software transfer procedure was not translated into procedures, thus was not performed prior to its release, and the IV&V organization had not performed a review of the software transfer procedure and did not recognize that the software transfer procedure had been released without the required audit. This issue is identified as an example of Nonconformance 99900404/2014-201-01.

### CIM Software Integration and Installation Plans

#### a. Inspection Scope

The inspectors reviewed the high level CIM-SRNC SLC planning documents that WEC indicated were ready for NRC inspection to determine if these documents provided adequate guidance for the CIM-SRNC subsystem integration and installation processes. These documents included the CIM-SRNC Project Plan (WNA-PD-00050-GEN, Revision 10), CIM-SRNC Software Program Manual (SPM) (6105-00015, Revision 2), Management Plan (6105-00000, Revision. 7), and CIM-SRNC FPGA Development Plan (6105-00014, Revision 1).

The inspectors assessed the decomposition of integration and installation plans from the SPM into lower tier documents. Detailed guidance for software integration for the CIM, including software module integration into a single FPGA design, flashing the FPGA, and testing the integrated hardware and software, was identified in the CIM-SRNC FPGA Development Plan and Test Plan (6105-00005, Revision 7).

The inspectors assessed selected attributes from the integration and installation plans as outlined in the SPM, including prioritization, risk assessment, and personnel responsibilities and the integrated CIM-SRNC product testing to verify that they were in accordance with the prescribed software development life cycle activities.

#### b. Observations and Findings (CIM Software Integration and Installation Plans)

The inspectors determined that IEEE 1074 Clause 5.3.7 "Plan Integration," required inputs from Clauses 5.1.5, "Prioritize and Integrate Software Requirements," 5.2.7, "Perform Detailed Design," and 7.1.6 "Plan Testing" in order to develop the Integration Plan. The inspectors determined that IEEE 1074 requires the integration plan to be tailored specifically to the outputs from the Clauses 5.1.5, 5.2.7, and 7.1.6 outlined above. The inspectors determined that the CIM-SRNC SPM had insufficient details regarding the specific integration process requirements specified by IEEE 1074. The inspectors also determined that, WEC's IV&V process was not adequately performed in order to identify this translation discrepancy between the CIM-SRNC SPM and IEEE 1074. WEC initiated Corrective Action Program – Issue Report (CAP-IR)

#14-016-M010 to capture and disposition this deficiency. These issues are identified as examples of Nonconformance 99900404/2014-201-01.

#### Software Quality Assurance Plan and Software Development Plan

##### a. Inspection Scope

The inspectors reviewed WEC policies and procedures associated with software QA and development for the SLC planning phase of the CIM. The inspectors reviewed documentation generated due to the completion of the CIM SLC planning phase, including the SQAP and the Software Development Plan. The inspectors also interviewed responsible personnel to verify compliance with Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and AP1000 licensing basis commitments.

The inspectors conducted a review of 6105-00001, "CIM-SRNC Quality Assurance Plan," Revision 6, dated September 2013, to verify that the SQAP addressed certain QA elements related to licensing basis commitments including management tasks, industry standards and practices, reviews and audits. The SQAP was reviewed to verify the inclusion of key attributes including specifying which software products are covered by the plan, QA organization interactions and independence, oversight of SLC development phases, documents requirements, audits and reviews, and provisions to assure that problems will be documented and corrected. Implementing procedures were reviewed to ensure that QA procedural requirements identified in the SQAP were adequately addressed.

##### b. Observations and Findings (Software Quality Assurance Plan and Software Development Plan)

No findings of significance in this area.

#### Software Verification and Validation Plans

##### a. Inspection Scope

The inspectors reviewed WEC's plans and procedures and interviewed WEC personnel responsible for the CIM-SRNC IV&V Plan, Development Project Plan (WNA-PD-00050-GEN, Revision 10), CIM-SRNC Management Plan (6105-00000, Revision. 7), CIM-SRNC FPGA Development Plan CIM-SRNC (6105-00014, Revision 1), and the CIM-SRNC SPM (6105-00015, Revision 2), CIM-SRNC FPGA Development Plan (6105-00014, Revision 1), and associated procedures. The inspectors reviewed specific design control measures related to project IV&V process.

The inspectors assessed the AP1000 licensing commitments established in the DCD and the translation into plans and procedures the mandatory processes prescribed by IEEE 1012-1998 (IEEE 1012) and its associated RG 1.168 that specify the essential activities required for the IV&V process to maintain the software integrity level prescribed by the project. The inspectors assessed the adequacy of the planning documents and the implementation of the activities described within each V&V planning document. The inspectors reviewed the IV&V phase Summary Report (6105-00092, Revision 2) to determine the scope and quality of the IV&V review performed for the planning and concept phase activities.

b. Observations and Findings (Software Verification and Validation Plans)

The inspectors determined that the DCD commitments specified by IEEE 1012 and its associated RG1.168 were not adequately translated into the CIM-SRNC IV&V Plan and therefore not adequately performed in the associated lifecycle phases for the CIM-SRNC Subsystem. In addition, the inspectors determined that WEC did not identify or document these translation or performance issues. Examples include: (1) IV&V organization had not performed a review of the software transfer procedure and did not recognize that the software transfer procedure had been released without the required audit; (2) Recursive activities for IV&V, which were prescribed for verifying and validating the inclusion and completion of the aforementioned activities, were also not specified, and (3) the WEC IV&V plan referenced the Hardware/Software/User Requirements Allocations, which are mandatory activities that are essential to the concept and planning phase activities of the SLCM, however the IV&V plan stated that these activities would not be performed for the concept and planning phases without any justification for not performing these essential activities. These issues are described in the previous design control sections of this report, and are identified as examples of Nonconformance 99900404/2014-201-01 and 99900404/2014-201-02.

The inspectors determined that from the review of the CIM-SRNC Project plan, CIM-SRNC Project Management plan, CIM-SRNC SPM, CIM SRNC IV&VP, and the results of the management review for the lifecycle activities that the IV&V process did not meet the requirements specified in IEEE 1012, Clause 5.2.1, which specifies that a system requirements review must include the user needs, regulatory requirements, and the compliance standards used for the project. The inspectors noted that the CIM-SRNC IV&V process did not evaluate the requirements specified in IEEE 603-1991, which is required by 10 CFR 50.55a(h)(3) for the development of safety systems used in nuclear power plants after 1999.

The inspectors also noted that the IV&V review of the planning phase activities did not identify or adequately justify the use of QA organizational resources for certain IV&V activities. Specifically, the current WEC IV&V Plan, Table 1-1, stated that during the installation phase, all activities for the flashing of devices and testing of the product are done with oversight by the QA organization and therefore no IV&V activities are needed. The use of the QA organization to perform the IV&V function as part of these phases of the design effort did not ensure complete independence of the QA function.

The inspectors determined that the AP1000 DCD protection and safety monitoring system, and thus the CIM-SRNC requirements were not being adequately implemented. In addition, the inspectors determined that the compliance standards and user needs as described in other sections of this report were not evaluated for the system requirements review. The inspectors determined that the IV&V effort did not adequately identify and decompose all applicable requirements from the AP1000 DCD. These issues are identified as examples of Nonconformances 99900404/2014-201-01 and 99900404/2014-201-02.

c. Conclusions

The inspectors identified numerous examples of inadequate development and implementation of WEC's policies and procedures associated with the SLC planning phase of the CIM. These issues included: (1) deficiencies associated with the



translation of lifecycle and IV&V requirements; and (2) deficiencies associated with the implementation of adequate procedural requirements and performance of IV&V activities. These issues are identified as NONs 99900404/2014-201-01, and 99900404/2014-201-02, respectively.

## 2. Inspection

### a. Inspection Scope

The inspectors reviewed inspection policies and procedures to determine if WEC's controls were in compliance with the regulatory requirements of Criterion X, "Inspection," of Appendix B to 10 CFR Part 50. In addition, the inspectors discussed the inspection program with WEC inspection personnel responsible for implementation, reviewed documented results of completed inspections, and observed inspections performed as part of the ongoing nuclear-related fabrication and testing activities, including receipt and in-process inspections to verify inspection program implementation.

#### Receiving Inspection

The inspectors evaluated procedure WEC NA 10.1.3, "Inspections," Revision 3, dated March 29, 2013, that describes the process for performance of receipt, in-process, and final inspection activities at WEC, and verified the procedure was used by WEC staff during the conduct of receipt and in-process inspection activities observed.

The inspectors observed the receipt inspection for PMS Cabinet VS3-PMS-JD-SOEB01, and witnessed receipt inspection of PMS cabinet VS3-PMS-JD-ILCA01. The inspectors verified the use of receipt inspection report (RIC VS3-PMS-JD-ILCA01) and use of design drawing 10100D53, Revision 1, dated January 30, 2013, in accordance with inspection guidance.

The inspectors observed WEC quality control inspection personnel performing receipt inspection activities to confirm the as-built cabinet was consistent with the detailed design drawing for the unit. The inspectors observed the WEC staff using inspection tools to perform the inspection, confirmed detailed design reference materials were adequately used, and observed the process for identifying and documenting any deficiencies (QN items) identified during the receipt inspection. The inspectors also reviewed samples of completed documentation, including QNs created due to anomalies found during the receipt inspection.

#### In-Process Inspection

The inspectors, observed In-process inspection activities associated with PMS Cabinet SV4 AP1000 PMS-ILC Division C-G01, and reviewed shop traveler order purchase order (PO) 40093193, dated December 23, 2013, which was in progress during the inspection week during Cabinet Hardware Testing (CHT) activities. The inspectors verified that the instruments and controls (I&C) technician was performing test configuration activities in accordance with the PO and cabinet design drawings 10099D15 Revision 1 and 10098D27, Revision 2. The inspectors observed the WEC quality control (QC) inspection personnel confirmed, through markings, indications, and tagging, the status of all cabinet hardware in preparation for on-going CHT. The inspectors verified that adequate QC oversight activities were completed and adequately documented.

b. Observations and Findings

No findings of significance in this area.

c. Conclusions

The inspectors determined that the implementation of WEC's programs for control of inspection activities were consistent with the regulatory requirements of Criterion X of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. Test Control

a. Inspection Scope

PMS CHT

The inspectors reviewed WEC's policies and procedures governing the implementation of its test program and observed in-process testing to verify compliance with Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Specifically, the inspectors reviewed test procedure SV4-PMS-T1P-001, "Vogle Unit 4 AP1000 Protection and Safety Monitoring System Bistable/Coincidence Logic Cabinet Hardware Test Procedure," revision 0, July 2013 and observed in-process testing of PMS cabinet SV4-PMS-JD-BCCC01 to ensure applicable testing and regulatory requirements were adequately addressed.

The inspectors reviewed test procedure SV4-PMS-T1P-001 to verify the inclusion of test personnel qualification, test objectives, and instructions, necessary to achieve test objectives, test setup, identified acceptance criteria, and provisions for recording test results, including any observed deficiencies, their resolution, and any necessary retesting. The inspectors also reviewed test logs to ensure environmental conditions were recorded and measuring/test equipment was properly identified with required calibration information. The test data sheets and shop travelers were reviewed to verify documentation of test results, acceptance criteria being met and documented quality control acceptance of test results.

The inspectors observed in-process CHT of PMS panel SV4-PMS-JD-BCCC01 to ensure testing was being conducted in accordance with the identified test procedure including witnessing the sequential energization test, inrush and steady state current test, and the power supply alignment procedure. The inspectors also observed testing personnel documenting test results and QC performing quality checks at prescribed hold-points. The inspectors interviewed responsible testing personnel to verify that testing was conducted in accordance with the applicable test procedure, personnel were adequately qualified, and there was sufficient knowledge of the process for handling test deviations and anomalies.

PMS System Integration Testing

Inspectors observed WEC test team personnel conducting portions of the System Integration Testing (SIT) related to the Maintenance and Test Panel (MTP) and Safety Display Trend Tests utilizing the Standard Input/Output Simulator (SIOS) verification tool. The SIOS evaluated the findings of the Display Capture Tool (DCT), an automated

test tool that mimicked human interaction with the test system, such as moving a mouse to different point on the display screen. In addition, the WEC Test Team Manager provided the inspectors with the qualification records of the Toshiba personnel involved in the DCT testing. The inspectors also reviewed the calibration documentation for several pieces of test equipment being utilized by test personnel while in several different testing configurations.

The inspectors noted that there are three discrete portions of the PMS SIT phase of its testing program for the PMS, including Time Response Testing, MTP/Safety Display Trend Testing, and the Abnormal Conditions Testing. The inspectors observed a portion of the MTP/Safety Display Trend Testing and determined the tests was performed in accordance with the written test instructions and was adequately implemented.

#### Diverse Actuation System (DAS) Factory Acceptance Testing

The inspectors observed portions of the testing being conducted for the Vogtle Unit 4 DAS cabinets under WEC Test Procedure APP-DAS-T1P-300 "AP1000 Diverse Actuation System Factory Acceptance Test," Revision 6. Specifically, the inspectors focused on activities associated with Input/Output (I/O) signal mapping outlined in section 3.2 of the procedure. The inspectors verified additional sections of the test procedure to ensure they aligned with test plan, APP-DAS-T5-001 "AP1000 Diverse Actuation System Test Plan," revision 1. These additional sections included calibration, indications and bypasses, time response, and miscellaneous tests. The inspectors verified that these tests were also accounted for in the test data package (data sheets).

The inspectors reviewed WEC Procedure 11.1 "Test Control," revision 0, related to attributes for pre-job briefing and lessons learned activities. The inspectors verified that these activities had been completed for the DAS testing to date.

The inspectors walked through the steps for manually measuring a squib valve actuation pulse (miscellaneous test) with the lead DAS test engineer. The inspectors verified that all equipment was available to conduct this test, including a customized DAS test cart and oscilloscope. The inspectors noted that the Vogtle Unit 4 DAS was the seventh system being factory tested, and that the test team had developed a significant level of proficiency with all of the DAS testing.

The inspectors observed that the DAS Functional Integration Test (FIT) steps had been incorporated into the DAS factory testing at the request of the AP1000 I&C integration team. The inspectors verified that the FIT incorporation was controlled and that no FIT aspects had been inadvertently eliminated from the factory testing procedure.

#### b. Observations and Findings

The inspectors determined that the PMS CHT, PMS SIT, and DAS factory acceptance testing that was observed by the inspectors was being performed, assessed, evaluated and documented in a controlled manner. Personnel conducting the testing were knowledgeable of test plan and documentation requirements, and had demonstrated test control procedure attributes.

No findings of significance were identified in this area.

#### c. Conclusions

The inspectors determined that the implementation of WEC's programs for control of testing activities were consistent with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. No findings of significance were identified.

#### 4. Nonconformance Reports and Corrective Action Documents

##### a. Inspection Scope

The inspectors reviewed corrective action and nonconformance documents related to the CIM and PMS to ensure that conditions adverse to quality: (1) were properly identified and correctly disposition in the appropriate processes, (2) contained proper management review approval, and (3) were evaluated for their effect on the item's safety function or qualification, when applicable. In addition, the inspectors verified that corrective actions accurately reflected the guidelines in the procedure WEC 16.2 "Westinghouse Corrective Action Process" for significance classification levels for each sample of corrective action reviewed in the WEC's corrective action (lotus notes) database. The inspectors reviewed APP-GW-GDP-054/APIP 4-5, "Discrepancy Issue Request System" which is separate electronic database used to notify consortium members of conditions adverse to quality or discrepancies identified by another consortium member's corrective action system. The DIRS system processes corrective actions, tracks them to closure and distributes them to the affected consortium member.

The inspectors also reviewed supplier corrective action reports, root causes and extent of condition reviews to verify in each case that the original cause of the conditions were properly identified and the corrective actions taken to preclude its recurrence was correctly implemented and documented at the appropriate levels of management. In addition, the inspection team reviewed corrective actions and nonconformances resulting from a sample of commercial grade surveys, audits, and evaluations performed by WEC to provide periodic inspection and verification of control processes of sub-suppliers.

In addition, the inspectors reviewed the vendor's implementation of corrective actions associated with the findings from a previous NRC Inspection conducted at CS Innovations, a wholly-owned subsidiary of WEC, from April 25, 2011, through April 29, 2011. NRC Inspection Report No. 99901404/2011-201, dated July 20, 2011, documents the results of that inspection (Agencywide Document Access and Management System (ADAMS) Accession No. ML1118900005).

##### b. Observations and Findings

In reviewing documentation to verify closure of previous Nonconformances 99901404/2011201-03 and 99901404/2011201-04, the NRC determined that, due to WEC's ongoing assessment of the CIM product quality, actions completed to achieve full compliance submitted by WEC in April 2011 (ADAMS Accession No. ML11234A271) may not be incorporated and/or reflected in the current design of the CIM. The NRC will review actions to verify appropriate corrective action was taken after WEC completes the assessment of the CIM product quality, and specifically after Issue Report (IR) 13-214-M047 and IR 14-009-W005 have been closed.

##### c. Conclusions

The inspectors determined that the implementation of WEC's program for control of nonconforming material, parts, or components and corrective actions were consistent with the regulatory requirements in Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

5. Cyber Security

a. Inspection Scope

The inspectors reviewed the purchase order issued to WEC by Southern Nuclear Operating Company for work associated with 10 CFR 73.54, "Protection of digital computer and communication systems and networks." The inspectors reviewed the implementation of the executed Phase 1 requirements for the AP1000 Standard Plan Cyber Security for Vogtle Units 3 and 4. Specifically, the inspectors evaluated how critical systems were defined, assessed, classified, and documented. In addition, the inspectors reviewed the adequacy of procedures developed for the identification of critical digital assets, interface specifications, and AP1000 cyber security scoping, consequence analysis, and defensive architecture. WEC is in the process of outlining Phase 2 requirements that will involve the implementation of Phase 1 requirements and procedures.

In addition, the inspectors reviewed the project plan for CIM/SRNC development, Section 4.13, "Security Requirements." The inspectors verified that the requirements committed to in the project plan were implemented, and specifically, that the CIM and SRNC FPGA development environment was assessed and documented.

b. Observations and Findings

No findings of significance in this area.

c. Conclusions

The inspectors determined that WEC's implementation of purchase order issued to Westinghouse by Southern Nuclear Operating Company for work associated with 10 CFR 73.54, "Protection of digital computer and communication systems and networks." conformed to the requirements of Criteria IV, "Procurement Document Control," and VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.

6. Entrance and Exit Meetings

On January 13, 2014, 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 January 17, 2014, the inspectors presented the inspection results during an exit meeting with Mr. David Howell, Senior Vice-President Automation and Field Services, and other WEC personnel.

## ATTACHMENT

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

<b>Name</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
David Howell	WEC-AFS	X	X	
Larry Erin	WEC-RQE	X	X	
Peter Varga	WEC			X
Brian C Johnson	WEC			X
Kyra Durinsky	WEC-AFS	X	X	X
Nicole Stadelman	WEC-AFS	X	X	X
Dale Harmon*	WEC	X	X	X
Rick Very	WEC			X
Brain Domitrovich	WEC			X
Marci Maher	WEC			X
Stephanie Greier	WEC			X
Matthew Nolte	WEC			X
Timothy Bauar	WEC			X
Veronica Alberino	WEC			X
Stacey Miller	WEC			
Richard Paese	WEC-NPP	X	X	X
Tony Galore	WEC			X
Michael Stamm	WEC			
Sarah DiTomasso	WEC	X	X	
Bob Hirmanpour	SNC	X	X	X
Warren Odess-Gillett*	WEC	X	X	X

<b>Name</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
Kevin Neumann	WEC	X	X	X
Maria Assard	WEC-AFS	X	X	X
Pietro Porco	WEC-AFS	X	X	X
Jason Perine	WEC-AFS	X	X	X
Steve Seaman	WEC	X	X	
Bill Irmén	WEC-AFS	X	X	X
Jan Dudiak	AFS	X		
Stephanie Seager	WEC-AFS	X		
Matthew Wierzehowski	WEC-AFS	X		
Stephen Packard	WEC-AFS	X	X	X
Pavel Tyrpak	WEC-AFS	X	X	
Brian Bedford*	WEC	X	X	
Shawn Downey	WEC-AFS	X	X	
Peter Hung	WEC-AFS	X	X	
Michael Shaffer	WEC-AFS	X	X	
Tom McLaughlin	WEC-AFS	X		
Ken Lunz	WEC-AFS	X	X	
John Wiessmann	WEC-AFS	X		X
George Stathus	WEC-AFS	X	X	
Chris Srock	WEC-AFS	X	X	
David Arrigo	WEC	X		
Wes Vaughn	SNC	X		
Jason Weathersby	SCE?	X	X	

<b>Name</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
David Jarosh	WEC-AFS	X		
Leo Chraska	WEC-NPP	X		
Rodman Roberts	AFS	X		
Thomas Ray	WEC-NPP	X		
Robert Lane*	WEC-NPP	X		
Susan Mullen*	WEC	X		
Bob Phillips*	WEC	X	X	
Jennifer Drylie*	WEC	X		
Steve Radomsk*	WEC	X		
Dan Harris*	WEC	X	X	
Eric Rossi*	WEC	X	X	
Murat Uzman*	WEC	X		
Marty Ryan*	WEC	X	X	
Harold Maguire*	WEC	X	X	
Ryder Thompson*	SCE3G	X		
Nick Kellenberger*	SCE3G	X		
Stan Thomason*	SNC	X		
Robert Sutter*	SNC	X		
Mike Yox*	SNC	X		
Dan Bierbauer*	SNC	X		
Mac Stofko	WEC-AFS		X	
Sue Mirven	WEC-AFS		X	
Cecil Karaaslan	WEC-AFS		X	



<b>Name</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>	<b>Interviewed</b>
Steven Radamski	WEC-NPP		X	
Robert Myers	WEC			X
Stephanie Smith*	WEC-AFS		X	
John Zuemie*	WEC-NPP		X	
Gerard Couture*	WEC-NPP		X	
Kristina Honomichl*	SNC		X	
Juan Peralta*	WEC		X	
Erick Matusek	AFS		X	
Greg Galletti	NRC	X	X	
Stacy Smith	NRC	X	X	
Shavon Edmonds	NRC	X	X	
Thomas Fredette	NRC	X	X	
Theodore Fanelli	NRC	X	X	
Lisa Castelli	NRC	X	X	
Robert Mathis III	NRC	X	X	
William Roggenbrodt	NRC	X	X	
Stella Opara	NRC	X	X	
Richard Rasmussen	NRC		X	

\*Participated by conference call

2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors"

IP 43004, "Inspection of Commercial-Grade Dedication Programs"

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
99900404/2014-201-01	Opened	NON	Criterion III	2.5.02.14
99900404/2014-201-02	Opened	NON	Criterion III	2.5.02.14
99901404/2011-201-01	Closed	NOV	10 CFR 21.21 (a)	N/A
99901404/2011-201-02	Closed	NON	Criterion III	N/A
99901404/2011-201-03	Discussed	NON	Criterion XV	N/A
99901404/2011-201-04	Discussed	NON	Criterion III	N/A
99901404/2011-201-05	Closed	NON	Criterion I	N/A
99901404/2011-201-06	Closed	NON	Criterion XVI	N/A

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

The U.S. Nuclear Regulatory Commission (NRC) inspection team identified the following ITAAC related to components being designed, manufactured, and tested at Westinghouse Electric Company (WEC). At the time of the inspection, WEC was involved in certain testing activities including PMS CHT, SIT, and DAS Factory Acceptance Testing (FAT) for the 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 two findings associated with the ITAAC 2.5.02.14 (subtask [a] - Design requirements phase may be referred to as conceptual or project definition phase) described below.

COL #	DCD#	Design Commitment	Component/Activity
519	2.5.01.04	The DAS hardware and any software are developed using a planned design process which provides for specific design documentation and reviews during the following lifecycle stages (subtask [b] of design commitment - system test phase)	Vogtle Unit 4 DAS cabinets under WEC Test Procedure APP-DAS-T1P-300 "AP1000 Diverse Actuation System Factory Acceptance Test," Revision 6. Observed Input/Output (I/O) signal mapping test, WEC Procedure 11.1 "Test Control," Revision 0, walked through of the steps for manually measuring a squib valve actuation pulse (miscellaneous test).
550	2.5.02.11	The PMS hardware and software are developed using a planned design process during the system	Vogtle 4 SIT - related to the Maintenance and Test Panel (MTP) and Safety Display Trend Tests utilizing the Standard Input/Output

		integration and test phase for system hardware and software (subtask [d] of design commitment - system integration and test phase)	<p>Simulator (SIOS) verification tool.</p> <p>Vogtle 4 CHT - Test procedure SV4-PMS-T1P-001, "Vogtle Unit 4 AP1000 Protection and Safety Monitoring System Bistable/Coincidence Logic Cabinet Hardware Test Procedure," Revision 0, July 2013. Observed in-process testing of PMS cabinet SV4-PMS-JD-BCCC01 including witnessing the sequential energization test, inrush and steady state current test, and the power supply alignment procedure.</p>
551	2.5.02.12	The PMS software is designed, tested, installed and maintained using a graded process with specific requirements for software V&V (subtask [c] V&V and reviewer independence)	<p>Vogtle 4 SIT - related to the Maintenance and Test Panel (MTP) and Safety Display Trend Tests utilizing the Standard Input/Output Simulator (SIOS) verification tool.</p> <p>Vogtle 4 CHT - Test procedure SV4-PMS-T1P-001, "Vogtle Unit 4 AP1000 Protection and Safety Monitoring System Bistable/Coincidence Logic Cabinet Hardware Test Procedure," Revision 0, July 2013. Observed in-process testing of PMS cabinet SV4-PMS-JD-BCCC01 including witnessing the sequential energization test, inrush and steady state current test, and the power supply alignment procedure.</p>
553	2.5.02.14	The CIM is developed using a planned design process which provides for specific design documentation and review (subtask [a] Design requirements phase may be referred to as conceptual or project definition phase)	<p>Review of all CIM planning phase documentation, and interviews with WEC personnel responsible for development and implementation of planning phase activities in accordance with the documents identified in Documents review section of this report.</p> <p>Nonconformances 99900404/2014-201-01, and 99900404/2014-201-02 are material to ITAAC 2.5.02.14 subtask [a] because the findings concern the adequacy of the development and implementation of the CIM planning phase activities which are an integral portion of the CIM software design lifecycle model.</p>

## 5. DOCUMENTS REVIEWED:

### Quality Manuals and Plans

#### Specifications, Test Plans, Procedures, and Drawings

- 6105-00000, "CIM-SRNC Management Plan," Revision 7, September 2013
- 6105-00001, "CIM-SRNC Quality Assurance Plan," Revision 6, September 2013
- 6105-00002, "CIM-SRNC CM Plan," Revision 6, September 17, 2013
- 6105-00005, "CIM-SRNC Test Plan," Revision 7, September 17, 2013
- 6105-00013, "CIM-SRNC Independent Verification & Validation (IV&V) Plan," Revision 6, September 17, 2013
- 6105-00014, "CIM-SRNC FPGA Development Plan," Revision 1, September 2013
- 6105-00015, "CIM-SRNC Software Program Manual," Revision 2, September 17, 2013
- 6105-00030, "CIM-SRNC Design Tools," Revision 5
- 6105-00053, "CIM-SRNC Configuration Status Accounting," Revision 12, October 8, 2013
- 6105-00070, "CIM-SRNC CM Report," Revision 5, October 8, 2013
- 6105-00092 "CIM-SRNC IV&V Summary Report," Revision 2, October 9, 2013
- 6105-00100, WEC Project Plan – "Project Plan Component Interface Module (CIM) and Safety Remote Node Controller (SRNC) Development," Revision 9, October 7, 2013
- 6105-10073, "SRNC PCBA Pre-Test Procedure," Revision 2
- 6105-20025 "CIM FPGA Build Procedure," Revision 2, October 2, 2013
- 6105-20048, Assembly Serial Number W001#00610, Traveler-CIM FPGA Update Process, Revision 3
- 6105-20073, "CIM PCBA Pre-Test Procedure," Revision 4, October 2, 2013
- 9006-00007, "CIM-SRNC Flashing Procedure," Revision 4, October 2, 2013
- 9006-00014, "Document Review," Revision 2 (couldn't find this ref in binder)
- 9006-00021, "Software Transfer to Manufacturing," Revision 0
- 9006-00025, "Engineering Change Notice," Revision 1, September 20, 2013
- 9006-00030, "Change Control Board," Revision 2, September 20, 2013
- 9006-00602, "Advance Logic Systems Document Management and Storage," Revision 0, September 20, 2013
- 9006-01501, "Defect Management Work Instruction," Revision 2, September 20, 2013
- 9009-00001, "CIM-SRNC Flashing Record," Revision 2, October 2, 2013
- APP-DAS-J4-001, "AP1000 Diverse Actuation System (DAS) System Design Specification," Revision 3
- APP-DAS-J4-004, "AP1000 Diverse Actuation System (DAS) System Design Requirements," Revision 4
- APP-DAS-J1-001, "AP1000 Diverse Actuation System (DAS) Functional Requirements," Revision 5,
- APP-GW-E1-100, Revision1, AP1000 Cyber Security Scoping, Consequence Analysis, and Defensive Architecture, October 2011
- APP-GW-E1-101, Revision0, AP1000 Scope of Systems for the 10CFR 73.54 Cyber Security Rule, March 2012
- APP-GW-E1-102, Revision 0, Critical Digital Asset Identification Procedure, March 2012
- APP-GW-E0-004, Revision 4, AP1000 Electronic System Security Controls, May 2012
- APP-GW-GL-700, "AP1000 Design Control Document," Revision 16 and Revision 19
- VSP\_VSG\_001000, "Cyber Security Program," Jan 27, 2011
- APP-GW-E0-003, Revision 0, AP1000 Cyber Security Scope of Supply, May 2012

- APP-ADD-J4Y-002, "Cyber Security Monitoring System Architecture," Revision A, May 2012
- APP-GW-J4-111, "AP1000 Interface Specification for Cyber Security Monitoring System," Revision A, May 2012
- APP-DDS-J4-159, "AP1000 Cyber Security Monitoring System Functional Design Requirements," Revision 0, March 2012
- APP-PMS-J4-003, "AP1000 Protection and Safety Monitoring System Subsystem Requirements Specification," Revision 7, September 06, 2013
- APP-GW-J5-001, "AP1000 Core Instrumentation & Control Systems Cable Scheduling Support Information," Revision 3, February 21, 2013
- APP-GW-GAP-106 / APIP 4-3, "Corrective Action Interface," Revision 4, October 30, 2013
- APP-GW-GDP-054/APIP 4-5, "Discrepancy Issue Request System," Revision 0, April 11, 2013
- Design drawing 10100D53, "VC Summer Unit 3 AP1000 PMS ILC Division A Cabinet Configuration," Revision 1, January 30, 2013
- Design drawing 10099D15, Vogtle Unit 4 AP1000 PMS ILC Division C Cabinet Configuration" Revision 1, January 21, 2013
- Design drawing 10098D27, Vogtle Unit 4 AP1000 PMS ILC Division C Sub-rack Configuration," Revision 2
- ECN105-0049, Engineering Change Notice (couldn't find this ref in binder)
- Engineering Change Notice Report for Project D105 (couldn't find this ref in binder)
- NA 3.18, "Project Creation (Scottsdale Operation)," Revision 1, September 19, 2013
- NA 3.18, "Project Management," Revision 1, August 30, 2013
- NA 4.51, "Field Programmable Gate Array (FPGA) Development Procedure," Revision 1, September 19, 2013
- NA 4.52, "Design (Scottsdale Operations)," Revision1, September 19, 2013
- NA 18.1 "In Process Software Audits," Revision 0, September 19, 2013
- NA 10.1.3, "Inspections," Revision 3, dated March 29, 2013
- NA 11.0.2 "Test Procedures," Revision 4,
- NND-12-0125, "Change Order #14 – Cyber Security Phase 1," March 6, 2012
- SVP-SV0-001321, "Delivery of Cyber Security Phase 1 Milestone 2," May 15, 2012
- WCAP-17179-P (APP-GW-GLR-143), "AP1000™ Component Interface Module Technical Report," Revision 4, December 2013
- WEC 7.1, "Supplier QA Program Qualification and Assessment," Revision 5, September 19, 2013
- WEC 11.1, "Test Control," Revision 0,
- WEC 15.1, "Deviation Notices," Revision 0, July 4, 2012
- WEC 15.2, "Use of Hold Tags," Revision 0, October 30, 2013
- WEC 16.2, "Westinghouse Corrective Actions Process (Lotus Notes-CAP's)," Revision 6, September 19, 2013
- WEC 16.3, "Corrective Action Review Board," Revision 3, December 16, 2013
- WEC 16.9, "Trending Process," Revision 1.3, August 27, 2012
- WEC 18.1, "Internal Audits," Revision 3, September 19, 2013
- WEC 21.0, "Identification and Reporting of Conditions Adverse to Nuclear Safety," Revision 7.1, September 19, 2013
- WEC-13-119, "In-Process Software Audit of the Requirement Phase for the Component Interface Module (CIM) Project," November 15, 2013
- WEC-13-100, "AP1000(R) Open Items and Holds," May 6-10, 2013
- WEC-12-50, "Supplier Quality Oversight (SQO) & Quality Engineering (QE)," April 19, 2013
- WEC-12-34, "Westinghouse AP1000 Plant Engineering," October 15, 2012

- WEC-2007-191, "Supplier Audit Report for CS Innovations," November 16, 2007
- WEC's AP1000 design control document (DCD), APP-GW-GL-700, Revision 19, June 13, 2011
- WES-2011-387, "Supplier Audit Report for CB&I," August 1, 2011
- WNA-TR-02718-GEN, "CIM SRNC Subsystem Test Report," Revision 1, October 2012
- WNA-TP-04034-GEN, "CIM SRNC Test Tool Validation Procedure," Revision 0, March 2012
- WNA-TR-02714-GEN, "CIM SRNC Test Tool Validation Report," Revision 0, April 2012
- WNA-TP-04019-GEN, "CIM SRNC Subsystem Test Procedure," Revision 1, April 2012
- WNA-IG00320-GEN Revision 2, "Receipt Inspection Documentation," 8/3/13
- WNA-PD-00050-GEN, "Component Interface Module (CIM) and Safety Remote Node Controller (SRNC) Development," Revision 10
- WNA-CS-00014-GEN, "CS Innovations Development Environment Evaluation," Revision 1
- WNA-CS-00117-GEN, "Cyber Security Assessment Report Isolated Development Infrastructure," Revision 0, October 2013

#### Test Procedures and Documents

- APP-DAS-T1P-300, "AP1000 Diverse Actuation System Factory Acceptance Test Procedure," Revision 5, December 2, 2013
- APP-DAS-T1D-300, "AP1000 Diverse Actuation System Factory Acceptance Test Data Sheets," Revision 5, December 2, 2013
- APP-DAS-T5-001, "AP1000 Diverse Actuation System Test Plan," Revision 1, December 2, 2013
- APP-GW-T5-002, "AP1000 Instrumentation and Control Systems Design Validation and Integration Test Specification," Revision 0
- VS2-DAS-T2R-300, "VC Summer U2 AP1000 Diverse Actuation System Factory Acceptance Test Report," Revision 0
- VSP\_VSG\_001718, Execution Version – Change Order #14 – Cyber Security Phase 1, February 28, 2012
- VSP\_VSG\_001759, Fully Executed Change Order #14 – Cyber Security Phase 1, March 14, 2012
- SVP\_SV0\_001060, Consortium Proposal for Phase I of AP1000 Standard Plan Cyber Security for Vogtle Units 3 and 4, October 28, 2011
- VSG\_VSP\_001002, Change Order #14 – Cyber Security Phase 1, March 6, 2012
- Georgia Power, Southern Company, PO Change Order PO: SNG23758-0004, Revision 5, June 28, 2013
- APP-GW-GBH-361 Rev 1, Westinghouse AP-1000 Integrated I&C Test Strategy,
- CIM-SRNC Subsystem Test Report, WNA-TR-02817 Revision 1, October 2012

#### Internal Audit Report Documents

- SCAR WES-2012-302, "Commercial Grade Survey of ABB AB Control Technology," July 26, 2013
- WES-2012-302-R, "WEC's Supplier Commercial Grade Survey Report of ABB AB Control Tech (Vasteras, NA)," August 27, 2012

- SCAR 11-212-M008, "Audit WES-2011-387 Finding #1 ND-01 (Corrective Action Procedure)," November 16, 2011
- SCAR 11-212-M010, "Audit WES-2011-387 Finding #3 BM-01 (Audits)," November 01, 2011
- Readiness Review Report – Vogtle 3&4 Internal Assessment of CIM Planning Phase (Nov 2012)

- Corrective Action Documents

- CAR 13-323-M009, "WEC-13-119: IEEE 603 Compliance Evaluation Spreadsheet," December 11, 2013
- CAR 13-323-M011 "WEC-13-119: RAW not archived in EDMS," December 2, 2013
- CAPs-RCA-12-103-M041, "NRC Inspection Summary-AP1000 Requirements Phase," June 14, 2012
- Issue Report (#14-016-M057) CRA-2013-140: CIM-SRNC Configuration Management Plan-Missing CI 9006-00021
- Issue Report 11-206-M050 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-02," June 09, 2012
- Issue Report 11-206-M051 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-03," June 15, 2012
- Issue Report 11-208-M054 "Perform an extent of a condition for the Notice of Violation (NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-01) to perform using WEC 21.0," August 16, 2011
- Issue Report 11-206-M052 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-04," July 27, 2012
- Issue Report 11-206-M053 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-05," January 16, 2012
- Issue Report 14-009-W005, "CIM Significant Breakdown in Quality Assurance," January 9, 2014
- Issue Report 12-103-M041 "NRC Inspection at Vogtle for the PMS system," January 13, 2014
- Issue Report 11-206-M049 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-05," October 27, 2011
- Issue Report 12-241-M035 "NRC Inspection at EQ New Stanton, NON 99901403/2012-201-03," May 22, 2013
- Issue Report 13-179-M051 "NRC Inspection at CS Innovations 25-Apr-2011, NON 99901404/2011-201-05," January 16, 2012
- Issue Report 12-241-M032 "NRC NON 99901403/2012-201-04," April 11, 2013
- Issue Report 13-357-M010 " Potential Cold Joint Formed During Layer A Placement Under CVBH," January 07, 2014
- Issue Report 13-214-M047, "CIM Product Quality Assessment," August 2, 2013
- Issue Report 14-016-M010 "CIM-SRNC Management Plan Insufficient Detail"
- Issue Report 14-015-M032 – Several out of specification readings were missed by both the test team and the IV&V team while undertaking the CIM-SRNC Subsystem Test
- Issue Report 14-017-M004 – Multiple CIM Test Reports and Test Summary Reports were requested of Westinghouse, but the test were unable to be retrieved by the Integrated Development Infrastructure (IDI) repository.

- WEC NonConformance Documents

- QN60056012, "BCC Div C Cabinet Configuration G01," (CIT), February 19, 2013

- QN60057992, "AO650" (PLC), June 28, 2013
- QN60058368, "Vogtle Unit 3 AP1000 DAS," July 26, 2013
- QN60059657, "Processor, PM646B MDL," October 01, 2013
- QN60059690, "CI610 BUS EXTENDER," October 03, 2013
- QN60057924, "DO630 16 CH.250 VAC ISOLATED RELAY MDL," June 24, 2013
- QN60059945, "VC SUMMER UNIT 2 AP1000 DAS," October 17, 2013
- QN60060874, "VOGTLE UNIT 4 AP1000 DAS," December 18, 2013
- QN60057750, "Cabinet VS2 PMS ILC DIV C G02," May 10, 2013
- QN60057793, "Cabinet VS2 PMS MTC DIV A G01," May 10, 2013
- QN60060248, "DP620 High Speed Counter MDL," November 05, 2013
- QN60057749, "Cabinet VS2 PMS ILC DIV C G02," June 12, 2013
- NCR105-0602, 2012-08-05, Nonconformance Report

#### Commercial-Grade Dedication Documents

- Commercial grade dedication instruction (CDI) 2625 for AC160 Nuclear Critical Components, Revision 19, August 05, 2013
- CDI-4057, "Commercial Dedication Instruction of Services associated with Build to Print Electro-mechanical Parts and Assemblies," Revision 10, September 16, 2013

#### Miscellaneous Documents

- IEEE Standard 730-1998, "IEEE Standard for Software Quality Assurance Plans," Institute of Electrical and Electronics Engineers, 1998
- IEEE Std. 1074-1995, "IEEE Standard for Developing Software Life Cycle Processes," 1995
- IEEE Standard 1012-1998, "IEEE Standard for Software Verification and Validation," 1998
- Regulatory Guide 1.173, "Developing Software Life Cycle Processes for Digital Computer Software used in Safety Systems of Nuclear Power Plants," dated September 1997
- Regulatory Guide 1.169, "Configuration Management Plans for digital Computer Software used in Safety Systems of Nuclear Power Plants," 1997
- NUREG/CR-6101, "Software Reliability and Safety in Nuclear Reactor Protection Systems," US Nuclear Regulatory Commission, June 11, 1993
- On-Time Ticket, 5292, 5415, 5615
- Pre-Job Brief Checklist – DAS testing
- Risk Assessment Worksheet – CIM/SRNC
- Shop Traveler 40093103 Cabinet SV4 AP1000 PMS ILC DIV C – December 23, 2013

#### 6. ACRONYMS USED:

ADAMS	Agencywide Documents Access and Management System
WEC	Assurance Technical Services
CGD	commercial grade dedication
CFR	<i>Code of Federal Regulations</i>
CHT	cabinet hardware Testing
CIM	Component Interface Module
CSI	CS Innovations, Inc.
DAC	design acceptance criteria
DAS	Diverse Actuation System
DCIP	Division of Construction Inspection and Operational Programs



EVIB	Electrical Vendor Inspection Branch
FAT	factory acceptance testing
FPGA	Field Programmable Gate Array
IEEE	Institute of Electrical and Electronics Engineers
IP	inspection procedure
IR	issue report
ITAAC	Inspections, tests, analyses, and acceptance criteria
IV&V	independent verification and validation
M&TE	measuring and test equipment
MTP	maintenance and test panel
NON	Notice of Nonconformance
NOV	Notice of Violation
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PMS	Plant Monitoring System
PO	purchase order
QA	quality assurance
QC	quality control
SDP	software development plan
SIL	software integrity level
SIOS	standard input/output simulator
SIT	system integration testing
SLC	software life cycle
SLCM	software life cycle model
SOP	Standard Operation Procedures
SQAP	software quality assurance program
U.S.	United States (of America)

