

July 31, 2013

Mr. Alan D. Fogle, Quality Systems
and Operational Excellence Director
Ultra Electronics, Nuclear Sensors
and Process Instrumentation
707 Jeffrey Way
Round Rock, TX 78665

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 99900880/2013-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Fogle:

From June 17, 2013, through June 21, 2013, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Ultra Electronics, Nuclear Sensors and Process Instrumentation facility in Round Rock, TX. The enclosed report presents the results of the inspection.

The purpose of this limited-scope inspection was to assess Ultra Electronics' compliance with provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and provisions of selected sections of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." This technically focused inspection specifically evaluated Ultra Electronics' implementation of quality activities associated with design control, equipment qualification, inspections, test, analyses, and acceptance criteria (ITAAC) related work, fabrication, and testing of safety-related components. The team selected samples with emphasis on the AP1000 resistance temperature detectors and pressure transmitters. The NRC inspection team did not identify any findings associated with the ITAAC in Section 8 of the enclosure to this letter. This NRC inspection report does not constitute NRC endorsement of Ultra Electronics' overall quality assurance (QA) or 10 CFR Part 21, "Reporting of Defects and Noncompliance," programs.

The NRC inspection team concluded that Ultra Electronics is adequately implementing its QA program in support of the design, manufacturing, and testing of the sampled instrumentation and control equipment, with the exception of one design control nonconformance. Specifically, the inspection team determined that the implementation of design control related to the procurement and control of software was not consistent with regulatory requirements. The detailed finding and references to the applicable requirements are identified in the enclosures to this letter.

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

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," the NRC will make a copy of this letter, its enclosures, and

your response available electronically for public inspection in the NRC's Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System (ADAMS), 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 be 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 Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99900880

Enclosures:

1. Notice of Nonconformance
2. Inspection Report 99900880/2013-201

your response available electronically for public inspection in the NRC's Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

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Sincerely,

/RA/

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

Docket No.: 99900880

Enclosures:

1. Notice of Nonconformance
2. Inspection Report 99900880/2013-201

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NRC-001

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DATE	07/15/2013	07/26/2013	07/26/2013	07/10/2013
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DATE	07/10/2013	07/26/2013	07/24/2013	07/31/2013

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NOTICE OF NONCONFORMANCE

Ultra Electronics
Round Rock, TX.

Docket No.: 99900880
Inspection Report No.: 99900880/2013-201

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted at the Ultra Electronics facility in Round Rock, TX, on June 17 - 21, 2013, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Ultra Electronics by NRC licensees:

- A. Criterion III, "Design Control," 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," states, in part, that design control measures shall provide for verifying or checking the adequacy of design by the performance of a suitable testing program.

Ultra Electronics procedure 100-20.1, "Software Quality Assurance," Revision 4, dated January 2013, Section 5.5, states, in part, after Internally Developed Software or 3rd Party Software is approved for use and installed it shall be controlled in accordance with released procedures and instructions.

Contrary to the above, as of June 21, 2013, Ultra Electronics did not verify the adequacy of design of safety-related components by the performance of a suitable testing program. Specifically, Ultra Electronics did not appropriately control Lab View 3rd Party Software in accordance with released procedures and instructions or demonstrate by another means of verification (i.e. dedication or conducting tests not relying on the same software used for design) that the software was capable of performing its safety function as related to the following tests:

- (1) N9004 RTD Hysteresis test.
- (2) DTN-2070 Pressure Transmitter Temperature Compensation test.

This issue has been identified as Nonconformance 99900880/2013-201-01

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, Construction Electrical Vendor 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 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."

Dated this the 31st day of July 2013.

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

Docket No.: 99900880

Report No.: 99900880/2013-201

Vendor: Ultra Electronics, Nuclear Sensors and Process Instrumentation
707 Jeffrey Way
Round Rock, TX 78665

Vendor Contact: Alan Fogle, Director of Quality Systems & Operational Excellence
alan.fogle@ultra-nspi.com
512-434-2878

Background: Ultra Electronics' Nuclear Sensors and Process Instrumentation business manufactures a broad line of temperature sensors and pressure transmitters for safety related, inside containment and balance of plant installations. The company is legally Weed Instruments, which is a legacy product-line and is still headquartered in Round Rock (a suburb of Austin), TX. Ultra Electronics manufactures nuclear qualified temperature sensors, thermowells and transmitters, pressure transmitters and fiber optic modems for the commercial nuclear industry and for nuclear plants under construction.

Inspection Dates: June 17-21, 2013

Inspection Team Leader: George Lipscomb NRO/DCIP/CEVB

Inspectors: Douglas Bollock NRO/DCIP/CEVB
Robert Mathis III R-II/DCI/CIB1
Annie Ramirez NRO/DCIP/CEVB
Jose Jimenez NRO/DCIP/CEVB

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

EXECUTIVE SUMMARY

Ultra Electronics NSPI
99900880/2013-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to assess Ultra Electronics' compliance with provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and verify that Ultra Electronics implements 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." This technically focused inspection specifically evaluated Ultra Electronics' implementation of quality activities associated with design control, equipment qualification (EQ), work related to inspection, test, analysis, and acceptance criteria (ITAAC), fabrication, and testing of safety-related components. The team selected samples with an emphasis on the N9002 and N9004 resistance temperature detectors (RTD), and N-E Series and DTN Series pressure transmitters. The NRC identified these product lines because the RTDs and DTN pressure transmitters are anticipated to be used in new reactor construction, and the N-E Pressure transmitters are currently used in operating plants. Some of the activities observed by the NRC inspection team were associated with ITAAC from Revision 19 of the certified AP1000 design. The NRC inspection team did not identify any findings associated with the ITAAC contained in Section 8 of this report. The NRC conducted this inspection at Ultra Electronics' Nuclear Sensors and Process Instrumentation manufacturing facility in Round Rock, TX.

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

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"

The NRC inspection team used Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated April 25, 2011; IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated April 25, 2011; IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012, and IP 65001.E, "Inspection of the ITAAC-Related Qualification Program," dated August 19, 2008 to conduct this inspection.

This is the first NRC inspection of Ultra Electronics.

With the exception of the nonconformance described below, the NRC inspection team concluded that Ultra Electronics is adequately implementing its QA program in support of the design, manufacturing, and testing of the sampled equipment. The results of this inspection are summarized below.

Design Control

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls design in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Based on the limited sample of RTD and pressure transmitters design documents, drawings, procedures, and interviews with Ultra Electronics staff, and with the exception of Nonconformance 99900880/2013-201-01, the inspectors determined that Ultra Electronics is adequately implementing design control

processes in support of safety-related component design. Nonconformance 99900880/2013-201-01 provides examples of commercial software used for pressure transmitter and RTD design and product testing that was not properly controlled under Ultra Electronics commercial - grade dedication (CGD) or software QA programs, or by other means.

Commercial-Grade Dedication

The NRC inspection team concluded that Ultra Electronics has established a program that adequately controls CGD in accordance with the regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of CGD activities reviewed, the inspectors determined that Ultra Electronics is effectively implementing its CGD program in support of safety-related component manufacturing.

10 CFR Part 21

The NRC inspection team concluded that Ultra Electronics has established a 10 CFR Part 21 program in accordance with the regulatory requirements of 10 CFR Part 21. Based on the limited sample of documents reviewed, the inspectors also determined that Ultra Electronics is appropriately implementing its policies and procedures associated with the 10 CFR Part 21 program.

Manufacturing Control and Inspection

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls manufacturing and inspection activities in accordance with the regulatory requirements of Criterion V and Criterion X of Appendix B to 10 CFR Part 50. Based on the limited sample of manufacturing and inspection activities observed and documents reviewed, the inspectors determined that Ultra Electronics is effectively implementing its manufacturing and inspection programs in support of safety-related component manufacturing.

Test Control

With the exception of Nonconformance 99900880/2013-201-01 described in Section 1 of this report, the NRC inspection team determined that Ultra Electronics has established a program that adequately controls testing in accordance with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Based on the limited sample of test activities observed and documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing these control processes in support of safety-related component manufacturing.

Control of Measuring and Test Equipment

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls M&TE in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of test activities observed and M&TE documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its M&TE program in support of safety-related component manufacturing and testing.

Procurement and Supplier Control

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls procurement of equipment and services in accordance with the regulatory requirements of Criterion IV and VII of Appendix B to 10 CFR Part 50. Based on the limited sample of procurement documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its procurement program in support of safety-related component manufacturing.

AP1000 Equipment Qualification

The NRC inspection team determined that Ultra Electronics' programmatic controls of procured qualification testing services for the qualification of RTDs and pressure transmitters to be used in the AP1000 reactor design were adequate at this intermediate stage. Although final AP1000 qualification documentation was not complete at the time of the inspection, the NRC inspection team concluded that procedures and tests established to qualify the RTDs and pressure transmitters adequately translated the qualification requirements to be used in the closure of ITAAC 2.01.02.7a.i and ITAAC 2.01.02.5a.ii.

Nonconformance and Corrective Action Programs

The NRC inspection team determined that Ultra Electronics corrective action program requirements and implementation for the samples selected were consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team also determined that, for the samples inspected, Ultra Electronics adequately implemented its procedures to control nonconforming materials, parts, or components in accordance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50.

Audits

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls audits in accordance with the regulatory requirements of Criterion XVIII of Appendix B to 10 CFR Part 50. Based on the limited sample of audit documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its internal and external audit programs in support of safety-related component manufacturing.

REPORT DETAILS

1. Design Control

a. Inspection Scope

The Nuclear Regulatory Commission (NRC) inspection team reviewed Ultra Electronics' quality assurance (QA) program described in Section 4 of Ultra Electronics' Quality Assurance and Control Manual, Regulation 100-1, which is a high-level document that delineates the QA program. The NRC inspection team also reviewed safety-related design development processes, design control change process, design verification and validation, and design-based procedures for the manufacture of Westinghouse N9002 and N9004 resistance temperature detectors (RTD), and the N-E11 and DTN-series pressure transmitters to verify regulatory compliance with Criterion III, "Design Control," of Appendix B to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50. These components will be used in the Westinghouse Electric Company AP1000 design nuclear plants and in the current domestic nuclear plants.

The NRC inspection team interviewed Ultra Electronics engineering, quality, and plant operations staff to verify appropriate implementation of design changes and that design changes were as controlled as in the original design through the engineering change notice (ECN) process. Also, the NRC inspection team reviewed the traceability of several Westinghouse RTD and pressure transmitter purchase orders (PO) design specifications and the Ultra Electronics design descriptions to ensure that the technical requirements for the RTDs and pressure transmitters were correctly translated into job orders, procedures and instructions issued for the N9004 RTD, N-E11, and DTN 2070 pressure transmitters.

In addition, the NRC inspection team also assessed measures established by Ultra Electronics to ensure the use of software does not adversely impact the development, validation, or test verification of component design or fabrication of the RTDs and pressure transmitters to be used in the AP1000.

b. Observations and Findings

The NRC inspection team verified that the QA manual adequately identifies the design organization that prescribes and documents design activities, and the process that allows verification that Ultra Electronics' designs meets PO design requirements. The NRC inspection team found that Ultra Electronics created measures that ensured design basis and applicable regulatory requirements were correctly translated into drawings, procedures, and instructions.

The NRC inspection team verified that job orders contained the design drawings, instructions, fabrication procedures, and tests requirements derived from the received PO's design requirements and that any design changes followed the ECN program developed by Ultra Electronics. NRC inspection team also verified Ultra Electronics adequately implemented the ECN process for the reviewed design changes and that measures were established to prevent unauthorized personnel from performing changes on design-related documents.

The NRC inspection team verified that Ultra Electronics was adequately implementing procedure Quality System Department Regulation (QSDR) 100-20.1, "Software Quality Assurance," to control the use of software. The NRC inspection team found during inspection of Ultra Electronics testing activities that in two cases, N9004 RTD Hysteresis Test and DTN-2070 Pressure Transmitter Temperature Compensation Test, Ultra Electronics used Lab View commercial software to run automated test processes. The Lab View software was programmed by Ultra Electronics to control, verify and document test parameters for the various test equipment used as part of the acceptance and documentation of test results. The NRC inspection team learned the software was considered safety-related under the Ultra Electronics software QA program, but noted it was not appropriately controlled under the current Software QA Program (as specified in Company Regulation 100-20.1, Revision 4) or by any other means to assure that the commercially purchased software would perform its safety-function associated with testing (e.g., assurance of test parameters and profiles were properly controlled).

Some verification was performed to validate resistance temperature calculations for the N9004 RTD Hysteresis Test, but there was no documented verification that the automated test profile and data recording software for the test were functional as designed. The observed testing was unmonitored by personnel and occurred over extended periods of time (12 or more hours). For the DTN-2070 Pressure Transmitter Temperature Compensation Test the test results are used to determine resistor changes to ensure accurate readings of the pressure transmitter through the range of its operations and to validate performance of the final transmitter. The NRC inspection team found through interviews with Ultra Electronics staff that the same software controls were used during design verification testing of the DTN-2070 Pressure Transmitter and N9004 RTD.

The NRC inspection team determined that Ultra Electronics did not appropriately control Lab View 3rd Party Software in accordance with released procedures and instructions or demonstrate by another means of verification (i.e. dedication or conducting tests not relying on the same software used for design) that the software was capable of performing its safety function as related to the testing of safety related components. Ultra Electronics stated at the exit meeting that they had entered the finding in their corrective action program. This issue is identified as Nonconformance 99900880/2013-201-01.

c. Conclusions

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls design in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Based on the limited sample of RTD and pressure transmitters design documents, drawings, procedures, and interviews with Ultra Electronics staff, and with the exception of Nonconformance 99900880/2013-201-01, the NRC inspection team determined that Ultra Electronics is adequately implementing design control processes in support of safety-related component design.

2. Commercial Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed Ultra Electronics policy, procedures, and implementation of CGD for use in safety-related applications to verify compliance with applicable regulatory requirements. This assessment included a review of the procedures governing the implementation of CGD activities, interviews with Ultra Electronics personnel, and review of related documentation.

The NRC inspection team reviewed Ultra Electronics Company Regulation 60-2, "Procedure for the Utilization, Procurement and Dedication of Items Used in Nuclear Safety-Related Assemblies," which is a high-level document governing Ultra Electronics' CGD process that establishes the requirements and responsibilities for dedicating commercial grade items procured for use in safety-related applications. The NRC inspection team reviewed the technical evaluations and CGD plans for select subcomponents for AP1000 9004 model RTD and DTN pressure transmitters as well as N-E Pressure transmitters for the U.S. operating fleet.

The NRC inspection team reviewed the Purchased Part Specification for the capsule assembly for N-E11 pressure transmitters. The NRC inspection team reviewed how Ultra Electronics verifies critical characteristics of material and heat treatment of the metals used in the capsule assembly through record verification upon receipt along with the commercial-grade survey conducted at the supplier. The NRC inspection team also reviewed Ultra Electronics verification of purchased material configuration by checking dimensions upon receipt, and operability through testing during manufacturing and final operability tests of the assembled units. The NRC inspection team also reviewed the specifications for the junction gate field-effect transistors (JFET) used in DTN pressure transmitters.

The NRC inspection team also reviewed the PO for some of the subcomponents that make up the N9004 RTD, N9002 RTD, DTN pressure transmitters and the N-E11 pressure transmitters. The NRC inspection team also reviewed the acceptance test procedure and documentation to ensure Ultra Electronics was properly dedicating each part per their processes and procedures.

b. Observations and Findings

The NRC inspection team verified that Ultra Electronics is adequately controlling the dedication of all subcomponents including listing the dedication methods used for each subcomponent in accordance with their established policies and procedures.

The NRC inspection team verified that Ultra Electronics tests JFETs functional critical characteristics during transmitter assembly and final testing, and has lot controls of the JFETs when they are received by the original equipment manufacturer (OEM) or OEM approved distributors. Also, the NRC inspection team verified that for the 9004 RTD assembly boxes the critical characteristics of dimensions and the material characteristics are verified both upon receipt and by checking the component material test report. NRC inspection team verified Ultra Electronics personnel were conducting receipt inspections in accordance with procedures which included visually checking or measuring the critical characteristics of each subcomponent to verify they would perform

their intended. The NRC inspection team verified that the commercial-grade surveys conducted at the sub-suppliers ensured that the requirements of the acceptance criteria for the components were met. The NRC inspection team noted that Ultra Electronics conducted sample material verification testing or final assembly testing when material characteristics were critical in order to demonstrate proper material characteristics in accordance with their procedures.

The NRC inspection team also verified samples of subcontractor-provided certificates of conformance for CGD receipt inspection of junction box assemblies, platinum wiring and Alumina ceramic used in RTDs; capsule assemblies and force bars used in N-E pressure transmitters; and JFETs and diaphragms used in DTN pressure transmitters were in compliance with Ultra Electronics procedures.

c. Conclusions

The NRC inspection team concluded that Ultra Electronics has established a program that adequately controls CGD in accordance with the regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of CGD activities reviewed, the inspectors determined that Ultra Electronics is effectively implementing its CGD program in support of safety-related component manufacturing. No findings of significance were identified.

3. 10 CFR Part 21

a. Inspection Scope

The NRC inspection team reviewed Ultra Electronics' policies and implementing procedures that govern Ultra Electronics' 10 CFR Part 21 program with an emphasis on the AP1000 RTD and pressure transmitters to verify compliance with the regulatory requirements. The inspectors evaluated Ultra Electronics' 10 CFR Part 21 postings and a sample of evaluations that Ultra Electronics has performed to meet the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.6, "Posting Requirements." The NRC inspection team walked down the different process areas in the facility to ensure Ultra Electronics posted the required documents in conspicuous locations consistent with the intent of 10 CFR 21.6(a)(2). In addition, the NRC inspection team discussed the 10 CFR Part 21 program with Ultra Electronics management and technical staff.

b. Observations and Findings

The NRC inspection team verified that Ultra Electronics' policy and implementing procedures met the requirements of 10 CFR 21.21 and that procedures provide a direct connection between control of nonconformance and corrective actions and the 10 CFR Part 21 program. The NRC inspection team evaluated several samples of 10 CFR Part 21 evaluations performed by Ultra Electronics for basic components shipped to several customers including operating plants. The 10 CFR Part 21 evaluations reviewed included detailed description of the nonconforming issues, date of discovery, timelines requirements, and notification of requirements when determinations were made regarding the existence or nonexistence of a substantial safety hazard.

The NRC inspection team verified that Ultra Electronics implemented and maintained proper postings requirements under 10 CFR 21.6, "Posting Requirements." The postings included a current revision of 10 CFR Part 21, Section 206 of the Energy Reorganization Act of 1974, and updated Ultra Electronics procedures that implemented 10 CFR Part 21 regulations.

c. Conclusions

The NRC inspection team concluded that Ultra Electronics has established a 10 CFR Part 21 program in accordance with the regulatory requirements of 10 CFR Part 21. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Ultra Electronics is appropriately implementing its policies and procedures associated with the 10 CFR Part 21 program. No findings of significance were identified.

4. **Manufacturing Control and Inspection**

a. Inspection Scope

The NRC inspection team reviewed inspection policies and procedures, with an emphasis on the AP1000 N9004 RTD and the N-E11/DTN 2070 pressure transmitters, to determine if Ultra Electronics controls were in compliance with the regulatory requirements of Criterion V, "Instructions, Procedures, and Drawings," and Criterion X, "Inspection," of Appendix B to 10 CFR Part 50. In addition, the inspection team interviewed personnel associated with RTD resistance elements subassembly manufacturing, including welding of RTD housing tube and electrical wiring.

The NRC inspection team conducted a walk through for selected assembly steps of the N9004 RTD, N-E11, and DTN 2070 pressure transmitters' product lines. The NRC inspection team also interviewed engineering, quality, and inspection personnel associated with the DTN pressure transmitter elements, housing, circuit board trimming, testing and final assembly to ensure design, fabrication and acceptability requirements were understood and adequately translated to Ultra Electronics procedures.

The NRC inspection team observed a sample of in-process inspection activities, and reviewed related documentation for the RTD tube assembly welding and N-E11 pressure transmitter final assembly before shipping.

The NRC inspection team reviewed qualification records for manufacturing personnel were designated as appropriately trained for assembly activities and that proper training and qualification requirements for quality control (QC) inspection personnel were established in the company's policies and procedures.

b. Observations and Findings

The NRC inspection team verified fabrication activities related to sampled RTD resistance element subassembly processes, DTN 2070 circuit board trimming and assembly, and the N-E11 component housing and final assembly followed Ultra Electronics manufacturing procedures. The NRC inspection team verified qualified personnel were knowledgeable about the manufacturing process of the RTD and pressure transmitters and that work packages completed contained the required

documentation and received review and approval by the right level of management in accordance to company's quality assurance policies.

The NRC inspection team noted that QC inspection personnel were knowledgeable of general inspection requirements, used approved inspection procedures for the tube assembly welding and pressure transmitter final assembly, and verified that discrepancies were resolved. The NRC inspection team also verified through sample of records that QC personnel conducting inspection activities had a current QC certification.

c. Conclusions

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls manufacturing and inspection activities in accordance with the regulatory requirements of Criterion V and Criterion X of Appendix B to 10 CFR Part 50. Based on the limited sample of manufacturing and inspection activities observed and documents reviewed, the inspectors determined that Ultra Electronics is effectively implementing its manufacturing and inspection programs in support of safety-related component manufacturing. No findings of significance were identified.

5. Test Control

a. Inspection Scope

The NRC inspection team reviewed testing policies and procedures, with an emphasis on the AP1000 model N9004 RTD and DTN 2070 differential pressure transmitters, to determine if Ultra Electronics' controls were in compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Inspectors reviewed Ultra Electronics procedure QSDR 100-9.3, "Product Realization – General Regulation," which provides high-level programmatic controls for test activities. Also, the inspectors reviewed individual job orders and lower-level procedures which provide the detailed test requirements. In addition, the inspectors interviewed temperature detector and pressure transmitter test personnel, compared testing observations to the related procedures, and reviewed related test documentation to verify appropriate program implementation. The NRC inspection team observed engineering personnel conduct reviews and approval of two sets of test results for the N9004 to ensure the proper procedures were being used. The NRC inspection team also reviewed procedure QSDR 100-2.1, "Qualifications Procedure for Inspection, Examination and Testing Personnel," which established training requirements and methods to qualify personnel who perform inspection and testing activities.

b. Observations and Findings

The NRC inspection team observed three in-process tests on the N9004 RTD sensor sub-assemblies, two in-process tests on the NE pressure transmitter, and one in-process test on the DTN 2070 differential pressure transmitter. The NRC inspection team noted that test personnel used calibrated measuring and test equipment (M&TE) during the testing and that they were knowledgeable about the proper use and configuration of each instrument. The NRC inspection team found that test personnel were knowledgeable, understood and followed the associated test procedures, and appropriately documented the results.

The NRC inspection team found that engineering personnel were knowledgeable and thorough in their review and documentation of test results. The NRC inspection team also verified personnel were appropriately qualified by QA through sampled qualification records of personnel conducting observed N9004 and DTN 2070 test activities.

c. Conclusions

With the exception of Nonconformance 99900880/2013-201-01 described in Section 1 of this report, the NRC inspection team determined that Ultra Electronics has established a program that adequately controls testing in accordance with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Based on the limited sample of test activities observed and documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing these control processes in support of safety-related component manufacturing.

6. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed M&TE policies and procedures to determine if Ultra Electronics' controls were in compliance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The inspectors reviewed Ultra electronics procedure QSDR 100-12.1, "Measuring and Test Equipment Calibration Control Program," to ensure all M&TE used in the fabrication of N9004 RTD, NE pressure transmitter, and DTN 2070 differential pressure transmitter test activities are appropriately controlled, documented, and calibrated. In addition, the inspectors interviewed personnel associated with control of test equipment for observed temperature detector and pressure transmitter testing activities, compared observations related to M&TE to the related procedures, and reviewed associated M&TE documentation, to verify appropriate program implementation.

b. Observations and Findings

The NRC inspection team verified M&TE controls and activities for both in-house calibration and procurement of calibration services were conducted accordance with procedure QSDR 100-12.1. The NRC inspector evaluated the M&TE documentation for an in-house calibrated Time Response Apparatus used with N9004 RTD testing and for an externally calibrated pressure source used with DTN 2070 testing. The NRC inspection team verified that the procurement of commercial calibration services requirements supported by the American Association for Laboratory were included in both M&TE procedures and in the sampled purchase orders. The NRC inspection team also verified for a sample of out-of-calibration documentation that an evaluation of effect on previous test results was completed and QA personnel were knowledgeable of out-of-calibration procedures.

c. Conclusions

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls M&TE in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of test

activities observed and M&TE documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its M&TE program in support of safety-related component manufacturing and testing. No findings of significance were identified.

7. Procurement and Supplier Control

a. Inspection Scope

The NRC inspection team reviewed procurement and supplier related procedures, a sample of purchasing records, and interviewed related personnel to determine if Ultra Electronics procurement and supplier controls were in compliance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed Section 6, "Procurement Control," of Regulation 100-1 of the Ultra Electronics Quality Assurance and Control Manual, which gives an overview of the requirements for supplier source evaluation and selection to validate a supplier's capability to provide items or services under procurement specifications. The inspectors also reviewed Section 3, "Contract Review," and Section 6, "Procurement Control," of Regulation 100-1 of the Ultra Electronics Quality Assurance & Control Manual, which describes the processes and controls established to ensure purchased items and services meet applicable technical and quality requirements. The inspectors also selected a sample of POs, associated approved supplier list entries, and other related Ultra Electronics documents for evaluation. The inspectors reviewed the audits of two 10 CFR Appendix B suppliers and POs for safety-related seismic and environmental qualification testing services.

b. Observations and Findings

The NRC inspection team verified that the technical requirements of Ultra Electronics transferred to related POs and were issued to suppliers. The NRC inspection team confirmed that technical requirements were transferred to the relevant POs without modification or amendment. The inspectors found that all sampled supplier qualifications were conducted by Ultra Electronics survey or audit. The NRC inspection team found that the lead auditor and supply chain personnel were knowledgeable of supplier control and purchasing control procedures and appropriately implemented Ultra Electronics purchasing requirements.

c. Conclusions

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls procurement of equipment and services in accordance with the regulatory requirements of Criterion IV and VII of Appendix B to 10 CFR Part 50. Based on the limited sample of procurement documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its procurement program in support of safety-related component manufacturing. No findings of significance were identified.

8. AP1000 Equipment Qualification

a. Inspection Scope

The NRC inspection team reviewed PO and associated procurement documents issued by Westinghouse, and Ultra Electronics equipment qualification test plan and procedures relating to the design of AP1000 RTDs and pressure transmitters, to ensure that qualification requirements were appropriately translated into applicable qualification procedures in support of ITAAC closure. The NRC inspection team reviewed Westinghouse procurement documents for the DTN pressure transmitter qualification included test requirements for Thermal Aging, Radiation Aging, Wear Aging, Vibration Aging, Containment Pressure, Seismic, EMC, Design Basis Event (DBE)-Accident Radiation, DBE- Pressure Transient, DBE-Temperature Transient, Post- Design Basis Accident (DBA) Submergence, and Post-DBA Chemistry. The inspectors also reviewed Westinghouse procurement documents for the qualification of the RTDs included test requirements for Thermal Aging, Radiation Aging, Vibration Aging, Containment Pressure, Seismic, DBE-Accident Radiation, DBE- Pressure Transient, DBE- Temperature Transient, Post-DBA Submergence, and Post-DBA Chemistry. The applicable ITAACs are referenced in section 4 of the attachment to this report. The inspectors conducted interviews with equipment qualification personnel and reviewed implementing procedures to ensure that the oversight and monitoring of qualification testing activities were adequate.

b. Observations and Findings

The NRC inspection team verified that the Ultra Electronics qualification test plan and procedures for the qualification of the DTN-series pressure transmitter and the RTDs included the qualification tests specified in Westinghouse procurement documents and that Ultra Electronics were adequately translated into implementing procedures. The NRC inspection team learned that while the current qualification of the DTN-series pressure transmitters were specific to the AP1000 reactor design for China, the qualification would be the same for the domestic AP1000 reactor design (ITAAC 2.01.02.5a.ii).

The RTDs being procured by Westinghouse were designated to be used in the domestic AP1000 reactor design for the Reactor Coolant System (RCS) Cold Leg Narrow and Wide Range RTDs, RCS Hot Leg Narrow and Wide Range RTDs, Passive Residual Heat Removal (PRHR) Return Line temperature elements, and Pressurizer Level Leg reference temperatures. The NRC inspection team learned that qualification testing of the RTDs was still in progress and that the final report of qualification results would not be available until all the qualification tests were complete. At the time of the inspection, one of the two RTD models being qualified was still undergoing DBA Submergence testing at a contractor test facility. The qualification of these RTDs will support the future closure of ITAAC 2.01.02.7a.i.

The inspectors verified the available documentation for completed portions of the equipment qualification conformed to the procedure requirements. The review of the available equipment qualification documentation indicated that Ultra Electronics is adequately implementing the qualification processes for the selected samples of the RTDs or DTN-series equipment qualification.

c. Conclusions

The NRC inspection team determined that Ultra Electronics' programmatic controls of procured qualification testing services for the qualification of RTDs and pressure transmitters to be used in the AP1000 reactor design were adequate at this intermediate stage. Although final AP1000 qualification documentation was not complete at the time of the inspection, the NRC inspection team concluded that procedures and tests established to qualify the RTDs and DTN- series pressure transmitters adequately translated the qualification requirements to be used in the closure of ITAAC 2.01.02.7a.i and ITAAC 2.01.02.5a.ii. No findings of significance were identified.

9. Nonconformance and Corrective Action Programs

a. Inspection Scope

The NRC Inspection team reviewed several nonconformance and corrective action documents with an emphasis on the AP1000 RTDs and pressure transmitters to verify that procedures have been established and implemented for controlling nonconforming materials, parts or components in accordance with the requirements of Criterion XV, "Nonconforming Materials, Parts or Components," of Appendix B to 10 CFR Part 50, and correcting conditions adverse to quality in accordance with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the nonconformance and corrective action programs with Ultra Electronics management and technical staff. Also, the NRC inspectors sampled corrective action reports classified as conditions adverse to quality in which procedure QSDR 100.16.1, "Corrective and Preventive Action Procedure," required a root cause evaluation.

b. Observations and Findings

The NRC inspection team verified that, for the sample of nonconformance reports reviewed, Ultra Electronics had (1) resolved the nonconformance reports it identified in accordance with Ultra Electronics approved procedures, (2) presented an appropriate technical justification for various dispositions, (3) taken adequate action with regard to the nonconforming material or item, and (4) subjected all identified nonconformance reports, as appropriate, to a 10 CFR Part 21 assessment or evaluation.

The inspectors noted that the root cause reports had adequate cause and actions, and contained a development plan to prevent reoccurrence. In addition, the inspectors verified that Ultra Electronics implemented a program to monitor component performance and to ensure effective corrective actions were implemented.

c. Conclusions

The NRC inspection team determined that Ultra Electronics corrective action program requirements and implementation for the samples selected were consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspectors also determined that, for the samples inspected, Ultra Electronics adequately implemented its procedures to control nonconforming materials, parts, or components in accordance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

10. Audits

a. Inspection Scope

The NRC inspection team reviewed audit policies and procedures to determine if Ultra Electronics' controls were in compliance with the regulatory requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed Ultra Electronics procedure QSDR 100-18.3, "Internal Audit Procedure," which describes their audit program, gives guidelines, and provides a general overview of the performance of internal audits, and procedure QSDR 100-2.2, "Qualification Procedure for Auditors," which describes auditor and lead auditor qualifications. In addition, the NRC inspection team discussed the internal audit program with Ultra Electronics personnel responsible for planning and implementing internal audits as well as reviewed completed audits, and all of the current lead auditor and auditor qualifications, to verify audit program implementation.

b. Observations and Findings

The NRC inspection team verified internal audit were completed annually, that it covers all 18 criteria of Appendix B 10 CFR Part 50, that each audit was conducted following an audit checklist approved by QA, that the audits are performed by a qualified lead auditor with assistance from other qualified auditors, that all discrepancies were noted and tracked, and associated documentation justified audit closure.

The NRC inspection team verified that the Ultra Electronics auditor qualifications follow the American Society of Mechanical Engineers NQA-1-1994, Supplement 2S-3 guidance and Ultra Electronics procedural requirements for auditor qualifications. The NRC inspection team also verified that each lead auditor and auditor qualification is tracked on a record, which is maintained by a quality engineer.

c. Conclusions

The NRC inspection team determined that Ultra Electronics has established a program that adequately controls audits in accordance with the regulatory requirements of Criterion XVIII of Appendix B to 10 CFR Part 50. Based on the limited sample of audit documents reviewed, the NRC inspection team determined that Ultra Electronics is effectively implementing its internal and external audit programs in support of safety-related component manufacturing. No findings of significance were identified.

11. Entrance and Exit Meetings

On June 17, 2013, the NRC inspection team presented the inspection scope during an entrance meeting with Mr. Daniel L. Upp, Ultra Electronics President, and other Ultra Electronics personnel. On June 21, 2013, the inspectors presented the inspection results during an exit meeting with Mr. Upp and other Ultra Electronics personnel.

ATTACHMENT

1. Persons Contacted and NRC Staff Involved:

Name	Title	Affiliation	Entrance	Exit	Interviewed
Daniel L. Upp	President	Ultra-NSPI	X	X	
Alan Fogle	Director, QA	Ultra-NSPI	X	X	X
Deborah Mazoch	Director, HR	Ultra-NSPI	X	X	
Adam Gaither	Vice President , Engineering	Ultra-NSPI	X	X	
Toni Crowe	Vice President, Operations	Ultra-NSPI	X	X	X
Rick Anderson	Technical Advisor	Ultra-NSPI	X	X	X
Patrick Calvin	Engineer	Ultra-NSPI			X
Angela Nugent	Design Engineer	Ultra-NSPI			X
Todd Reynolds	Engineer	Ultra-NSPI			X
G.R. Leighton	Vice President, Finance & Admin	Ultra-NSPI			X
Todd Reynolds	Engineer	Ultra-NSPI			X
Alan Gilchrist	Development Engineer	Ultra-NSPI			X
Jacob Sanchez	Metrology Lead	Ultra-NSPI			X
Matt Maxwell	Metrology Technician	Ultra-NSPI			X
Michael Sanchez	Technician	Ultra-NSPI			X
Ricky Wentrcek	Production Supervisor	Ultra-NSPI		X	X
Lydia Cole	Training Coordinator	Ultra-NSPI			X
John Labaj	Manufacturing Manager	Ultra-NSPI			X
Scott Berman	Quality Engineer II	Ultra-NSPI	X	X	X
Bruce Koach	Quality Engineer II	Ultra-NSPI			X
Charlie Brown	Director, Logistics	Ultra-NSPI	X	X	
Mark McCray	CTO	Ultra-NSPI	X	X	
David Stephens	QA Engineer	Ultra-NSPI			
Joe Cheatham	Vice President, Sales	Ultra-NSPI	X	X	

Name	Title	Affiliation	Entrance	Exit	Interviewed
Mark Dorman	Engineer	Ultra-NSPI	X	X	
Anthony Durkowski	Project Manager	Ultra-NSPI		X	
George Lipscomb	Inspector	NRC	X	X	
Douglas Bullock	Inspector	NRC	X	X	
Robert Mathis III	Inspector	NRC	X	X	
Annie Ramirez	Inspector	NRC	X	X	
Jose Jimenez	Inspector	NRC	X	X	

2. Inspection Procedures Used:

IP 43002, "Routine Inspections of Nuclear Vendors"

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

IP 36100, "Inspection of 10CFR Part 21 and Programs for Reporting Defects and Noncompliance"

IP 65001.E, "Inspection of the ITAAC-Related Qualification Program"

3. Items Opened, Closed, And Discussed:

<u>Item Number</u>	<u>Status</u>	<u>Type</u>	<u>Description</u>
99900880/2013-201-01	Opened	NON	App. B, Criterion III

4. Inspections, Tests, Analyses, and Acceptance Criteria

At the time of the inspection, Ultra Electronics was involved in manufacturing safety-related resistance temperature detectors (RTDs) and pressure transmitters for the AP1000 reactor design. The NRC inspection team reviewed Ultra Electronics' quality assurance (QA) controls in the areas of design control, procurement, training, inspection, testing, and measuring and test equipment. The inspections, tests, analyses, and acceptance criteria (ITAAC) design commitment referenced below are for future use by the U.S. Nuclear Regulatory Commission (NRC) staff during the ITAAC closure process. The listing of these ITAAC design commitments does not constitute that they have been

met and closed. The NRC inspection team did not identify any findings associated with the ITAAC identified below.

2.01.02.5a.ii	The seismic Category I equipment identified in Table 2.1.2-1 can withstand seismic design basis loads without loss of safety function.
2.1.02.07a.i	The Class 1E equipment identified in Table 2.1.2-1 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.

5. Documents Reviewed:

10 CFR Part 21 Documents

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21 Evaluation, "Omission of the Cabinet Modification Data Sheets," initiated January 16, 2012

10 CFR PART 21 Evaluation, "Visual Display Unit Updates," initiated April 1, 2012

10CFR PART 21 Evaluation, "Network Configuration Anomaly," initiated July 20, 2010

Quality Management Procedures

Regulation 100-1, "Quality Assurance & Control Manual," Revision 11, December 19, 2012

Company Regulation 60-2, "Procedure for the Utilization, Procurement and Dedication of Items Used in Nuclear Safety-Related Assemblies," Revision 7, June 2013

Doc 0005-001-0028, "Technical Evaluation for Commercial Grade Services," Revision 2, June 6, 2013

Standard Operating Procedure (SOP)-0031, "Standard Operating Procedure for Commercial Grade Dedication," Revision 0, June 3, 2013

Quality Systems Department Regulation (QSDR) 100-2.1, "Qualifications Procedure for Inspection, Examination and Testing Personnel," Revision 7, December 2011

QSDR 100-2.2, "Qualification Procedure for Auditors," Revision 8, December 2012

QSDR 100-4.1, "Purchase Order Requirements," Revision 9, March 2013

QSDR 100-7.1, "Quality Verification of Purchased Items," Revision 8, April 2010

QSDR 100-7.2, "Independent Verification of Raw Materials," Revision 5, August 2011

QSDR 100-9.3, "Product Realization – General Regulation," Revision 1, September 2009

QSDR 100-9.4, "Product Calibration & Metrology Lab Manual," Revision 4, December 2011

QSDR 100-10.1, "Inspection and Test Plan Procedure," Revision 2, December 2011

QSDR 100-10.3, "Source Inspection Procedure," Revision 2, December 2010

QSDR 100-12.1, "Measuring and Test Equipment Calibration Control Program," Revision 9, December 2012

QSDR 100-18.1, "Audit/Survey Procedure for Nuclear Qualified Vendors," Revision 6, May 2013

QSDR 100-18.2, "Supplier Evaluation Procedure," Revision 4, August 2011

QSDR 100-18.3, "Internal Audit Procedure," Revision 7, November 2010

QSDR 100-20.1, "Software Quality Assurance," Revision 4, January 2013

Software Procedures and Documents

Doc 3109-000060-001, "Design Requirements: MetLab Metrology Hysteresis Software," Revision 0, February 2, 2012

Doc 3109-000060-002, "Validation Procedure: MetLab Metrology Hysteresis Software," Revision 1, August 22, 2012

ECN 9183 for Doc 3109-000060-002 Revision 0 to Revision 1, August 24, 2012

ECN 9186 for Doc 3109-000060-003 Revision 0 to Revision 1, August 24, 2012

Manufacturing/Inspection/Testing Procedures

PI9C300-05, "Process Instruction for Plus 32 Control Cabinet Logic/Termination," Revision A, April 25, 2012

PI16-ADU365-01, "Process Instruction for Heatsink Assembly, Speed Control P/N 16-ADU365-01," Revision A, August 20, 2012

PI43N3-01, "Process Instruction for 43N3-01 Pump Speed/Phase Reference Sensor Assembly," Revision G, July 9, 2012

PIDC-012138-01, "Process Instruction for Magnet Assembly P/N DC-012138-01," Revision D, February 20, 2012

DC-012438, "Acceptance Test Procedure for 43N3-01 and 43N3-02 Phase Reference and Pump Speed Sensor" Revision D, May 2, 2012

Doc 0003-106-5004, "Manufacturing, Testing, and Handling for Model N-E11GM Nuclear Electronic Pressure Transmitter," Revision 1, June 12, 2001

Doc 3047-304381-013, "Time Response Test Procedure," Revision 5, January 8, 2013

Doc 3057-304381-015, "Insulation Resistance Procedure," Revision 3, November 16, 2004

Doc 3032-304381-011, "Sensor Calibration Procedure," Revision 4, October 19, 2011

Doc 0003-259-0029-PRC, "Transmitter Assembly, Trim, and Temp. Comp. Procedure," Revision 8, April 25, 2013

KBW2315/61, "Acceptance Test Procedure for Spare Module Testing," Revision G, undated

KBW2315/81, "Acceptance Test Procedure for Plus 32 Control Cabinet 9C300," Revision A, undated

Doc 0006-401-0019, "DTN 2070 Drive Board 0700-300-0007T – assembly and Trim Procedure," Revision 2

Doc 0006-401-0021, "DTN 2070 Motherboard Test Procedure," Revision 1

Doc 0020-002-0044, "Final Inspection Procedure for N-E10 Series Pressure Transmitter," Revision 2

Doc 0003-106-2192, "Terminal Head, Extension, and Terminal Block on QDC Assembly Procedure for N 9004, 615 or similar RTDs," Revision 0

Doc 0003-106-5004, "Manufacturing, testing, and Handling for Model N-E11 GM Nuclear Electronics Pressure Transmitter," Revision 1

Doc 0003-201-0001, "Procedure for application of Conformal Coating/Dipping Method for Printed Circuit Boards," Revision 0

Doc 0003-259-0029, "DTN 2070 Transmitter assembly, Trim, and Temperature Compensation Procedure," Revision 8

Doc 0003-259-0030, "DTN 2070 Transmitter Final Assembly," Revision 3

Doc 0511-001-9116T, "MWO Fabrication Procedure for 100 Ohm .003850 Platinum F.T.R. Element for Nuclear Applications," Revision 5

Doc 1000-250-00112T, "Manufacturing Work Order Cast Iron Base and Cover Assembly," Revision 8

Doc 1000-520-0001T, "Manufacturing Work Order for 10-50 mA Amplifier Assembly," Revision 9

Doc 3129-AP1000-001, "Westinghouse AP1000 Qualification Test of NSPI Resistance Temperature Sensors," Revision 6, February 12, 2013

Doc 3005-AP1000-007, "Concurrent Functional Test Procedure – AP1000 Qualification of RTD's," Revision 2, June 26, 2012

Doc 3131-AP1000-008, "Thermal cycling Procedure for Resistance Temperature Detectors Westinghouse AP1000 Qualification," Revision 5, December 7, 2012

Doc 3144-AP1000-002, "Thermal Aging Procedure for Resistance Temperature Detectors Westinghouse AP1000 Qualification," Revision 8, December 7, 2012

Doc 3144-AP1000-006, "Radiation Aging Procedure for Resistance Temperature Detectors Westinghouse AP1000 Qualification," Revision 2, September 30, 2011

Doc 3144-AP1000-014, "Vibration Aging Procedure – Resistance Temperature Detectors," Revision 4, March 4, 2013

Doc 3144-AP1000-019, "Seismic Qualification Test Procedure – Resistance Temperature Detectors," Revision 6, March 4, 2013

Doc 3144-AP1000-027, "DBA/LOCA Qualification Test Procedure - Resistance Temperature Detectors," Revision 6, March 4, 2013

Doc 3078-RD5075-012, "Qualification Test Procedure - DTN2070 Pressure and Differential Pressure Transmitters," Revision 2, September 7, 2012

Doc 3078-RD5075-007, "EMC Qualification Test Procedure - NSPI Pressure Transmitters Model DTN2070," Revision 2, September 27, 2011

Assembly and Test Records

Job Order (J/O) 744843, NE Pressure Transmitter S/N NP0001253, June 20, 2013 (in-process)

J/O 746082, N9004 Resistance Temperature Detectors S/N N32827 thru N32835, April 24, 2013 (in-process)

J/O 747788, DTN 2070 Differential Pressure Transmitter S/N P0002247, May 30, 2013 (in-process)

Work Order (W/O) 739612, "Hysteresis 17-point Form," S/N N32119 thru N32125, January 16, 2013

W/O 740216, "Hysteresis 8-point Form," S/N N31807 thru N31813, October 31, 2012

W/O 746082, "Time Response Data Report," S/N N32827 thru N32835, June 18, 2013

W/O 746082, "Hysteresis 17-point Form," S/N N32827-BY and N32827-RW, June 20, 2013 (in-process)

J/O 747788, "Form Q-67C," S/N P0002247, June 20, 2013 (in-process)

Calibration Procedures and Records

Doc 0004-099-0045, "Calibration Verification Procedure for Time Response Apparatus PE 01684," Revision 0, November 3, 1993

Doc 0005-001-0028, "Technical Evaluation for Commercial Grade Services," Revision 2, June 6, 2013

Form Q-72CC, "P.E. Calibration Verification," for Time Response Apparatus PE 01684, December 5, 2012

"Calibration Certificate," from Mensor Calibration for Ultra Electronics Component PE 01829, January 11, 2011

Form Q-173A, "Notification of Out-of-Tolerance Condition," for PE 01829, January 17, 2011

Procurement Documents

Purchase Order (PO) 101018 to Steris Corporation for Irradiation Testing of N9002 and N9004 RTDs for AP1000, June 26, 2012

PO 101305 to Qualtech NP for Vibration Aging, Seismic, and LOCA testing of N90004 RTDs for AP1000, January 3, 2013

PO 102649 to Steris Corporation for Irradiation Testing of N9004 RTDs for AP1000, December 14, 2012

PO 102797 to Qualtech NP for Vibration Aging, Seismic, and LOCA testing of N90004 RTDs for AP1000, March 28, 2013

PO 103774 to Qualtech NP for Vibration Aging, Seismic, and LOCA testing of dummy N90002 RTDs for AP1000, March 28, 2013

PO 101199 to Reliable Manufacturing Inc., for N9004 RTD 316L Stainless Steel Junction Box Cover for AP1000, July 14, 2012

PO 101198 to Reliable Manufacturing Inc., for N9004 RTD 316L Stainless Steel Housing Junction Box for AP1000, July 16, 2012

PO 101430 to Invensys Systems Inc., for N-E11 Capsule Assembly, August 20, 2012

PO 102415 to Sigmund Cohn Corp., for platinum wire in RTDs, November 19, 2012

PO 101991 to Trendsetter Electronics, for JFETs used in DTNs for AP1000, October 5, 2012

PO 99601 to Trendsetter Electronics, for JFETs used in DTNs for AP1000, February 3, 2012

PO 101648 to Interfet Corp., for JFETs used in DTNs for AP1000, August 29, 2012

PO 102372 to Mensor Calibration for Calibration Services Mensor Pressure Source S/N 180651 (PE 01829), November 14, 2012

PO 102374 to Interfet Corp., for JFETs used in DTNs for AP1000, November 14, 2012

PO 4500364418 Westinghouse to Ultra Electronics for AP1000 RTDs – Southern – Vogtle Units 3 and 4, October 19, 2010

PO 4500364418 Westinghouse to Weed Instrument Company Inc. for AP1000 Resistance Temperature Detectors change notices 1-8, October 19, 2010

PO 4500364560 Westinghouse to Ultra Electronics for AP1000 RTDs –SCANA – Summer Units 2 and 3, October 20, 2010

PO 4500345481 Westinghouse to Ultra Electronics for AP1000 DTN Transmitter Qualification May 7, 2010

APP-GW-G1-002, “AP1000 Plant Equipment Qualification Methodology,” Revision 3, February 2012

APP-GW-VP-040, “AP1000 Safety-Related Field Sensors Equipment Qualification Specification,” Revision 0, December 2009

Non-conformance and Corrective Action Documents

RWK-549, “1) Item 19 screws were loose in 2 places, 2) missing S/N marking,” initiated January 31, 2013

IPI-847, “PI16-ADU365-01 – Drawing / PI inconsistency entered into system,” initiated January 31, 2013

IPI-731, “First Energy rejection of 120 relays,” initiated January 4 2013

IPI-265, “Markings missing on 5A and 6A fuses,” initiated February 22, 2012

IPI-451, “Solid leads are crimped but specifications do not allow lugs to be crimped to solid leads,” initiated June 13, 2012

IPI-167, “Omission of the cabinet Modification Data sheets,” initiated January 19, 2012

NC00000565, “Design Spec APP-JE62-ZO-001 requires test pulse peak to peak voltages,” initiated May 17, 2012

NC00000602, “Post Lungmen Site Installation,” initiated October 12, 2012

NC00000535, “Letter from GE regarding a potential issue with two algorithms,” initiated March 1, 2012

CA00000590, “DRS CR regarding Lungmen Cabinets,” initiated September 24, 2012

CA00000526, "Updates to FCAD's and cabinets FDI datasheets," initiated April 9, 2012

CA00000556, "VDU Updates for GE," initiated March 3, 2012

CA00000415, "DNV P1 Audit –Calibration Issue," initiated March, 14, 2011

CA00000487, "Shipped KBC318-1 instead of KBC318-2," initiated April 9, 2012

CA00000592, "Fuses failed required test fuse P/N," initiated January 2, 2013

CA00000488, "Various 6n Circuit Card Assemblies were shipped to KHNP less Burn-IN," initiated March 9, 2012

CAPA 1065, "QSDR 100-20.1 'Software Control' Deployment," initiated June 20, 2013

SCAR, "Vendor/ Supplier Corrective Action Request from GE," initiated February 1, 2012

Design Documents

APP-JE53-Z0R-001, "AP1000 Class 1E Resistance Temperature Detectors Data Sheet Reports," Revision 2, October 2012

APP-JE53-Z0-001, "General Design Equipment Specification for Class 1E Resistance Temperature Detectors," Revision 2, October 2012

APP-GW-Z0-620, "AP 1000 Requirements for Marking of Reactor Plant Components and Piping" Revision 1

APP-GW-GAH-030, "Quality Assurance Requirements for Safety Related Components/Services of Standard AP 1000 Plants" Revision 3

Commercial Grade Dedication Documents

Doc 0575-001-0008T, "Capsule Assembly," Revision 3, August 15, 2012

Doc 0038-003-0024-SPC, "Purchase Specifications for Linear Integrated Systems JFETs used on DTN, for AP1000," Revision 2, May 18, 2012

Doc 0038-003-0025, "Purchase Specification for Interfet JFETs used in DTN, for AP1000," Revision 2, October 27, 2011

Doc 0038-001-0002, "Material Specification for Alumina Tubing Standard Catalog Types & Sizes," Revision 1, October 7, 2002

Doc 0038-001-0003, "Material Specification for Platinum Wire," Revision 10, September 19, 2008

Doc 0885-101-665T, "Housing, Junction Box, 316L S.S. N9004 Assembly for AP1000," Revision 0, March 14, 2011

Doc 0885-1-1-0666T, "Cover, Junction Box, 316L S.S. N9004 Assembly for AP1000,"
Revision 0, March 14, 2011

Doc 0020-002-0017, "Acceptance Test Procedure for Incoming Platinum Wiring,"
Revision 7, March 4, 2010

Commercial Grade Survey Reports

Commercial Grade Survey of Dow Corning Corporation (oil for NE11/13 and DTN
pressure detectors), February 20, 2013

Commercial Grade Survey of Dow Corning Corporation, July 26, 2012

Commercial Grade Survey of Able Coil & Electronics (coil windings and bobbin detector
assemblies), April 11, 2013

Commercial Grade Survey of Able Coil & Electronics, October 13, 2009

Commercial Grade Survey of Invensys Systems Foxboro (force bar and capsule
assemblies), April 19-20, 2011

Commercial Grade Survey of Invensys Systems Foxboro, April 2-3, 2009

Commercial Grade Survey of Strain Measurement Devices, Inc. (beam differential and
diaphragm pressure sensors for nuclear applications), April 12, 2013

Commercial Grade Survey of Strain Measurement Devices, Inc., May 20, 2010 by
Global Quality Assurance

Commercial Grade Survey of Strain Measurement Devices, Ltd United Kingdom, April
20-21, 2010

Audits

Internal

2011 Internal Audit, conducted October 3-6, 2011

2012 Internal Audit, conducted October 1-4, 2012

External

SDI Audit #17127, NIAC shared Audit of Qualtech NP, February 21-23, 2012.

Areva Audit #411-4, NIAC shared Audit of Structural Integrity Associates, November 9-
11, 2010

Auditor Qualifications

Auditor Qualification and Training Record for Scott Jewett, dated September 27, 2012

Auditor Qualification and Training Record for Susan Strmiska, dated September 27, 2012

Lead Auditor Qualification and Training Record for Scott Berman, dated September 4, 2012

Lead Auditor Qualification and Training Record for David Stephens, dated September 27, 2012

Miscellaneous Documents

Approved Supplier List, electronically controlled, June 18, 2013

“Training Log,” for Matthew Maxwell, December 4, 2012

Form Q-35, “Certification of Qualification Inspection, Examination and Testing Personnel,” for Matt Maxwell, December 14, 2012

Form Q-95, “Certification of Personnel Performing Quality Level A or B Work,” for Ricky Wentrcek, October 19, 1994

Form Q-95, “Certification of Personnel Performing Quality Level A or B Work,” for Ricky Wentrcek, October 22, 1997

5. Acronyms Used

ADAMS	Agencywide Documents Access and Management System
CEVB	Electrical Vendor Branch
CFR	<i>Code of Federal Regulations</i>
CGD	Commercial-Grade Dedication
DBA	Design Basis Accident
DBE	Design Basis Event
DCIP	Division of Construction Inspection and Operational Programs
ECN	Engineering Change Notice
EMC	Electromagnetic Compatibility
EQ	Equipment Qualification
IP	Inspection Procedure
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
J/O	Job Order
JFET	Junction Gate Field-Effect Transistors
M&TE	Measuring and Test Equipment
NIAC	Nuclear Industry Assessment Committee
NIST	National Institute of Standards and Technology
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
NSPI	Nuclear Sensors & Process Instrumentation
OEM	Original equipment manufacturer
PO	Purchase Order
PRHR	Passive Residual Heat Removal

QA	Quality Assurance
QC	Quality Control
QSDR	Quality Systems Department Regulation
RCS	Reactor Coolant System
REG	Regulation
RTD	Resistance Temperature Detector
S/N	Serial Number
U.S.	United States (of America)
W/O	Work order