September 09, 2014

Wiley Finley, Director,
Business Segment
Curtiss-Wright QualTech NP, Huntsville
125 West Park Loop
Huntsville, AL 35806

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF CURTISS-WRIGHT QUALTECH NP – HUNTSVILLE REPORT NO. 99901441/2014-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Finley:

On July 21 to July 25, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Curtiss-Wright QualTech NP (QualTech) facility in Huntsville, AL. The purpose of the limited-scope inspection was to assess QualTech'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 QualTech's quality assurance (QA) program associated with: design control; qualification testing; commercial grade dedication; inspections; testing controls; measuring and test equipment; nonconformance; 10 CFR Part 21; oversight of contracting activities; procurement document; audits; and corrective action activities for operating reactor plants. In addition, during this inspection, the NRC staff looked at the qualification activities for electrical connectors for the AP1000 squib valves associated with inspections, tests, analyses, and acceptance criteria (ITAAC) from revision 19 of the approved AP1000 design certification document. Specifically, these activities were associated with ITAAC 2.1.02.07a.i and 2.2.03.07a.i related to qualification of the electrical connectors used in the AP1000 squib valves. This report contains one ITAAC finding associated with a specific ITAAC 2.1.02.07a.i and 2.2.03.07a.i. The finding is material to the ITAAC acceptance criteria, specifically since the resolution of the nonconformances created in relation to the ITAAC will determine if the electrical connectors were qualified under the most adverse conditions assumed for a harsh environment without a loss of safety function. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of your overall QA or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC inspection team found that the implementation of your QA program did not meet certain NRC requirements imposed on you by your customers or NRC licensees in the areas of design control, control of purchased material, equipment, and services and test control. Specifically, QualTech did not ensure that the design basis/qualification report for generation 3 quick disconnect electrical connectors were correctly translated into the maintenance and installation procedure. Additionally, QualTech failed to ensure that electromagnetic interference qualification testing services obtained through

Wyle Labs met the requirements of QualTech's purchase orders. Finally, QualTech did not document and evaluate five examples of test deviations. 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 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's Public Document Room or through 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 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.

Sincerely,

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

Docket No.: 99901441

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99901441/2014-201
and Attachment

Wyle Labs met the requirements of QualTech's purchase orders. Finally, QualTech did not document and evaluate five examples of test deviations. 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 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's Public Document Room or through 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 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.

Sincerely,

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

Docket No.: 99901441

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99901441/2014-201
   and Attachment

DISTRIBUTION:
ASakadales
ERoach
KKavanagh
wfinley@curtisswright.com

ADAMS ACCESSION No.: ML14231B268 *Concurred via email NRO-002

OFFICE	NRO/DCIP/EVIB	NRO/DCIP/EVIB	NRO/DCIP/EVIB	NRO/DCIP/QVIB
NAME	EHuang	SSmith*	ARamirez*	AArmstrong*
DATE	08/21/2014	08/22/2014	08/24/2014	08/25/2014
OFFICE	RII	NRO/DCIP	NRO/DCIP/IGCB*	NRO/DCIP/EVIB
NAME	CJones*	TFrye*	BAnderson	RRasmussen
DATE	08/21/2014	08/26/2014	08/25/2014	09/09 /2014

OFFICIAL RECORD COPY

NOTICE OF NONCONFORMANCE

Curtiss-Wright QualTech NP
Huntsville, AL 35806

Docket No.: 99901441
Inspection Report No.: 99901441/2014-201

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted at the Curtiss-Wright QualTech NP (QualTech) facility in Huntsville, AL, on July 21–25, 2014, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on QualTech 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, "Measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in § 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions."

   Contrary to the above, QualTech failed to ensure the design basis/qualification report was correctly translated into the maintenance and installation procedure. Specifically, Section 5.0, "Qualification Maintenance and Installation," of the environmental qualification test report for the ½ inch Generation 3 EGS quick disconnect (QDC) electrical connectors states in part that, "the o-ring must be discarded and a new o-ring installed prior to reconnection" whenever the connector is disconnected. However, Section 5.0, "Maintenance and Installation," of the instruction for installation of the QDC, states in part that "it is not mandatory that the o-ring be discarded and a new o-ring installed prior to reconnection." Therefore, if a vendor/licensee did not replace the o-ring prior to reconnection, then the original qualification assumptions would not be bounded.

   This issue has been identified as Nonconformance 99901441/2014-201-01.

B. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR 50 states in part that, "Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery."

   Contrary to the above, QualTech failed to ensure that the electromagnetic interference (EMI) qualification testing services obtained through Wyle Labs met the requirements of QualTech's purchase orders (PO). PO 4500542184 from PSEG to QualTech required the use of Electric Power Research Institute (EPRI) TR-102323, revision 2 and/or revision 3 or NRC Regulatory Guide (RG) 1.180, revision 1 to be used for EMI testing of the general electric transient analysis recording system. These revisions of the EPRI standards require specific International Electrotechnical Commission (IEC) standards to ensure that the EMI testing be performed to specific criteria and test setup. QualTech's PO 60-07956 to Wyle Labs required the use of EPRI TR-102323 revision 3 to be used. However, Wyle Labs used different versions of the IEC standards than those referenced in the applicable EPRI document. QualTech accepted the Wyle report as-is and failed to evaluate if the differences in IEC standards conformed or enveloped PSEG's PO requirements specified for the testing.

This issue has been identified as Nonconformance 99901441/2014-201-02

C. Criterion XI, "Test Control," of Appendix B to 10 CFR 50 states in part that, "A test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Test results shall be documented and evaluated to assure that test requirements have been satisfied."

Contrary to the above, the team identified five examples where test requirements were not satisfied and there was no documentation of evaluations for these test deviations. Specifically, QualTech provided test report EGS-TR-HC1741-01 to Rockbestos-Suprenant Cable Corporation (RSCC) for a loss of coolant accident/design basis accident (LOCA/DBA) environmental qualification test of Firewall III insulated wire/cable as follows:

- Electrical current load applied to an RSCC electrical cable during harsh environment qualification testing did not maintain the specified magnitude of 20 amps for the duration of the test. Electrical current decreased to a value of 17.8 amps at 480 seconds and stayed below the required current for the remainder of the test duration. The RSCC test plan stated that samples must be electrically energized at their rated voltage and current as described by the National Electric Code – 2008 which matched QualTech's test report specifying a rated current of 20 amps, however no deviation report or evaluation was done despite the lower value.

- Temperatures applied during a harsh environment testing of RSCC electrical cables remained below the required minimum values at all sensor locations during the first 10 seconds. The measurements recorded by one of the three thermocouples did not reach the required peak temperature of 441^{o}F until 90 seconds had elapsed as compared to a required peak at 10 seconds. The measurements by another thermocouple never reached the required peak temperature at all and stayed around 430^{o}F.

- Environmental pressure recorded by pressure sensors during the LOCA/DBA test dropped below required minimal values on several instances during the first 400 seconds. At 115 seconds, the lowest measured pressure was about 62 psig where the minimum allowed was 64 psig and at 315 seconds, the lowest measured pressure was about 63 psig where the minimum allowed was 70 psig.

- Photographic records appended to the QualTech test report showed that harsh environment testing of RSCC cables caused extensive cracking and segmentation of some of the cable jackets. In addition, the jacket on one specimen exhibited gross failure from apparent melting. However, the test report conclusion stated that no anomalies had occurred and that degradation to the test specimens was limited to "crazing and cracking." The RSCC test plan stated that qualification of the electrical cable was based upon an assumption that the jacket does not crack.

Additionally, functional testing of electrical connectors for 8-inch squib valves (Westinghouse test specimen “LP01”) did not impose the specified magnitude of 3.7 amps for electrical pulse current during the baseline test. The actual current applied was 3.57 amps. For the post-thermal aging test, the actual current applied was 3.63 amps. For the post-radiation aging test, the actual current applied was 3.53 amps. The NRC inspection team noted that Section 3.3 of Westinghouse test plan APP-PV70-VPH-001 stated that the squib valve design employed a 3.7 amp current to actuate the igniters.

This issue has been identified as Nonconformance 99901441/2014-201-03

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 noncompliances; and (4) the date when your corrective action will be completed. Where good cause is shown, consideration will be given to extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or through the NRC’s 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, 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 withholding of such material, 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.

Dated this the 9th day of September 2014.

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

Docket No.:	99901441
Report No.:	99901441/2014-201
Vendor:	Curtiss-Wright QualTech NP 125 West Park Loop Huntsville, AL 35806
Vendor Contact:	Mr. Wiley Finley, Director, Business Segment wfinley@curtisswright.com
Nuclear Industry Activity:	Curtiss-Wright QualTech NP, located at 125 West Park Loop, Huntsville, AL, provides electrical connectors, penetration assemblies, motor control centers, and electrical panels to U.S. nuclear power plants.
Inspection Dates:	July 21–25, 2014
Inspection Team Leader:	Eugene Huang, NRO/DCIP/EVIB
NRC inspection team:	Stacy Smith, NRO/DCIP/EVIB Annie Ramirez, NRO/DCIP/EVIB Aaron Armstrong, NRO/DCIP/QVIB Carl Jones, RII
Approved by:	Richard A. Rasmussen, Chief Electrical Vendor Inspection Branch Division of Construction Inspection and Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

Curtiss-Wright QualTech NP - Huntsville
99901441/2014-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this vendor inspection to verify that Curtiss-Wright QualTech NP (hereafter referred to as QualTech), 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 QualTech's electrical connectors, penetration assemblies, motor control centers, and electrical panels for operating power plants and AP1000 squib valve electrical connectors qualification in relation to inspections, tests, analyses, and acceptance criteria (ITAAC) 2.1.02.07a.i and ITAAC 2.2.03.07a.i. The NRC inspection team reviewed the: oversight of contracted activities; corrective action; commercial grade dedication (CGD); nonconformances; procurement document; design control; 10 CFR 21; audits; inspections; test control; and measuring and test equipment (M&TE) programs. The NRC conducted this inspection at QualTech's facility in Huntsville, AL.

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

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

The NRC inspection team used Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013, IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated April 25, 2011, and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

The information below summarizes the results of this inspection.

10 CFR Part 21 Program

The NRC inspection team determined that QualTech appropriately translated the requirements of 10 CFR Part 21 into their implementing procedures and, for those activities that the NRC inspection team reviewed, implemented them as required. No findings of significance were identified.

Commercial Grade Dedication

The NRC inspection team determined that the implementation of QualTech's programs for CGD activities was consistent with the regulatory requirements of Criterion III, "Design Control," Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," Criterion X, "Inspection," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Design Control

The NRC inspection team determined that QualTech did not adequately implement the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC

inspection team issued Nonconformance 99901441/2014-201-01 for QualTech's failure to ensure that field changes were subjected to the design control measures that were applied to the original design for the Generation 3 EGS quick disconnect electrical connectors.

AP1000 and Operating Reactor Qualifications

Based on the inspection samples reviewed, the NRC inspection team determined that, with the exception of the notice of nonconformance identified in Section 8, "Test Control," of this report, QualTech's procedures and implementation of equipment qualification activities were consistent with requirements specified in customer orders and the QualTech Quality Assurance Manual. No additional findings of significance were identified.

Procurement Document Control and Oversight of Contracted Activities

The NRC inspection team determined that QualTech did not adequately implement the requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99901441/2014-201-02 for QualTech's failure to ensure that electromagnetic interference services conformed to the requirements set forth in the purchase documents.

Measuring and Test Equipment

The NRC inspection team determined that the implementation of QualTech's programs for control of calibration and use of M&TE was consistent with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Inspection

The NRC inspection team determined that the implementation of QualTech's program for inspection was consistent with the regulatory requirements of Criterion X, "Inspections," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Test Control

The NRC inspection team determined that QualTech has not established a program that adequately implements the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99901441/2014-201-03 for QualTech's failure to ensure that deviations from specified test parameters or acceptance criteria (i.e. test anomalies) were not documented and evaluated in accordance with requirements for nonconforming items.

Nonconformance Program

The NRC inspection team determined that the implementation of QualTech's program that documents and evaluates nonconformances was consistent with the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts, of Components," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Corrective Action Program

The NRC inspection team determined that the implementation of QualTech's program that documents and evaluates corrective actions was consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Internal Audits

The NRC inspection team determined that the implementation of QualTech's program that adequately controls audit activities was consistent with the regulatory requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. 10 CFR Part 21

a. Inspection Scope

The NRC inspection team reviewed QualTech's policies and implementing procedures that govern its Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21 program to verify compliance with the requirements of 10 CFR Part 21. The NRC inspection team also reviewed QualTech's procedures that govern corrective actions and the control and correction of nonconforming items to verify an adequate link to the 10 CFR Part 21 process. Section 20.0, "10 CFR Part 21 – Reporting of Defects and Noncompliance," of the QAM describes the requirements for complying with 10 CFR Part 21. Standard Operating Procedure (SOP) 19.1, "Reporting of Defects and Noncompliances Per 10 CFR 21," establishes the procedural methods for evaluating deviations and reporting defects.

The NRC inspection team reviewed QualTech's 10 CFR Part 21 policy and procedures and related documentation, and interviewed QA staff members. The inspection team verified that SOP 15.1, "Control of Nonconforming Materials, Parts or Components," and SOP 16.1, "Corrective Action," provide adequate links to the Part 21 procedure. Specifically, the NRC inspection team evaluated implementation of the 10 CFR Part 21 reporting program by sampling required evaluations of deviations from technical requirements that could create a substantial safety hazard. Specifically, the inspection reviewed evaluation 2014-02, failures analysis of Potter & Brumfield Relay, and evaluation 2014-01, potential defect in General Electric Type CR120AD controls relays.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that QualTech appropriately translated the requirements of 10 CFR Part 21 into their implementing procedures and, for those activities that the NRC inspection team reviewed, implemented them as required. No findings of significance were identified.

2. Commercial Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed QualTech's policies and procedures governing the implementation of its CGD program to verify compliance with Criterion III, "Design Control," Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," Criterion X, "Inspection," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed QualTech's SOP 20.1, "Dedication of Commercial Grade Items For Nuclear Safety-Related Use and Services," which provides the methodology for dedicating commercial-grade items/services to be used in the manufacture of safety-related activities, including the development of critical characteristics and the respective acceptance criteria. The NRC inspection team reviewed the nuclear-qualified Grayboot-A product line and generic part dedication plans to ensure that critical characteristics for each particular design were included. In addition, the NRC inspection team reviewed a sample of inputs to the dedication process, including: 1) customer/supplier purchase orders (PO), 2) development of critical characteristics, and 3) acceptance process. The NRC inspection team reviewed QualTech surveys of commercial-grade suppliers used for the acquisition of raw materials and services to ensure critical characteristics for commercial grade activities were appropriately tested or verified, and that the commercial grade items and were manufactured in accordance with the supplier's QA program validated by QualTech.

The NRC inspection team observed activities related to the manufacture of safety-related activities to ensure personnel were trained, that procedures were available, and that the proper in-process inspections took place. QualTech's specifications were reviewed and receipt inspection personal were interviewed to verify that manufacturing instructions and procedures were in agreement with activities performed by the operators. The NRC inspection team also observed the receipt inspections for Crimp tooling used in manufacturing to verify that the requirements adequately translated to the dedication plan.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's programs for CGD activities was consistent with the regulatory requirements of Criterion III, "Design Control," Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," Criterion X, "Inspection," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed QualTech's policies and procedures for design control to verify compliance with Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team evaluated QualTech's design change control process and procedures established in QualTech's QAM. Specifically, the NRC inspection team reviewed design changes to ensure they would not invalidate qualification with respect to seismic, aging, radiation, and electrical properties. The NRC inspection team specifically reviewed design changes related to the AP1000 squib valve

connector assembly, the Generation 3 EGS quick disconnect electrical connectors, and changes related to Grayboot electrical connectors.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team found that QualTech failed to ensure that field changes were subjected to the design control measures that were applied to the original design for Generation 3 EGS QDC electrical connectors. Specifically, Section 5.0, "Qualification Maintenance and Installation," of the environmental qualification test report for the ½ inch Generation 3 EGS QDC electrical connectors states that the, "…o-ring must be discarded and a new o-ring installed prior to reconnection" whenever the connector is disconnected. However, the NRC inspection team identified that Section 5.0, "Maintenance and Installation," of the instruction for installation of the QDC, as noted in report no. EGS-TR-23066-04, states in that it is not mandatory that the o-ring be discarded and a new o-ring installed prior to reconnection. QualTech immediately opened QA corrective action report 2014-006, dated July 24, 2014, to document the discrepancy between the qualification report and the installation instructions. QualTech informed the NRC inspection team that this product has been shipped to multiple customers, such as Topworx, Inc. in accordance with PO 23066-42. It is not clear if any shipped QDCs have been installed, since their original intended use is for the AP1000 reactors, but if the QDC has been installed and disconnected/reconnected without replacing the O-ring, it may not be bounded by qualification report EGS-TR-23009-14 and able to perform its intended safety function if the O-ring was damaged.

This issue has been identified as Nonconformance 99901441/2014-201-01.

d. Conclusions

The NRC inspection team determined that QualTech did not adequately implement the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99901441/2014-201-01 for QualTech's failure to ensure that field changes were subjected to the design control measures that were applied to the original design for generation 3 EGS QDC electrical connectors.

4. AP1000 and Operating Reactor Qualifications

a. Inspection Scope

The NRC inspection team examined the implementation of equipment qualification activities for components and assemblies that had been designated for use in the AP1000 reactor plant design. Qualification test procedures, instructions, and records were compared to the requirements of customer specifications, specified industry standards, and as applicable, the AP1000 Design Criteria Document (DCD), Tier 2, Appendix 3D to confirm test parameters and acceptance criteria conformed to defined requirements.

Equipment qualifications for the following items were reviewed by the NRC inspection team:

a.1 Review of Qualification of Squib Valve Electrical Connector Assemblies

The review of equipment qualification test procedure EGS-TR-23063-011 determined that the sequence of testing accurately followed the sequence specified in Westinghouse test plan APP-PV70-VPH-001, and was generally consistent with the AP1000 DCD, Tier 2, Appendix 3D and Institute of Electrical and Electronics Engineers (IEEE) 572-1985, "IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations." Qualification tasks included baseline tests, radiation (gamma) aging, thermal cycle aging, vibration aging, seismic testing (both single frequency sinusoidal motion sweeps and multi-frequency tests), containment pressure test, design basis accident test, and submergence tests.

The NRC inspection team evaluation of a March 18, 2014, radiation aging report by subcontractor Southwest Research determined that that radiation dose rates and total integrated dose conservatively conformed to parameters specified in requirement documents. Similarly, the NRC inspection team's review of QualTech records for aging of test specimens from effects of non-seismic vibration and operating basis earthquakes determined that the required parameters and methodologies were correctly implemented for those environmental factors.

The NRC inspection team reviewed data acquisition system reports of random multi-frequency simulations of safe shutdown earthquakes for aged specimens of electrical connectors for 8-inch squib valves and 14-inch squib valves. Data showed that amplitudes and frequencies of input motions applied to the specimens conservatively enveloped the required test spectra. A comparison of QualTech test procedure EGS-TR-23063-011 to Westinghouse test plan APP-PV70-VPH-001 determined that the required test spectra accurately applied the margins defined for the required response spectra.

Direct observation of harsh environment testing (i.e. "design basis accident (DBA) testing") of 14-inch squib connectors determined that the test configuration conformed to requirements and the sequence of testing followed the test procedure, including pre-test baseline functional testing of continuity, insulation resistance, and connector functionality. The pressure and temperature applied to the connectors generally enveloped the required values.

The NRC inspection team reviewed results for submergence testing for aged specimens of electrical connectors for 8-inch squib valves that was conducted following the conclusion of DBA testing. The NRC inspection team noted that submergence testing was not required for the connectors for the 14-inch squib valves. Data showed that chemical composition, chemical reactivity, and time of exposure for the test conservatively enveloped the required test profile. A comparison of QualTech test procedure EGS-TR-23063-011 and Westinghouse test plan APP-PV70-VPH-001 determined that the required test parameters accurately applied the margins defined for the test activity.

a.2 Review of Qualification of NAMCO Limit Switches

The review of test report EGS-TR-HC911-01 determined that parameters and test scope defined for environmental and seismic testing of NAMCO Limit Switches

incorporated the requirements specified in the applicable portions of NAMCO PO PRT1570-00 as outlined in QualTech work order HJ2436-HC911. The test requirements were found to be consistent with IEEE-344-1975 "Seismic Qualification of Class 1E Equipment." As documented on Appendix II of the test report EGS-TR-HC911-01, the duration of the simulated design basis seismic event was 90 minutes per axis. The switches were tested for frequencies between 2 – 64 hertz with an acceleration of 6.6 times gravitational acceleration. After completion of seismic testing, the active components of the limit switches (i.e. the switches) were submitted to DBA testing. The passive components (i.e. the magnets) were exposed to the effects of a design basis high steam line break accident. Functionality of the test specimens was verified before and after testing by visual inspection and through gap distance activation measurements.

a.3 Review of Qualification of RSCC Electrical Cable

The review of test report EGS-TR-HC1741-01 determined that parameters and test scope defined for harsh environment testing of RSCC electrical cable incorporated the requirements specified in the applicable portions of RSCC test plan TP-1201 as outlined in QualTech work order HC1741. As documented in Section 3.1.2 of the test report, the duration of the simulated DBA/loss of coolant accident (LOCA) was limited to the initial 1,500 seconds of the accident profile, and was intended to represent the transient portion of the DBA/LOCA profile. Functionality of the test specimens after testing was verified by visual inspection and through insulation resistance measurements.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

Based on the inspection samples reviewed, the NRC inspection team determined that, with the exception of the notice of nonconformance identified in section 8, "Test Control," of this report, QualTech's procedures and implementation of equipment qualification activities were consistent with requirements specified in customer orders and the QualTech QAM. No additional findings of significance were identified.

5. Procurement Document Control and Oversight of Contracted Activities

a. Inspection Scope

The NRC inspection team reviewed QualTech's policies and implementing procedures that govern the implementation of QualTech's oversight of contracted activities to verify compliance with Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team verified that applicable quality requirements, including technical, regulatory, and reporting requirements, were specified in the procurement documents reviewed and extended to lower-tier suppliers when necessary. Additionally, the NRC inspection team reviewed the procedures and

implementation to select and qualify vendors supplying basic components and services, through a sample of certificates of calibrations, audits, surveys, and receiving inspections.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team identified that QualTech failed to ensure that the EMI qualification testing services obtained through Wyle Labs met the requirements of QualTech's POs. PO 4500542184 from PSEG to QualTech required the use of EPRI TR-102323, revision 2 and/or revision 3 or NRC RG 1.180, revision 1 to be used for EMI testing of the general electric transient analysis recording system. The NRC inspection team noted that QualTech chose to conform to EPRI TR-102323 revision 3 in their PO 60-07956 to Wyle Labs. The NRC inspection team identified that Wyle Labs used different versions of the International Electrotechnical Commission (IEC) standards than those referenced in the applicable EPRI document and there was no evaluation performed to evaluate the acceptance of the differences. QualTech accepted the report as is. The NRC inspection team discussed with QualTech staff how the differences in revision of IEC standards may have less conservative assumptions regarding test equipment, equipment setup, and test parameters.

This issue has been identified as Nonconformance 99901441/2014-201-02.

c. Conclusions

The NRC inspection team determined that QualTech did not adequately implement the requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99901441/2014-201-02 for QualTech's failure to ensure that EMI services conformed to the requirements set forth in the purchase documents.

6. Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team examined the implementation of controls for use and protection of instruments used to obtain measurements of safety-related process parameters and equipment configurations.

SOP 12.1, "Control of Measuring and Test Equipment," was reviewed to confirm the procedure addressed the requirements of the corporate QAM and 10 CFR Part 50, Appendix B. The review evaluated whether the procedure provided controls for certifying the calibration of tools and instruments and established measures to assure the accuracy of the devices possessed valid relationships to nationally recognized standards.

The inspection scope included a review of a sample of five deviation reports issued to document instances where measuring and test equipment were found out of tolerance. The review was performed to confirm that nonconforming conditions had been

documented and were provided evaluations to determine whether adverse effects had resulted from prior use of the devices.

The NRC inspection team evaluated a sample of calibration records for the qualification equipment use by QualTech. All calibrations were performed in house with the exception of the calibration of the seismic table accelerometers. Calibration services for the accelerometers were contracted to Technical Maintenance Incorporated. The NRC inspection team determined that the supplier was on the approved supplier list and was authorized to provide calibration services traceable to National Institute of Standards and Technology (NIST) standards. In addition, the NRC inspection team confirmed that all calibrations were performed annually by qualified personnel.

Direct observations of M&TE used for test and inspection activities determined that the equipment was within their calibration due dates and the selection of M&TE were consistent with tolerances described in test procedures. The inspector did not found any anomaly related to the calibration of the equipment.

The inspection sample included the following measuring and test equipment:

- EGS-160, Hipotronics AC/DC Hipot Tester
- EGS-296, Dytran Accelerometer
- EGS-354, Dytran Accelerometer
- EGS-356, Dytran Accelerometer
- EGS-421, Mensor Digital Pressure Transducer
- EGS-474, Primary Current Injection Test Set
- EGS-546, Dytran Accelerometer
- EGS-548, Dytran Accelerometer
- EGS-563, VR8500 Vibrational Controller
- EGS-611, GSG Go/No Go Thread Ring Gage
- EGS-624, Digital Multimeter
- EGS-667, Clamp-on Ammeter
- EGS-688, Agilent Data Acquisition System
- EGS-716, Agilent Multiplexer Card
- EGS-825, Pressure Transducer
- EGS-827, Pressure Transducer
- EGS-872, Thermocouple
- EGS-874, Thermocouple
- EGS-989, VR8500 Vibrational Controller

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's programs for control of calibration and use of M&TE was consistent with the regulatory

requirements of Criterion XII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

7. Inspection

a. Inspection Scope

The NRC inspection team evaluated the implementation of inspections that were conducted to verify the conformance of safety-related items and activities to specified requirements. The inspection scope included direct observation of inspection activities, interviews with responsible inspection personnel, and reviews of procedures, specifications, and records.

SOP 10.1, "Inspection Procedures," was reviewed to confirm the procedure addressed the requirements of the corporate QAM and 10 CFR Part 50, Appendix B. In addition, procedure EGS-TR-23063-011 was reviewed to confirm the requirements of the SOP were addressed for inspections of squib valve electrical connectors, including specifying the type of observations required, identifying items inspected, documenting the results of examinations and tests, and identifying and dating the authorized representative for the activities witnessed.

The NRC inspection team also reviewed records of post-test visual inspections of electrical cable as documented in qualification report EGS-TR-HC1741-01. The review was performed to determine whether results were adequately documented in accordance with specified requirements.

Direct observations were conducted of QualTech quality inspectors as they verified the structural integrity of NAMCO limit switches during dynamic seismic testing. The observations included interviews with the quality inspection personnel and an evaluation whether their inspections were implemented in accordance with approved instructions.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's program for inspection was consistent with the regulatory requirements of Criterion X, "Inspections," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

8. Test Control

a. Inspection Scope

The NRC inspection team examined the implementation of equipment qualification tests that were performed to verify the equipment designs adequately addressed specified

requirements for performance under worst case earthquakes and harsh operating environments.

SOP 11.1, “Test Control,” was reviewed to confirm the procedure addressed the requirements of the corporate QAM and 10 CFR Part 50, Appendix B. In addition, procedure EGS-TR-23063-011 was reviewed to confirm the requirements of the SOP were addressed for qualification testing of safety-related squib valve electrical connectors. Elements of the test procedure evaluated for this inspection included the adequacy of test requirements and acceptance criteria in flowing down applicable design requirements and technical guidance. Test records were reviewed for adequacy of information recorded, including identification of test personnel, documentation of results, and reviews for acceptability of results.

The NRC inspection team also reviewed records of harsh environment testing of Rockbestos-Surprenant Cable Corporation (RSCC) electrical cables as documented in qualification report EGS-TR-HC1741-01. The review was performed to determine whether test parameters conformed to specifications provided by the customer, and whether test results were adequately documented and evaluated.

The NRC inspection team reviewed the verification and validation of the Vibration Research Corporation VibrationVIEW Version 9.0.13 software that is utilized with the Vibration Research Corporation Vibration Controllers on the EGS tri-axial seismic simulation tester and the EGS single axis electro-dynamic vibration tester. The NRC inspection team reviewed the procedure VR8500-VVP-9.0.13, “Software Verification and Validation Procedure for Vibration Research Corporation Vibration Controller Module Number VR8500 Software Version 9.0.13.”

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

Five examples were identified where deviations from specified test parameters or acceptance criteria (i.e. test anomalies) were not documented and evaluated in accordance with requirements for nonconforming items.

1. Functional testing of electrical connectors for 8-inch squib valves (Westinghouse test specimen “LP01”) did not impose the specified magnitude of 3.7 amps for electrical pulse current during the baseline test (actual current applied was 3.57 amps), the post-thermal aging test (actual current applied was 3.63 amps), or the post-radiation aging test (actual current applied was 3.53 amps). The NRC inspection team noted that Section 3.3 of Westinghouse test plan APP-PV70-VPH-001 stated that the squib valve design employed a 3.7 amp current to actuate the igniters.

2. Electrical current load applied to an electrical cable (RSCC test specimen “B”) during harsh environment qualification testing did not maintain the specified magnitude of 20 amps for the duration of the test. Electrical current decreased to a value of 17.8 amps at 480 seconds and remained below the required magnitude for the balance of the test duration. Section 13.0 of RSCC test plan TP-1201 stated that samples must be electrically energized at their rated voltage

and current as described by the National Electric Code – 2008. Section 3.1.2 of QualTech test report EGS-TR-HC1741-01 specified a rated current of 20 amps.

3. Temperatures applied during harsh environment testing of RSCC electrical cables remained below the required minimum values at all sensor locations during the first 10 seconds. The measurements recorded by the "back" thermocouple did not reach the required peak temperature until 90 seconds had elapsed (as compared to a required peak at 10 seconds). The measurements by the "front thermocouple never reached the required peak temperature.

4. Pressures applied during harsh environment testing of RSCC electrical cables decreased below the required minimum values on several instances during the first 400 seconds. For example, at 115 seconds into the test, lowest measured pressure was approximately 62 psig as compared to a minimum allowed pressure of approximately 64 psig. At 315 seconds, lowest measured pressure was approximately 63 psig as compared to a minimum allowed pressure of approximately 70 psig.

5. Photographic records appended to QualTech test report EGS-TR-HC1741-01 showed that harsh environment testing of RSCC cables caused extensive cracking and segmentation of some of the cable jackets. The jacket on another specimen exhibited gross failure from apparent melting. In contrast, Section 2.0 of RSCC test plan TP-1201 stated that qualification of the electrical cable was based upon an assumption that the jacket does not crack. Although the test report contained an observation that the test specimens exhibited "crazing and cracking," the condition was not documented as a failure to meet acceptance criteria and was not evaluated in accordance with procedures for nonconforming items.

The NRC inspection team determined that although QualTech included all the raw data in the test report package, the failure to document and evaluate departures from specified test parameters introduced uncertainties regarding the acceptability of the results of the equipment qualification activities. If left uncorrected or unresolved, the capability of the squib valve connectors and the electrical cable to withstand harsh accident environments would be indeterminate.

This issue has been identified as Nonconformance 99901441/2014-201-03

c. Conclusions

The NRC inspection team determined that QualTech has not established a program that adequately implements the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99901441/2014-201-03 for QualTech's failure to ensure that deviations from specified test parameters or acceptance criteria (i.e. test anomalies) were not documented and evaluated in accordance with requirements for nonconforming items.

9. Nonconformances

a. Inspection Scope

The NRC inspection team reviewed policies, implementing procedures, and records that governed the control of nonconforming materials, parts, and components to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the QualTech's Corporate QAM, which contain QualTech's overall quality policies, to ensure it addressed the regulatory requirements for nonconforming items.

The NRC inspection team also reviewed QualTech's procedures that govern identification, control and correction of nonconforming items. The NRC inspection team reviewed QualTech's procedures SOP 15.1, "Control of Nonconforming Materials, Parts, or Components." The NRC inspection team reviewed other processes at QualTech that could identify a nonconformance (such as Notice of Anomalies) to ensure they are used in the nonconformances process. The NRC inspection team reviewed the nonconformance and notice of anomalies logs for 2013 and 2014, and selected 28 samples to review in detail to ensure the processes were being followed and the dispositions appeared appropriate. The NRC inspection team reviewed the training records for the QC Manager and one of the QC NRC inspection team, who were authorized to sign off on nonconformance's dispositions to ensure they were trained on the regulatory requirements and QualTech processes and implementation for nonconforming items.

The NRC inspection team reviewed the procedures that would perform rework of nonconformances to ensure that quality requirements were maintained and all inspections were required to be performed as appropriate. The NRC inspection team verified that QualTech's procedures address the requirement that nonconforming material, parts, or components shall be identified and segregated if appropriate, and verified the implementation of this requirement through a walkdown of the shop area. The NRC inspection team discussed the nonconformance and notice of anomalies processes with the QC Manager, and two QC personnel to assess their understanding of the regulatory requirements and QualTech processes and implementation.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's program that documents and evaluates nonconformances was consistent with the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts, of Components," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

10. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed policies, implementing procedures, and records that govern corrective actions to verify compliance with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed QualTech's Quality

Manual, which contain QualTech's overall quality policies, to ensure it addressed the regulatory requirements for corrective action.
To verify that QualTech's implementation of the corrective action process meet regulatory requirements, the NRC inspection team reviewed a sample of QualTech's CARs. The NRC inspection team reviewed other processes at QualTech that could identify a condition adverse to quality (such as internal and external audits, and customer complaints) to ensure that they used the corrective action process.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's program that documents and evaluates corrective actions was consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

11. Internal Audits

a. Inspection Scope

The NRC inspection team reviewed audit policies and procedures to determine if QualTech's controls were in compliance with the regulatory requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the internal audit program with personnel responsible for the planning and implementation of internal audits and reviewed completed audits and auditor qualifications to verify audit program implementation.

The NRC inspection team reviewed procedure SOP 18.1, "Quality Assurance Audits and Follow-Up Corrective Action," which describes the procedural method for planning, scheduling, preparing, conducting, and documenting audits. QualTech documents and closes out all corrective actions associated with the audit through the audit program. The NRC inspection team evaluated the 2012 and 2013 audits and verified that all identified audit findings were adequately closed.

b. Observations and Findings

No findings of significance in this area were identified.

c. Conclusions

The NRC inspection team determined that the implementation of QualTech's program that adequately controls audit activities was consistent with the regulatory requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

12. Entrance and Exit Meetings

On July 21, 2014, the NRC inspection team presented the inspection scope during an entrance meeting with Mr. Tony Gill, Quality Assurance Manager, and other QualTech personnel. On July 25, 2014, the NRC inspection team presented the inspection results during an exit meeting with Mr. Wiley Finley, Director, Business Segment, and other QualTech personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED

Name	Title	Affiliation	Entrance	Exit	Interviewed
W. Finley	Director, Business Segment	QUALTECH		X	
T. Gill	QA Manager	QUALTECH	X	X	X
G. Elam	R&D/EPA Manager	QUALTECH	X	X	X
J. Tumlinson	Products Engineering Manager	QUALTECH	X	X	X
C. Covan	Quality Assurance Administrator	QUALTECH	X	X	X
B. Meyer	Quality Assurance Administrator	QUALTECH	X	X	X
T. Franchuk	Director Quality	QUALTECH		X	X
R. Golub	EQ/CGD Engineering Manager	QUALTECH		X	X
M. Noblitt	Sr. Engineer	QUALTECH			X
D. Bentley	Engineer	QUALTECH			X
S. Frazier	Lab Technician	QUALTECH			X
D. Fuhrman	Engineer	QUALTECH			X
R. Wessel	US Licensing	WESTINGHOUSE		X	X
E. Huang	Inspection Team Leader	NRC	X	X	
A. Ramirez	Inspection Team Member	NRC	X	X	
S. Smith	Inspection Team Member	NRC	X	X	
A. Armstrong	Inspection Team Member	NRC	X	X	
C. Jones	Inspection Team Member	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 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance”

3. ITEMS OPENED, CLOSED, AND DISCUSSED:

Item Number	Status	Type	Description	Applicable ITAAC
99901441/2014-201-01	OPEN	NON	Criterion III	N/A
99901441/2014-201-02	OPEN	NON	Criterion VII	N/A
99901441/2014-201-03	OPEN	NON	Criterion XI	ITAAC 2.1.02.07a.i and 2.2.03.07a.i

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/or tested at the QualTech Huntsville facility. At the time of the inspection, QualTech was involved in harsh environment testing of electrical connectors for AP1000 squib valves. For the ITAAC listed below, the NRC inspection team reviewed QualTech's quality assurance controls in the areas of design control, test control, inspection, measuring and test equipment, 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. During this inspection, the NRC inspection team identified one finding that was associated with two ITAAC.

COL #	DCD #	Design Commitment	Component/Activity
24	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.	The affected equipment included connectors to be installed on the 4th Stage ADS squib valve operators inside containment. The NRC inspection team observed conduct of procedure EGS-TR-23063-011 which applied design basis accident conditions for pressure, temperature, and chemical sprays to test specimens which had been subjected to prerequisite aging from temperature cycles, pressure cycles, non-seismic vibration cycles, and radiation exposure. Functionality of the test specimens were tested before, during, and after completion of the simulated accident profiles. A notice of nonconformance was issued for failure of the functional test to apply the specified magnitude for test current.

COL #	DCD #	Design Commitment	Component/Activity
170	2.2.03.07a.i	The Class 1E equipment identified in Table 2.2.3-1 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.	The affected equipment included connectors to be installed on IRWST injection squib valve operators and containment recirculation squib valve operators inside containment. The NRC inspection team observed conduct of procedure EGS-TR-23063-011 which applied design basis accident conditions for pressure, temperature, and chemical sprays to test specimens which had been subjected to prerequisite aging from temperature cycles, pressure cycles, non-seismic vibration cycles, and radiation exposure. Functionality of the test specimens were tested before, during, and after completion of the simulated accident profiles. A notice of nonconformance was issued for failure of the functional test to apply the specified magnitude for test current.

5. DOCUMENTS REVIEWED:

Procedures

- SOP 3.1, "Control of Design Engineering," dated May 31, 2013
- SOP 5.2, "Preparation and control of Design Drawings," Revision D, dated May 31, 2013
- SOP 20.0, "10 CFR Reporting of Defects and Noncompliance," dated April 17, 2012
- SOP 6.1, Revision D, "Control of Technical Documents," dated May 31, 2013
- SOP 9.8, Revision F, "Order Entry and Project Planning," dated May 31, 2013
- SOP 10.1, Revision D, "Inspection Procedures," dated January 28,2013
- SOP 11.1, Revision E, "Test Control," dated May 31, 2013
- SOP 12.1, Revision G, "Control of Measuring and Test Equipment," dated December 30, 2013
- SOP 15.1, "Controls of Nonconforming Materials, Parts of Components," Revision H, dated July 11, 2013
- SOP 16.1, "Corrective Action," Revision H, dated December 23, 2013
- SOP 19.1, "Reporting of Defects and Noncompliances Per 10 CFR 21," Revision C, dated July 1, 2013

Purchase Orders

- PO #70104652, dated January 20, 2014 (Qual Tech Report No. 23066-642, dated February 25, 2014)
- PO #HP00004172, “Electrical Feed Through,” dated January 14, 2014
- PO #HP00002405, “ Assurance Technical Services, Preform Harsh Environment DBE Testing in Accordance with EGS-TR-HC1150-01, Revision B, Section 5.6,” dated April 8, 2013
- PO #HP00004175, “Exelon Power Labs Material, testing of Tallow,” dated January 22, 2014
- PO #HP00004713, “Exelon Power Labs Material Testing Analysis (2) Filter Specimens, HP 4501-1-1 and HP4658-1-1,” dated June 19, 2014
- PO #00001674, “Clarke Testing of Pneumatic Actuator,” dated April 3, 2014
- PO #HP00001410, “Clarke Testing of Vibration Aging and Seismic Testing,” dated May 17, 2012
- PO #00004605, “Applied technical Service Inc. Proof Pressure Testing to 15,000 PSI on Pressure Regulator,” dated May 22, 2014
- PO #HP00004496, “Applied technical Service Inc. Machining Sample Prep and Tensile Testing,” dated May 22, 2014
- PO #HP00001394, “QualTech Np Cincinnati Operation for Testing Services EGS-DP-E08-01, Rev Original, and Project Summary HC884 (HJ2371),” dated May 15, 2012
- PO #HP00001165, “Seismic Testing Services Changed to Include 5 OBE Tests, 1SSE Test and Resonance Search from 1 to 5 Hz with 8 Different Accelerometers,” dated February 28, 2012
- PO #00004134, to Southwest Research Institute to provide products radiation testing, Change 0, dated January 6,2014
- PO #4500615900, 14 INCH ADS- Squib Valve Qual Test Fixture with two Squib Valve Connector Assembly Mark 3 Connector Assemblies and two Low Profile Support Assembly for Squib Valve Connector Assemblies. Job. No. HW54/HJ5202123063.
- PO #HP00004134 Southwest Radiation Institute, Products Radiation Testing Aging Squib Valve fixtures, dated January 6,2014
- PO #7725428R1, “CENG, Nine Mile Nuclear Stations, dated February 4, 2014
- PO #60-08541, PO for GR-16 & GR-18, dated December 9, 2010
- PO #4500138236, Dominion Nuclear Inc. order for GR-18, dated April 14, 2014
- PO #HP00002770, “Scotch Insulating Tape 130C, ¾”x30’,” dated July 15,2013
- PO #HP2770, “Order, “Scotch Insulating Tape 130C, ¾”x30’
- PO #00513530, “Exelon Generation Company LLC, Scotch Insulating Tape 130C, ¾”x30’,” dated December 05, 2013
- PO #HP000814, “Kanata Electric Services NEQ Heat Shrink,” February 2, 2014
- PO #00001119, “DA/PRO Rubber GB-2A(12-14) QTY 23, DWG B-N-1038-1-2, dated October 3, 2012
- PO #10398189, “Entergy Nuclear Operations, Grayboot “A” Kit P/N GB-2A (12-14), QTY 23, dated December 13, 2013
- PO #HP00002540, “Distribution Supply Company Clamp Wire GB-1-8 7.0-505 GB-1-8 and GB-1-9,” June 6, 2013
- PO #50207R1, “EXCEL Energy Grayboot “A” Part GB-1A(10-14) OS,“ dated Febuary13 2014

- PO #00004134, to Southwest Research Institute to provide products radiation testing, Change 0, dated January 6, 2014

Drawings

- B-N-23063-018, "Monel Flex Conduit Assembly," Revision C, dated November 6, 2013
- B-N-23063-025, "Squib Valve Connector Assembly Mark 3 Part No, 23063-025," dated November 1, 2013
- Drawing B/N-23063-021, Assembly for Squib Valve Connector, P/N 23063-021, dated January 11, 2013

Equipment Qualification and Test Reports

- Test Report EGS-TR-HC2311-01, failures analysis of Potter & Brumfield Relay, dated June 11, 2014
- Report No. 9493-162 for electrical conduit seal assembly
- Inspection Report 880706-2081 for Epoxy
- Software verification and validation report for vibration research corporation vibration research controller module number VR8500 software version 9.0.13 for EDVT control computer service tag no, 80Y1XV1, dated March 20, 2013
- VR8500-VVP-9.0.13, "Software Verification and Validation Procedure for Vibration Research Corporation Vibration Controller Module Number VR8500 Software Version 9.0.13," dated March 20, 2013
- EGS-TR-23009-14, "Test Report for Nuclear Environmental Qualification of ½ inch Generation 3 EGS QDC Electrical Connector," Revision A, dated May 16, 2011
- Data Acquisition System Report, "23063/HJ5202 Vibration Aging of Westinghouse 14 Inch Squib Valve Assembly ADS-01 and ADS-02," dated July 3, 2014
- Data Acquisition System Report, "23063/HJ5202 SSE RMF Seismic Test of Westinghouse 8 Inch Squib Valve Connector Assembly," dated May 16, 2014
- Data Acquisition System Report, "23063/HJ5202 SSE RMF Seismic Test of Westinghouse 14 Inch Squib Valve Assembly," dated July 9, 2014
- Data Sheet 1, "Baseline and Functional Tests - Baseline Test of SN 0006 11-271 LP01," dated February 18, 2014
- Data Sheet 1, "Baseline and Functional Tests – Post Radiation Test of SN 0006 11-271 LP01," dated February 26, 2014
- Data Sheet 1, "Baseline and Functional Tests – Post Thermal Aging Test of SN 0006 11-271 LP01," dated April 10, 2014
- Data Sheet 1, "Baseline and Functional Tests – Post RMF Test of SN 0006 LP01," dated May 19, 2014
- EGS-TR-23063-011, revision B, "Test Procedure for Nuclear Environmental Qualification of Squib Valve Connector Assembly Mark 3 Part Number 23063-025 and Low Profile Support Assembly for Squib Valve Connector Assemblies Part Number 23063-021," dated June 3, 2014
- EGS-TR-HC1741-01, Test Report for LOCA/DBA Environmental Qualification Test of Firewall® III Insulated Wire/Cable Manufactured by RSCC Wire and Cable, LLC," dated June 28, 2013

- EGS-TR-HC911-01, “Nuclear Environmental Qualification of NAMCO Series EA120 Limit Switches,” Revision H, dated July 27, 2014
- Form 2046, “Equipment Used Sheet, J/N 23062/H5202,” dated February 26, 2014

Commercial Grade Dedication

- Commercial Grade Dedication Plan EGS-DP-M35-01, “Dedication / Seismic Procedure for Pressure Regulator,” dated October 23, 2000
- Commercial Grade Dedication Plan EGS-TR-E48-01, “Dedication for Removal and Installation Assembly / Components Wiring,” dated July 26, 2008
- Commercial Grade Dedication Plan EGS-DP-M70-01, “Dedication Procedure for Fiber Optic Cable,” dated July 30, 2000
- Commercial Grade Dedication Plan EGS-DP-I&C-10-01, “Dedication Procedure for Switching Transistor,” dated July 1, 2000
- Commercial Grade Dedication Plan EGS-DP-E31-01, “Dedication Procedure for Indication Light,” dated October 22, 1998
- Commercial Grade Dedication Plan EGS-DP-M26-01, “Dedication Procedure for Non-Metallic O-Ring,” dated November 19, 2006
- Commercial Grade Dedication Plan EGS-DP-M70-01, “Dedication Procedure for Fiber Optic Cable,” dated July 30, 2000
- Commercial Grade Dedication Work Order HC1741 (HJ4396), “LOCA Test per RSCC Test Plan,” dated June 14, 2013
- Commercial Grade Dedication Plan SAIC-TR-1038.2-03, Guidelines for EGS Grayboot “A” connectors, dated October 27, 1997
- DA/PRO Rubber Commercial Grade Survey Broken Arrow QA-13-18, dated May 7, 2013
- DA/PRO Rubber Commercial Grade Survey Valencia QA-11-07, dated August 15, 2011
- Exelon Power Labs175 North Calm Road Coatesville QA-14-14, dated February 14 2012
- Applied Technical Service (ATS) Triad Court Marietta, dated January 17, 2014
- Clark Laboratories1801 Rt. 51 South Jefferson Hills QA-12-08, dated February 14, 2012

Nonconformances (Deficiency Reports and Notice of Anomalies)

- Deviation Report 2014-002, “Busman Fuse High Resistance,” dated January 6, 2014
- Deviation Report 2014-007, “Washer, Helical #6 not to Acceptance Criteria,” dated January 9, 2014
- Deviation Report 2014-017, “Dimensions found out of tolerance,” dated January 16, 2014
- Deviation Report 2014-021, “Improper potting on SQIB Valve,” dated January 20, 2014
- Deviation Report 2014-024, “Pin insulators supplied with incorrect dimensions,” dated January 30, 2014
- Deviation Report 2014-031, “Failed Breaker Testing,” dated February 26, 2014
- Deviation Report 2014-036, “GS THD greater than 5%,” dated February 7, 2014
- Deviation Report 2014-039, “Actuator stalled during cycle aging,” dated February 7, 2014
- Deviation Report 2014-047, “RAM Material not Dedicated,” dated February 14, 2014
- Deviation Report 2014-049, “9205 Module Catastrophic Fail,” dated February 14, 2014
- Deviation Report 2014-055, “Connector Treads Accepted a No-Go,” dated February 20, 2014

- Deviation Report 2014-061, “Failed Visual Testing,” dated February 21, 2014
- Deviation Report 2014-066, “B Dimensions of Rod Guides out of tolerance,” dated February 28, 2014
- Deviation Report 2014-072, “Failed Electrical Testing,” dated March 6, 2014
- Deviation Report 2014-076, “EGS-421 was found out of tolerance,” dated June 16, 2014
- Deviation Report 2014-077, “EGS-611 was found out of tolerance,” dated May 20, 2014
- Deviation Report 2014-078, “EGS-688 found out of tolerance,” dated June 16, 2014
- Deviation Report 2014-089, “Failed Electrical Testing,” dated March 14, 2014
- Deviation Report 2014-092, “EGS-160 found out of tolerance,” dated June 6, 2014
- Deviation Report 2014-095, “EGS-716 found out of tolerance,” dated June 25, 2014
- Deviation Report 2014-096, “Failed Electrical Testing,” dated March 17, 2014
- Deviation Report 2014-105, “Failed Electrical Testing,” dated March 25, 2014
- Deviation Report 2014-117, “Failed Relay contact resistance ,” dated April 4, 2014
- Deviation Report 2014-119, “Visual marks on Connector Shell,” dated May 3, 2014
- Deviation Report 2014-144, “S/N 9343 failed IR testing,” dated June 7, 2014
- Deviation Report 2014-147, “S/N3336 & S/N3334 failed IR testing,” dated June 12, 2014
- Deviation Report 2014-160, “S/N9410 Failed dielectric testing,” dated June 12, 2014
- Deviation Report 2014-189, “Medium Voltage splice failed dielectric testing,” dated June 24, 2014
- Deviation Report 2014-199, “Leakage between potting and wires during testing,” dated July 1, 2014
- Deviation Report 2014-206, “Sockets P/N 913601-243, 244, 245, 246 failed dialectic testing, ” dated July 2, 2014
- Deviation Report 2014-208, “Switches wired wrong during assembly,” dated August 2, 2014

Audits

- QA-12-48, “2012 Internal Audit Documentation Package”
- QA-13-45, “2013 Internal Audit Report”

Design Changes

- Engineering Change Notice B-N-23063-018-03, dated November 1, 2013

Calibration Records

- List of M&TE Inventory and Status, dated July 3, 2014
- EGS- 827, Pressure Transmitter Model 615-150-1-12-8-ORF, dated March 21, 2014
- EGS-624- Digital Multimeter Model 289, dated May 16, 2014
- EGS-825 Pressure Transmitter Model 615-150-1-1-2-8-ORF, dated March 21, 2014
- EGS-667 Clamp Meter Model 325, dated November 20, 2013
- EGS-474 Primary Current Injection Test Model LET-400-RDC, dated November 14, 2014
- EGS-874 Thermocouple calibration sheet (Pre- LOCA), dated July 17, 2014
- EGS-548 DYTRAN Accelerometer Model 3056BET, PO No. HP00002184, dated January 14, 2014

- EGS-354 DYTRAN Accelerometer Model 3056BET, PO No. HP00002184, dated January 14, 2014
- EGS-356 DYTRAN Accelerometer Model 3056BET, PO No. HP00002184, dated January 14, 2014
- EGS-546 DYTRAN Accelerometer Model 3056BET, PO No. HP00002184, dated January 14, 2014
- EGS-296 DYTRAN Accelerometer Model 3056BET, PO No. HP00002184, dated January 14, 2014
- EGDS-989 (IFCEBB) and EGDS-990 (26 F942), Review of Auto-Cal Verification for VR8500 Vibrational Controllers, dated July 16, 2014
- EGDS-563 (12BEA), and EGDS-565 (12B2EC), Review of Auto-Cal Verification for VR8500 Vibrational Controllers, dated March 2014

New Condition Reports Generated

- Corrective Action Report 2014-002, "Track the resolution of NOAs generated to address anomalies observed during Squib Valve connector Qualification Tests," dated July 22, 2014
- Corrective Action Report 2014-004, "Notices of Anomaly Not Written," dated July 23, 2014

Miscellaneous

- EGS J/N 8807-08, "Documentation Requirements for EGS P.O. #00678," dated February 12, 1992
- Record of qualification for lead auditor for Phyllis Grela and Rene Delaney
- Letter 23063-HJ5199-04, Rev C, "Aging Analysis for 8 Inch LP and 14 Inch ADS Squib Valve Connector Assembly Mark 3 Assemblies," dated February 1, 2014 from Qual Tech to Westinghouse
- EGS-TR-23066-04, "Instructions for Installation of EGS Generation 3 Model 23066, 23067 and 23068 Quick Disconnect Connectors (QDC)," dated January 18, 2010.
- Form 2046, "Equipment Used Sheet, J/N 23062/H5202," dated 2/26/2014
- List of M&TE Inventory and Status, dated 7/3/2014
- RSCC Test Plan TP-1201, revision 0, "Qualification of Firewall® III Irradiation Cross-Linked Polyethylene Insulation KXL-760G with Chlorosulfonated Polyethelene Jacket KH-131 or Irradiation Cross-Linked Polyethylene Jacket KXL-760G for Nuclear Class 1E Service in AP1000 Nuclear Generating Power Stations for 60 Years of Qualified Life at 90º C," dated July 17, 2012
- Southwest Research Institute Final Report, "Irradiation Services for Squib Valve Fixture and Connector Assemblies, Project 17669.15.001," dated March 18, 2014
- Westinghouse Engineering & Design Coordination Report (E&DCR) APP-GW-GEF-424, "Temperature and Pressure Envelopes for Use In Equipment Qualification of AP1000Components," Revision 0
- Westinghouse document APP-PV70-VPH-001, Rev. 3, "AP1000 Squib Valve Equipment qualification Test Plan"
- NAMCO purchase order PRT15070-00 Nuclear Environmental Qualification of NAMCO EA120 Limit Switches Job No. (HJ2436) HC911, February 17, 2014

- RSCC Test Plan TP-1201, revision 0, “Qualification of Firewall® III Irradiation Cross-Linked Polyethylene Insulation KXL-760G with Chlorosulfonated Polyethelene Jacket KH-131 or Irradiation Cross-Linked Polyethylene Jacket KXL-760G for Nuclear Class 1E Service in AP1000 Nuclear Generating Power Stations for 60 Years of Qualified Life at 90º C,” dated July 17, 2012
- Southwest Research Institute Final Report, “Irradiation Services for Squib Valve Fixture and Connector Assemblies, Project 17669.15.001,” dated March 18, 2014
- Westinghouse Engineering & Design Coordination Report (E&DCR) APP-GW-GEF-424, “Temperature and Pressure Envelopes for Use In Equipment Qualification of AP1000Components,” Revision 0
- Westinghouse document APP-PV70-VPH-001, Revision 3, “AP1000 Squib Valve Equipment qualification Test Plan”

5. ACRONYMS USED:

ADAMS	Agencywide Documents Access and Management System
CAR	corrective action request
CFR	Code of Federal Regulations
CGD	commercial grade dedication
EMI/RFI	electromagnetic and radio-frequency interference
EQ	equipment qualification
EVIB	Electrical Vendor Inspection Branch
IEEE	Institute of Electrical and Electronics Engineers
IP	inspection procedure
LOCA	loss of coolant accident
M&TE	measuring and test equipment
NON	Notice of Nonconformance
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NRO	Office of New Reactors
PO	purchase order
QA	quality assurance
QDC	quick disconnect
SSC	structure, system, or component