March 13, 2013

Mr. Brian Gilmartin, Director of Quality
DRS Consolidated Controls, Inc.
21 South Street
Danbury, CT 06810

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 99901417/2013-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Gilmartin:

From January 28, 2013, through February 1, 2013, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the DRS Consolidated Controls, Inc. (DRS-CCI) facility in Danbury, CT. The enclosed report presents the results of the inspection.

The purpose of this limited-scope inspection was to assess DRS-CCI's compliance with the provisions of selected sections 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 DRS-CCI's implementation of quality activities associated with the design, procurement, manufacture, and testing of instrumentation and control equipment with an emphasis on the reactor coolant pump (RCP) speed sensor for the Westinghouse AP1000, the digital control voltage regulator and speed controller for the AREVA-MOX emergency diesel generator (EDG), and the distributed control system (DCS) DRS Plμs 32. This NRC inspection report does not constitute NRC endorsement of DRS-CCI's overall quality assurance (QA) or 10 CFR Part 21, "Reporting of Defects and Noncompliance," programs.

The NRC inspection team concluded that DRS-CCI 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 software design 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, 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.: 99901417

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99901417/2013-201

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."

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DATE	03/08/2013	03/08/2013	03/11/2013	03/13/2013

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NOTICE OF NONCONFORMANCE

DRS Consolidated Controls, Inc.
21 South Street
Danbury, CT 06810

Docket No. 99901417
Inspection Report No 99901417/2013-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted from January 28, 2013, through February 1, 2013, of activities performed at DRS Consolidated Controls, Inc. (DRS-CCI), it appears that one activity was not conducted in accordance with NRC requirements that are contractually imposed upon DRS-CCI by its customers or NRC licensees.

> 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, "The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization."
>
> DRS-CCI procedure ER7357/70, "Commercial Generic Software and Hardware Test Plan," Revision B, dated June 25,2012, states, in part, "Members of the Test Engineering Group, which is separate from the Software Development Group that created the software, shall perform software package inspections. This provides an independent examination of the software for validation and verification."
>
> Contrary to the above, as of February 1, 2013, DRS-CCI failed to perform appropriate verification and checking processes by allowing individuals who perform the original design to perform the verification or checking of the design. Specifically, during the verification and validation of the requirements and design phases of the software development lifecycle for its emergency diesel generator automatic voltage regulator and governor speed control, DRS-CCI failed to appropriately establish and implement measures that prevent software design individuals or groups from verifying or checking their own work as required by the "Commercial Generic Software and Hardware Test Plan" procedure.
>
> This issue has been identified as Nonconformance 99901417/2013-201-01.

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, 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, the NRC will consider extending the response time.

Because the NRC will make your response available electronically for public inspection in the NRC Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System, which is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, 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, "Protection of Safeguards Information: Performance Requirements."

Dated this 13th day of March 2013

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

Docket No.:	99901417
Report No.:	99901417/2013-201
Vendor:	DRS Consolidated Controls, Inc. 21 South Street Danbury, CT 06810
Vendor Contact:	Brian Gilmartin, Director of Quality Phone: 203-798-3072 BGilmartin@drs.com
Background:	DRS Consolidated Controls, Inc. (DRS-CCI), designs, qualifies, and manufactures instrumentation and control equipment primarily for the U.S. Navy and the commercial nuclear industry. The DRS-CCI scope of supply includes, but not limited to, reactor coolant pump speed sensors, digital control voltage regulators and speed controllers for emergency diesel generators, and a distributed control system, DRS Plμs 32.
Inspection Dates:	January 28-February 1, 2013
Inspection Team Leader:	George Lipscomb, NRO/DCIP/CEVB
Inspectors:	Douglas Bollock NRO/DCIP/CEVB Louis Dumont R-II/DCI/CIB1 Shavon Edmonds NRO/DCIP/CEVB Erik Martinez NRO/DE/ICE2 Kenneth Mott NRO/DE/ICE1
Approved by:	Richard A. Rasmussen, Chief Electrical Vendor Branch Division of Construction Inspection and Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

DRS Consolidated Controls, Inc.
99901417/2013-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to verify that DRS-CCI 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 DRS-CCI's implementation of quality activities associated with the design, procurement, manufacture, and test of instrumentation and control (I&C) equipment with an emphasis on the reactor coolant pump (RCP) speed sensor for the Westinghouse AP1000, the digital control voltage regulator and speed controller for the AREVA-MOX emergency diesel generator, and the distributed control system (DCS) DRS Plμs 32. The NRC identified these product lines because the RCP speed sensors are anticipated to be used in new reactor construction, and the digital control voltage regulator and speed controller are expected to be used in a new fuel facility construction. The NRC conducted this inspection at DRS-CCI's manufacturing facility in Danbury, CT.

The following regulation 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; and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012, to conduct this inspection.

This is the first NRC inspection of DRS-CCI.

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

Software Control

Based on the limited sample of software development activities observed and documents reviewed up to the end of the design-phase of DRS-CCI's software development lifecycle, the NRC inspection team determined that DRS-CCI design activities affecting software quality, software development design change, and modification recording were accomplished in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

However, while assessing the implementation of DRC-CCI's software verification and validation (V&V) program, the NRC inspection team discovered that a software engineer (a software designer), who had been a part of the independent V&V review effort, reviewed his own work.

The NRC inspection team determined DRS-CCI failed to appropriately establish and implement measures that prevent software design individuals or groups from verifying or checking their own work within independent verification and validation (I-V&V) processes. This failure to meet the technical independence requirements of Criterion III of Appendix B to 10 CFR Part 50, is identified as Nonconformance 99901417/2013-201-01.

Non-Software Design Control

Based on the limited sample of design documents, drawings, and procedures reviewed related to the RCP speed sensor, the NRC inspection team determined that DRS-CCI is adequately implementing its non-software design control program in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50.

10 CFR Part 21

The NRC inspection team determined that DRS-CCI appropriately translated the requirements of 10 CFR Part 21 into implementing procedures and, for the limited sample of activities that the inspectors reviewed, implemented them as DRS-CCI procedures require.

Manufacturing Control and Inspection

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

Commercial-Grade Dedication

The NRC inspection team concluded that DRS-CCI has established a program that adequately controls commercial-grade dedication (CGD) in accordance with the regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of CGD documents reviewed, the NRC inspection team determined that DRS-CCI is effectively implementing its CGD program in support of safety-related component manufacturing.

Procurement/Supplier Control

The NRC inspection team concluded that DRS-CCI has established a program that adequately controls procurement of equipment and services under 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. Based on the limited sample of procurement documents reviewed, the NRC inspection team determined that DRS-CCI is effectively implementing its procurement program in support of safety-related component manufacturing.

Testing and AP1000 Equipment Qualification

The NRC inspection team determined that DRS-CCI has established a program that adequately controls testing in accordance with the regulatory requirements of Criterion XI, “Test Control,” of

Appendix B to 10 CFR Part 50. Based on the limited sample of test activities observed and documents reviewed, the inspectors determined that DRS-CCI is adequately implementing these control processes in support of safety-related component manufacturing. The NRC inspection team was unable to assess DRS-CCI equipment qualification (EQ) activities in support of AP1000 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) closure, because Westinghouse had only contracted for equipment and not EQ test activities.

Nonconformance and Corrective Action Programs

Based on the limited sample of nonconformance and corrective action documents reviewed, the NRC inspection team determined that the implementation of DRS-CCI's program for control of nonconforming material, parts, or components and corrective actions was consistent with the regulatory requirements in Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

Audits

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

REPORT DETAILS

1. Software Control

a. Inspection Scope

The NRC inspection team reviewed the DRS-CCI software quality assurance (QA) program, software design control change process, software verification and validation, and safety-related software development processes, procedures, and implementation for the AREVA-MOX emergency diesel generator (EDG) safety-related software control system development project to verify regulatory compliance in accordance with Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

In addition, the NRC inspection team reviewed the traceability of several Fairbanks Morris Engine (FME) purchase order (PO) EDG control system requirements between the PO design specifications and the software design descriptions (SDD) to verify that PO design specification requirements were correctly translated, that the translation of the requirements into the system requirements specification (SRS) were correct, unambiguous, and verifiable, and that the final design outputs are relatable to the design input.

b. Observations and Findings

Software Development Quality Assurance Plan

The NRC inspection team noted the FME PO requires DRS-CCI to have a documented QA program that meets Appendix B to 10 CFR Part 50 requirements using the implementation guidance of NQA-1-1994, Subpart 2.7, "Quality Assurance Requirements of Computer Software for Nuclear Facility Applications." The NRC inspection team interviewed DRS-CCI personnel and also reviewed the following software quality assurance plan (SQAP) documents: Commercial Nuclear Quality Assurance Manual (CNQA), Software Quality Assurance Plan for Commercial Nuclear Applications, Software Configuration Management Plan for Commercial Nuclear Applications, Software Safety Plan for Commercial Nuclear Applications, Software Development Plan for Applications in Commercial Nuclear Plants, Commercial Generic Software and Hardware Test Plan, and Software Verification and Validation Plan for Commercial Nuclear Applications, to assess the implementation of the DRS-CCI Software Development Quality Assurance Plan. No significant issues were identified.

Software Development Program Change and Modification Tracking

DRS-CCI's CNQA, section 3.1, states that design changes from approved design inputs, including the reasons for the changes, will be identified, approved, documented, and controlled. DRS-CCI's SQAP, section 6.2, states that a software review will be performed on products to ensure change requests are captured, reviewed, and tracked to closure. The NRC inspection team assessed implementation of DRS-CCI software development design changes by reviewing various corrective action records and document revision updates for applicable changes. The NRC inspection team determined that the records sampled were legible, adequate, retrievable, adequately protected, and traceable to appropriate design input entries. No significant issues were identified.

Software Requirements Traceability

The NRC inspection team forward traced a small sample of selected PO design specification requirements from the PO design specifications to the SDD using the Bi-Directional Traceability Matrix (BDTM) to verify that applicable design inputs were correctly translated to the design phase. The NRC inspection team also assessed the quality of the SRS to ensure that the transfer of design specification EDG control system requirements into the SRS was correct, unambiguous, and verifiable, and that the final design output documents for the design phase (the SDD) are relatable to the design input requirements.

The NRC inspection team determined that applicable design inputs were correctly translated (up to the design phase), and that the final design output documents for the design phase (the SDD) are relatable to the design input requirements for the FME AREVA-MOX EDG Automatic Voltage Regulator (AVR) and Governor Speed Controller (GSC) software development project. No significant issues were identified.

Safety-Related Software Development Independent Verification and Validation

The FME PO requirement states that software verification and validation (V&V) shall be performed ensuring compliance with Institute of Electrical and Electronics Engineers (IEEE) 1012-1998 and the exceptions identified by NRC Regulatory Guide 1.168, "Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

The NRC inspection team evaluated ER7357/63, "Software Verification and Validation Plan for Commercial Nuclear Application," to verify that the plan and the associated V&V processes met the regulatory requirements of IEEE-1012-1998. The NRC inspection team also evaluated the Software V&V Phase Summary Report for the EDG GSC and Software V&V Phase Summary Report for the EDG AVR to ensure that they were developed in accordance with the regulatory requirements of IEEE-1012 and the DRS-CCI software verification and validation plan (SVVP).

The NRC inspection team noted that DRS-CCI procedure ER7357/70, "Commercial Generic Software and Hardware Test Plan," required independence between software development and software testing activities. The inspectors assessed the vendor's organizational charts to verify requisite organizational independence between the software engineering group and the software testing group, which provides independent verification and validation (IV&V). The inspectors also evaluated final software lifecycle output documents (the combined SRS/SDD document) to verify the appropriate IV&V implementation of the software design group's final design output documents and the testing group's final V&V output documents through the design phase of the software lifecycle (SLC).

The NRC Inspection team sampled the following documents associated with IV&V implementation:

Original design documents:

- SC-013919/01, "Design Basis Specification for EDG AVR," Revision B
- SC-013919/02, "Design Basis Specification for EDG GSC," Revision B

- SC-013919/06, “SRS/SDD for EDG Automatic Voltage Regulator (AVR),” Revision B
- SC-013919/07, “SRS/SDD for EDG Governor Speed Control (GSC),” Revision B

Related independent V&V documents:

- SC-013919/14, “S/W V&V Phase Summary Report for EDG Speed Control,” Revision B

- SC-013919/15, “S/W V&V Phase Summary Report for EDG Automatic Voltage Regulator,” Revision B

While assessing these final software design documents, the inspectors discovered that a software engineer (a software designer who was a member of the design group) was also the IV&V reviewer (a member of the testing group who verified his own design work) for the above documents. The inspectors learned that DRS-CCI considered assigning design personnel to an IV&V review role was acceptable under ER7357/70 provisions and this example was not an isolated occurrence. However, the inspectors did not review other examples during the inspection.

The NRC inspection team determined this did not meet Criterion III, “Design Control,” of Appendix B to Title 10 of the *Code of Federal Regulation* (10 CFR) Part 50, and IEEE-1012 independent V&V requirements. This issue is identified as Nonconformance 99901417/2013-201-01.

c. Conclusion

With the exemption of Nonconformance 99901417/2013-201-01 and based on the limited sample of software development activities observed and documents reviewed up to the end of the design phase of DRS-CCI’s software lifecycle, the NRC inspection team determined that DRS-CCI design activities affecting software quality, software development design change, and modification recording were accomplished in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50.

2. Non-Software Design Control

a. Inspection Scope

The NRC inspection team reviewed DRS-CCI’s design control plan, which is described in section 3 of DRS-CCI’s commercial nuclear quality assurance manual, associated procedures, and design work instructions and drawings related to the AP1000 Reactor Coolant Pump (RCP) speed sensor, to verify that DRS-CCI non-software design controls comply with the regulatory requirements of Criterion III, “Design Control,” of Appendix B to 10 CFR Part 50. Also, the NRC inspection team interviewed DRS-CCI staff to assess the implementation of the non-software design control program and ensure that design activities were accomplished in accordance with quality assurance procedures.

b. Observations and Findings

DRS-CCI's design control methodology is described in section 3 of DRS-CCI's commercial nuclear quality assurance manual, DQP-OL-016, which is a high-level document that delineates the DRS-CCI QA program. The NRC inspection team noted that the QA manual identifies a design organization that prescribes and documents design activities with a level of detail necessary for a controlled design process that allows verification that the design meets requirements. The inspectors found that DRS-CCI created measures to ensure that design basis and applicable regulatory requirements were correctly translated into drawings, procedures and instructions.

The NRC inspection team interviewed DRS-CCI staff to verify appropriate implementation of design changes and that design changes were as controlled as the original design. During the assessment of DRS-CCI's implementation of design changes, the inspectors discovered that the DRS-CCI design change control process is administered through an electronic data management system called "Omnify." DRS-CCI staff demonstrated how design changes are performed in Omnify, and the inspectors noted measures were established to prevent unauthorized personnel to perform changes on design-related documents.

The NRC inspection team verified the technical requirements for RCP speed sensors and speed phase-reference sensors, and the AP1000 specification data sheet for RCP speed sensor technical requirements were correctly translated into specifications, procedures, and instructions with emphasis on drawing 43N3, which is the design drawing of the pump speed sensor.

c. Conclusions

The NRC inspection team determined that DRS-CCI has established a program that adequately controls non-software design in accordance with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Based on the limited sample of RCP speed sensor design documents, drawings and procedures reviewed, and interviews with DRS-CCI staff, the inspectors determined that DRS-CCI is effectively implementing these non-software control processes in support of safety-related component design. No findings of significance were identified.

3. 10 CFR Part 21

a. Inspection Scope

The NRC inspection team reviewed DRS-CCI policies and implementing procedures that govern DRS-CCI's 10 CFR Part 21, "Reporting of Defects and Noncompliance," program with an emphasis on the AP1000 RCP speed sensor and the AREVA-MOX EDG control system to verify compliance with the regulatory requirements. The inspectors evaluated DRS-CCI's 10 CFR Part 21 postings and a sample of evaluations that DRS-CCI 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." In addition, the inspectors discussed the 10 CFR Part 21 program with DRS-CCI management and technical staff.

b. Observations and Findings

10 CFR Part 21 Policies and Procedures

The NRC inspection team verified that the DRS-CCI's policy and implementing procedures met the requirements of 10 CFR Part 21.21 for evaluating deviations and failures to comply associated with substantial safety hazards of basic components. The inspectors verified that DRS-CCI procedures contained the requirements in 10 CFR 21.21 for directors or responsible officers to notify the NRC of identified defects or failures to comply. In addition, DRS-CCI procedures incorporated the appropriate timelines for evaluation and reporting identified in 10 CFR Part 21. The inspectors verified that DRS-CCI procedures provide a direct connection between control of nonconformance and corrective actions and the Part 21 program. The inspectors concluded that DRS-CCI procedures provide the necessary guidance to assess deviations and failures to comply in an effective and timely manner under regulatory requirements.

10 CFR Part 21 Evaluations

DRS-CCI informed the NRC inspection team that they had not performed any 10 CFR Part 21 evaluations for any safety-related components related to the AP1000 RCP speed sensor and the AREVA-MOX EDG control system at the time of this inspection. The inspectors evaluated several samples of Part 21 evaluations performed by DRS-CCI for basic components shipped to General Electric. These Part 21 evaluations contained a discovery date, detailed descriptions of the nonconforming issues, and a determination whether a substantial safety hazard existed. Evaluations also included timelines and notification requirements when determinations are made regarding the existence or nonexistence of a substantial safety hazard in a component. The inspectors determined that DRS-CCI Part 21 evaluations met the regulatory requirements. The inspectors also evaluated a sample of corrective action reports and nonconformance reports to verify adequate DRS-CCI 10 CFR Part 21 evaluation and disposition, including notifications to customers regarding component deficiencies.

10 CFR Part 21 Postings

The NRC inspection team verified that DRS-CCI implemented and maintained proper postings requirements under 10 CFR 21.6. The postings included a current revision of 10 CFR Part 21, Section 206 of the Energy Reorganization Act of 1974, and updated DRS-CCI procedures that implemented 10 CFR Part 21 regulations. The inspectors walked down each of the locations and also verified that DRS-CCI posted the required documents in conspicuous locations consistent with the intent of 10 CFR 21.6(a)(2).

c. Conclusions

The NRC inspection team concluded that DRS-CCI 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 DRS-CCI 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 emphasis on the AP1000 RCP speed sensor and the AREVA-MOX EDG control system, to determine if DRS-CCI's 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 inspectors interviewed RCP speed sensor magnet subassembly manufacturing personnel and observed inprocess inspection of the EDG GSC heatsink subassembly. The inspectors compared manufacturing and inspection observations to the related procedures, and reviewed final assembly and inspection documentation, to verify appropriate program implementation.

b. Observations and Findings

Manufacturing Control

The NRC inspection team learned there were no inprocess fabrication activities for the RCP speed sensor or EDG control system during the NRC inspection period, so the inspectors requested manufacturing personnel walk through selected assembly steps while using applicable procedures and equipment. The inspectors evaluated a sample of two complete RCP speed sensor magnet subassembly documentation packages while discussing magnet subassembly fabrication with manufacturing personnel.

The inspectors noted that manufacturing personnel referred to various measuring and test equipment (M&TE) during the fabrication walkthrough, they were knowledgeable about the proper use and configuration of each instrument, and the equipment displayed a current calibration sticker. The inspectors found that the manufacturing personnel understood and followed the fabrication procedures, and the related documentation was complete and approved.

Inprocess Inspection

The inspectors observed a sample of inprocess inspection activities and evaluated related documentation for the GSC heatsink subassembly. The inspectors noted that QC inspection personnel were knowledgeable of general inspection requirements, used approved inspection procedures for the heatsink subassembly, and self-identified three minor deficiencies during their inspection.

Additionally, the inspectors verified that the QC inspector was knowledgeable about the nonconformance process for inspection-identified anomalies, and observed the creation of appropriate nonconformance reports relating to the self-identified deficiencies.

Qualification of Assembly Personnel and QC Inspectors

The NRC inspection team noted manufacturing personnel training was tracked by a "Skills Matrix" that the manufacturing department maintained. The inspectors verified that manufacturing personnel were designated as appropriately trained for assembly activities for a selected sample of completed documentation.

Additionally, the inspectors evaluated training and qualification requirements for QC inspection personnel as defined in DQP-SP-013, "Inspection and Test Personnel Training Procedure." The inspectors verified that the procedure described methods to qualify and certify personnel who perform inspections and testing activities. The inspectors also sampled qualification records for QC personnel conducting observed DRS-CCI inspection activities to confirm a current QC certification.

c. Conclusions

The NRC inspection team determined that DRS-CCI 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 DRS-CCI is effectively implementing its manufacturing and inspection programs in support of safety-related component manufacturing. No findings of significance were identified.

5. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed DRS-CCI policy, procedures, and implementation for commercial grade 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 commercial-grade dedication (CGD) activities, interviews with DRS-CCI personnel, and review of related documentation. The inspectors reviewed the technical evaluations and CGD plans for the AP1000 Reactor Coolant Pump Speed Sensors, and portions of the AREVA-MOX FME EDG control cabinet.

b. Observations and Findings

DRS-CCI Procedure DQP-SC-007, "Dedication of Commercial Grade Items," is a high-level document governing DRS-CCI's CGD process that establishes the requirements and responsibilities for dedicating commercial-grade items procured for use in safety-related applications.

Each major component produced by DRS-CCI has a technical evaluation or system dedication plan, which describes the design-basis critical characteristics. Each component or subcomponent has its own CGD plan that lists the critical characteristics for that component. Included in the CGD plan are the acceptance criteria or reference acceptance test criteria for each critical characteristic. The plan also notes the dedication methods used. The EDG AVR and GSC were not yet dedicated, but followed technical evaluation acceptance criteria. In accordance with the system dedication plan KF 1317/384, "System Dedication Plan for the Fairbanks Morse Engine Mixed Oxide Processing Project (FME MOX)," DRS-CCI plans for the AVR and GSC to have associated CGD plans with each component once it had reached production.

The inspectors noted the AP1000 RCP speed sensor consisted of both commercial and Appendix B sub-components and was appropriately dedicated. The technical evaluation identified three sub-component critical characteristics: checking for visual damage,

correct dimensions and proper function. Resistance and inductance, insulation resistance, and dielectric strength were functionally tested, and the completed unit was operational tested. The inspectors verified the results with the acceptance test procedure. The inspectors also reviewed the POs for the subcomponents that made up the RCP speed sensor. Each subcomponent came with certificates of compliance and material property validation when appropriate. In all cases, the receipt inspections checked the critical characteristics visually or by testing to verify each subcomponent would perform its intended function.

The inspectors evaluated the overall dedication plan for the FME EDG control cabinet, which provided technical evaluation of the system. The inspectors verified implementation by sampling multiple CGD plans for subcomponents, including a power supply assembly, analog control module, digital control module, and spare modules. In each instance the CGD plan called out the critical characteristics of each subcomponent and identified the CGD method for accepting each part. The inspectors also evaluated the CGD plans for circuit boards, power supplies, modules, and termination and cable assemblies. In these cases, the inspectors reviewed the acceptance test procedure and documentation to ensure DRS-CCI was properly dedicating each part based on its processes and procedures.

The inspectors noted Section 7, "Control of Purchased Items and Services," of DQP-OL-016 of the DRS-CCI Commercial Nuclear Quality Assurance Manual describes the requirements for supplier source evaluation and selection to validate a supplier's capability to provide items or services under procurement specifications.

The inspectors evaluated three commercial-grade surveys conducted at commercial suppliers. The inspectors noted appropriate verification of critical characteristics as part of the dedication process.

c. Conclusions

The NRC inspection team determined that DRS-CCI 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 documents reviewed, the NRC inspection team determined that DRS-CCI is effectively implementing its CGD program in support of safety-related component manufacturing. No findings of significance were identified.

6. Procurement/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 DRS-CCI 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 inspectors also selected a sample of POs, associated approved supplier list entries, and other related DRS-CCI documents for evaluation.

b. Observations and Findings

Section 4, “Procurement Document Control,” and Section 7, “Control of Purchased Items and Services,” of DQP-OL-016 of the DRS-CCI Commercial Nuclear QAM describes the processes and controls established to ensure purchased items and services meet applicable technical and quality requirements. DQP-SC-003, “Supplier Quality Assurance,” details the DRS-CCI procurement processes and qualification of approved suppliers. As required by these procedures, suppliers are evaluated during procurement and applicable requirements are passed down to DRS-CCI suppliers through purchase orders.

The inspectors confirmed that technical requirements were transferred to the relevant POs without modification or amendment and were issued to suppliers. The inspectors found that all supplier qualification was conducted as required by DRS-CCI survey or audit. The inspectors found that the lead auditor and supply chain personnel were knowledgeable of supplier control and purchasing control procedures and appropriately implemented DRS-CCI purchasing requirements for the samples inspected.

The inspectors also evaluated the supplier oversight procedures DQI-SC-013, “Supplier Audit Survey Program”; DQI-SC-051, “Brokered Part Screening Process”; DQP-SC-053, “Counterfeit Electronic Parts Control Program”; SEP-01-01-W03(I), “Common Supplier Quality Clauses”; and DQP-SP-014, “Product Inspection and Test,” which together established the processes and procedures to provide quality oversight of subsuppliers for safety-related equipment. These procedures enhanced the DRS-CCI procurement processes, adding assurances to the quality of their procured products by using industry best practices for minimizing potential counterfeit parts and adding rigor to the process of choosing suppliers when original manufacturers are not available.

Specially, the inspectors assessed the audits of and purchase orders for Zachary Nuclear Engineering Inc., Clark Testing Dynamics Lab, and Industrial Testing Labs (ITLS). Zachary provides software drawing development for DRS-CCI, and Clark and ITLS provide safety-related electromagnetic and environmental testing of equipment. The inspectors found the audits were conducted following approved checklists, followed DRS-CCI processes, and appropriately covered the scope of supply.

c. Conclusions

The NRC inspection team determined that DRS-CCI 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 DRS-CCI is effectively implementing its procurement program in support of safety-related component manufacturing. No findings of significance were identified.

7. Testing and AP1000 Equipment Qualification

a. Inspection Scope

The NRC inspection team reviewed testing policies and procedures, with emphasis on the AP1000 RCP speed sensor and the AREVA-MOX EDG control system, to determine if DRS-CCI's controls were in compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. In addition, the inspectors interviewed RCP speed sensor final acceptance test (FAT) personnel and EDG PIµs-32 cabinet test personnel. The inspectors compared testing observations to the related procedures and reviewed final assembly and test documentation to verify appropriate program implementation.

Additionally, the inspectors reviewed Westinghouse procurement documents to determine if design-basis parameters for AP1000 RCP speed sensor equipment qualification (EQ) were appropriately translated into applicable DRS-CCI EQ test and analysis in support of Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) closure.

b. Observations and Findings

The NRC inspection team learned that DRS-CCI had previously completed various EQ activities (both inhouse and subcontracted), but that Westinghouse had not contracted with DRS-CCI for RCP speed sensor EQ activities. Westinghouse did purchase RCP speed sensor design engineering, plus prototype, qualification, and production units for both foreign and domestic clients. As a result, the inspection team was unable to assess DRS-CCI EQ activities in support of AP1000 ITAAC closure.

The inspectors learned the EDG PIµs-32 qualification cabinet was scheduled for full power testing during the NRC inspection before shipment to a subcontractor for further EQ testing. The inspectors observed inprocess EDG PIµs-32 test procedure development for use later in the EQ process, plus evaluated work orders, assembly documentation, and process instructions for the qualification cabinet. Because of unexpected delays in the preparation of the cabinet for full power testing, the inspectors were unable to observe actual testing, but found the reviewed documentation met requirements.

No other inprocess test activities for the RCP speed sensor or EDG control system were planned during the NRC inspection period, so the inspectors requested test personnel to walkthrough selected portions of the RCP speed sensor FAT while using applicable procedures and test equipment. The inspectors evaluated a sample of two complete RCP speed sensor FAT documentation packages while discussing FAT procedures with test personnel.

The inspectors noted that test personnel referred to various M&TE during the FAT walkthrough, they were knowledgeable about the proper use and configuration of each instrument, and the equipment displayed a current calibration sticker. The inspectors found that the test personnel understood and followed the FAT procedures, and related documentation was complete and approved.

c. Conclusions

The NRC inspection team determined that DRS-CCI 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 inspectors determined that DRS-CCI is effectively implementing these control processes in support of safety-related component manufacturing. No findings of significance were identified.

8. 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 RCP speed sensor and the AREVA-MOX EDG control system 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 DRS-CCI management and technical staff.

b. Observations and Findings

Nonconformance Program

DRS-CCI informed the NRC inspection team that they have not issued any nonconformance reports associated with any safety-related components related to the AP1000 RCP speed sensor or the AREVA-MOX EDG control system at the time of this inspection. However, the inspectors selected a sample of other nonconformance reports to verify items are reviewed and evaluated in accordance with DRS-CCI QA manual and procedures. The NRC inspection team verified that, for the sample of nonconformance reports reviewed, DRS-CCI had (1) dispositioned the nonconformance reports it identified in accordance with DRS-CCI 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.

Corrective Action Program

The inspectors evaluated corrective actions to verify that items are reviewed and dispositioned consistent with DRS-CCI implementing procedures. Specifically, the NRC inspection team sampled corrective action reports classified as conditions adverse to quality in which a root cause evaluation was required by DQP-SP-034, "Corrective Action Process." The inspectors noted that the root cause reports had adequate causes and actions, and contained a development plan to prevent reoccurrence. In addition, the inspectors verified that DRS-CCI implemented a trending program to monitor component performance and to ensure effective corrective actions were implemented.

c. Conclusions

The NRC inspectors determined that DRS-CCI corrective action program requirements and implementation 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, DRS-CCI 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.

9. Audits

a. Inspection Scope

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

b. Observations and Findings

DRS-CCI procedure DQP-SP-033, "Internal Audit Program," describes its audit program and gives guidelines and a general overview of the performance of internal audits. A DRS-CCI quality engineer tracks all audits conducted to ensure they are being conducted periodically for each standard and regulation committed to by the DRS-CCI quality program, including Appendix B to 10 CFR Part 50. Each audit is to be conducted following an audit checklist approved by QA, and performed by a qualified lead auditor. The inspectors noted the Appendix B areas covered in each audit are specified in the audit checklist, thoroughly covered, and tracked by the quality engineer, so that DRS-CCI can ensure that all 18 criteria of Appendix B are covered each year. The inspectors evaluated multiple audits and verified each criterion was met on an annual basis for the past year. The inspectors also verified that previous audits conducted were complete and checked against the audit scheduling tool to ensure all criteria were met each year. The inspectors verified the audits were successfully completed with all discrepancies noted and tracked, and with adequate documentation to justify the audit completion. The inspectors noted that some audits were conducted by a contracted auditor, Global Quality Assurance. The audit record included qualifications of the contracted auditors in accordance with DRS-CCI procedures.

The auditor and lead auditor qualifications are described in DRS-CCI procedure DQI-SP-044, "Qualification/Certification of Audit Personnel." The DRS-CCI auditor qualifications are to follow the ANSI 45.2.23 guidance for auditor qualifications. Each lead auditor and auditor qualification is to be tracked on a record, which is maintained by a quality engineer. The inspectors evaluated all of the lead auditor and auditor qualifications records of DRS-CCI, which also included the audits performed annually by each auditor to maintain qualification. Audit records were also evaluated for two previous employees who led audits over the previous 2 years. All qualifications were

appropriately recorded and met the DRS-CCI procedural requirements and the guidelines of ANSI 45.2.23.

c. Conclusions

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

10. Entrance and Exit Meetings

On January 28, 2013, the inspectors presented the inspection scope during an entrance meeting with Mr. Jeff Armstrong, DRS-CCI Vice President–General Manager, and other DRS-CCI personnel. On February 1, 2013, the inspectors presented the inspection results during an exit meeting with Mr. Armstrong and other DRS-CCI personnel.

ATTACHMENT

1. Persons Contacted and NRC Staff Involved:

Name	Title	Affiliation	Entrance	Exit	Interviewed
J. Armstrong	Vice President – General Manager	DRS -CCI	X	X	
B. Gilmartin	Director of Quality Assurance	DRS -CCI	X	X	X
G. Disbrow	Senior Program Manager	DRS -CCI	X	X	X
S. Zucaro	Vice President - Engineering	DRS -CCI	X		
S. Butler	Director of Contracts	DRS -CCI	X		
P. Lemon	Vice President Supply Chain	DRS -CCI	X		
K. Doyon	Operations Director	DRS -CCI	X	X	
B. Tomlinson	Manager Supplier Quality	DRS -CCI			X
S. Narciso	Shipping Manager	DRS -CCI			X
R. Mosca	Senior Quality Engineer	DRS -CCI	X		X
K. Owens	Senior Quality Engineer	DRS -CCI	X	X	X
D. Kulp	System Engineer	DRS -CCI	X	X	X
W. Kulas	Senior Quality Engineer	DRS -CCI	X	X	X
P. Stankiewicz	System Engineer	DRS -CCI	X	X	X
F. DeCarlo	Mechanical engineer	DRS -CCI	X	X	X
W. Jaroszynski	Quality Engineer	DRS -CCI	X		
E. Mathew	Software Quality Engineer	DRS -CCI	X		
C. Lucaci	In-process Inspector	DRS -CCI			X
A. Zganiacz	Electrical Engineer	DRS -CCI			X
R. Shea	Test Engineer	DRS -CCI			X
R. Patel	Technician 1	DRS -CCI			X
P. Jasinski	In-process Inspector	DRS -CCI			X
C. Anderson	In-process Inspector	DRS -CCI			X
D. Sheldon	Technician	DRS -CCI			X

Name	Title	Affiliation	Entrance	Exit	Interviewed
S. Lydem	Manufacturing Specialist	DRS -CCI			X
R. Rasmussen	Branch Chief, CEVB	NRC		X	
G. Lipscomb	Inspection Team Lead	NRC	X	X	
L. Dumont	Inspection Team Member	NRC	X	X	
S. Edmonds	Inspection Team Member	NRC	X	X	
D. Bollock	Inspection Team Member	NRC	X	X	
E. Martinez	Inspection Team Member	NRC	X	X	
K. Mott	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 10CFR Part 21 and Programs for Reporting Defects and Noncompliance"

3. Items Opened, Closed, And Discussed:

Item Number	Status	Type	Description
99901417/2013-201-01	Opened	NON	App. B, Criterion III

4. Documents Reviewed:

10 CFR Part 21 Documents

10 CFR Part 21 Evaluation, "Omission of the cabinet Modification Data sheets," initiated January 16, 2012

10CFR 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

DQP-OL-016, "Commercial Nuclear Quality Assurance Manual," Revision 1, June 4, 2012

DQI-PD-010, “Manufacturing and Inspection Processes Directory,” Revision 2, November 23, 2009

DQI-PD-032, “Manufacturing and Inspection Production Process Control,” Revision 7, undated

DQP-PD-054, “Product Identification and Traceability, “Revision 2, August 18, 2011

DQI-SP-003, “Product Inspection Instruction,” Revision 4, March 25, 2009

DQP-SP-013, “Inspection and Test Personnel Training Procedure,” Revision 2, December 10, 2011

DQP-SP-014, “Product Inspection and Test,” Revision 1, August 29, 2011

DQP-SP-048 “10 CFR Part 21 Evaluation and Reporting,” Revision 3, undated

DQP-SP-034 “Corrective Actions,” Revision 1, December 03, 2011

DQP-SP-035 “Corrective/Noncompliance and Preventative Actions processing in TI PQA” Revision 2, August 26, 2011

DQP-SP-060 “DRS Continuous Improvement,” Revision 1, August 26, 2011

DQP-SP-053 “DRS Commitment Tracker,” Revision 0, October 09, 2009

DQP-SP-052 “DRS Non Conformance Procedure,” Revision 3

DQP-OL-021, “Engineering Training Plan,” Revision 0, undated

DQP-SP-032AA, “Quality Assurance Record of Inspection and Test Personnel Qualification/Certification,” for Patricia Jasinski, June 12, 2012

DQP-SP-032BB, “Annual Inspector/Tester Record of Proficiency,” for Patricia Jasinski, undated

AP-11.1, “Test Control,” Revision E, December 6, 2006

DQP-SC-007, “Dedication of Commercial Grade Items,” Revision 0, February 18, 2010

DQP-SC-003, “Supplier Quality Assurance,” Revision 0, February 18, 2010

DQI-SC-013, “Supplier Audit Survey Program,” Revision 0, February 11, 2010

DQI-SP-044, “Qualification/Certification of Audit Personnel,” Revision 0, February 9, 2009

DQP-SP-033, “Internal Audit Program,” Revision 1, May 14, 2012

DQI-SC-051, “Brokered Part Screening Process,” Revision 0, May 2, 2011

DQP-SC-053, “Counterfeit Electronic Parts Control Program,” Revision 0, November 28, 2012

DQI-SP-044A, “Record of Auditor Qualification/Certification,” Revision 0, March 18, 2009

DQI-SP-044A, “Record of Auditor Qualification/Certification,” Revision 2, December 19, 2012

SEP-01-01-W03(I), “Common Supplier Quality Clauses,” Revision B, April 24, 2012

SEP-10-02-DBy(M), “Procedure for document / Part identification & Release – Danbury,” Revision C, December, 2012

SEP-04-01M, “Process for Product Development”, Revision B, undated

DC-013269, “Wire Stripping Procedure,” Revision B, July 23, 2012

QP-4500388070, “Quality Plan for Westinghouse AP1000 Reactor Coolant Pump Speed Sensor & Phase Reference JE62 &J E40,” Revision 1, April 25, 2012

DQI-SP-010, “Swaging – eyelets, Rivets, Terminals),” Revision 0, July /23, 2012

DQP-SP-351, “DRS-CCI Record and Retention Policy,” Revision 3, undated

Software Procedures and Documents

AP-3.2, “Software Design Process,” Revision F

ER7357/20, “Plus 32 System Topical Report,” Revision D, December 20, 2011

ER7357/70, “Commercial Generic Software and Hardware Test Plan,” Revision B, June 25, 2012

ER7357/63, “Software Verification And Validation Plan For Commercial Nuclear Applications,” Revision B

ER7357/64, “Software Quality Assurance Plan For Commercial Nuclear Applications,“ Revision B

ER7357/65, “Software Configuration Management Plan For Commercial Nuclear Applications,” Revision A

ER7357/66, “Software Development Plan For Applications In Commercial Nuclear Plants,” Revision A

ER7357/69, “Software Safety Plan For Commercial Nuclear Applications,” Revision A

SC-013919/01, “Design Basis Specification for EDG AVR,” Revision B

SC-013919/02, “Design Basis Specification for EDG GSC,” Revision B

SC-013919/04, “Bi-Directional Traceability Matrix for MOX EDG Control System (BDTM),” Revision A

SC-013919/06, “SRS/SDD for EDG Automatic Voltage Regulator (AVR),” Revision B

SC-013919/07, “SRS/SDD for EDG Governor Speed Control (GSC),” Revision B

SC-013919/09, “Statement of Work for Functional Interconnect Diagram Development for EDG Controls,” Revision B

SC-013919/14, “S/W V&V Phase Summary Report for EDG Speed Control,” Revision B

SC-013919/15, “S/W V&V Phase Summary Report for EDG Automatic Voltage Regulator,” Revision B

SC-014058, “System Architecture Drawing FME/MOX EDG Control,” Revision B

Work Product Review Form (WPRF) Document No.T-DOC00037, “Peer Review Form for the Software Req. Spec. and Software Design Description for the Emergency Diesel Generator Governor Speed Control,” May 31, 2011

Omnify Software Product Lifecycle Management Solutions Database Storage System for AREVA-MOX EDG Control System Project Defect Logs (on-line database), accessed January 31, 2013.

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

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

Assembly/Test Records

“W/O JBF126750,” P/N 9C300-QUAL, December 10, 2012

"Discrete Job Traveler/Record," P/N 9C300-QUAL, in-process (undated)

"Discrete Job Traveler/Record," P/N 16-ADU365-01, Revision B1, in-process (undated)

"Discrete Job Traveler Job # JJN39219," P/N DC-012138-02, Revision B, in-process (undated)

"Discrete Job Traveler Job # JJN39099," P/N 43N3-02, Revision H, in-process (undated)

"Final Cabinet Assembly Document," P/N 9C300-QUAL, November 16, 2012

DWG No. 9C300, "Plus 32 Control Cabinet Logic/Termination," Revision A, undated

WL9C300-05, "Wire List for Cabinet Assembly 9C300-05," Revision C, undated

"Acceptance Test / Calibration Data for JJN 39099, P/N 43N3-02," Serial # C01029, December 14, 2012

"Acceptance Test / Calibration Data for JJN 39099, P/N 43N3-02," Serial # C01031, December 14, 2012

Procurement Documents

Westinghouse PO No. 4500296766 to DRS CCI for AP1000 Reactor Coolant Pump Speed/Phase Reference Sensors, original and revisions 1-7, March 12, 2009

Westinghouse PO No. 4500388070 to DRS CCI for AP1000 Reactor Coolant Pump Speed/Phase Reference Sensors – Southern – Vogtle Units 3 and 4, April 27, 2011

Westinghouse PO No. 4500388073 to DRS CCI for AP1000 Reactor Coolant Pump Speed/Phase Reference Sensors – SCANA - Summer Units 2 and 3, April 27, 2011

Westinghouse APP-JE62-Z0-002, "Qualification Specification for Reactor Coolant Pump Speed/Phase Reference Sensor," Revision B, April 2010

Fairbanks Morse Engine PO No. 1117365 to DRS CCI for AREVA-MOX Emergency Diesel Generator Control System, Revision 2, August 18, 2011

Non-conformance / 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 03, 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 09, 2012

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

Design Documents

APP-JE62-Z0-001, “General Design Specification for reactor Coolant Pump Speed / Phase reference Sensor,” Revision 3, undated

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

APP-JE62-Z5-004, “Project Management and Administrative Purchase Agreement Requirements for Speed Sensors and Phase Reference Sensors,” Revision 2, undated

APP-JE62-Z5-003, “Appendix 3 Technical Requirements for Speed Sensors and Phase Reference Sensors,” Revision 2, October 26, 2011

KBW 2315/27, “ATP Power Supply Assembly 8N76,” Revision A, October 9, 2003

KBK 2361/2, “Printed Wiring Board Analog Control,” Revision A, August 25, 2000

KBK 2361/1, “Printed Wiring Board- Digital Control,” Revision A, April, 17, 2000

Design Drawings

43N3, “Pump Speed Sensor,” Revision H

DC-012138, “Magnet Assembly,” Revision D

DC-012317, “Coil End and Magnet Assembly,” Revision C

Fairbanks Morse Engine Drawing No. 11879051, “Quality Assurance Requirements Shaw MOX 700043,” Revision 2, March 31, 2011

Fairbanks Morse Engine Drawing No. 13 002 245, “Emergency Engine-Generator Control Specification Areva Shaw MOX 700043,” Revision 2, May 13, 2011

Fairbanks Morse Engine Drawing No. 13 002 246, “Emergency Engine-Generator Governor Speed Control Specification Areva Shaw MOX 700043,” Revision 3, March 31, 2011

Fairbanks Morse Engine Drawing No. 13 002 247, “Emergency Engine-Generator Voltage Regulator Specification Areva Shaw MOX 700043,” Revision 3, March 31, 2011

Fairbanks Morse Engine Technical Requirements No.BF5630, “Nuclear Safety Related Procurement Requirements,” undated

Commercial Grade Dedication Documents

KF 1317/384, “System Dedication Plan for the Fairbanks Morse Engine Mixed Oxide Processing Project (FME MOX),” Revision C, November 6, 2012

KF 1317/384-09, “Commercial Grade Dedication Plan for Power Supply Assembly, 8N76-1,” Revision A, September 10, 2012

KF 1317/395, “AP1000 RCP Speed/Phase Reference Sensor Technical Evaluation,” Revision C, December 11, 2012

KF 1317/395-01, “Commercial Grade Dedication Plan for 43N3-02 RCP Speed Sensor,” Revision C, December 11, 2012

DC-012438, “Acceptance Test Procedure for 43N3-01 and 43N3-02 Phase Reference and Pump Speed Sensor,” Revision 0, April 30, 2012

KF 1317/384-03, “Commercial Grade Dedication Plan for Analog Control Module (ACM, 6N765-1,” Revision A, September 10, 2012

KBW 2315/22, “Acceptance Test Procedure for Modules 6N754-1,-2,-3, 6N756-1, 6N757-1,-2, 6N760-1, 6N761-1, 6N762-1, 6N763-1, 6N765-1, 6N766-1, 6N768-1, 6N769-1, 6N770-1 for DRS Consolidated Controls, INC,” Revision G, November 18, 2011

KBW 2315/61, “Acceptance Test Procedure for Spare Module Testing,” Revision G, July 17, 2012

KF 1317/384-01, “Commercial Grade Dedication Plan for Digital Control Module (DCM1), 6N760-1,” Revision A, September 10, 2012

KF 1317/384-02, “Commercial Grade Dedication Plan for Digital Control Module (DCM3), 6N762-1,” Revision A, September 10, 2012

Qualified Supplier List, electronically controlled, accessed January 30, 2013

Commercial Grade Survey Reports

Audit No. SAN 2011-006 for Kimchuk Inc, dated November 15, 2011

Audit No. SA 2009-07 for Target, dated November 5, 2009

Audit No. SAN 2012-03 for Dayton T Brown, dated February 29, 2012

Audits-Internal

Audit No. P237, dated November 27, 2012

Audit No. P236, dated October 29, 2012

Audit No. P233, dated November 27, 2012

Audit No. P238, dated December 19, 2012

Audit No. P239, dated December 18, 2012

Audit No. P242, dated November 29, 2012

Audits-External

Audit No. SAN 2012-01 for Industrial Testing Labs (ITLS), dated March 9, 2012

Audit No. SAN 2012-02 for Clark Testing labs, dated March 22, 2012

Audit No. SAN 2011-01 for Zachary Nuclear Engineering Inc., dated June 25, 2011

Lead auditor qualification record DQI-SP-044A, Rev 0

L. Belanger, April 16, 2012

D. Arpie, April 16, 2012

R. Evanko, April 16, 2012

W. Kulas, April 16, 2012

R. Mosca, April 16, 2012

K. Owens, April 16, 2012

J. Powers, April 16, 2012

Miscellaneous Documents

"Skills Matrix," for R. Patel, on-line record, reviewed January 30, 2013

19817, "Progress Energy NUPIC Audit of DRS," Revision 1, April 22, 2008

8856-DRS-2967, "DRS letter to GE regarding Lungmen Issues," January 20, 2012

8856-DRS-2987, "Notification made to GE/Taiwan Power Company (Lungmen)," initiated April 06, 2012

8856-DRS-3028, "Notification letter to GE/Lungmen about the network configuration anomaly," initiated August 6, 2012

LTO-00998, "FDDR/GE Field deviation Disposition," Revision 0, September 20, 2012

LTO-00586, "FDDR/NIM & CIMPFD," Revision 0, July 16, 2011

LTI-05237, "FDDR/NIM & CIMPFD" Revision 0, July 19, 2011

DC-012710, "Packaging, Packing and storage Procedure for 43N3 Commercial Pump Speed Sensors," Revision D, July 24, 2012

5. ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
AVR	Automatic Voltage Regulator
BDTM	Bi-Directional Traceability Matrix
CCI	Consolidated Controls, Inc.
CEVB	Electrical Vendor Branch
CFR	*Code of Federal Regulations*
CGD	Commercial-Grade Dedication
CNQA	Commercial Nuclear Quality Assurance
DCIP	Division of Construction Inspection and Operational Programs
DCS	Distributed Control System
EDG	Emergency Diesel Generator
EQ	Equipment Qualification
FAT	Final Acceptance Test
FME	Fairbanks Morse Engine
GSC	Governor Speed Control
IEEE	Institute of Electrical and Electronics Engineers
IP	Inspection Procedure
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
IV&V	Independent Verification and Validation
MFFF	Mixed Oxide Fuel Fabricating Facility
MOX	Mixed Oxide
M&TE	Measuring and Test Equipment
NON	Notice of Nonconformance
NQA	Nuclear quality assurance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PI	Process instruction
P/N	Part number
PO	Purchase Order
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
RCP	Reactor coolant pump
SDD	Software design description
SDP	Software development plan
SDPCNP	Software Development Plan for Commercial Nuclear Plants
SLC	Software lifecycle
SQAP	Software quality assurance plan
SRS	System requirements specification
SV&V	Software verification and validation
SVVP	Software verification and validation plan
U.S.	United States (of America)
V&V	Verification and Validation
W/O	Work order
WPRF	Work Product Review Form