December 4, 2009

Mr. Stewart Shannon, Director
Performance and Quality Improvement
Curtiss Wright Flow Control Company,
Electro-Mechanical Division (EMD)
1000 Wright Way
Cheswick, PA 15024

SUBJECT: NRC INSPECTION REPORT NO. 99901383/2009-201, NOTICE OF VIOLATION, AND NOTICE OF NONCONFORMANCE

Dear Mr. Shannon:

On October 19-23, 2009, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Curtiss Wright Flow Control Company, Electro-Mechanical Division (hereafter referred to as Curtiss Wright-EMD) facility in Cheswick, PA. The purpose of the inspection was to perform a limited scope inspection to assess Curtiss Wright-EMD compliance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The enclosed report presents the results of this inspection. This inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC staff determined that a violation of NRC requirements occurred. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The violation in the Notice is being cited because Curtiss Wright-EMD did not provide adequate procedural guidance to evaluate deviations and failures to comply associated with substantial safety hazards consistent with the requirements of 10 CFR Part 21.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

During this inspection, NRC inspectors also found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers. Specifically, the NRC inspection team determined that Curtiss Wright-EMD was not implementing its design control process consistent with regulatory requirements or the Curtiss Wright-EMD QA Program Manual (QAPM). 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 Public Document Room or from the NRC's document system (ADAMS), accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response, (if applicable), 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,

/RA/

Juan Peralta, Chief
Quality and Vendor Branch 1
Division of Construction Inspection
& Operational Programs
Office of New Reactors

Docket No. 99901383

Enclosures:
1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report No. 99901383/2009-201

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 Public Document Room or from the NRC's document system (ADAMS), accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response, (if applicable), 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,

/RA/

Juan Peralta, Chief
Quality and Vendor Branch 1
Division of Construction Inspection
& Operational Programs
Office of New Reactors

Docket No. 99901383

Enclosures:
1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report No. 99901383/2009-201

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NAME	SSoto	SCrane	YWong	RPatel	KHeck
DATE	11/23/2009	11/20/2009	11/23/2009	11/19/2009	11/19/2009
OFFICE	NRO/DCIP/CQVP	NRO/DCIP/CQVP	NRO/DCIP/CCIP.CAET	NRO/DCIP/CQVP/BC	
NAME	RPrato	KKavanagh	TFrye	JPeralta	
DATE	11/23/2009	11/30/2009	11/23/2009	12/4/2009	

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NOTICE OF VIOLATION

Curtiss Wright Flow Control Company
Electro-Mechanical Division (EMD)
Cheswick, PA 15024

Docket Number 99901383
Inspection Report Number 2009-201

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Curtiss Wright Flow Control Company, Electro-Mechanical Division (Curtiss Wright-EMD) facility in Cheswick, Pennsylvania on October 19 -23, 2009, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10, Section 21.21, "Notification of Failure to Comply or Existence of a Defect and Its Evaluation," of the *Code of Federal Regulations* (CFR), paragraph 21.21(a), requires, in part, that each individual, corporation, partnership, or other entity subject to 10 CFR Part 21 shall adopt appropriate procedures to evaluate deviations and failures to comply associated with substantial safety hazards as soon as practicable.

In part, 10 CFR 21.21(a)(1) requires that deviations and failures to comply be evaluated within 60 days of discovery in order to identify a reportable defect or failure to comply that could create a substantial safety hazard were it to remain uncorrected.

Paragraph §21.21(a)(2) requires, in part, that, if an evaluation of an identified deviation or failure to comply cannot be completed within 60 days from discovery, an interim report is prepared and submitted to the Commission through the director or responsible officer in writing within 60 days of discovery of the deviation or failure to comply.

Paragraph §21.21(a)(3) requires, in part, that a director or responsible officer be informed as soon as practicable, and, in all cases, within the five working days after completion of the evaluation if the manufacture, construction, or operation of a facility or activity, or a basic component supplied for such a facility or activity (i) fails to comply with the Atomic Energy Act of 1954, as amended, or (ii) contains a defect.

Paragraph §21.21(b) requires, in part, that if a deviation or failure to comply is discovered by a supplier of basic components and the supplier determines that it does not have the capability to perform the evaluation to determine if a defect exists, then the supplier must inform the purchasers or affected licensees within five working days of this determination.

Paragraph §21.21(d)(3)(i) requires, in part, an initial notification by facsimile to NRC Operations Center or by telephone within two days following receipt of information by the director or responsible officer on the identification of a defect or a failure to comply.

Paragraph §21.21(d)(3)(ii) requires, in part, a written notification to the NRC within 30 days following receipt of information by the director or responsible corporate officer on the identification of a defect or a failure to comply.

Contrary to the above, as of October 23, 2009, Curtiss Wright-EMD's 10 CFR Part 21, implementing procedure IDPQ02, "Identification and Reporting of Conditions Adverse to Safety Per 10 CFR Part 21" did not provide procedural guidance for: 1) evaluating deviations and failures to comply associated with substantial safety hazards within 60 days of discovery; 2) submitting an interim report to the NRC if an evaluation of an

identified deviation or failure to comply cannot be completed within 60 days of discovery; 3) notifying the Curtiss Wright-EMD responsible officer within five days when it is determined that a defect that could cause a substantial safety hazard exists; 4) notifying the affected purchasers or licensees if Curtiss Wright-EMD does not have the capability to perform the evaluation to determine if a defect exists; and 5) notifying the NRC of defects and failures to comply (i.e., initial and written notification).

In addition, Curtiss Wright-EMD failed to make an interim report regarding a Part 21 evaluation that was ongoing for more than 60 days after discovery.

These issues have been identified as Violation 99901383/2009-201-01.

This is a Severity Level IV Violation (Supplement VII).

Pursuant to the provisions of 10 CFR 2.201, "Notice of Violation," Curtiss Wright-EMD is hereby required to submit 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, Quality and Vendor Branch 1, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Violation. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, accessible 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, "Requirements for the Protection of Safeguards Information."

Dated this the 4th day of December 2009.

NOTICE OF NONCONFORMANCE

Curtiss Wright Flow Control Company
Electro-Mechanical Division (EMD)
Cheswick, PA 15024

Docket Number 99901383
Inspection Report Number 2009-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Curtiss Wright Flow Control Company, Electro-Mechanical Division (Curtiss Wright-EMD) facility in Cheswick, Pennsylvania on October 19 -23, 2009, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Curtiss Wright-EMD by NRC licensees:

A. Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR Part 50), "Domestic Licensing of Production and Utilization Facilities," states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in appropriate design documents.

   Curtiss Wright-EMD, "Quality Assurance Program Manual" (QAPM), Section 3.3, "Design Specification," states, in part, that the design specification shall include all information required by NCA-3252 and is to be reviewed and approved by Performance & Quality Improvement (PQI) and other functional departments, as applicable. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1998 Edition, Section III, Division 1, NCA-3252, "Content of Design Specifications," states, in part, that the Design Specification shall contain sufficient detail to provide a complete basis for Division 1 construction. NCA-3252 further states that *[a]ll Design Specifications shall include items (1) through (7) below:*

   > *(1) the functions and boundaries of the items covered (NCA-3254);*
   > *(2) the design requirements [NCA-2110(a) and (b) and NCA-2140] including all required overpressure protection requirements [NCA-3220(m)];*
   > *(3) the environmental conditions, including radiation;*
   > *(4) the Code classification of the items covered (NCA-2000);*
   > *(5) material requirements including impact test requirements;*
   > *(6) when operability of a component is a requirement, the Design Specification shall make reference to other appropriate documents which specify the operating requirements;*
   > *(7) the effective Code Edition, Addenda, and Code Cases to be used for construction.*

   Contrary to the above, Curtiss Wright-EMD Design Specification DS10031, "AP1000 Reactor Coolant Pump External Heat Exchanger Design Specification," Revision 0, did not include 1) references to the design bases (NCA-2140, Design Bases) or 2) reference to other appropriate documents which specify any additional operating requirements (NCA-3252(a)(6)) for the external heat exchanger design.

   These issues are identified as Nonconformance 99901383/2009-201-02.

B. Criterion III of Appendix B to 10 CFR Part 50 states, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by performance of design reviews or by the use of alternate or simplified calculational methods.

Curtiss Wright-EMD QAPM, Section 3.5.1 "Design Reviews," states that "Design reviews are to verify that designs meet the functional requirements, contractual requirements, and industry codes and standards which are specified in the design specification. To do this, the design review committee reviews drawings, specifications and analyses, and any other documentation which substantiates that the design meets the applied requirements." In addition, Curtiss Wright-EMD implementing procedure, IDPE22, "Checking Design Calculations and Design Verification," requires that the design review chairperson and lead engineer perform the applicable design reviews and sign and date each action item chit form to document their review of the technical content.

Contrary to the above, 121 design review action item chit forms, related to the AP1000 reactor coolant pump (RCP) flywheel and AP1000 RCP pressure boundary components and seismic analysis design reports, did not document that the applicable design reviews had been performed since they had not been signed and dated by the chairperson or lead engineer.

This issue is identified as Nonconformance 99901383/2009-201-03.

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, Quality and Vendor Branch 1, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformances. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid noncompliance; and (4) the date when your corrective action will be completed. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC'S Agencywide Documents Access and Management System, which is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Dated this the 4th day of December 2009.

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

Docket No.:	99901383
Report No.:	99901383/2009-201
Vendor:	Curtiss Wright Flow Control Company, Electro-Mechanical Division (EMD) 1000 Wright Way Cheswick, PA 15024
Vendor Contact:	Mr. Stewart Shannon, Director Performance and Quality Improvement (724) 275-5671 E-mail: sshannon@curtisswright.com
Nuclear Industry Activities:	Curtiss Wright Flow Control Company is a supplier of safety-related and commercial-grade components and services to nuclear utilities, the U.S. Navy, and power plant equipment manufacturers throughout the world.
Inspection Dates:	October 19-23, 2009
Inspectors:	Kerri Kavanagh — NRO/DCIP/CQVA, Team Leader Robert Prato — NRO/DCIP/CQVA Kenneth Heck — NRO/DCIP/CQVA Raju Patel — NRO/DCIP/CQVA Samantha Crane — NRO/DCIP/CQVA Soly Soto — NRO/DCIP/CQVA Yuken Wong — NRO/DE/EMB2
Approved by:	Juan Peralta, Chief Quality and Vendor Branch A Division of Construction Inspection & Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

Curtiss Wright Flow Control Company
99901383/2009-201

The purpose of this inspection was to verify that Curtiss Wright Flow Control Company, Electro-Mechanical Division (Curtiss Wright-EMD) implemented an adequate quality assurance (QA) program that complied 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." The inspection also verified that Curtiss Wright-EMD implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance" (hereafter referred to as 10 CFR Part 21), that met the regulatory requirements of the U.S. Nuclear Regulatory Commission (NRC). The inspection was conducted at the Curtiss Wright-EMD facility in Cheswick, Pennsylvania, during the period October 19-23, 2009.

The following served as the bases for the NRC inspection:

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

The NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," and IP 36100, "Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Nonconformance," during the conduct of this inspection.

The NRC had not previously performed an inspection at the Curtiss Wright-EMD facility in Cheswick, PA. The results of this inspection are summarized below.

With the exception of one violation and two nonconformances described below, the NRC inspection team concluded that the Curtiss Wright-EMD QA policies and procedures complied with the applicable requirements of 10 CFR Part 21 and Appendix B to 10 CFR Part 50. The NRC inspection team further concluded that Curtiss Wright-EMD personnel were implementing these policies and procedures effectively.

10 CFR Part 21

The NRC inspection team identified Violation 99901383/2009-201-01 involving multiple examples of Curtiss Wright-EMD's failure to meet the requirements of 10 CFR Part 21. The specifics of the violation are documented in the Notice of Violation and are described below in the body of this report. The NRC cited the violation because Curtiss Wright-EMD did not provide adequate procedural guidance to evaluate deviations and failures to comply associated with substantial safety hazards, and failed to make an interim report regarding a Part 21 evaluation that was ongoing for more than 60 days.

Training and Qualification of Personnel

The NRC inspection team concluded that the training and qualification of Curtiss Wright-EMD personnel conform to the regulatory requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team concluded that Curtiss Wright-EMD's staff has been effectively implementing the Curtiss Wright-EMD Quality

Assurance Program Manual (QAPM), and associated implementing procedures for training and qualification of personnel. The NRC inspection team did not identify any significant findings.

Design Control

The NRC inspection team identified two nonconformances associated with Curtiss Wright-EMD's failure to meet the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901383/2009-201-02 identifies Curtiss Wright-EMD's failure to reference the design bases and other appropriate documents which specify operating requirements in the reactor coolant pump external heat exchanger design specification. Nonconformance 99901383/2009-201-03 identifies Curtiss Wright-EMD's failure to provide documented evidence that the technical review activities required by their design review process had been performed. With the exception of these issues, the NRC inspection team concluded that Curtiss Wright-EMD's design control process conforms to regulatory requirements and has been implemented in accordance with the applicable Curtiss Wright-EMD policies and procedures.

Document Control

The NRC inspection team concluded that Curtiss Wright-EMD's document control activities conform to the regulatory requirements of Criterion VI, "Document Control," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively implementing the Quality Program Manual (QPM), QAPM and the associated implementing procedures for document control. The NRC inspection team did not identify any significant findings.

Control of Purchased Material, Equipment, and Services and Audits

The NRC inspection team concluded that the external and internal audits performed by Curtiss Wright-EMD conform to the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively implementing the Curtiss Wright-EMD QPM and associated implementing procedures for external and internal audits. The NRC inspection team did not identify any significant findings.

Control of Special Processes

The NRC inspection team concluded that Curtiss Wright-EMD's controls of special processes conform to the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively implementing the QPM, QAPM and the associated implementing procedures for the control of special processes. The NRC inspection team did not identify any significant findings.

Test Control

The NRC inspection team concluded that Curtiss Wright-EMD's test controls conform to the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively

implementing the QPM, QAPM and the associated implementing procedures for test control. The NRC inspection team did not identify any significant findings.

Nonconforming Materials, Parts, or Components

The NRC inspection team concluded that Curtiss Wright-EMD's controls of nonconforming materials, parts, and components conform to the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively implementing the Curtiss Wright-EMD QPM and associated implementing procedures for nonconforming materials, parts, or components. The NRC inspection team did not identify any significant findings.

Corrective Action

The NRC inspection team concluded that Curtiss Wright-EMD's corrective action program conforms to the regulatory requirements of Criterion XVI, "Corrective Actions," of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's staff has been effectively implementing the Curtiss Wright-EMD QAPM and the associated implementing procedures for its corrective action process. The NRC inspection team did not identify any significant findings.

REPORT DETAILS

1. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD's policies and implementing policy and procedures that govern the 10 CFR Part 21 (Part 21) process to verify compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." In addition, the NRC inspection team evaluated a sample of Curtiss Wright-EMD's purchase orders (POs) for compliance with the requirements of 10 CFR 21.31, "Procurement Documents," reviewed two Part 21 evaluations, and reviewed Curtiss Wright-EMD's implementation of posting requirements in accordance with 10 CFR 21.6, "Posting Requirements." Specifically, the NRC inspection team reviewed the following Curtiss Wright-EMD policies, procedures, and supporting documentation:

- QPM, "Quality Program Manual," Revision 8, dated April 16, 2009
- IDPQ02, "Identification and Reporting of Conditions Adverse to Safety Per 10CFR21," Revision 6, Effective Date 02/27/2007
- IDPQ18, "Significant Quality Problem Investigation and Resolution," Revision 3, dated July 31, 2009
- Curtiss Wright Corporate Policy No. 5, "Record Retention Policy and Schedules"
- PAI304 and IDPA14, Curtiss Wright-EMD's records management procedures
- Recent Part 21 Training slides on a draft revision of the Part 21 procedure, IDPQ02, and applicable training records from 07/23/2009 through 09/11/2009
- Part 21 Report regarding AP1000 RCP SN001 shortened coast-down time and speed sensor failure, dated 10/16/2009
- Part 21 Report regarding the No 1 Seal Housing for Cartridge Seals RTD plug fillet weld code compliance, dated 09/29/2008
- CAR-2009-00315 and 00316 regarding 10CFR Part 21 procedural deficiencies both dated 09/23/2009
- PO No. 452607, Change Notice 1: Atlas Castings and Technology – Impeller Casting, dated October 12, 2009
- PO No. 453078: Nova Machine Products Co. – Hex Nuts, dated October 5, 2009
- PO No. 453283: Patriot Forge Inc. – Radial Bearing Cartridge, Rough Turned, dated October 12, 2009

b. Observations and Findings

b.1 Postings

The NRC inspection team observed that Curtiss Wright-EMD had posted a notice in bulletin boards at the two main entryways. Each posting included a copy of Section 206 of the Energy Reorganization Act of 1974, as amended; a copy of 10 CFR Part 21; and a reference to IDPQ02, "Identification and Reporting of Conditions Adverse to Safety Per 10CFR21" and where the implementing procedure may be examined.

b.2 10 CFR Part 21 Procedure

The NRC inspection team reviewed the QPM, and implementing procedure IDPQ02. IDPQ02 outlines the responsibilities to identify, control, document, and resolve conditions used for reporting of deviations and failures to comply discovered at the Curtiss Wright-EMD facility. During its review of the procedure, the NRC inspection team determined that IDPQ02 did not contain sufficient guidance to ensure adequate implementation of 10 CFR Part 21 requirements. More specifically, the NRC inspection team identified the following procedural deficiencies:

- IDPQ02 did not provide instructions to identify deviations and failures to comply associated with substantial safety hazards as soon as practicable and in all cases, except as provided under 10 CFR 21.21(a)(2), within 60 days of discovery

- IDPQ02 did not provide instructions to ensure that if an evaluation of an identified deviation or failure to comply potentially associated with a substantial safety hazard cannot be completed within 60 days from the discovery of a deviation or failure to comply, an interim report is prepared and submitted to the Commission

- IDPQ02 did not provide instructions to ensure that a director or responsible officer subject to the regulations of this part is informed as soon as practicable and, in all cases, within the five working days after completion of the evaluation

- IDPQ02 did not provide instructions to ensure that deviations or failure to comply discovered by suppliers of basic components, or services associated with basic components that does not have the capability to perform the evaluation to determine if the defect exists, then the supplier must inform the purchasers or affected licensees within five working days

- IDPQ02 did not provide instructions to notify the NRC of defects and failures to comply (i.e., initial and written notification)

The NRC inspection team identified these procedural deficiencies as an example of Violation 99901383/2009-201-01.

b.3 10 CFR Part 21 Implementation

The NRC inspection team requested copies of the records pertaining to all Curtiss Wright-EMD 10 CFR Part 21 (Part 21) evaluations. The NRC inspection team learned that Curtiss Wright-EMD had performed only two Part 21 evaluations as a result of an identified deviation. The Part 21 evaluation regarding AP1000 RCP SN001 was initiated on October 16, 2009, and was still in the evaluation stage at the time of this inspection. The second Part 21 evaluation regarding the Number 1 Seal Housing for Cartridge Seals resistance temperature detector (RTD) plug fillet weld code compliance was initiated on September 29, 2008, and, although determined not to be a deviation or failure to comply associated with a substantial safety hazard, the evaluation was not completed until August 25, 2009, and no interim report had been provided to the NRC.

Therefore, the NRC inspection team determined that Curtiss Wright-EMD's failure to provide an interim report to the NRC to be another example of Violation 99901383/2009-201-01.

The NRC inspection team also reviewed a select sample of corrective action reports (CARs) and nonconformance reports to verify that Curtiss Wright-EMD had adequate guidance in place to evaluate such reports for applicability to 10 CFR Part 21. The NRC inspection team determined that both the nonconformance and corrective actions processes contain the necessary guidance to evaluate applicability to 10 CFR Part 21 requirements.

b.4 Purchase Orders

The NRC inspection team noted that the Curtiss Wright-EMD procurement process imposes the requirements of 10 CFR Part 21 on its qualified suppliers by incorporating supplier quality requirements into all POs for nuclear safety-related materials, items, and services.

The NRC inspection team reviewed a sample of Curtiss Wright-EMD POs and verified that Curtiss Wright-EMD had implemented its 10 CFR Part 21 program in a manner consistent with the requirements described in 10 CFR 21.31 for basic components.

c. Conclusions

The NRC inspection team issued Violation 99901383/2009-201-01 for Curtiss Wright-EMD's failure to adopt appropriate procedures pursuant to 10 CFR 21.21 and for its failure to provide an interim report to the NRC. Specifically, the NRC inspection team determined that procedure IDPQ02 did not provide adequate guidance to: 1) evaluate deviations and failures to comply associated with substantial safety hazards within 60 days of discovery; 2) submit an interim report to the NRC if an evaluation of an identified deviation or failure to comply cannot be completed within 60 days of discovery; 3) notify the Curtiss Wright-EMD's responsible officer within five days when it is determined that a defect that could cause a substantial safety hazard exists; 4) notify the affected purchasers or licensees if Curtiss Wright-EMD does not have the capability to perform the evaluation to determine if a defect exists; and 5) notify the NRC of defects or failures to comply (i.e., initial and written notification).

2. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD's policies and procedures to verify that Curtiss Wright-EMD was implementing training activities in a manner consistent with regulatory requirements and industry standards. The NRC inspection team reviewed the personnel training and qualification process to verify conformance with the requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the personnel training and qualification process with Curtiss Wright-EMD management and technical staff.

Specifically, the NRC inspection team reviewed the following Curtiss Wright-EMD policies and procedures:

- Quality Assurance Program Manual For Construction of Class 1, 2, 3 Components, Parts, NS Supports and Supply of Material in Accordance With ASME Section III, Division 1 Requirements (QAPM), Chapter 1.2, "Indoctrination and Training," Revision 3, Dated April 17, 2009
- EP004, "Training," Revision 13, dated April 16, 2007
- 107 WE, "Training of Materials and Processes Engineering and Laboratory Personnel," Revision 4, dated April 30, 2007
- IDPA33, "Training and Development Needs Assessment," Revision 8, April 15, 2009
- DPQ03, "Indoctrination of New Personnel," Revision 6, dated March 10, 2003
- PAI 108, "Qualification Requirements for Audit Personnel," Revision 11, dated October 1, 2009
- PAI 105, "Qualification of Inspectors," Revision 15, dated June 23, 2004
- IDPM72, "Training of Hourly Personnel," Revision 4, dated February 12, 2008
- IDPM03, "Welder Performance Qualification," Revision 3, dated October 7, 2004
- PAI 801, "Nondestructive Examination Personnel Qualification Practice," Revision 16, dated October 6, 2006
- PAI 102, "Training of Performance and Quality Improvement (PQI) Office Personnel," Revision 12, dated April 13, 2009
- TP81, "Qualification of Test Technicians and Examiners," Revision A, dated March 10, 2003
- 329 WE, "Procedure for Metallographic Personnel Qualification," Revision 4, dated August 14, 2001

b. Observations and Findings

b.1 Qualification and Training of Inspection and Test Personnel

The Curtiss Wright-EMD QAPM, Section C10.2 describes the responsibilities and authority for establishing training and qualification requirements for Curtiss Wright-EMD personnel. The NRC inspection team determined that the qualification requirements are consistent with NQA-1994, Supplement 2S-1, "Supplementary Requirements for the Qualification of Inspection and Test Personnel," as required by American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section III, "Rules for Construction of Nuclear Facility Components," and Criterion II of Appendix B to 10 CFR Part 50.

PAI 105 defines the program for establishing and maintaining the qualification of inspectors including an annual eye exam.

TP81 defines the program for establishing and maintaining the qualification of test technicians and examiners.

The NRC inspection team also reviewed training and qualification records for three inspectors and two test personnel and the associated eye exams for the three inspectors. The records reviewed included education, experience, on-the job training and additional training; and annual evaluations reviewed and approved by their managers. The NRC inspection team discussed the training requirements with the respective managers of inspection and test personnel. The inspection team verified that

the qualification records of the inspection and test personnel were complete and met the requirements of Curtiss Wright-EMD's procedures.

b.2 Lead Auditor Indoctrination and Training Activities

The Curtiss Wright-EMD QAPM, Section C18.1 describes the authority, responsibility, and qualification requirements for lead auditors. The NRC inspection team determined that the qualification requirements are consistent with NQA-1-1994, Supplement 2S-3, "Supplementary Requirements for the Qualification of Quality Assurance Program Audit Personnel" and Criterion II of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed training and qualification records for four lead auditors. The records reviewed included training, experience, qualification credits, audit participation, examination scores, and annual evaluations approved by the Principal Supplier Quality Administrator. The NRC inspection team verified that Curtiss Wright-EMD had documented training on the appropriate training record forms in accordance with Curtiss Wright-EMD's procedures.

b.3 Qualifications and Training of Nondestructive Examination Personnel

The Curtiss Wright-EMD QAPM, Section C10.3 states that all nondestructive examination (NDE) personnel are examined, qualified, and certified in accordance with Curtiss Wright-EMD written practice which complies with the ASME Code, Sections III and V, "Nondestructive Examination," and American Society for Nondestructive Testing SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing," current ASME Code reference edition or addenda.

PAI 801 delineates the practice for qualifying and certifying personnel to perform nondestructive examinations and to establish a method of maintaining qualifications through periodic performance and monitoring. Instruction outlines the initial qualification and certification effort and the control for keeping the certification current.

The NRC inspection team reviewed qualification records for three NDE personnel. The qualification records reviewed were accurate, current, and met the requirements of the QAPM, ASME Code, Sections III and V, and SNT-TC-1A. The eye examination records of NDE personnel were current and conformed with the requirements of PAI 801.

b.4 Qualifications and Training of Welders

The Curtiss Wright-EMD QAPM, Section C9.4 describes the responsibilities, authority, and methods for qualifying welders. Performance qualification records for welders are evaluated and the performance qualification report is updated monthly.

IDPM03 defines Curtiss Wright-EMD's activities required to maintain the necessary complement of qualified production welders. These activities include the design, preparation, actual weld tests, and subsequent evaluations necessary to qualify welders, maintain qualifications, or re-qualify welders.

The NRC inspection team reviewed qualification records and eye exams for two welders. The records indicated that each welder was qualified in accordance with the requirements of Curtiss Wright-EMD's QAPM and ASME Code, Sections III and IX,

"Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators." The NRC inspection team verified that the performance qualification records of the welders were current and that they were evaluated in accordance with the requirements of the ASME Code, Sections III and IX.

b.5 Indoctrination and Training of Engineers and Performance and Quality Improvement (PQI) Personnel

The Curtiss Wright-EMD QAPM, Section C1.2, describes the responsibilities and authority and the indoctrination and training of personnel performing activities affecting quality. Training is provided to ensure that personnel comprehend the QA program requirements, and to ensure that proficiency in performance of related functions is achieved and maintained.

IDPQ03 establishes a method of ensuring that newly-hired personnel are aware of Curtiss Wright-EMD's QA programs and their applicability to quality-related activities. The training program includes the scope and implementation of the QA programs, applicable codes and standards, and an overview of the PQI organization, deliberate malpractice, and reporting of defects and nonconformances.

IDPA33 provides a means to ensure that departments have adequately assessed and trained personnel in their organizations to properly perform all assigned and anticipated work activities. All managers and supervisors are responsible for performing, at a minimum, an annual needs assessment to identify areas in which their personnel will need additional or refresher training and development to satisfy business needs.

The NRC inspection team reviewed a sample of training records for personnel performing activities affecting quality. Records reviewed included training records for a manufacturing engineer, two mechanical engineers, a registered professional engineer, and two senior quality engineers. Training of personnel was also discussed with the respective managers. All training needs were assessed on an annual basis. The NRC inspection team verified that training of personnel performing activities affecting quality met the indoctrination and training requirements of Curtiss Wright-EMD's QAPM and procedures.

c. Conclusions

The NRC inspection team concluded that Curtiss Wright-EMD's program requirements for training and qualification of personnel are consistent with the requirements of Criterion II of Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that Curtiss Wright-EMD's QAPM and associated training and qualification procedures were adequate and effectively implemented. The NRC inspection team did not identify any significant findings.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD's policies and implementing procedures that govern the design control activities to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. More specifically, the NRC inspection team reviewed the following Curtiss Wright-EMD policies and procedures:

- Curtiss Wright-EMD QAPM for Construction of Class 1, 2, 3 Components, Parts, NS Supports and Supply of Material in Accordance with ASME Section III, Division 1 Requirements, Section C3.1 Design Control, Revision 3
- Curtiss Wright-EMD QPM, Section 4.0 Design Control, Revision 8, dated April 16, 2009
- IDPE22, "Checking Design Calculations and Design Verification," Revision 007, dated December 20, 2006
- IDPE26, "Design Documentation," Revision 4, dated June 30, 2006
- IDPE27, "Engineering Document Signature Requirements," Revision 5, dated May 7, 2008

The NRC inspection team also reviewed the following documents related to AP1000 Reactor Coolant Pump (RCP) pressure boundary components and flywheels, and Watts Bar, Unit 2, RCP pressure boundary components to verify the effective implementation of Curtiss Wright-EMD design control requirements:

- APP-MP01-V2-001 through 010, "AP1000 Reactor Coolant Pump Outline," Revision 3, dated April 15, 2009
- APP-MP01-M2-001, "AP1000 Reactor Coolant Pump Design Specification," Revision 1, dated July 21, 2008
- EM 7242, "AP1000 Reactor Coolant Pump Casing and Main Closure Generic Pressure Boundary Report," Revision 0, dated October 31, 2008
- EM 7255, "AP1000 Reactor Coolant Pump End Closure Generic Pressure Boundary Report," Revision 0, dated October 31, 2008
- DRR 2103A, "Intermediate Peer Design Review for the AP1000 RCP Flywheels Design Data Package," Revision 0, dated June 19, 2006
- DRR 2103B, "Intermediate Peer Design Review for the AP1000 RCP Flywheel Design," Revision 0, dated July 31, 2006
- DRR 2103B, "Intermediate Peer Design Review for the AP1000 RCP Flywheel Design," Revision 1, dated July 11, 2007
- China AP1000 RCP Program Project Work Plan, dated August 1, 2008
- APP-RCS-M1-001, "Reactor Coolant System Design Transients," Revision 1, dated August 6, 2007
- DRR 2108A, "Intermediate Peer Design Review for the AP1000 RCP Pressure Boundary Components and Seismic Analysis Design Data Package," Revision 0, dated September 24, 2007
- DRR 2108B, "Intermediate Peer Design Review for the AP1000 RCP Pressure Boundary Components and Seismic Analysis Design Review Report," Revision 0, dated October 31, 2007
- EM 7250, "AP1000 RCP Generic Safety-Related Components Report," Revision 0, dated October 3, 2008
- ET/09-7, "Design Review Activity Biannual Report," dated October 20, 2009
- ET/08-3, "Review Activity Biannual Report – Second Half 2007," dated April 30, 2008
- ET/08-9, "Review Activity Biannual Report – First Half 2008," dated December 23, 2008
- ET/07-07, "Review Activity Biannual Report – First Half 2007," dated December 21, 2007
- ET/09-2, "Review Activity Biannual Report," dated May 15, 2009
- ET/09-5, "Review Activity Biannual Report – Second Half 2008," dated August 28, 2009
- HI-2083994, "Seismic/Fatigue Analysis of AP1000 Heat Exchanger," Revision 1, dated December 31, 2008

- DS10031, “AP1000 Reactor Coolant Pump External Heat Exchanger Design Specification,” Revision 0, dated October 6, 2008
- EM 6424, “TVA Watts Bar Units 1 and 2 Model 93A RCP Cartridge Seal Conversion Unit Pressure Boundary Summary Report,” Revision 2, dated July 14, 1992
- G-677188, “Reactor Coolant Pump Equipment Specification,” Revision 1, dated January 12, 1973
- 559687, “Cartridge Seal Conversion Package – Model 93A and Model 93AS RCP,” dated January 2, 1992
- 678814, “TVA Watts Bar Nuclear Plant Reactor Coolant Pump Equipment Specification,” Revision 4, dated February 10, 1975
- EM 5001, “TVA Watts Bar Units 1 and 2 – 93A Reactor Coolant Pump Pressure Boundary Component Summary Report,” Addendum 1, dated December 3, 1979
- EM 5001, “TVA Watts Bar Units 1 and 2 – 93A Reactor Coolant Pump Pressure Boundary Component Summary Report, dated April 26, 1978
- EM 5001, TVA Watts Bar Units 1 and 2 – 93A Reactor Coolant Pump Pressure Boundary Component Summary Report,” Revision 1, dated August 29, 1980
- 114E921, “General Assembly Shaft Seal Pump,” Revision 17
- 114E920, “TVA Reactor Coolant Pump Outline,” Revision 16, dated February 7, 1995

b. Observations and Findings

b.1 Contract Requirements

The NRC inspection team reviewed contract requirements and discussed contract specifics with Curtiss Wright-EMD contract administrators for the purpose of verifying that contract requirements were accurately and fully reflected in Curtiss Wright-EMD design and test processes. The NRC inspection team verified that Curtiss Wright-EMD is a holder of N and NPT certificates of authorization for ASME Class 1, 2 & 3 vessels, pumps and valves, valid through May 2012.

b.1.1 Vogtle Reactor Coolant Pumps

Westinghouse purchase order (PO) 4500265, dated April 30, 2008, documents the contractual requirements for procurement of eight Model N10087-A1 RCPs for Vogtle Units 3 and 4. The components are nuclear safety-related and the contracts invokes the requirements of 10 CFR Part 21, 10 CFR 50 Appendix B, and ASME NQA-1994. The RCPs are to be manufactured in accordance with governing design specification APP-MP01, as supplemented by APP-GW-VLR-010 for fabrication and inspection. Performance testing requirements include RCP flow rate and head, auxiliary load, and coastdown in accordance with an approved factory acceptance test. Test completion is scheduled consistent with a delivery date of 2013.

b.1.2 Watts Bar Reactor Coolant Pumps

Westinghouse PO 45C0246058, dated November 1, 2007, documents the contractual requirements for four RCP Model 93AS internal assemblies for Watts Bar Unit 2. The components are nuclear safety-related and the contract invokes the requirements of the ASME Code, Section III for Class 1 components and Equipment Specification 678814. The regulatory requirements of 10 CFR Part 21 and 10 CFR 50, Appendix B apply. Manufacturing tasks shall be performed in accordance with the ASME Code of record, to be N-stamped at a later date. Testing to be conducted include a hydrostatic pressure test, operational test at rated

temperature and pressure, and RCP backseat test. At the time of the inspection, one pump was ready to ship with a delivery date of July 2010.

b.2 Design Control Implementation

b.2.1 Design Control

The Curtiss Wright-EMD QAPM, Section C3.1, 'Design Control," describes the measures for controlling the processing and treatment of purchase order requirements together with the subsequent design functions interface, review, analyses, and conversion to drawings and specifications, and their changes.

The NRC inspection team reviewed the QAPM for Construction of Class 1, 2, 3 components, related design control implementing procedures, and AP1000 RCP specifications, drawings and pressure boundary report. The NRC inspection team verified that the AP1000 RCP Design Specification, AP1000 RCP Outline Drawings, AP1000 RCP Casing and Main Closure Generic Pressure Boundary Report, and AP1000 RCP End Closure Generic Pressure Boundary Report are in accordance with the design specification and QAPM requirements.

The NRC inspection team reviewed the TVA Watts Bar Nuclear Plant RCP Equipment and General Assembly Shaft Seal Pump Specification, related pressure boundary component summary report, and TVA RCP outline drawing. The NRC inspection team verified that these design documents were in conformance with applicable design requirements and Curtiss Wright-EMD implementing procedures.

The NRC inspection team reviewed DS10031, "AP1000 Reactor Coolant Pump External Heat Exchanger Design Specification." The NRC inspection team verified that DS10031 was certified by a registered professional engineer. DS10031 specifies the ASME Code, Section III, Division 1, 1989 Edition through 2000 Addenda, as the design requirement. However, the NRC inspection team identified that DS10031 did not meet all the requirements of the ASME Code or the Curtiss Wright-EMD QAPM. Specifically, the Curtiss Wright-EMD QAPM, Section 3.3, "Design Specification," states that the design specification shall include all information required by NCA-3252. The ASME Code, 1998 Edition, Section III, Division 1, NCA-3252, "Content of Design Specifications," states, in part, that the Design Specification shall contain sufficient detail to provide a complete basis for Division 1 construction. NCA-3252 further states that *[a]ll Design Specifications shall include items (1) through (7) below:*

(1) the functions and boundaries of the items covered (NCA-3254);
(2) the design requirements [NCA-2110(a) and (b) and NCA-2140] including all required overpressure protection requirements [NCA-3220(m)];
(3) the environmental conditions, including radiation;
(4) the Code classification of the items covered (NCA-2000);
(5) material requirements including impact test requirements;
(6) when operability of a component is a requirement, the Design Specification shall make reference to other appropriate documents which specify the operating requirements;
(7) the effective Code Edition, Addenda, and Code Cases to be used for construction.

The NRC inspection team identified that the design specification for the AP1000 RCP External Heat Exchanger Design did not include 1) the necessary references to the design bases (NCA-2140, Design Bases) as required by NCA-3252(a)(2) or 2) reference to other appropriate

documents which specify any additional operating requirements (NCA-3252(a)(6)) for the external heat exchanger design.

This issue is identified as Nonconformance 99901383/2009-201-02.

b.2.2 Design Verification

The NRC inspection team reviewed the Curtiss Wright-EMD design review process and related documentation. The QAPM, Section 3.5 "Design Verification," and implementing procedure IDPE22, "Checking Design Calculations and Design Verification," provide the polices and procedures for the design review process.

Curtiss Wright-EMD QAPM, Section 3.5.1, "Design Reviews," requires design reviews to be performed to verify that designs meet the functional requirements, contractual requirements, and industry codes and standards which are specified in design specifications. To this end, the design review committee reviews drawings, specifications and analyses, and any other documentation to substantiate that the design meets the applicable requirements.

In addition, Curtiss Wright-EMD implementing procedure, IDPE22 requires that the design review chairperson and lead engineer perform the applicable design reviews and sign and date each action item chit form to document their review of the technical content.

The NRC inspection team reviewed the AP1000 RCP flywheel Intermediate Design Review package, the Pressure Boundary Components and Seismic Analysis Intermediate Design Review Data Package, and the AP1000 RCP Flywheel Intermediate Peer Design Review Report for compliance with requirements of QAPM and IDPE22. In addition, the second AP1000 RCP Flywheel Intermediate Peer Design Review Report was also reviewed. The NRC inspection team verified that these design documents were in conformance with applicable design requirements. However, the NRC inspection team identified that Curtiss Wright-EMD was not fully implementing its design verification procedures.

Specifically, the NRC inspection team identified that 121 design review action item chit forms did not document that the applicable design reviews had been performed since they had not been signed and dated by the chairperson or lead engineer as required by Curtiss Wright-EMD IDPE22. The breakdown of the unsigned action item chit forms are: 73 from DRR 2103B, Revision 0, Intermediate Peer Design Review for the AP1000 RCP Flywheel Design Report; 13 from DRR 2103B, Revision 1, the Second Intermediate Peer Design Review for the AP1000 RCP Flywheel Design Report; and 35 from the Intermediate Peer Design Review for the AP1000 RCP Pressure Boundary Components and Seismic Analysis Design Review Report.

This issue is identified as Nonconformance 99901383/2009-201-03.

c. Conclusions

The NRC inspection team concluded that, with the exception of the items identified in Nonconformance 99901383/2009-201-02 and Nonconformance 99901383/2009-201-03, Curtiss Wright-EMD's staff has been effectively implementing the Curtiss Wright-EMD design control process consistent with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50 and the provisions of Curtiss Wright-EMD QAPM and applicable implementing procedures.

4. Document Control

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD policies and procedures for document control to verify compliance with Criterion VI, "Document Control," of Appendix B to 10 CFR Part 50. More specifically, the NRC inspection team reviewed the Curtiss Wright-EMD QPM, the applicable implementing procedures listed below that govern the review, approval, revision, and withdrawal of documents, such as instructions, procedures, and drawings that affect quality-related activities. In addition, the NRC inspection team reviewed other quality-related documents such as instructions, procedures, drawings, routings, weld joint records, NDE reports, qualifications, and revision notices (RN).

The NRC inspection team interviewed Curtiss Wright-EMD staff to discuss the distribution of documents through the computer release system and how the quality related documents such as procedural forms, NDE reports, routings, and RNs are maintained. In addition, the NRC inspection team reviewed selected documents to determine if the documents were reviewed, approved, and released by authorized personnel in accordance with Curtiss Wright-EMD procedures. Within the scope of these inspection activities, the NRC inspection team reviewed the following Curtiss Wright-EMD documentation:

- QPM, Chapter 5, "Document and Data Control," Revision 8, dated April 16, 2006
- QAPM, Chapter 6, "Control of Documents and Changes," Revision 3, dated April 17, 2009
- IDPA48 "On-line Department Procedures," Revision 002, dated May 17, 2007
- IDPQ20 "Making Temporary Changes and/or Corrections to Work Instructions," Revision 004, dated December 12, 2008
- IDPE06 "Engineering Procedures," Revision 006, dated March 31, 2003
- IDPE05 "Special Instruction System," Revision 007, dated April 20, 2009
- IDPA01 "Control Procedures for Interdepartmental Procedures," Revision 014, dated February 27, 2009
- INSIDP04 "IDP Control Process," Revision 003, dated February 10, 2009
- INSIDP08 "IDP Electronic Approval Signoff," Revision 003, dated February 10, 2009
- PAI100 "Instruction System for the Performance and Quality Improvement Department," Revision 012, dated March 16, 2009.
- PAI105 "Qualification of Inspectors," Revision 015, dated June 23, 2004
- PAI611 "Visual Inspection Guidelines," Revision 008, dated February 01, 2005
- IDPE27 "Engineer Document Signature Requirement," Revision 005, dated May 07, 2008
- AP100 Reactor Coolant Pump Generic Safety Related Components Report, Revision 0, dated October 3, 2008
- China AP1000 RCP Program Project Work Plan (PWP), Revision 1, dated August 1, 2008
- Intermediate Peer Design Review for the AP1000 RCP Pressure Boundary and Seismic Design (Design Report 2108B), Revision 0, dated October 31, 2007
- Intermediate Design Review of the AP1000 RCP Pressure Boundary Components and Seismic Analysis, Revision 0, dated September 24, 2007
- EP002 "Engineering Procedure Administration," Revision 011, dated April 16, 2007
- EP004 "Training," Revision 013, dated April 16, 2007

- IDPE27 “Engineering Document Signature Requirements,” Revision 005, dated May 7, 2008
- IDPE36 “Electronic Approval of Part Drawings Produced by the CAD System,” Revision 002, dated June 20, 2008
- Drawings 6D70012 and 6D70008

b. Observations and Findings

The Curtiss Wright-EMD QAPM, Chapter 6, “Control of Documents” describes the measures for preparation, review, approval, release, and control of drawings, specifications, and procedures. The QAPM also describes the requirements for the release of documents such as contract, technical, and design information in addition to special instructions and internal procedures.

The CW- EMD QPM, Chapter 5, ”Document and Data Control,” describes document and data control, document approval and issuance, QPM document control, computer software control, and specification and drawing controls. The QPM also describes the requirements for ensuring that all activities affecting the quality of items and services are accomplished according to interdepartmental and departmental procedures, work instructions, and controlled data such as customer order requirements.

The NRC inspection team reviewed Curtiss Wright-EMD’s procedures for document control and verified that Curtiss Wright-EMD’s program to control the issuance of documents was implemented and maintained in accordance with its implementing procedures. The inspection team verified that the document control system identifies the documents to be controlled and the individuals responsible for review, approval, and issuance of these documents. The NRC inspection team also verified that the document control system controls changes or revisions to controlled documents.

C. Conclusion

The NRC inspection team concluded that Curtiss Wright-EMD’s staff has been effectively implementing the Curtiss Wright-EMD document control process consistent with the regulatory requirements of Criterion VI of Appendix B to 10 CFR Part 50 and the provisions of Curtiss Wright-EMD’s QAPM, QPM, and associated document control implementing procedures and instructions. The NRC inspection team identified no significant findings.

5. Control of Purchased Material, Equipment, and Services and Audits

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD’s policies and implementing procedures that govern the control of internal and external audits to verify compliance with the requirements of Criterion VII, “Control of Purchased Material, Equipment, and Services,” and Criterion XVIII, “Audits,” of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of internal and external audit reports to evaluate compliance with program requirements and adequate implementation of those requirements. In addition, the inspection team reviewed corrective actions that address deficiencies identified by the audit findings for adequacy and timeliness.

Documents reviewed for this area of inspection include the following:

- Policy No. 330, “Curtiss-Wright Electro-Mechanical Corporation Purchasing Manual Change Notice Procedure,” Revision 9, dated March 27, 2005
- Policy No. 324, “Curtiss-Wright Electro-Mechanical Corporation Purchasing Manual Selection of Suppliers,” Revision 7, dated May 2, 2005
- PAI 207, “Procurement Document Planning and Review,” Revision 22, dated March 18, 2009
- IDPM09, “Purchased Material Control and Analysis, “ Revision 7, dated June 4, 2008
- PAI 314, “Supplier Certification Evaluation,” Revision 17, dated September 28, 2009
- PAI 221, “Supplier Qualification and Assessment,” Revision 19, dated January 21, 2009
- INSQP001, “Supplier Audits,” Revision 1, dated January 21, 2009
- PA 1532, “Supplier Evaluation Form,” Revision 3, dated February 7, 1986
- PA 934, “Supplier Evaluation Form,” Revision 6,” dated August 13, 2008
- PAI 412, “Internal Assessments,” Revision 25, dated October 1, 2009
- Curtiss-Wright Electro-Mechanical Corporation (EMD) 2009 Internal Assessment Schedule, dated January 19, 2009
- 2009 internal audits and associated corrective action reports
- 2008 internal audits and associated corrective action reports
- PA 319, “Supplier Quality System Evaluation Report,” for Tioga Pipe, dated August 31, 2009
- WES-2009-130, Westinghouse NIAC Audit of Tioga, “Supplier Quality Program Audit Report,” dated August 28, 2009
- PA 319 for Swagelok Company, dated August 6, 2009
- Senior Flexonics Pathway Report No. NIAC 14010, “Supplier Audit – Swagelok Company,” dated July 24, 2009
- PA 319 for Forge Monchieri, dated October 16, 2007
- Curtiss Wright-EMD Audit No. SQE-2007-12, dated October 10, 2007
- PA 319 for Dubose National Energy Service, dated June 1, 2009
- VAR-0905-01, Doosan Heavy Industries NIAC audit of DuBose National Energy Service, “Vendor Survey/Audit Report – NIAC Audit No. 14011,” dated May 29, 2009

b. Observations and Findings

The Curtiss Wright-EMD QAPM, Sections C7.1 and Section C18.1 establish requirements for external and internal audits, respectively.

The QAPM, Section C7.1 identifies the requirements for (1) performing the initial audit of suppliers prior to placement on the Curtiss Wright-EMD’s qualified supplier list (QSL); (2) approval of supplier procedures; (3) triennial audits of suppliers; and (4) supplier quality documentation. The QAPM requires that an audit schedule be developed based on the supplier’s performance, date of last audit, type of production involved, complexity, ASME Code certification, and commensurate with the production schedule. Suppliers of (1) ASME Code components or materials; (2) Appendix B to 10 CFR Part 50; or (3) subcontracted services for Section III of the ASME Code are audited, at a minimum, triennially. Curtiss Wright-EMD supplements triennial audits with annual audits or performance assessments. Additionally, Curtiss Wright-EMD performs an annual evaluation of the QSL.

PAI 221 establishes a system for qualifying and assessing suppliers’ quality programs, personnel, equipment, and processes; and for providing material, product, and services in

accordance with contract requirements. PAI 221 directs the user to conduct supplier audit using INSQP001 and documenting the results on PA 319 and PA 319A.

The NRC inspection team reviewed the Curtiss Wright-EMD QSL and noted that 48 suppliers were listed as Appendix B suppliers. The QSL listed the supplier's name, address, last audit date, auditing organization (i.e., Nuclear Industry Assessment Committee (NIAC) or Curtiss Wright-EMD), ASME Code certifications, and qualification status consistent with the requirements of the Curtiss Wright-EMD QAPM. Curtiss Wright-EMD takes credit for approximately 12 to 13 NIAC audits per year after evaluating the NIAC audit reports for applicability to Curtiss Wright-EMD.

The NRC inspection team reviewed the following sample of supplier audits and the associated PA 319 forms:

- Tioga Pipe Supply Company – NIAC audit conducted in July 2009. The NIAC audit identified five findings against the Tioga Pipe quality program. Curtiss Wright-EMD evaluated the NIAC audit of Tioga on PA 319 documenting the areas where findings were identified. The Curtiss Wright-EMD listed Tioga Pipe on its QSL with a restriction on shipment due to the open NIAC findings.
- Swagelok Company – NIAC audit conducted in July 2009. The NIAC audit identified one observation and no findings against the Swagelok quality program. Curtiss Wright-EMD evaluated the NIAC audit of Swagelok on PA 319 documenting the acceptability of Swagelok as an Appendix B to 10 CFR Part 50 and ASME Section III NCA 3800 supplier. The Curtiss Wright-EMD QSL identifies Swagelok as a qualified supplier, however, Curtiss Wright-EMD procures Swagelok fittings through Pittsburgh Valve and Fitting Company and not with Swagelok directly. The Curtiss Wright-EMD QSL explicitly states that procurements with Pittsburgh Valve and Fitting Company are restricted to procurement of Swagelok products.
- Forge Monchieri – Curtiss Wright-EMD audit conducted in September 2007. The Curtiss Wright-EMD audit identified three findings against the Forge Monchieri quality program. Findings have been closed based on objective evidence received on May 31, 2008 as documented on PA 319A dated June 18, 2008. The Curtiss Wright-EMD identifies Forge Monchieri as a qualified supplier with no restrictions on the QSL.
- DuBose National Energy Service – NIAC audit conducted in May 2009. The NIAC audit identified two observations and no findings against the DuBose quality program. Curtiss Wright-EMD evaluated the NIAC audit of DuBose as documented on PA 319. The Curtiss Wright-EMD identifies DuBose as a qualified supplier with no restrictions on the QSL.
- Mattco Forge Inc – expired on the Curtiss Wright-EMD QSL as denoted by "N" on the QSL. Mattco Forge decided not to maintain its Appendix B program. As such, Curtiss Wright-EMD treats Mattco Forge Inc as a commercial supplier of seal forgings and dedicates the forgings that are required to be safety-related.

The Curtiss Wright-EMD QAPM, Section C18.1 outlines the process for the conduct of internal audits. PAI 412 establishes the responsibilities and requirements for planning, scheduling, coordinating, conducting, reporting, verifying corrective actions, and maintaining records of internal assessments.

The NRC inspection team reviewed the Curtiss Wright-EMD 2008 and 2009 internal assessment schedules. At the time of the inspection, Curtiss Wright-EMD had conducted seven

of the nine internal audits scheduled for 2009. The NRC inspection team reviewed the seven 2009 audit reports and associated corrective action requests. All findings from the seven internal audits were documented in CARs consistent with PAI 412. The remaining two internal audits for 2009 had the audit plan issued at the time of the inspection. These plans included audits of control of inspection, test, and measuring equipment; inspection and test status; control of nonconforming product; and corrective and preventive action. The internal audit plans, audit reports, and associated CARs were consistent with PAI 412.

The NRC inspection team also reviewed a sample of the 2008 internal audits and their associated findings and corrective actions. The NRC inspection team observed that the internal audits were performed in accordance with written procedures and check lists. The QAPM requires that appropriately trained personnel who do not have direct responsibilities in the areas being audited perform these audits and that management responsible for the audited areas document and review the results of the audit. The lead auditors' qualifications were reviewed by the NRC inspectors, as described in Section 2.

c. Conclusions

The NRC inspection team concluded that Curtiss Wright-EMD is implementing its control of purchased materials, equipment, and services and its audit requirements consistent with the regulatory requirements of Criterion VII and Criterion XVIII of Appendix B to 10 CFR Part 50, respectively. Based on the sample of audits reviewed, the inspection team also determined that Curtiss Wright-EMD has been effectively implementing its policies and associated procedures. The NRC inspection team did not identify any significant findings.

6. Control of Special Processes

a. Inspection Scope

The NRC inspection team reviewed the Curtiss Wright-EMD QAPM, QPM and related implementing policies and procedures that govern the control of special processes to verify compliance with Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. More specifically, the NRC inspection team reviewed Curtiss Wright-EMD QAPM, Section C9, "Heat Treating and Welding," and Section C10, "Examinations, Tests, and Inspection." In addition, the NRC inspection team reviewed Curtiss Wright-EMD QPM, Section 9, "Process Control."

The NRC inspection team reviewed Curtiss Wright-EMD's implementing policies and procedures for welding, nondestructive examination (NDE), and brazing. For welding and activities, the NRC inspection team reviewed routings, weld procedure specifications, supporting procedure qualification records, preheat data, and welder qualifications. For NDE, the NRC inspection team reviewed radiography (RT) procedures, RT reports, RT Level I and Level II inspector qualifications, ultrasonic testing (UT) reports, UT Level II inspector qualifications, and visual inspection (VT) procedures.

NRC inspection team reviewed the following documents:

- QAPM, "Quality Assurance Program Manual," Section C9, "Heat Treating and Welding," Revision 3, dated April 17, 2009
- QAPM, Section C10, "Examinations, Tests, and Inspection," Revision 1, dated July 14, 2008

- QPM, “Quality Program Manual,” Section 9, “Process Control,” Revision 8, dated April 16, 2009
- IDPM03, “Welder Performance Qualification,” revision 3, dated October 7, 2004
- IDPM10, “Weld and Braze Procedure Qualification,” revision 4, dated October 7, 2004
- IDPM21, “Creation, Update, and Issuance of Routings and Process Plans,” revision 8, dated December 16, 2008
- MP 0684, “Procedure for Control in the EMD Weld Shop,” revision 18, July 23, 2008
- MP 0684TT, “Procedure for Control in the EMD Weld Shop for AP1000 RCP - Technology Transfer,” revision 2, July 31, 2008
- PAI 111, “Standard Inspection Instructions,” revision 14, dated March 26, 2009
- PAI 611, “Visual Inspection Guidelines,” revision 8, dated February 1, 2005
- PAI 611TT, “Visual Inspection Guidelines,” revision 0, dated January 12, 2009
- PAI 614, “Inspection Standard Operating Procedure,” revision 14, dated March 24, 2005
- PAI 801, “Nondestructive Examination Personnel Qualification Practice,” Revision 16, dated October 6, 2006
- PAI 807, “Radiographic Operational Methods and procedures,” Revision 11, dated February 10, 2006
- RSS0157, “Radiographic Shooting Sketch for AP1000 Longitudinal Seam Welds (Stator or Rotor),” Revision A, dated February 10, 2009
- RT10001, “Radiographic Test Procedure AP1000 RCP Technology Transfer,” Revision 1, dated April 29, 2008
- 302 WE, “Record of welder/welder operator performance qualifications (based on QW 484 or ASME IX) for Welding Qualification Code CMS070805A,” dated February 11, 2009
- 302 WE, “Record of welder/welder operator performance qualifications (based on QW 484 or ASME IX) for Welding Qualification Code CTM070811YP,” dated April 23, 2001
- PA 073, “Weld Joint Record for U598=1163E88G06 rev 009, Work Order 765342, Joint 56, Cooling Coils.”
- PA 073, “Weld Joint Record for U598=930C392G03 rev 010, Work Order 779579 Turning Vane and Diffuser Assembly, Joint 62.”
- PA 073, “Weld Joint Record for U598 ID99786 G01 rev 005, Work Order 764469, Rotor Journal Final Machining, Joint 55.”
- PA 073TT, “Weld Joint Record for U597=6D70111G01 Rev 002, Work Order 764843, Shell/Flange, Joint 2.”
- PA 073TT, “Weld Joint Record for U597=6D70111G01 Rev 002, Work Order 764843, Shell/Flange Carbon Steel Fabrication Joint 65A, 65B.”
- PA 073TT, “Weld Joint Record for U597=6D70111G01 Rev 002, Work Order 764843, Shell/Flange Carbon Steel Fabrication Joint 66.”
- PA 073TT, Weld Joint Record for U597=6D70336G01 Rev 002, Work Order 771893, TB/Diffuser Assembly, Joint 27.”
- PA 073TT, “Weld Joint Record for U597=6D70561G01 rev 5, Work Order 776894, Upper Flywheel Shell, Joint 42.”
- PA 2957, “Radiographic Inspection Report No 15674, “ Revision 1, February 3, 2006
- PA 366TT, “Ultrasonic Test Report 15846,” Revision 0. November 13, 2008
- PA0068, NDE Eye Examinations
- PA0066, NDE Qualification Records
- PA257TT, “Radiographic Exposure Record Ap1000 RCP Technology Transfer,” Revision 0, dated October 20, 2009
- Procedure Qualification Record 24022

- Procedure Qualification Record 24023
- Procedure Qualification Record 82127PQ052
- Procedure Qualification Record 934D153G01

The NRC inspection team witnessed welding and NDE activities being performed on AP1000 components bound for China that used the same controls and processes that will be used for US AP1000 components. These observations included witnessing of the Chinese AP1000 RCP stator can seam weld radiography testing (RT) including the radiographic shooting sketch (RSS0157), the radiographic test procedure (RT10001), and the qualifications and eye exams of the Level I and Level II NDE personnel performing the RT. In addition, the NRC inspection team verified that qualified and calibrated equipment was being used to perform the examination and reviewed the documents generated in support of these fabrication activities to verify compliance with Curtiss Wright-EMD program requirements and to verify adequate implementation of those requirements.

The NRC inspection team reviewed the AP1000 stator jacket heat exchanger assembly end ring welding documentation including the routing (U597=6D70752G01), weld joint record, welding procedure specification (WPS 82124PQ017), the two supporting procedure qualification reports (PQR 24022 and PQR 24023), and the welder's qualifications.

The NRC inspection team also reviewed a sample of completed routing forms for AP1000 and Watts Bar Unit 2 reactor coolant pumps and the supporting documentation, such as weld joint records, NDE reports, and the qualifications of the welders and NDE personnel performing those activities.

b. Observations and Findings

The Curtiss Wright-EMD QAPM describes the process for welding, and welding related activities including welding activities used to fabricate Class 1, 2, and 3 components, parts, and nuclear stamp (NS) supports in accordance with ASME Code, Section III, Division 1, requirements. The QAPM also describes the processes for NDE and other related inspection activities.

The Curtiss Wright-EMD QPM describes the control of special processes such as NDEs welding, brazing, cleaning, and heat treating. In part, the QPM states that NDEs are performed in accordance with SNT-TC-1A or other specified requirements. The QPM also provides guidance for personnel, equipment, and procedures used to perform special processes; qualification of processes and personnel for welding to ASME Code or other specified requirements; and welding to the requirements of ASME Code Section IX.

Implementing procedure IDPM21 provides instructions for manufacturing routings and process plans. MP0684 and MP0864TT provide the instructions for production welding including the welding process, weld records and drawings, verification of welder qualification, NDE of weld, and specification verification. IDPM10 provides instruction for welding and brazing procedure qualification. MP0772TT provides instruction for the control of brazing for AP1000 RCP and for the control and surveillance of production brazing. IDPM03 defines the activities required for qualification, to maintain qualification, or for requalification of production welders.

PA111 provides instructions and guidelines for inspection of manufacturing routings. PAI 614 provides the inspection standard operating procedures including the process for evaluating and documenting NDE defects, and instruction for weld inspections. PAI 801 describes the practice for qualifying and certifying NDE personnel. PAI 807 describes radiographic operational

methods procedures, and available equipment necessary to perform a radiographic inspection. RT10001 describes the radiographic test procedure and provides radiographic requirements and acceptance standards for welds. PAI 611 and PAI 611TT provide guidelines for visual inspection.

The NRC inspection team confirmed that Curtiss Wright-EMD established and implemented procedures for the control of special processes. In addition, the NRC inspection team verified that applicable procedures provide effective guidance for completing special process control documentation such as routings, process sheets, instructions, checklists, or other related activities.

The NRC inspection team confirmed that the Curtiss Wright-EMD's manufacturing process used routings to control shop production activities. The routings and associated documents incorporated witness and hold points for the customer, authorized nuclear inspector (ANI), and Curtiss Wright-EMD quality control inspectors, and identified the applicable drawings, material specifications, work instructions, and procedures applicable to the manufacturing activity being performed.

The NRC inspection team found that the routings and associated documentation provided sufficient guidance for fabrication activities to be performed in accordance with specified requirements and in the correct sequence. The routings and associated documentation included personnel and equipment qualification requirements; required conditions; acceptance criteria; and checkpoints that require signature, initials, or stamp and date of the authorized representative for the activities witnessed.

The NRC inspection team determined that Curtiss Wright-EMD's welding on ASME Code materials and fabrication of ASME Code items were performed by qualified welders and welding operators in accordance with approved welding procedure specifications. The inspection team verified that Curtiss Wright-EMD's welding procedure specifications, welders, and welding operators were qualified in accordance with the requirements of the QAPM and ASME Code Section III and Section IX.

The NRC inspection team verified that nondestructive examiners were qualified in accordance with SNT-TC-1A and ASME Code Sections III and V. Based on witnessed NDE activities and the review of completed NDE reports, the NRC inspection team verified that the personnel performing NDE activities were appropriately qualified and their qualifications and eye exams were current. The NRC inspection team verified that Curtiss Wright-EMD's NDE procedures were consistent with ASME Code requirements. The NRC inspection team also observed an RT activity that was conducted consistent with Curtiss Wright-EMD's QA program and procedures.

c. Conclusions

The NRC inspection team concluded that Curtiss Wright-EMD's staff was effectively implementing the control of special processes consistent with the regulatory requirements of Criterion IX of Appendix B to 10 CFR Part 50, ASME Code requirements, and the provisions of Curtiss Wright-EMD's QPM, QAPM, associated implementing procedures, and special process control documents such as routings, process sheets, instructions, and checklists. The NRC inspection team did not identify any significant findings.

7. Test Control

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD policies and implementing procedures that govern test activities to verify compliance with Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

Within the scope of this inspection, the NRC inspection team reviewed the following Curtiss Wright-EMD documents:

- Curtiss Wright-EMD QPM Section 10.0, "Inspection and Testing," Revision 8, dated April 16, 2009
- Curtiss Wright-EMD QAPM for Construction of Class 1,2,3 Components, Parts, NS Supports and Supply of Material in Accordance with ASME Section III, Division 1 Requirements, Section C.11, "In-Process and Final Inspection and Testing," Revision 4, dated July 27, 2009
- Curtiss Wright-EMD Test Procedure No. 80, "Administration of Test Department Procedures," Revision E, dated September 10, 2008
- Curtiss Wright-EMD Test Procedure No. 81, "Qualification of Test Technicians and Examiners," Revision A, March 10, 2003
- Curtiss Wright-EMD Test Procedure No. 11. "Test Data Control," Revision G, dated May 1, 2002
- Curtiss Wright-EMD Test Procedure No. 12, "Computer Control of Instrument Calibration," Revision AC, dated November 27, 2006

The NRC inspection team reviewed the following test specifications related to AP1000 and Watts Bar pumps to verify effective implementation of design and contractual requirements.

- Curtiss Wright-EMD Test Specification 10088, "AP1000 Model N10086-A1 RCP Lead Unit Test Specification," Revision 2, dated May 22, 2009
- Curtiss Wright-EMD Test Specification 712282, Functional Acceptance Testing of Large Reactor Coolant Pump Models 93A, 93A1, 100, and 100D," Revision BA, dated April 21, 2003 (as supplemented by Special Instruction 56715 for verification of impeller and pressure boundary acceptability)
- Curtiss Wright-EMD Test Specification 00105, "Leak Test Specification for AP1000 Reactor Coolant Pumps – AP1000 RCP Technology Transfer," Revision 2, dated June 8, 2009
- Curtiss Wright-EMD Drawing No. 6F70683, "Flywheel Initial and Final Assembly," (Note specifying flywheel overspeed test specification), Revision 3, dated October 16, 2009.
- Curtiss Wright-EMD Test Specification 921656, "Cartridge Seal Mock-up Production Testing," Revision H, August 28, 2002

b. Observations and Findings

b.1 Test Facilities

The NRC inspection team toured Curtiss Wright-EMD test facilities for full flow testing of pump assemblies and for separate tests of pump components, such as flywheels and seal cartridges.

In conjunction with the tour of the test facilities, the NRC inspection team observed work in-process on Watts Bar pump assemblies and on AP1000 pump components similar to those to be manufactured for the Vogtle units. These activities included grinding and metal removal from a Watts Bar pump rotor, and machining of an impeller and wrapping of a stator winding for an AP1000 pump motor. The NRC inspection team was accompanied by the Curtiss Wright-EMD Test Manager who discussed the operational and technical aspects of the various testing facilities. Curtiss Wright-EMD technical personnel were available to discuss specific areas during the evaluation, including test technicians, who explained facility operation, test engineers who conducted the tests, and design engineers, who discussed evaluation of the test data.

b.2 AP 1000 RCP Design Verification

The NRC inspection team toured the Y-Loop test facility, which is configured to conduct design verification testing on the RCPs for the AP1000 reactor type during the first quarter of 2010. The NRC Inspection team toured the facility, and reviewed loop operation, auxiliary systems, calibration records, and control room layout. Test loop operation was discussed with an AP1000 test engineer. A pump being tested is mounted vertically in the test section and is capable of delivering full primary flow and stator coolant at operating temperature and pressure. Tests are monitored by two operators on panels displaying configuration diagrams of the facility with real time system parameters. All data is recorded electronically in a format amenable to engineering evaluation. The control log book, which is maintained by the operators to record significant operational activities, was reviewed. The logbook recorded preoperational activities beginning July 2009.

The NRC inspection team reviewed Test Specification 10088, which defines all engineering test requirements in the Y-Loop test facility for the prototype AP1000 RCP in accordance with Westinghouse Design Specification APP-MP01-M2-001. The test specification addresses test data and records, design and operating requirements, and preoperational tasks. Test requirements include no-load testing, thrust bearing testing, cold and hot performance characteristics, net positive suction head testing, coastdown, and other tests necessary to fully qualify the AP1000 RCP design.

b.3 Other Test Facilities

The NRC inspection team reviewed the P-Loop, where the current lines of Curtiss Wright-EMD pumps are functionally tested. The NRC inspection team observed that a pump was installed in the testing casing, awaiting installation of the end coupling. The NRC inspection team reviewed TS712282, which is being used for functional testing of the Watts Bar pumps internals manufactured under PO 45C0246058. The specification provides complete step-by-step instructions for the performance of the functional acceptance test with explanations and references to promote understanding of the purpose of these steps by operating personnel and those who witness the test. Acceptance testing conducted under this specification includes performance testing, hydrostatic testing, seal leakage testing, and loss-of-injection testing. For the purpose of reviewing completed test data and evaluating Curtiss Wright-EMD's test control process for RCPs, the NRC inspection team reviewed an RCP functional test report for Diablo Canyon, dated August 26, 2005. The test report for this RCP Model 93A, similar to the Watts Bar RCPs, was determined to be adequate and met applicable requirements.

In addition to the full flow performance test loops and associated procedures, the NRC inspection team reviewed the following component test facilities and associated test specifications: (1) Hydro Test Facility for performing leak testing on the AP1000 RCP flywheel;

(2) Rotor Test Facility, where flywheel overspeed spin tests are conducted; and (3) Cartridge Seal Testing Facility, where seal cartridges are leak tested. Raw data for a cartridge test package, conducted on October 7, 2009, were discussed with a test technician who explained operation of the test facility and with the Seal Engineer, who explained how raw test data for a test conducted on October 3, 2009 (CSA_09_65) were evaluated and who demonstrated how it met the acceptance test requirements. The NRC inspection team reviewed the archived data package, which contained the certificate of conformance, contract information, and supporting test data, and found it adequate.

c. Conclusions

The NRC inspection team concluded that Curtiss Wright-EMD has established an effective test program that complies with Criterion XI of Appendix B to 10 CFR Part 50. Tests are being conducted in accordance with written procedures that provide adequate guidance for establishing and controlling test conditions, incorporate requirements and acceptance limits of applicable design documents, provide the necessary documentation to evaluate component performance, and provide reasonable assurance that nuclear-safety-related components shall perform satisfactorily in service.

8. Control of Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD policies and procedures for control of nonconforming materials, parts, or components to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team reviewed the Curtiss Wright-EMD QAPM, Section C15.1, "Nonconforming Items," and the Curtiss Wright-EMD QPM, Section 13, "Control of Nonconforming Product." These sections establish policies and procedural requirements for controlling nonconforming materials, parts and components.

The NRC inspection team also reviewed a sample of nonconformance reports initiated during the previous 36-month period. These nonconformance reports documented deficiencies primarily identified by Curtiss Wright-EMD personnel. The NRC inspection team discussed the nonconformance process with responsible Curtiss Wright- EMD management and staff to confirm that applicable regulatory requirements are being effectively implemented.

Within the scope of this inspection, the NRC inspection team reviewed the following Curtiss Wright-EMD documents:

- QAPM, Section C.15.1, "Nonconforming Items," Revision 3, dated July 27, 2009
- QPM, Section 13, "Control of Nonconforming Products," Revision 8, dated April 16, 2009
- IDPQ01, "Control of Nonconforming Material," Revision 15, dated February 25, 2008
- INS11, "Initiating a Material Reject Report," Revision 000, dated November 29, 2006
- IDPQ24, "Modified Work Instructions, Drawings and Procedures and Nonconformance Process," Revision 001, dated September 17, 2008
- PAI302, "Processing of Material Review Reports (MRRs) by PQI," Revision 018, dated April 22, 2009
- MRR 2722, dated October 20, 2009
- MMR 1018Y, dated April 24, 2009

- MRR 2325Y, dated October 15, 2009
- MRR 2168Y, dated October 19, 2009
- MRR 9832X, dated March 24, 2009
- MRR 9719X, dated March 31, 2009
- Error Correction Tag (ECT) 29610, dated August 6, 2007
- ECT 29612, dated August 6, 2007
- ECT 29812, dated May 19, 2009
- ECT 29813, dated July 22, 2009

b. Observations and Findings

The NRC inspection team reviewed Curtiss Wright-EMD's QAPM, Section 15 which describes the general requirements for implementing the Curtiss Wright-EMD nonconforming material control system as it relates to incoming and in-process materials. The NRC inspection team also reviewed implementing procedure IDPQ01, which describes the control of nonconforming materials (purchased or processed), and paperwork from the development of a Material Reject Report (MRR), through the retention and use of MRRs for trending, determining root cause, and verifying effectiveness of corrective actions to prevention reoccurrence. IDPQ01 supplementary attachment INSP 16, "Rework," outlines the actions for reworking nonconforming items per a MRR. The NRC inspection team verified that Curtiss Wright-EMD's process for controlling nonconforming materials is linked to 10 CFR Part 21 reporting requirements as part of design engineering's disposition activities.

The NRC inspection team toured plant areas where MRR records were maintained, discussed the review process with a receipt inspector, reviewed a sample of MRRs for items pending disposition, and witnessed processing of MRR rework and related Oracle database documentation. The NRC inspection team verified that nonconforming materials, parts, and components were appropriately identified and segregated.

The NRC inspection team reviewed implementation of the Error Correction Tag (ECT) process which maintains ECT records, including dispositions, rework operation, verification, and closure documentation. The NRC inspection team reviewed a sample of 4 ECTs and 25 MRRs, 8 of which were in process. The NRC inspection team verified that nonconforming items were reviewed in accordance with documented procedures for materials, parts, and components that were scrapped, repaired, reworked, or dispositioned as used-as-is. The disposition documentation contained technical justifications for items that were repaired or dispositioned used-as-is. The NRC inspection team verified that repaired or used-as-is items with design requirements were subject to design control measures commensurate with those applied to the original design.

The NRC inspection team reviewed repair work being conducted for an AP1000 RCP stator core assembly, documented on MRR 8665X. The NRC inspection team verified that the repair work was performed in accordance with the MRR disposition as documented in the repair routing and the acceptance criteria noted on Electro-Chemical Etching procedure RP10658 Revision 1, dated June 29, 2009.

As part of their nonconformance process, Curtiss Wright-EMD performs a trend analysis of MRRs that are significant to quality. The NRC inspection team interviewed the preventive action coordinator, who monitors MRR trend analyses and issues monthly and quarterly reports.

Each week, the coordinator issues a Project Quality Point Risk Operation Analysis, which addresses issues concerning work in process and relates them to previous experience.

c. Conclusions

The NRC inspection team concluded that the Curtiss Wright-EMD staff was effectively implementing the process for the control of nonconforming materials, parts, or components, consistent with the requirements of Criterion XV of Appendix B to 10 CFR Part 50 and the provisions of the Curtiss Wright-EMD QAPM, QPM, and associated implementing procedure. The NRC inspection team did not identify any significant findings.

9. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed Curtiss Wright-EMD's policies and procedures that govern the corrective action process to ensure that they adequately describe the process and implement the requirements of Criterion XVI, "Corrective Actions." of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of CARs to determine whether they document and adequately describe conditions adverse to quality, the cause of these conditions, and corrective actions taken to prevent recurrence. The NRC inspection team discussed the corrective action process with responsible Curtiss Wright-EMD management and staff to verify that applicable regulatory requirements are being effectively implemented.

Within the scope of this inspection, the NRC inspection team reviewed the following Curtiss Wright-EMD documents:

- Curtiss Wright-EMD QAPM, Section C16.1, "Corrective Action," Revision 3, dated July 27, 2009
- IDPQ17, "Corrective Action Request," Revision 9, dated November 19, 2008
- IDPQ18, "Significant Quality Problem Investigation and Resolution," Revision 3, dated July 31, 2009
- IDPA55, "Government, Commercial and Utility Field Feedback Tracking Procedure," Revision 1, dated January 09, 2008
- CAR 2009-00224, dated September 4, 2009
- CAR 2009-00225, dated September 4, 2009
- CAR 2009-00253, dated April 1, 2009
- CAR 2009-00299, dated April 1, 2009
- CAR 2009-00269, dated April 1, 2009
- CAR 2009-00305, dated September 17, 2009
- CAR 2008-00134, dated June 19, 2008
- Significant Quality Problem (SQP) Report No-08-004, dated June 20, 2008

b. Observations and Findings

The NRC inspection team reviewed Curtiss Wright-EMD's QAPM, Section 16.0 which describes the requirements for implementing the Curtiss Wright-EMD corrective action program. The NRC inspection team also reviewed implementing procedures and practices that provide the necessary guidance for promptly identifying, documenting, and correcting conditions adverse to quality. The QAPM requires that the scope of conditions reported in CARs include significant

conditions identified by nonconformance reports (NCR); ANI, internal, customer and NRC audits; improvements initiated by the performance and quality organization; MRR trend analyses; and nonconformances reported by customers.

Implementing procedure IDPQ17 establishes program responsibilities and describes the corrective action process for actions relating to the production processes for both Curtiss Wright-EMD and its vendors. The procedure allows conditions adverse to quality to be identified through various means, including nonconformances that are repetitive, internal and external audits, nonconformances related to safety issues, monitoring reports, field service reports, external audits, and source surveillances.

Implementing procedure IDPQ18 establishes program responsibilities and describes the process for identifying, documenting, evaluating and resolving significant quality problems. In addition, the NRC inspection team verified that IDPQ18 provides the necessary guidance to link Curtiss Wright-EMD's corrective actions program to 10 CFR Part 21 reporting requirements.

Implementing procedure IDPA55 establishes responsibilities and describes the field feedback tracking process for handling customer complaint reports. For reported conditions, corrective action requests are processed in accordance with IDPQ27 with a determination of cause, corrective action, recommendations for improvement and feedback to the customer. Contract administrators respond to their customers and issue monthly reports of actions taken on customer complaints, which are distributed to the director of the applicable business segment(s) and the director of PQI.

The NRC inspection team reviewed a sample of CARs to verify the effective implementation of the corrective action process. Based on its review of these CARs, the NRC inspectors confirmed that the causes of significant or recurring conditions were evaluated, corrected, and closed. The NRC inspection team also reviewed CARs issued to suppliers for deficiencies identified during receipt inspections or for MRRs of a repetitive nature. The NRC inspection team verified that CARs were promptly processed, root cause(s) documented, and corrective and preventive actions initiated, and reviewed by Curtiss Wright-EMD quality personnel for effectiveness.

The NRC inspection team reviewed a sample of Curtiss Wright-EMD significant quality problem reports (SQPRs) and interviewed responsible Curtiss Wright-EMD management and staff. The NRC inspection team verified that the process was being effectively implemented, and was in conformance with applicable regulatory requirements. The NRC inspection team reviewed SQPR 08-004 relating to the loss of cleanliness during fabrication of an AP1000 RCP thermal barrier. The NRC inspection team verified that Curtiss Wright-EMD SQPR personnel had performed a thorough investigation of the customer complaint and documented a root cause analysis. The NRC inspection team verified that 43 corrective actions related to this SQP were adequately documented, processed and closed in timely manner consistent with implementing procedure IDPQ18.

The NRC inspection team reviewed the Curtiss Wright-EMD customer complaint program for tracking and documenting customer complaints. The NRC inspection team reviewed the commercial and utilities field feedback tracking log for the AP1000 RCP maintained by the contract administrator. The log documented eight corrective actions initiated in response to customer complaints. The NRC inspection team verified that documentation of the root cause, corrective and preventative actions, and actions taken to prevent recurrence was effectively processed. The NRC inspection team verified that the complaints were being adequately

documented and distributed to design and quality engineering for technical and quality evaluations and processing consistent with implementing procedure IDPA55.

c. Conclusions

The NRC inspection team concluded that Curtiss Wright-EMD staff was effectively implementing the corrective action program consistent with the regulatory requirements of Criterion XVI of Appendix B to 10 CFR Part 50 and the provisions of the Curtiss Wright-EMD QAPM and associated implementing procedures. The NRC inspection team did not identify any significant findings.

10. Entrance and Exit Meetings

On October 19, 2009, the NRC inspection team discussed the scope of the inspection with Mr. James Drake, Curtiss Wright-EMD General Manager, and with the Curtiss Wright-EMD management and engineering staff. On October 22, 2009, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Gregory Hempfling, Senior Vice-President and General Manager, Electro-Mechanical Systems, Mr. James Drake, Curtiss Wright-EMD General Manager, and other Curtiss Wright-EMD management and engineering staff. Lists of entrance and exit meeting attendees are attached to this report as Attachment 1 and Attachment 2, respectively.

On October 23, 2009, a member from the NRC inspection team was asked to return to the Curtiss Wright-EMD facility to further explain Nonconformance 99901383/2009-201-02 regarding references to other documents that specify operating requirements. The NRC inspection team member provided the additional information to Curtiss Wright-EMD engineering staff members and re-exited the inspection with Mr. Stewart Shannon, the Director of Performance and Quality Improvement.

ATTACHMENT

1. PERSONS CONTACTED

Hempfling G.	Senior Vice-President Curtiss Wright, Electro-Mechanical Systems
Drake, J.	Curtiss Wright-EMD General Manager
Shannon, S.	Director, Performance and Quality Improvement
Asselta, R.	Manager Quality Engineer
Adams, M.	Structural and Thermal Analysis Manager
Blackburn, T.	Quality Engineering Manager
Bohinski, A.	Contract Manager
Brown,J.	Quality Engineering Manger/Records
Delestienne, S.	Contract Manager
Dietrich, D.	Project Manager
Donaldson, R.	Welding Engineer
Dougherty, M.	Manager, Test Engineering and Operations
Drag, G.	Material Reject Reports Coordinator
Dunn, T.	Lead Design Engineer for AP1000
Egley, A.	Inspector
Ferrero, J.	Compliance Assessment Coordinator
Figore, D.	Record Specialist
Grimm, J.	Level 2 NDE Inspector
Habron, B.	Principal Engineer, Test Engineering
Hall, B.	Manufacturing Operations Superintendent
Haneel, J	Design Engineer
Hesson, D.	Level 1 NDE Inspector
Hobbins, D.	Manager, Dynamic Acoustics and Hydraulic
Horomanski, C.	Engineering Manager
Iseman, D.	Level 3 NDE Examiner
Jenkins, S.	Design Engineer
Karl, D.	Quality Control Manager
Kline, R.	Design Manager
Kotch, M.	Quality Control Engineer
Lysiak, S.	Sr. Quality Engineer
Mawhinney, M.	Performance Improvement Coordinator
Pearlman, R.	Engineering Technology Engineer
Rady. J.	Product Manufacturing Engineering Manager
Randy, J.	Manager, Manufacturing Engineer
Renock, K.	Planner
Roofner, F.	Receipt Inspector
Rothermel, J.	Test Engineer
Rudolph, D.	Principal Contract Administrator
Scalise, F.	Sr. Quality Engineer
Sobo, D.	Test Engineer
Thomas, J.	Welder
West, W.	Purchasing Manager

2. INSPECTION PROCEDURES USED

Inspection Procedure 43002, “Routine Inspections of Nuclear Vendors”

Inspection Procedure 36100, "Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Nonconformance"

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

No previous NRC inspections had been performed at the Curtiss Wright Flow Control Company, Electro-Mechanical Division facility in Cheswick, PA, within the 5 years prior to this inspection.

The following items were found during this inspection:

Item Number	Status	Type	Description
99901383/2009-201-01	Opened	Violation	10 CFR Part 21
99901383/2009-201-02	Opened	Nonconformance	Criterion III
99901383/2009-201-03	Opened	Nonconformance	Criterion III

4. LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ANI	authorized nuclear inspector
CAR	corrective action report
CFR	*Code of Federal Regulations*
Curtiss Wright-EMD	Curtiss Wright Flow Control, Electro-Mechanical Division
ECT	error correction tag
MRR	material rejection report
NIAC	Nuclear Industry Assessment Committee
NCR	nonconformance report
NDE	nondestructive examination
NRC	U.S. Nuclear Regulatory Commission
NS	nuclear stamp
PA	performance assessment
PO	purchase order
PQI	performance and quality improvement
PWP	project work plan
QA	quality assurance
QAPM	Quality Assurance Program Manual
QPM	Quality Program Manual
QSL	qualified suppliers list
RCP	reactor coolant pump
RN	revision notice
QSL	qualified suppliers list
SQPR	significant quality problem report