April 22, 2011

Mr. Jeffery McConkey, Quality Assurance Manager
Flowserve Limitorque
5114 Woodall Road
Lynchburg, VA 24502

SUBJECT: NRC INSPECTION REPORT NO. 99900100/2011-201, NOTICE OF VIOLATION, AND NOTICE OF NONCONFORMANCE

Dear Mr. McConkey:

On February 28 – March 4, 2011, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Flowserve Limitorque facility (hereafter referred to as Limitorque) in Lynchburg, VA. The purpose of this limited scope inspection was to assess Limitorque's compliance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected aspects 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 determined that three violations of NRC requirements occurred. These violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the subject inspection report. The violations are being cited in the Notice because Limitorque failed to complete its evaluation or to prepare and submit an Interim Report to the Commission for an identified deviation or failure to comply potentially associated with a substantial safety hazard within 60 days from discovery pursuant to 10 CFR 21.21(a)(2), "Notification of failure to comply or existence of a defect and its evaluation;" failed to adopt appropriate procedures pursuant to 10 CFR 21.21(a); and failed to specify that the provisions of 10 CFR Part 21 apply to the procurement of basic components in accordance with 10 CFR 21.31, "Procurement documents."

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In addition, during this inspection, the NRC inspection team found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers or NRC licensees. Specifically, the NRC inspection team determined that Limitorque was not fully implementing its design control process; procurement document controls; control of purchase material, equipment, and services; test control; and audits consistent with regulatory requirements, the Flowserve Quality Management System Manual (QMSM), or applicable

implementing procedures. The specific findings and references to the pertinent requirements are identified in the enclosed Notice of Nonconformance (NON) and the circumstances surrounding them are described in detail in the enclosed inspection report.

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 NON. We will consider extending the response time if you show good cause for us to do so.

It is important to note that the NRC inspection team performed a limited scope inspection. The deficiencies identified may affect other portions of Limitorque's 10 CFR Part 21 and QA program that the NRC inspection team did not review. Therefore, Limitorque must extend its review, where applicable, beyond the specific examples identified by the NRC inspection team and apply corrective actions, as appropriate. In your response to the Notice and the identified NON, Limitorque should document the areas for which it extended its review beyond the specific examples of the deficiencies identified by the NRC inspection team, the extent of its review, any additional deficiencies, and the corrective actions implemented.

One additional area of concern identified during the NRC inspection is Limitorque's reliance on multiple standards to define the QA requirements in the QMSM. The NRC inspection team noted that the QMSM was primarily written for adherence to International Standardization Organization (ISO) 9001:2000 provisions. In addition, the QMSM states, in part, that the manual "will also comply with the following: Title 10 of the Code of Federal Regulations Part 21 and Part 50 Appendix B, NQA -1-1994, ATEX EN 13980:2002, IECEx and Military Specification MIL-I-45208A Amendment 1 – 1981 . . . ." However, the QMSM does not establish clear policies and guidance consistent with the requirements of Appendix B to 10 CFR Part 50.

The QMSM also states, in part, that in some cases "Military Specifications and Standards, ANSI parent and daughter, or other industry consensus standards have been used as guidelines in establishing methods by which Flowserve assures compliance with Quality Management Systems codes and standards referenced above. These guideline documents include, but may not be limited to: ANSI N45.2.2-1978, ANSI N45.2.9-1979, ANSI N45.2.13, Rev. 1-1997, ANSI N45.2.23-1978 . . . ." While both NQA-1-1994 and American National Standards Institute (ANSI) standard ANSI 45.2, "Quality Assurance Program Requirements for Nuclear Facilities," constitute acceptable approaches for implementing Appendix B to 10 CFR Part 50 requirements, your QMSM implies that NQA-1-1994 and ANSI 45.2 are both being relied upon to satisfy such requirements. This simultaneous reliance on different consensus standards is likely to lead to confusion, ineffective implementation of NRC requirements imposed on Limitorque by your customers or NRC licensees, and may result in the adoption of implementing procedures that do not have a clear nexus to QA program requirements. Specific examples illustrating a less than adequate nexus between the QMSM and the quality implementing procedures are documented in more detail in the enclosed report.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the "NRC's Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from NRC's Agencywide Documents Access and Management System, (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted

copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,
/RA/

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

Docket No. 99900100

Enclosures:
1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report No. 99900100/2011-201

from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,
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Juan Peralta, Chief
Quality and Vendor Branch 1
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& Operational Programs
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DISTRIBUTION:

RidsNroDcipCQVA	RPrato	TScarbrough	TSteadham	TKendzia
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RidsNroDcip	RidsNrrDeEQVB	JMcConkey@Flowserve.com		

ADAMS Package Accession No.: *concurred via email

OFFICE	NRO/DCIP/CQVA	R-II/DCI/CIB3	NRO/DE/SEB1	NRO/DCIP/CQVB	NRO/DCIP/CQVA
NAME	RPrato *	TSteadham *	TScarbrough *	DBollock *	FTalbot *
DATE	03 /31/2011	03 /31/2011	03 /31/2011	04 /14/2011	03 /31/2011
OFFICE	NRO/DCIP/CQVA	NRO/DCIP/CQVA	QTE	NRO/DCIP/CAEB/BC	NRO/DCIP/CQVA/BC
NAME	PCoco *	TKendzia	QTE Resource *	TFrye	JPeralta
DATE	04 /14/2011	04 / 19 /2011	04 /07/2011	04/22/2011	04 / 21/2011

OFFICIAL RECORD COPY

NOTICE OF VIOLATION

Flowserve Limitorque
Lynchburg, VA, 24502

Docket Number 99900100
Inspection Report No. 2011-201

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Flowserve Limitorque facility (hereafter referred to as Limitorque) in Lynchburg, VA, on February 28 - March 4, 2011, three violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are listed below:

A. Title 10 of the *Code of Federal Regulations* (10 CFR) 21.21(a), "Notification of failure to comply or existence of a defect and its evaluation," requires, in part, that "[e]ach individual, corporation, partnership, or other entity subject to the regulations in this part shall adopt appropriate procedures to -- (2) [e]nsure 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 discovery of the deviation or failure to comply, an interim report is prepared and submitted in writing to the Commission. . . within 60 days of discovery of the deviation or failure to comply."

   Quality Assurance Procedure (QAP), QAP 13.2, "Reporting of Defects for Safety Related Equipment," Revision 15, states, in part, that "[a]ny defect condition under evaluation which cannot be completed within 60 days from date of discovery shall be reported to the Nuclear Regulatory Commission (NRC) in the form of an Interim Report within 60 days."

   Contrary to the above, as of March 4, 2011, Limitorque did not complete an evaluation and failed to prepare and submit in writing to the Commission an interim report within 60 days of discovery of an identified deviation or failure to comply potentially associated with a substantial safety hazard. Specifically, the NRC inspection team determined that Limitorque had not completed its evaluation, nor prepared and submitted an Interim Report to the Commission for an ongoing Part 21 evaluation initially identified on September 28, 2010.

   This issue has been identified as Violation 99900100/2011-201-01.

   This is a Severity Level IV Violation (Section 6.5).

B. 10 CFR 21.21(a), requires, in part, that "[e]ach individual, corporation, partnership, or other entity subject to the regulations in this part shall adopt appropriate procedures to -- (1) [e]valuate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards as soon as practicable . . . in order to identify a reportable defect or failure to comply that could create a substantial safety hazard, were it to remain uncorrected."

   QAP 13.2 states, in part, that "if during the review, Quality Assurance determines the condition is "Not Reportable" or "Not Applicable", the basis for the decision shall be documented" in the Limitorque Corrective Action Requests (LCARs), and Audit Deficiency Notifications (ADNs). QAP 13.2 also states that Discrepant Material Reports (DMRs), Field Service Reports, Customer Reported Problems, LCARs, and ADNs /Audit Findings are the methods used by Limitorque to identify nonconforming conditions and deviations that need to be evaluated for reportability.

Contrary to the above, as of March 4, 2011, Limitorque failed to adopt appropriate procedures to evaluate deviations and failures to comply. Specifically, Limitorque failed to document the basis for determining a nonconforming condition associated with safety related LCAR to be "Not Reportable" or "Not Applicable" and to adequately document the basis for determining nonconforming conditions associated with multiple ADNs to be "Not Reportable" or "Not Applicable." In addition, Limitorque failed to include procedural guidance to evaluate Customer Reported Problems and Field Service Reports for defects and failures to comply associated with substantial safety hazards in QAP 14.2, "Customer Complaint Procedure," and QAP 19.3, "Servicing," respectively.

These issues have been identified as Violation 99900100/2011-201-02.

This is a Severity Level IV Violation (Section 6.5).

C. 10 CFR 21.31 states, in part, that "[e]ach individual, corporation, partnership, dedicating entity, or other entity subject to the regulations in this part shall ensure that each procurement document for a facility, or a basic component issued . . . specifies, when applicable, that the provisions of 10 CFR Part 21 apply."

QAP 6.1, "Purchasing Procedure," states that the procurement documents are to impose the requirements of 10 CFR Part 21 on its qualified suppliers in purchase orders for nuclear safety related materials, items, and services.

Contrary to the above, as of March 4, 2011, Limitorque issued procurement documents for basic components that did not impose the provisions of 10 CFR Part 21. Specifically, safety related services were procured from an approved vendor without imposing 10 CFR Part 21 reporting requirements.

This issue has been identified as Violation 99900100/2011-201-03.

This is a Severity Level IV Violation (Section 6.5).

Pursuant to the provisions of 10 CFR 2.201, "Notice of Violation," Limitorque 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 (Notice). 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.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

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 22nd day of April 2011.

NOTICE OF NONCONFORMANCE

Flowserve Limitorque
Lynchburg, VA, 24502

Docket Number 99900100
Inspection Report No. 2011-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Flowserve, Limitorque facility in Lynchburg, VA, on February 28 - March 4, 2011, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Limitorque 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 "[m]easures shall be established to assure that applicable regulatory requirements and the design basis . . . are correctly translated into specifications, drawings, procedures, and instructions . . . . The design control measures shall provide for verifying or checking the adequacy of design . . . . The verifying or checking process shall be performed by individuals or groups other than those who performed the original design."

   Flowserve's "Quality Management System Manual" (QMSM), states, in part, that "design and development changes shall be identified and records maintained," and that "changes shall be reviewed, verified, and validated, as appropriate, and approved before implementation."

   Contrary to the above, as of March 4, 2011, Limitorque failed to establish measures to assure that applicable regulatory requirements and design basis are correctly translated into specification, drawings, procedures, and instructions; and failed to perform independent reviews of changes to software used in the manufacturing of safety related actuators. Specifically, Limitorque failed to develop guidance for when software reviews are to be performed and to independently verify changes to the "Configurator" software used in the design and assembly of safety related Limitorque actuators.

   This issue has been identified as Nonconformance 99900100/2011-201-04.

B. Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50 states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements, design basis and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services."

   Quality Assurance Procedure (QAP), QAP 6.1, "Purchasing Procedure," states that the procurement documents are to impose the requirements of Appendix B to 10 CFR Part 50 on its qualified suppliers in purchase orders (POs) for nuclear safety related materials, items, and services.

   Contrary to the above, as of March 4, 2011, Limitorque failed to impose the requirements of Appendix B to 10 CFR Part 50 in documents for the procurement of safety related equipment and services. Specifically, Limitorque issued POs 179913 and 183027 for the purchase of electrical motors for use in safety related actuators without imposing the requirement of Appendix B to 10 CFR Part 50. In addition, Limitorque used "open" POs to procure calibration services for safety related instrumentation and analyses of lubricants used in safety related actuators without imposing the requirement of Appendix B to 10 CFR Part 50.

These issues have been identified as Nonconformance 99900100/2011-201-05.

C. Criterion V, "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50, states, in part, that "[a]ctivities affecting quality shall be prescribed by documented instructions, procedures, or drawing."

Flowserve's QMSM states, in part, that "[p]rocedures are established and shall be maintained that ensure the standard SMB, SMC, SB, SBD, and HBC qualified product design is maintained and that changes are reviewed for impact on Equipment Qualification."

Contrary to the above, as of March 4, 2011, Limitorque failed to provide instructions and procedures for certain activities affecting quality. Specifically, Limitorque used uncontrolled information (Additional QC Checks for SMB-000 Torque Switches) not documented in a quality related procedure to identify quality checks that need to be evaluated for SMB-000 torque switches used in safety related actuators. In addition, Limitorque failed to assure that activities affecting quality are correctly documented in quality procedures (e.g., QAP 3.1 and QAP 4.1) and assembly procedures (e.g., Assembly Procedure (AP) AP 9.2 and AP 9.3) used to design and assemble safety related actuators.

These issues have been identified as Nonconformance 99900100/2011-201-06.

D. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 states, in part, that "measures shall be established to assure that purchased material, equipment, and services whether purchased from a contractor or subcontractor conform to the procurement documents. . . . The effectiveness of the control of quality by contractors and subcontractors shall be assessed by the applicant or designee . . . ."

Contrary to the above, as of March 4, 2011, Limitorque failed to establish measures to assure that the purchase of material, equipment, or services conformed to procurement documents. Specifically, Limitorque accepted material test reports for components and materials used in safety related actuators provided by a non Appendix B subcontractor. In addition, Limitorque failed to identify or reference acceptance criteria for receipt inspection to verify that purchased equipment conform to procurement documents.

These issues have been identified as Nonconformance 99900100/2011-201-07.

E. Criterion VII of Appendix B to 10 CFR Part 50, states, in part, that "measures shall be established to assure that purchased material, equipment, and services conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by a contractor or subcontract, inspection at a contractor or subcontract source, and examination of product upon delivery."

Contrary to the above, as of March 4, 2011, Limitorque performed an external audit of an approved supplier on the Approved Vendors List for safety related components and services that did not evaluate the supplier's compliance with the requirements of Appendix B to 10 CFR Part 50. Specifically, in June 2009, Limitorque performed an audit of a qualified supplier of safety related actuator products and services including testing and calibration services. The audit evaluated the applicable requirements of International Standardization Organization (ISO) 9001:2000 and International Standardization Organization/International Electrotechnical Commission (ISO/IEC) 1725 for calibration services but did not include an evaluation of the applicable requirements for Appendix B to 10 CFR Part 50.

This issue has been identified as Nonconformance 99900100/2011-201-08.

F. Criterion XI, "Test Controls," of Appendix B to 10 CFR Part 50 states, in part, that a "Test Program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactory in service is identified and performed in accordance with written procedures which incorporate the requirements and acceptance limits contained in applicable design documents."

Engineering Instruction Procedure (EIP) EIP 373, "Production Test Procedure for SMB/SB Series Units Built for Westinghouse Project AP1000 Per Specification APP-PV95-Z-001," provides the detailed instructions for setting torque switches for SMB and SB series actuators. EIP 373 prescribes initial testing with the torque switch set at 1.0. Testing continues by progressively increasing the torque switch setting by half increment until the maximum torque switch setting is reached. The maximum torque switch setting for an SB-00 actuator is estimated to be approximately 2.5 as determined by Limitorque.

Contrary to the above, as of March 4, 2011, Limitorque failed to perform test activities consistent with the instructions in EIP 373 that was established to assure that actuator torque switches will perform satisfactory in service. Specifically, Limitorque technicians used an initial test setting of 2.75, and subsequently decreased the torque switch setting by half increments until reaching a torque switch setting of 1.0 during a full performance test of a safety related SB-00 actuator.

This issue has been identified as Nonconformance 99900100/2011-201-09.

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 22nd day of April 2011.

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

Docket No.:	99900100
Report No.:	99900100/2011-201
Vendor:	Flowserve Corporation, Limitorque Valve Actuator Systems 5114 Woodall Road Lynchburg, VA 24502
Vendor Contact:	Mr. Jeff McConkey, Quality Assurance Manager JMcConkey@Flowserve.com (434) 528-4400
Nuclear Industry Activities:	Limitorque manufactures motor operated valve actuators for nuclear power plants worldwide.
Inspection Dates:	February 28 - March 4, 2011
Inspectors:	Robert Prato, Team Leader, NRO/DCIP/CQVA Thomas Scarbrough, NRO/DE/SEB1 Timothy Steadham, R-II/DCI/CIB3 Frank Talbot, NRO/DCIP/CQVA Douglas Bollock, NRO/DCIP/CQVB Masao Nagai, NRO/DCIP/CQVB Paul Coco, NRO/DCIP/CQVA Thomas Kendzia, NRO/DCIP/CQVA
Approved by:	Juan Peralta, Chief Quality and Vendor Branch 1 Division of Construction Inspection & Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

Limitorque,
99900100/2011-201

The purpose of this U.S. Nuclear Regulatory Commission (NRC) inspection was to verify that the Flowserve Corporation, Limitorque Valve Actuator facility (hereafter referred to as Limitorque) 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." In addition, the inspection was performed to verify that Limitorque implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that met the NRC's regulatory requirements. The inspection was conducted at the Limitorque facility in Lynchburg, Virginia, during the period of February 28 - March 4, 2011.

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 Noncompliance," during the conduct of this inspection.

The previous NRC inspection of the Limitorque facility in Lynchburg, VA was in 1993. The results of this most recent inspection are summarized below.

The NRC inspection team identified three violations, and six nonconformances. The violations and nonconformances are described below. However, one additional area of concern identified during the NRC inspection is Limitorque's reliance on multiple standards to define the QA requirements in the QMSM. The NRC inspection team noted that the QMSM was primarily written for adherence to International Standardization Organization (ISO) 9001:2000 provisions. In addition, the QMSM states, in part, that the manual "will also comply with the following: Title 10 of the Code of Federal Regulations Part 21 and Part 50 Appendix B, NQA -1-1994, ATEX EN 13980:2002, IECEx and Military Specification MIL-I-45208A Amendment 1 – 1981 . . . ." However, the QMSM does not establish clear policies and guidance consistent with the requirements of Appendix B to 10 CFR Part 50.

The QMSM also states, in part, that in some cases "Military Specifications and Standards, ANSI parent and daughter, or other industry consensus standards have been used as guidelines in establishing methods by which Flowserve assures compliance with Quality Management Systems codes and standards referenced above. These guideline documents include, but may not be limited to: ANSI N45.2.2-1978, ANSI N45.2.9-1979, ANSI N45.2.13, Rev. 1-1997, ANSI N45.2.23-1978 . . . ." While both NQA-1-1994 and American National Standards Institute (ANSI) standard ANSI 45.2, "Quality Assurance Program Requirements for Nuclear Facilities," constitute acceptable approaches for implementing Appendix B to 10 CFR Part 50 requirements, your QMSM implies that NQA-1-1994 and ANSI 45.2 are both being relied upon to satisfy such requirements. This simultaneous reliance on different consensus standards is likely to lead to confusion, ineffective implementation of NRC requirements imposed on Limitorque by your customers or NRC licensees, and may result in the adoption of implementing procedures that do not have a clear nexus to QA program requirements. Specific examples illustrating a less than

adequate nexus between the QMSM and the quality implementing procedures are documented in more detail in the enclosed report.

10 CFR Part 21

With the exception of Violations 99900100/2011-201-01, 99900100/2011-201-02, and 99900100/2011-201-03, the NRC inspection team found that the portions of the Limitorque process for reporting of defects and nonconformances reviewed as part of this inspection met the requirements of 10 CFR Part 21. The NRC inspection team issued Violation 99900100/2011-201-01 for Limitorque's failure to prepare and submit an interim report for an ongoing evaluation of an identified deviation or failure to comply potentially associated with a substantial safety hazard within 60 days from discovery in accordance with 10 CFR 21.21(a)(2). The NRC inspection team issued Violation 99900100/2011-201-02 for Limitorque's failure to adopt appropriate procedures to evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards in accordance with 10 CFR 21.21(a)(1). The NRC inspection team issued Violation 99900100/2011-201-03 for Limitorque's failure to impose 10 CFR Part 21 reporting requirements in procurement documents for basic components in accordance with 10 CFR 21.31. Specifically, Limitorque failed to prepare and submit in writing an interim report to the Commission within 60 days from discovery of an identified deviation or failure to comply potentially associated with a substantial safety hazard; failed to effectively implement quality procedures that prescribes documenting the basis for not evaluating nonconforming conditions for Part 21 reportability and to adapt procedures to evaluate customer complaints and Field Service Reports for defects and failures to comply; and failed to impose the provisions of 10 CFR Part 21 on safety related (SR) purchase orders (POs).

Training and Qualification of Personnel

The NRC inspection team found that the portions of the Limitorque training and qualification program reviewed as part of this inspection met the requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50 and that Limitorque had effectively implemented the training and qualification implementing procedures. No significant findings were identified.

Design Control

With the exception of Nonconformance 99900100/2011-201-04, the NRC inspection team found that the portions of the Limitorque design control process reviewed as part of this inspection met the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99900100/2011-201-04 for Limitorque's failure to establish measures to assure that applicable regulatory requirements and design bases are correctly translated into specifications, drawings, procedures, and instructions and to provide for independent verifying and checking the adequacy of the "Configurator" software consistent with Criterion III of Appendix B to 10 CFR Part 50; and the QMSM. Specifically, Limitorque failed to develop guidance for when software reviews are to be performed, and to independently verify changes to the "Configurator" software used in the manufacturing of SR actuators.

Procurement Document Control

With the exception of Nonconformance 99900100/2011-201-05 and Nonconformance 99900100/2011-201-06, the portions of the Limitorque program for procurement document control that were reviewed as part of this inspection met the requirement of Criterion IV of Appendix B to

10 CFR Part 50. The NRC inspection team issued Nonconformance 99900100/2011-201-05 for Limitorque's failure to require a QA program to assure adequate quality for the procurement of SR components and services consistent with Criterion IV of Appendix B to 10 CFR Part 50 and applicable implementing procedures. Specifically, Limitorque issued POs 179913 and 183027 for the purchase of electrical motors for use in safety related actuators without imposing the requirement of Appendix B to 10 CFR Part 50. In addition, Limitorque used "open" POs to procure calibration services for safety related instrumentation and analyses of lubricants used in safety related actuators without imposing the requirement of Appendix B to 10 CFR Part 50.

The NRC inspection team issued Nonconformance 99900100/2011-201-06 for Limitorque's failure to provide instructions and procedures for certain activities affecting quality. Specifically, Limitorque used information (Additional QC Checks for SMB-000 Torque Switches) not controlled in a quality related procedure to provide quality checks for evaluating torque switches used in SR actuators. In addition, Limitorque failed to assure that activities affecting quality are correctly documented in quality assurance and assembly procedures used to design and assemble SR actuators.

Control of Purchased Material, Equipment, and Services

With the exception of Nonconformance 99900100/2011-201-07, the NRC inspection team found that the portions of the Limitorque process for controlling the purchase of materials, equipment, and services reviewed as part of this inspection met the requirements of Criterion VII, "Control of Purchase Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99900100/2011-201-07 for Limitorque's failure to establish measures to assure that the purchase of SR material, equipment, and services conform to their applicable procurement documents; and failure to assess the effectiveness of the control of quality by contractors and subcontractors consistent with Criterion VII of Appendix B to 10 CFR Part 50. Specifically, Limitorque used material test reports for components and materials used in SR actuators provided by a non Appendix B subcontractor. In addition, Limitorque failed to include or reference acceptance criteria for critical characteristics of SR components to assure that the purchase of material, equipment, and services conform to procurement documents during receipt inspections.

Control of Purchased Material, Equipment, and Services and Audits

With the exception of Nonconformance 99900100/2011-201-08, the NRC inspection team found that the portions of the Limitorque external and internal audit processes reviewed as part of this inspection met the requirements of Criterion VII and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50, and applicable implementing procedures. The NRC inspection team issued Nonconformance 99900100/2011-201-08 for Limitorque's failure to perform an adequate external audit for a supplier on the Approved Vendors List for SR components and services. Specifically, in June 2009, Limitorque performed an audit of a qualified supplier of SR actuator equipment and services including testing and calibration services. Limitorque's audit evaluated the requirements of International Standardization Organization (ISO) 9001:2000 and International Standardization Organization/International Electrotechnical Commission (ISO/IEC) 1725 for calibration services but did not include an evaluation of the requirements for Appendix B to 10 CFR Part 50.

Control of Special Processes

The NRC inspection team found that the portions of the Limitorque process for the control of special processes reviewed as part of this inspection met the requirements of Criterion IX, "Control

of Special Processes," of Appendix B to 10 CFR Part 50. The NRC inspection team concluded that Limitorque had effectively implemented the implementing procedures for the control of painting, nondestructive testing, and heat treatment activities. No significant findings were identified.

Test Control

With the exception of Nonconformance 99900100/2011-201-09, the NRC inspection team found that the portions of the Limitorque test control process reviewed as part of this inspection met the requirements of Criterion XI, "Test Controls," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99900100/2011-201-09 for Limitorque's failure to perform test activities consistent with engineering procedures used in testing basic components. Specifically, Limitorque technician did not perform torque switch load testing activities consistent with Engineering Instruction Procedure (EIP) 373 during a full performance test of a SR SB-00 actuator.

Control of Measuring and Test Equipment (MTE)

The NRC inspection team found that the portions of the Limitorque MTE control process reviewed as part of this inspection met the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The NRC inspection team concluded that Limitorque had effectively implemented the implementing procedures for the control of MTE. No significant findings were identified.

Corrective Action

The NRC inspection team found that the portions of the Limitorque Corrective Action Program reviewed as part of this inspection met the requirements of Criterion XVI of Appendix B to 10 CFR Part 50. The NRC inspection team concluded that Limitorque had effectively implemented the Corrective Action Program implementing procedures. No significant findings were identified.

REPORT DETAILS

1. 10 CFR Part 21 Program and 10 CFR 50.55(e) Program

   a. Inspection Scope

   The NRC inspection team reviewed the Flowserve Quality Management System Manual (QMSM) and implementing procedures that govern Limitorque's process for identifying, evaluating and reporting defects and nonconformances to verify compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." The inspection team visually inspected all Part 21 postings to verify compliance with 10 CFR 21.6, "Posting Requirements." In addition, the inspection team reviewed Limitorque's Part 21 Log, three closed Part 21 evaluations, the only currently open Part 21 evaluation, and attended the March 1, 2011, Part 21 Committee meeting to verify compliance with 10 CFR Part 21.21, "Notification of failure to comply or existence of a defect and its evaluation." The inspection team also evaluated a sample of Limitorque purchase orders (POs) to verify compliance with the requirements of 10 CFR 21.31, "Procurement Documents," and reviewed the policy, procedures, and applicable records to ensure compliance with 10 CFR 21.51, "Maintenance and inspection of records."

   Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

   - QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011
   - Quality Assurance Procedure (QAP) 1.1, "Management Review Procedure," Revision 9, dated August 08,2009
   - QAP 5.1, "Procedure for and Insurance of Internal Engineering Documents Processing Engineering Change Orders," Revision 6, dated February 22, 2011
   - QAP 6.1, "Purchasing Procedure," Revision 19, dated August 28, 2007
   - QAP 10.1, "Test Laboratory Procedure," Revision 12, dated November 20, 2008
   - Quality Control Procedure (QCP) 10.1, "Receipt Inspection Procedure," Revision 28, dated February 15, 2011
   - Quality Control Instruction (QCI) 10.1, "Recording of Inspection Data," Revision 1, dated June 04, 2008
   - QCP 10.5, "Inspection of Safety related Nuclear Service Units and Part Orders," Revision 11, dated September 23, 2010
   - QCI 11.4, "Control of Operator Inspection," Revision 0, dated March 21, 2011
   - QAP 13.2, "Reporting of Defects for Safety Related Equipment," Revision 15, dated October 04, 2010
   - QAP 13.3, "Discrepant Material Report Procedure (DMR)," Revision 16, dated May 12, 2010
   - QAP 14.1, "Corrective and Preventive Action Procedure," Revision 14, dated November 06, 2009
   - QAP 14.2, "Customer Complaint Procedure," Revision 10, dated August 27, 2009
   - QAP 16.1, "Handling and Storing Quality Records," Revision 18, dated November 24, 2010
   - QAP 19.2, "Return Material Authorization (RMA) Procedure," Revision 7, dated August 25, 2010
   - QAP 19.3, "Services," Revision 1, dated, July 13, 2009

- QAP 19.4, “Return Goods Procedure,” Revision 0, dated November 05, 2011
- Quality Assurance Instruction (QAI) 20.1, “Sample Plan for Destructive Testing,” Revision 2, dated February 06, 2006
- Flowserve, Limitorque “Part 21 Evaluation Log”
- Limitorque Corrective Action Request (LCAR) 10-2, Part Number 60-102-0130-3 was returned from Brunswick Nuclear Power Plant due to a hot tear in the casting, dated March 11, 2010
- Audit Deficiency Notification (ADN) 2009-07-B-E-01, “Supplier Audit Finding #1 Carboline (Lake Charles),” dated March 23, 2010
- ADN 2010-03-E-01, “Flowserve Motor Model Number does not match the Test Card Model Number,” dated September 16, 2010
- ADN 2010-07-E-01, “Supplier Audit Finding #1 Carboline (Green Bay, WI),” dated September 15, 2010
- ADN 2010-13-E-01, “NIAC Finding AF 158-13-01,” dated November 01, 2010
- 10 CFR Part 21 Evaluation No. 66 Folder

    - 10 CFR Part 21, Evaluation #61 , “Part 21 Committee Meeting Notes,” dated October 15, 2008
    - Email from Mr. Patrick McQuillan to Mr. B. Palline and Kyle Ramsey, “Nylon Retainers – 1604DC Bearings,” dated February 24, 2011
    - Email from Mr. B. Palline to Mr. Patrick McQuillan, “Nylon Retainers – 1604DC Bearings,” dated February 23, 2011
    - Product data sheet for 1600 Series Precision Ground Radial bearings
    - Multiple drawing of SMB-000 operators
    - Letter from Mr. Patrick McQuillan to Mr. Jeff McConkey and Kyle Ramsey, “Nylon Retainers – 1604DC Bearings,” dated February 02, 2011
    - Email from Mr. Chris Toler to Mr. Patrick McQuillan, “Nylon Retainers – 1604DC Bearings,” dated January 18, 2011
    - Email from Mr. D. Stewart to Mr. Chris Toler, “Nice ball bearings CC1-1604-DC,” dated January 28, 2011
    - Part 21 Committee Meeting Minutes dated September 28, 2010
    - Part 21 Committee Meeting Minutes dated January 18, 2011
    - Part 21 Committee Meeting Minutes dated March 01, 2011

- 10 CFR Part 21 Evaluation No. 65 Folder

    - Event Report 46403, “Part – 21 Report – Limitorque Limit Switch Defect,” dated November 08, 2010
    - Flowserve Engineering Document: EDD-126, “SMB Gear Limit Switch Contact Continuity Integrity, Loss of Signal,” dated December 09, 2010
    - 10 CFR Part 21, Evaluation #65 , “Final Report for CAR 25500-73903 / Part 21 Evaluation of Geared Limit Switch,” dated January 14, 2011
    - Vendor Quality Problem Corrective Action Plan No. V675D, “DC Motor Actuator (SB-3) w/Drive Sleeve Rotation Opposite to Billing Material,” dated August 02, 2010
    - Vendor Quality Problem Corrective Action Plan No. V675D, “DC Motor Actuator (SB-3) w/Drive Sleeve Rotation Opposite to Billing Material,” including Root Cause Analysis and Corrective Actions, dated August 20, 2010

- 10 CFR Part 21 Evaluation No. 63 Folder

    - 10 CFR Part 21, Evaluation #63 , "Part 21 Committee Meeting Results," dated August 05, 2010
    - Revised Form LP-11, "Flowserve Corporation Final Inspection and Test – Electric Operator," Revision 5
    - NRC Information Notice 2006-26, "Failure of Magnesium Rotors in Motor-Operated Valve Actuators," dated November 20, 2006
    - AREVA Corrective Action Report No. 2008-2683-CR, "Video-scope Inspection of Reliance/Limitorque AC Motors," dated August 18, 2008
    - Email from Mr. Patrick McQuillan to Mr. Jeff McConkey, "AREVA Baldor MG Rotor Evaluation," dated October 10, 2008

- 10 CFR Part 21 Evaluation No. 61 Folder

    - 10 CFR Part 21, Evaluation #61 , "Part 21 Committee Meeting Notes," dated October 15, 2008
    - Letter from Reliance Electric to Mr. Patrick McQuillan and Mr. Jeff McConkey dated September 30, 2008, (Subject not provided)
    - Event Report 44585, "Part 21 Report – Limitorque Limit Switch Defect," dated November 08, 2010

- In addition, the NRC inspection team reviewed the following Limitorque POs:

    - Limitorque Purchase Order (PO) 97422 from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 97423 from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 95802 from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009
    - Limitorque PO 95803 from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009
    - Limitorque PO 95805 from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009

b. Observations and Findings

b.1 Postings

The NRC inspection team visually inspected the Limitorque Part 21 postings. The inspection team observed that the Part 21 requirements were posted in enclosed bulletin boards in the cafeteria of the office building, and in two locations in the factory building. The Part 21 postings in the factory building were posted in the entryway to the administration portion of the factory building and in the entryway of the factory floor next to the workers' parking lot. The NRC inspection team verified that each posting included a copy of Section 206 of the Energy Reorganization Act

of 1974, as amended; a description of 10 CFR Part 21; and a description of the applicable procedure including the location where the procedure can be found and the name of the individual to whom reports may be made consistent with the requirements of 10 CFR 21.6.

b.2 10 CFR Part 21 Procedure

The NRC inspection team reviewed the Limitorque Part 21 policy and procedures and related documentation, interviewed the QA manager and members of Limitorque's staff, reviewed three completed Part 21 evaluations and the only ongoing Part 21 evaluation, and attended the March 1, 2011 Part 21 Committee meeting to better understand the Limitorque Part 21 process. The NRC inspection team reviewed QAP 13.2 which provides procedural guidance for reporting of deviations that could potentially affect the operability of any nuclear SR Limitorque actuator. The scope of this procedure included all basic component actuators, components, and spare parts necessary to assure that an actuator will perform its intended safety function. QAP 13.2 defines and outlines the responsibilities to identify, control, document, and resolve conditions used for reporting nonconforming conditions and deviations discovered at the Limitorque facility and through customer feedback. In addition, QAP 13.2 is an integrated procedure controlling both nonconformances and Part 21 reporting requirements as identified using DMRs, Field Service Reports, Customer Reported Problems, LCARs, and ADN/Audit Findings. The NRC inspection team verified that QAP 13.2 provides adequate guidance to evaluate nonconforming conditions or deviations including measures to perform analysis and to determine whether the evaluated nonconformances and deviations could result in a significant condition adverse to quality or create a substantial safety hazard.

The inspection team also verified that QAP 13.2 provides adequate guidance for the information required in written notifications as required by 10 CFR 21.21(d)(4) and the different timing requirements for 10 CFR Part 21 evaluation, notification, and reporting activities. However, the inspection team determined that Part 21 Evaluation No. 66 was identified September 28, 2010 and, as of March 4, 2011, the vendor had not completed its evaluation or submitted an interim report to the Commission. 10 CFR 21.21(a)(2) states, in part, "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 discovery of the deviation or failure to comply, an interim report is prepared and submitted to the Commission." Therefore, Limitorque failed to meet the 60 day interim reporting requirement for Part 21 Evaluation No. 66 as specified by 10 CFR 21.21(a)(2). This issue has been identified as Violation 99900100/2011-201-01.

The NRC inspection team reviewed QAP 13.3, which provides the procedural guidance for documentation, evaluation, and processing of DMRs. DMRs are used to document any identified failure to meet inspection activities relating to drawing attributes, variances from specifications, or deviations from standard accepted practices. QAP 13.3 identifies the quality assurance (QA) organization as being responsible for overseeing the creation of DMRs by its quality control (QC) inspectors performing material inspection activities, monitoring implementation of the program, using DMRs to report trends adverse to quality, resolving

vendor/supplier nonconformances, and determining whether LCARs are needed to correct and prevent recurring nonconforming conditions. The inspection team verified that QAP 13.3 provides adequate guidance for evaluating DMRs, to determine whether a discrepant material condition could result in a significant condition adverse to quality or a substantial safety hazard, and the need to refer individual DMRs to the Part 21 Committee to determine reporting requirements.

The NRC inspection team reviewed QAP 14.1, which provides procedural guidance for processing LCARs. LCARs are used to document hardware and program deficiencies. QAP 14.1 identifies the QA group as the responsible organization for tracking LCAR responses and closeout, and for determining whether potential conditions adverse to quality have been identified and need to be forwarded to the Part 21 Committee to determine reporting requirements. The inspection team verified that QAP 14.1 provides adequate guidance for evaluating LCARs, to determine whether the evaluated hardware and program deficiencies could result in a significant condition adverse to quality or could cause a substantial safety hazard, and the need to refer a LCAR to the Part 21 Committee to determine reporting requirements.

The NRC inspection team reviewed QAP 14.2, which provides the procedural guidance for processing customer complaints. The inspection team determined that QAP 14.2 does not discuss the need to determine whether customer complaints should be evaluated for potential conditions adverse to quality or that could cause a substantial safety hazard. The inspection team verified that QAP 14.2 does not provide guidance for documenting customer complaints on LCARs or ADNs, and does not provide guidance for forwarding customer complaints to the Part 21 Committee to determine reporting requirements. The inspection team reviewed the only two nuclear industry related customer complaint reports and verified that one was not safety related and the other was evaluated for Part 21 reportability.

The NRC inspection team reviewed QAPs 19.2, 19.3, and 19.4, which provide guidance for processing Field Service Reports. The inspection team determined that the Field Service Report QAPs do not discuss the need to determine whether Field Service Reports should be evaluated for potential conditions adverse to quality or that could cause a substantial safety hazard. The inspection team verified that the applicable QAPs do not provide guidance for documenting customer complaints on LCARs or ADNs, and do not provide guidance for forwarding Field Service Reports to the Part 21 Committee to determine reporting requirements.

10 CFR 21.21(a)(1) states, in part, that “individual, corporation, partnership, dedicating entity, or other entity subject to the regulations in this part shall adopt appropriate procedures to -- (1) Evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards as soon as practicable . . . ” QAP 13.2 states, in part, that the Flowserve QA program provides several methods for identifying nonconforming conditions or deviations including DMRs, Field Service Reports, customer reported problems, LCARs, ADNs and Audit Findings. QAP 13.2 provides guidance for nonconforming conditions or deviations that are “determined to be of a recurring nature and/or represents a significant condition adverse to quality, or a substantial safety hazard,

which is a result of a discrepancy in the design, application, manufacturing, etc." to be documented in an LCAR or ADN and forwarded to the Part 21 Committee for further evaluation to determine the need for 10 CFR Part 21 reporting. The inspection team found implementing procedures that provided guidance for Part 21 evaluation and reporting of DMEs, LCARs, and ADNs. However, inspection team was unable to identify guidance for evaluating and reporting defects and failures to comply associated with substantial safety hazards for Customer Reported Problems and Field Service Reports consistent with the requirement of 10 CFR 21.21(a)(1). This issue has been identified as Violation 99900100/2011-201-02.

b.3 10 CFR Part 21 Implementation

10 CFR 21.21(a)(1) states, in part, that "individual, corporation, partnership, dedicating entity, or other entity subject to the regulations in this part shall adopt appropriate procedures to -- (1) Evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards as soon as practicable . . . ." In accordance with QAP 13.2, if a nonconforming condition is determined to be "Not Reportable" or "Not Applicable," and is therefore not forwarded to the Part 21 Committee to be evaluated for reportability. QAP 13.2 states that the basis for said determinations needs to be documented in the "Additional Information" portion of an LCAR and ADN.

The NRC inspection team reviewed the only SR LCAR and four SR ADNs from the past 3 years which were not included in Limitorque's evaluation process for Part 21 reportability. The SR LCAR (LCAR 10-2) did not document Limitorque's evaluation and determination that this LCAR was "Not Reportable" or "Not Applicable" for further evaluation for Part 21 reportability. In addition, each of the four ADNs had a brief statement in the "Additional Information" portion of the ADN form which lacked an adequate basis for not forwarding the ADN to the Part 21 Committee. Limitorque's failure to effectively implement quality procedures for documenting the basis for not performing a Part 21 evaluation for nonconforming conditions associated with substantial safety hazards is inconsistent with the requirements of 10 CFR 21.21(a)(1). This issue is another example of Violation 99900100/2011-201-02.

The NRC inspection team reviewed the Limitorque Part 21 log that identified seven closed, potentially reportable conditions evaluated under the vendor's Part 21 Program in the last 10 years all of which were determined to be not reportable. The inspection team reviewed three of the closed Part 21 evaluations, the currently open Part 21 evaluation, and attended the March 1, 2011, Part 21 Committee meeting. The inspection team verified that Limitorque provided an interim report on one of the completed evaluations, consistent with the requirements of 10 CFR 21.21(a)(2), and made a final determination that the remaining two evaluations were not reportable under 10 CFR Part 21 in less than 60 days. Each item was identified for evaluation consistent with established procedures and the inspection team verified that the vendor's determination that a substantial safety hazard did not exist was based on a logical conclusion. More specifically, for the recent Part 21 notification made by Velan Valves regarding geared limit switch bent fingers (Limitorque Part 21 Evaluation No. 65), Limitorque performed a detailed root cause analysis (RCA) to determine the cause. The RCA was based on cycle testing of nine new switches from Flowserve stock and seven switches returned by Velan.

Testing of these torque switches could not reproduce the bend in the contact fingers during actuator operation. However, the bent finger condition was reproduced when a flat edged screw driver was introduced in the cycling process inconsistently with the limit switch setting instruction. As a result of the testing performed, Limitorque concluded that the damage was caused by improper use of a flat edge screw driver during limit switch setting. This conclusion was further supported by the bent spring studs and scuff marks on the stud heads of the damaged limit switches in questions and the lack of any operating experience indicating failures similar to those identified by Velan. As a result of these findings, Limitorque concluded that the limit switch defects were not 10 CFR Part 21 reportable. The NRC inspection team did not dispute Limitorque's final determination.

Part 21 Evaluation 63 identifies a condition in which three SMB-3 units were specified to open in the counterclockwise (CCW) direction in the Bill of Materials (B/M) but were delivered with a clockwise opening direction. This was caused by the motor being wired for normal clockwise rotation of the drive sleeve to open. Because actuators are often used in different applications, the product instruction manual specifies the need to verify proper actuator direction as part of the initial installation to address such a concern. As a result, Limitorque determined this issue was not 10 CFR Part 21 reportable. However, in response to this issue, Limitorque revised the factory assembly and documentation forms to require a bench test after final wiring to verify correct drive sleeve rotation consistent with specific requests in the B/M. The NRC inspection team did not dispute Limitorque's final determination.

Part 21 Evaluation No. 61 identifies a condition found in Limitorque actuator motors shipped without uniform coating of magnesium rotors. The need to coat magnesium rotors was identified in NRC Information Notice 2006-26. In response to the information notice, AREVA implemented video-scope inspections of motors shipped to end-users. The uncoated magnesium rotor in question was identified in August 2008, by the end-user on a motor shipped by AREVA prior to AREVA implementing corrective actions in response to Information Notice 2006-26, "Failure of Magnesium Rotors in Motor-operated Valve Actuators," dated November 20, 2006, identified the need to coat magnesium rotors. It was identified by the end-users video-scope inspection activities, also implemented in response to Information Notice 2006-26. Because this is a reported condition that has been communicated to the nuclear industry with corrective actions in place that are being effectively implemented, Limitorque determined this condition not to be 10 CFR Part 21 reportable. The NRC inspection team did not dispute Limitorque's final determination.

b.4 Purchase Orders

The NRC inspection team reviewed QAP 6.1 and verified that the Limitorque procurement process imposes the requirements of 10 CFR Part 21 on its qualified suppliers by incorporating supplier quality requirements into POs for nuclear SR materials, items, and services.

The NRC inspection team reviewed a sample of Limitorque POs. The inspection team identified that an "open purchase" was made for Exova testing services using

a credit card without generating separate POs. QAP 6.1 provides guidance for processing POs for services but does not specifically address testing services. Exova is on the Approved Vendor's list and has a program consistent 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"; however, because a separate PO was not generated, 10 CFR Part 21 reporting requirements were not applied for the SR services provided. Limitorque's failure to ensure that the provisions of 10 CFR Part 21 were applied for the purchase of SR services is inconsistent with the requirements of 10 CFR 21.31. This issue has been identified as Violation 99900100/2011-201-03.

b.5 Records Retention

The NRC inspection team reviewed Limitorque's 10 CFR Part 21 record retention policy and procedures. In accordance with the QMSM and QAPs 13.2 and 16.1, records shall be established and maintained to provide evidence of conformity to requirements in a legible, identifiable, and retrievable manner. The inspection team verified that Limitorque had developed procedures to define the controls needed for the identification, storage, protection, retrieval, retention time, and disposal of quality records. In addition, the inspection team verified that Part 21 notifications, review committee meeting minutes, Engineering Department Evaluations, applicable calculations and reports, and licensee notifications are considered quality records and must be maintained as permanent records.

c. Conclusions

With the exception of Violations 99900100/2011-201-01, 99900100/2011-201-02, and 99900100/2011-201-03, the NRC inspection team found that the portions of the Limitorque process for reporting of defects and nonconformances reviewed as part of this inspection met the requirements of 10 CFR Part 21. The NRC inspection team issued Violation 99900100/2011-201-01 for Limitorque's failure to submit an interim report for an ongoing evaluation of an identified deviation or failure to comply potentially associated with a substantial safety hazard within 60 days from discovery in accordance with 10 CFR 21.21(a)(2). The NRC inspection team issued Violation 99900100/2011-201-02 for Limitorque's failure to adopt appropriate procedures to evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards in accordance with 10 CFR 21.21(a). The NRC inspection team issued Violation 99900100/2011-201-03 for Limitorque's failure to specify 10 CFR Part 21 reporting requirements in procurement documents for basic components in accordance with 10 CFR 21.31. Specifically, Limitorque failed to complete an evaluation or to prepare and submit in writing an interim report to the Commission within 60 days from discovery of an identified deviation or failure to comply potentially associated with a substantial safety hazard. Limitorque also failed to, or inadequately document the basis for determining nonconforming condition to be "Not Reportable" or "Not Applicable" for further evaluation for Part 21 reportability; and failed to adapt procedures to evaluate customer complaints and Field Service Reports for defects and failures to comply. In addition, Limitorque procured SR services from an approved vendor without imposing the provisions of 10 CFR Part 21 reporting requirements.

2. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures that govern the Limitorque training and qualification process to verify compliance with the requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed Limitorque's personnel training and qualification records and discussed personnel training and qualification activities with Limitorque management and technical staff.

Specifically, the NRC inspection team reviewed the following policies and procedures:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011
- QAP 18.1, "Indoctrination and Training," Revision 13, dated April 30, 2010
- QAP 17.1, "Audits," Revision 1, dated August 27, 2009
- QCP 18.1, "Qualification and Certification of Inspection Personnel," Revision 4, dated February 2, 2011
- Limitorque Quality Assurance Study Record, Assignment Record for Lead Auditor Maintenance of Proficiency, Study Assignments for FY 2007-2010, records for five employees
- Limitorque Quality Control Inspector Qualification/Certification Records for FY 2007-2010, records for eight employees.

b. Observations and Findings

The NRC inspection team reviewed the QMSM, and implementing procedures, QAP 18.1, QAP 17.1 and QCP 18.1, which serve as the implementing procedures for indoctrination, QA, QC, and proficiency training. The inspection team identified that Limitorque schedules training of personnel on applicable quality policies, manuals and procedures as determined by the responsible organization. The inspection team verified that Limitorque personnel receive indoctrination training and periodic proficiency training on QA and QC activities, including tests, inspections, and specialized technical training as applicable to an individual's work activities. QCP 18.1 requires Limitorque personnel performing QC functions to be qualified, certified and recertified as required by applicable codes and standards, such as American Society of Nondestructive Testing SNT-TC-1A, "Non-Destructive Testing—Qualification and Certification of NDT Personnel." QAP 17.1 requires QA auditors be qualified and maintain qualification in accordance with American National Standards Institute (ANSI), ANSI N45.2.23, "Lead Auditor."

The inspection team reviewed the training records of Limitorque QC inspectors, and verified that each QC inspector qualified as a basic level QC inspector using a uniform training program. The inspection team noted that three QC inspectors were certified as Non-destructive Examination (NDE) Level II inspectors for both penetrant testing (PT) and magnetic particle testing (MT). The NRC inspection team verified that these certifications were current and consistent with the industry standard for Level II NDE inspectors, American Society of Nondestructive Testing SNT-TC-1A. The inspection team determined that Limitorque has a contract with a NDE Level III certified examiner to run its NDE

program, reviewed his certification and training records as maintained by Limitorque, and verified that the Level III examiner's training was current and consistent with industry standards.

The NRC inspection team reviewed training records related to implementation of the Limitorque QA program. The NRC inspection team reviewed QA personnel training records for all Limitorque QA auditors and verified that the QA personnel certifications were current and consistent with industry standard.

c. Conclusions

The NRC inspection team found that the portions of the Limitorque program for training and qualification of personnel that were reviewed as part of this inspection met the requirements of Criterion II of Appendix B to 10 CFR Part 50. The NRC inspection team concluded that Limitorque effectively implemented the training and qualification implementing procedures.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures that govern the Limitorque design control process to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. In addition, the inspection team reviewed a sample of POs, observed the processing of POs, observed dedication activities for a sample of actuator parts and resolution of identified discrepancies, observed manufacturing and testing activities for a nuclear SR actuator, and discussed the design control process with Limitorque management and technical staff beginning with the placement of orders for SR actuators to final assembled motor-operated actuators including the Certificate of Conformance (C of C) approval process. The NRC inspection team also reviewed Westinghouse Electric Company (WEC) policies, procedures, and related documentation specific to Limitorque's work being performed for the AP1000 project.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011
- QAP 3.1, "Order Entry and Processing Procedure," Revision 21, dated October 26, 2009
- Sales Administration Procedure (SAP) 3.4, "Configurator," Revision 2, no date specified
- QAP 4.1, "Design and Development Procedure," Revision 10, dated August 22, 2003
- QAP 5.1, "Procedure for and Insurance of Internal Engineering Documents Processing Engineering Change Orders," Revision 6, dated February 22, 2011
- QCI 5.1, "Use of Engineering Instruction Procedures," Revision 7, dated February 22, 2011

- QCP 5.1, “Quality Control Department Procedures,” Revision 15, dated February 6, 2006
- AP (Assembly Procedure) 9.2, “Wiring Procedure,” Revision 9, dated March 19, 2001
- AP 9.3, “Motorized Mechanical Assembly Procedure,” Revision 8, dated January 1, 1999
- QAI 10.1, “Acceptance Criteria for Electric Actuator Production Tests,” Revision 6, dated November 20, 2008
- QAP 10.1, “Test Laboratory Procedure,” Revision 12, dated November 20, 2008
- QAP 13.3, “Discrepant Material Report Procedure (DMR),” Revision 16, dated May 12, 2010
- Flowserve Inspection of Nuclear Service Worm Gears and Worm Gear Sectors, Form L2143 (Revision 0)
- Flowserve Wiring Inspection, Form L631 (Revision 4)
- Flowserve Corporation Final Inspection and Test – Electric Operator, Form LP-11 (Revision 5)
- Flowserve Inspection Sheet (wiring), Form LP-32 (Revision 3)
- Limitorque Test Open Data, Form L1090A, Revision 0, issued August 2006
- Limitorque Test Close Data, Form L1090B Revision 0, issued August 2006
- Limitorque Corporation Inspection Sheet for Nuclear Unit(s) Order, Form L-613, Revision C
- Limitorque Corporation Report of Non-Destructive Examination, Form L624, Revision B, issued January 1996
- Nuclear Certificate of Conformance (C of C): Unit(s), Form LP3378, Revision 2, dated October 14, 2010
- Nuclear C of C: Parts, Form LP-45H, Revision 10 dated January 12, 2010
- Nuclear Order Review/Check List, Form L3345QA, Revision 4, May 21, 2003
- Safety-Related Nuclear Service (green traveler sheet), Form L-193, Revision 5, May 27, 2010
- In addition, the NRC inspection team reviewed the following Limitorque POs:

    - Limitorque Purchase Order (PO) 97422 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 97423 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 95802 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009
    - Limitorque PO 95803 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009
    - Limitorque PO 95805 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009.

b. Observations and Findings:

b.1 Policies and Procedures

The NRC inspection team reviewed the Flowserve QMSM, which establishes the policy for the design control process and for the design and development of related changes. The inspection team also reviewed the applicable implementing procedures for the design control process, interviewed engineering, manufacturing and QA management and staff, and reviewed POs and sales orders to understand the process used to produce SR actuators.

The NRC inspection team reviewed QAP 3.1 which describes the processing of customer requests for quotation and contracts/POs, as applicable, for SR and non-SR actuators and parts. QAP 3.1 provides the means to ensure that customer expectations are understood, agreed upon, and entered into the Limitorque PO processing system and applies to processing POs for SR and non SR actuators and parts. QAP 3.1 requires contract administrators reviewing POs to verify that actuator specifications or part numbers and classifications are correct. If PO requirements are not applicable, incorrect, or need clarification, Limitorque provides a written notification to the customer, and places the order on hold until the PO is agreed upon by the customer and Limitorque and applicable change notices are documented and approved.

QAP 3.1 requires contract administrators to enter the PO information into the Limitorque business system ("Configurator") software that prepares the Bill of Material (B/M) for the manufacturing and testing of the equipment in accordance with SAP 3.4, and requires that an independent review be performed for each nuclear SR actuator order to verify that the PO information is properly specified. The B/M is used to track the actuator throughout the manufacturing and testing process. Limitorque procedures provide for changes to POs to be tracked. The "Configurator" software prepares a Customer Order Data Sheet upon completion of the PO. Applicable Limitorque forms track the completion of specific steps in the manufacturing and testing process for each actuator. The NRC inspection team reviewed Limitorque POs 97423, 95802, 95803, and 95805 and verified to the extent possible that these POs were processed in accordance with QAP 3.1 and consistent with Criterion III of Appendix B to 10 CFR Part 50. The NRC inspection team also reviewed the B/M and Customer Order Data Sheet prepared for manufactured actuators and verified that they were consistent with their applicable POs and QAP 3.1.

The NRC inspection team interviewed engineering, sales personnel, contract administrator, and associated management, in regards to the verification and validation process, change control process, and the engineering process in support of the SR POs. The NRC inspection team was informed that Sales and Contract Administrators work closely together to ensure that PO information is correctly entered into the "Configuator" system, and that engineering performs an independent review of SR POs information to verify the information specified and entered into Configurator system. The NRC inspection team identified that engineering performs the center of gravity calculation using a software program, performs an independent review of the data entered, and verifies that the output from the software is within expectations. The NRC inspection team reviewed

applicable PO packages and verified that the POs included the required engineering inputs and center of gravity calculations including independent reviews, where required.

The NRC inspection team interviewed sales, contract administrator and QA personnel and management about the Limitorque process for issuing a Certificate of Compliance (C of C) upon completion of the manufacturing and testing process for a nuclear SR actuator. The NRC inspection team observed that the Quality Control staff relies on the B/M and the engineering process without independent verification of the original PO information was correctly translated into the B/M.

b.2 Manufacturing Process Controls to Ensure Design Requirements Are Met

The NRC inspection team observed the manufacturing process for a Limitorque SMB-3 SR actuator (Order Number 104292.002), including mechanical assembly, gearbox grease application, initial operating tests, torque stand testing, and electrical wiring installation. The team also observed the control of changes during the manufacturing process for actuators.

The NRC inspection team verified that the B/M is used to track the actuator throughout the manufacturing and testing process and changes to POs are tracked throughout the processing, manufacturing and testing processes. The inspection team observed that applicable Limitorque forms are used to track the completion of specific steps of the manufacturing and testing process and the Configurator software generates a Customer Order Data Sheet for each actuator upon completion of the equipment order.

The NRC inspection team observed dedication activities for a Limitorque SMB-3 SR actuator (Order Number 104292.002), actuator parts, and resolution of identified discrepancies DMRs 21667, 21668, and 21669). The inspection team witnessed the engineering disposition of DMRs 21667, 21668, and 21669. The NRC inspection team verified that these activities were performed consistent with their implementing procedures and applicable regulatory requirements.

The NRC inspection team observed the design control process for a SR actuator and verified that the Limitorque manufacturing process, including mechanical assembly, testing, and electrical wiring installation, was performed by highly experienced and capable personnel. The inspection team verified that the assembly process provides QC holdpoints and independent verification of the completion of specific mechanical assembly, testing, and electrical wiring steps. The inspection team observed that the torque switch testing adequately demonstrated the actuator's required output capability as specified in the B/M. The inspection team verified that the Limitorque manufacturing process provided for successful assembly and testing of the sampled actuator consistent with the B/M.

The NRC inspection team observed that QAI 10.1 does not specify adjusting the instrument scale to provide for a more precise selection of the trip point for actuator torque switch setpoint. The use of the operating test scale during evaluation of diagnostic data can result in a less precise selection of torque switch trip point.

b.3 Implementation of Process Changes Related to Design Control

The NRC inspection team reviewed the Flowserve QMSM and change control process implementing procedure QAP 5.1. The NRC inspection team interviewed engineering, QA personnel and management regarding the change control process, and the "Configurator" and "Center of Gravity Calculation" software programs.

The NRC inspection team reviewed Engineering Change Order 22551 used to address a change from cast iron to ductile iron for Limitorque actuator parts. The inspection team verified that the independent review was performed consistent with the QMSM and applicable implementing procedure and that adequate direction was provided to implement the change.

The NRC inspection team discussed the "Configurator" software with Limitorque management and technical staff. The NRC inspection team observed that the "Configurator" software program, along with the "Center of Gravity Calculation" software were over 12 years old at the time of the inspection and no verification or validation has been performed during that period. The inspection team verified that no changes had been made to the "Center of Gravity Calculation" since it was originally validated. The inspection team, however, determined that some part and part number changes have been made in the "Configurator" software.

Criterion III of Appendix B to 10 CFR Part 50 states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. . . . The design control measures shall provide for verifying and checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. The verifying and checking process shall be performed by individuals or groups other than those who performed the original design." The Flowserve QMSM states, in part, that "design and development changes shall be identified and records maintained, and that changes shall be reviewed, verified, and validated, as appropriate, and approved before implementation." QAP 5.1 was used to evaluate potential changes to the "Configuator" software package, however, guidance for when a software review, verification, and validation needs to be performed had not been developed. In accordance with QAP 5.1, changes are to be evaluated, independently reviewed and if found to be acceptable the changes are made. QAP 5.1 does not address implementation of the change. The NRC inspection team determined that changes to the "Configuator" software were not being verified or checked by any person other than the individual making the changes.

Limitorque's failure to establish measures that are correctly translated into procedures or instructions for when software reviews, verifications and validations are required to be performed; and failure to perform the prescribed independent review of changes made to the "Configurator" software is not consistent with the requirements of Criterion III of Appendix B to 10 CFR Part 50, the Flowserve QMSM, and the applicable implementing procedures. This issue has been identified as Nonconformance 99900100/2011-201-04.

The NRC inspection team observed that design control and manufacturing process procedures for SR products are used as reference documents. The inspection team also verified that Limitorque design activities, changes, and manufacturing process activities observed within the scope of the design control review were accomplished in accordance with approved policies and implementing procedures.

c. Conclusions

With the exception of Nonconformance 99900100/2011-201-04, the portions of the Limitorque program for design control that were reviewed as part of this inspection met the requirements of Criterion III of Appendix B to 10 CFR Part 50, the Flowserve QMSM, and applicable implementing procedures; and were effectively implemented. The NRC inspection team issued Nonconformance 99900100/2011-201-04 for Limitorque's failure to establish measures that are accurately translated into specifications, drawings, procedures, and instructions; and failed to perform independent reviews of changes to software used for SR applications. Specifically, Limitorque failed to develop guidance for when software reviews are to be performed, to prevent inadequacies in design control procedures used to design and assemble SR Limitorque actuators, and to perform independent verification of changes to the "Configurator" software program used in SR applications.

4. Procurement Document Control

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures that govern Limitorque's process for controlling documents used to procure material, equipment, and services to verify compliance with Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. The inspection team reviewed procurement documents including POs, design specifications, testing and inspection requirements and activities, special processes requirements, witness and holdpoints, and applicable reporting requirements and reviews.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, POs, and supporting documentation:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008" Revision 3, dated February 15, 2011
- QAP 3.1, "Order Entry and Processing Procedure," Revision 21, dated October 26, 2009
- QAP 4.1, "Design and Development Procedure," Revision 10, dated August 22, 2003
- Procurement Procedure (PP) 6.1, "Material Standards Document Control to Outside Vendors," Revision 0, dated October 04, 2010
- PP 6.2 "Procedure for Processing Purchase Orders, " Revision 2, dated March 05, 2003
- QAP 6.1, "Purchasing Procedure," Revision 19, dated August 28, 2007
- QAP 6.2, "Qualification of Vendors and Suppliers," Revision 15, dated February 22, 2011

- QAP 10.2, “Safety Related Nuclear Service Procedure,” Revision 7, dated July 06, 2010
- AP (Assembly Procedure) 9.2, “Wiring Procedure,” Revision 9, dated March 19, 2001
- AP 9.3, “Motorized Mechanical Assembly Procedure,” Revision 8, dated January 1, 1999
- In addition, the NRC inspection team reviewed the following Limitorque POs and related documentation:

    - Limitorque PO No 182301 from Earle M. Jorgensen Company, Bar Stock intended to use to fabricate various actuator parts, dated January 05, 2011
    - Limitorque PO No 179913 from Baldor Electric, Inc, motors for use in valve actuators for safety related applications in commercial Nuclear Power Plants, dated August 16, 2010
    - Limitorque PO No 183027 from Baldor Electric, Inc, motors for use in valve actuators for safety related applications in commercial Nuclear Power Plants, dated February 16, 2011
    - Limitorque PO No 182998 from Carboline Inc., coating materials used on valve actuators for safety related applications in commercial Nuclear Power Plants, dated February 14, 2011
    - Limitorque PO No 181948 from Rockbestos, 14 AWG wire used in valve actuators for safety related applications in commercial Nuclear Power Plants, dated December 07, 2010
    - Limitorque PO No 183123 from Carboline Inc., coating materials used in valve actuators for safety related applications in commercial Nuclear Power Plants, dated February 22, 2011
    - Limitorque PO No 180109 from Crompton, Lubricant for assembling safety related actuators, dated August 08, 2010
    - Limitorque PO No 182075 from Donsco, Casting for assembling safety related actuators, dated December 14, 2010
    - Limitorque PO No 183060 from Crompton, Lubricant for assembling safety related actuators, dated February 17, 2011
    - Test Certificate Ref. No. T-004079, Issue 1, Torque Switch Contact Block FT-IR Analysis, dated March 18, 2010
    - Test Certificate Ref. No. T-003559, Issue 1, Torque Switch Terminal Block FT-IR Analysis, dated March 11, 2010
    - Test Certificate Ref. No. T-101730, Issue 2, Lubricant FT-IR Analysis, dated February 8, 2011
    - Test Certificate Ref. No. T-101739, Issue 1, Casting Tensile Test, dated February 01, 2011
    - Test Certificate Ref. No. T-102193, Issue 1, Casting Tensile Test, dated February 8, 2011
    - Certificate of Test, Flowserve Order Number 182301, dated February 22, 2011

- Certificate of Test, Flowserve Order Number 182870, dated February 10, 2011

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the Flowserve QMSM and procurement implementing procedure PP 6.1, which is used to communicate material standards changes to Limitorque suppliers including open POs that are affected by the change in the material standard. PP 6.2 provides guidance for PO data entry, related notes, and purchase history file. The NRC inspection team reviewed a sample of POs, accompanying notes, and purchase history files and verified that they were being documented consistent with the QMSM and implementing procedure.

The NRC inspection team reviewed QAP 6.1 which controls the process for developing and maintaining POs for production including the procurement of products and services. This procedure also provides the guidance for POs used for Limitorque supplied materials, vendor supplied material, changes to POs, PO notes, and PO requirements for nuclear grade materials. The inspection team also reviewed QAP 6.2, which is used to evaluate and control various procurement sources. This procedure provides guidance for processing supplier and vendor POs for raw materials, semi-finished and finished items, and services used in the manufacturing process. The NRC inspection team reviewed multiple POs in various stages of implementation and, with the exceptions noted below, verified that the POs reviewed were being processed consistent with their respective implementing procedure.

The NRC inspection team reviewed QAP 10.2, which establishes the process for a document inspection for furnished SR nuclear materials that includes all special valve actuators with SR components used for containment and non containment service. QAP 10.2 also provides guidance for the ordering process, production, inventory control, and stockroom control for SR materials and components. The NRC inspection observed that SR materials and components were appropriately marked and controlled consistent with Criterion IV of Appendix B, the QMSM, and applicable implementing procedures.

b.2 Implementation of Limitorque Purchase Orders

The NRC inspection team reviewed the following Limitorque procurement documents:

Limitorque Purchase Orders 179913 and 183027, Baldor Electric, Inc,

Limitorque POs 179913 and 183027 were used to purchase SR electric motors for use in SR actuators in accordance with Limitorque sales order number 104292.002. The NRC inspection team verified that the motor vendor was on Limitorque's AVL as an Appendix B supplier. Accordingly, the NRC inspection team reviewed the POs to determine whether Limitorque imposed Appendix B to 10 CFR Part 50 requirements for the purchase of a SR electric motor.

The NRC inspection team reviewed the technical requirements in the POs and verified that they were consistent with the requirements in the Limitorque sales order. The inspection team also verified that the nameplate data on the motor matched the data included in PO 179913.

The NRC inspection team reviewed QAP 6.1 and verified that procedural requirements were in place to require that POs contain minimum attributes including "specific quality procedures." The inspection team, however, determined that the POs did not impose the requirement of Appendix B to 10 CFR Part 50 and, as such, determined that Limitorque failed to assure that adequate quality requirements are included in procurement documents for SR equipment and services consistent with Criteria IV of Appendix B to 10 CFR Part 50 and the applicable implementing procedures. This issue has been identified as Nonconformance 99900100/2011-201-05.

Limitorque Purchase Order 180109, Crompton

Limitorque PO 180109 was used to purchase lubricant for assembling SR actuators. Limitorque purchased the lubricant as commercial grade and dedicated it for use in SR actuators. As part of the dedication process, Limitorque sent a sample of the lubricant to a laboratory for spectrum analysis to determine whether the lubricant was consistent with the baseline spectrum parameters for the approved lubricant.

The NRC inspection team reviewed the batch number and test results from the sample lubricant, and verified that the batch numbers matched and that the results indicated that the lubricant was acceptable. The inspection team determined that the test services were provided by a separate company, Exova. The request for services was initiated using a Limitorque "open" PO which is used for both SR and non SR services. Shipments are periodically sent to Exova for testing and verification. QAP 6.1 provides guidance for processing POs for services but does not specifically address testing services or "open" POs.

The NRC inspection team verified that Exova is on the Limitorque AVL and has a 10 CFR Part 50, Appendix B program. However, because separate POs are not generated for "open" POs, the provisions for 10 CFR Part 50, Appendix B are not being required for SR services being requested by means of an "open" PO. In addition, the test reports failed to indicate that a QA program was used for the SR services provided. The inspection team identified three additional requests for SR services from Exova that failed to impose Appendix B requirements.

The NRC inspection team also identified that Limitorque completed an "open" PO credit card purchase from Instrument Calibration and Technical Services (ICTS) for SR calibration services using an "open" PO and determined that Appendix B quality requirements were not imposed for the services requested. The NRC inspection team determined that Limitorque failed to require a QA program from contractors or subcontractors to assure adequate quality for SR services consistent with Criterion IV of Appendix B to 10 CFR Part 50 and the applicable implementing procedures. This issue is another example of Nonconformance 99900100/2011-201-05

The NRC inspection team requested documentation that Exova performed the SR services in accordance with their approved QA program. Limitorque contacted the vendor's quality manager who confirmed, in an email dated March 3, 2011, that "work performed to date for Limitorque has been undertaken in accordance with quality program in effect at the time as well as the requirements of 10 CFR Part 21 and Appendix B of 10 CFR Part 50.

b.3 Other Procurement Inspection Activities

The NRC inspection team observed the assembly of a SR actuator to determine if the assembly process was being performed in accordance with approved procedures and the actuator shop order.

The NRC inspection team determined that the parts previously inspected by QC were properly controlled to ensure that nonconforming items were not used during assembly. However, while observing torque switch evaluation, the NRC inspection team noticed a document entitled, "Additional QC Checks for SMB-000 Torque Switches," dated March 29, 2007, pinned to a bulletin board at the QC inspector's work area. This document was uncontrolled and contained instructions that are needed to ensure adequate quality of applicable torque switches. Because the information provided by the implementation of the activities identified in this document was not incorporated in a quality-related document, the inspection team was unable to verify that the actions required by this document was developed in a quality manner and were being performed for SMB-000 torque switches.

Criterion V, "Instruction, Procedures, and Drawings," of Appendix B to 10 CFR Part 50, states, in part, that "[a]ctivities affecting quality shall be prescribed by documented instructions, procedures, or drawing." In addition, Flowserve's QMSM states that procedures are established and shall be maintained to ensure that the Limitorque SMB, SMC, SB, SBD, and HBC qualified product is maintained. Limitorque's failure to prescribe all QC checks for SMB-000 Torque Switches in a quality related procedure is not consistent with the requirements of Criterion V, "Instruction, Procedures, and Drawings," of Appendix B to 10 CFR Part 50 of the Flowserve QMSM. This issue has been identified as Nonconformance 99900100/2011-201-06.

The NRC inspection team identified inadequacies in some of the Limitorque procedures that are not consistent with regulatory requirements or Limitorque policies and procedures. In accordance with Criterion V, of Appendix B to 10 CFR Part 50, activities affecting quality shall be prescribed in documented instructions and procedures. In addition, Flowserve's QMSM states that procedures are established and shall be maintained to ensure that the Limitorque SMB, SMC, SB, SBD, and HBC qualified product is maintained. Examples of the procedural inadequacies identified during the design control review include the following:

- Select procedures that reference the QMSM were not updated to reflect the changes made in a recent update to the QMSM. For example, QAP 4.1, Step 2.3 continues to reference QMSM, Section 5.4.1, which does not exist in the latest revision of the QMSM.

- QAP 3.1 references a flowchart as Exhibit A that could not be located, specifies an incorrect date of "11/11/11" in two places for placing orders on hold, and references Limitorque SAP 6.4, which could not be located.

- AP 9.2 does not reflect the new direction to apply Locktite to each bolt removed from the actuator during the wiring installation process.

- AP 9.3 does not require that detailed assembly instructions or drawings be specifically followed during the mechanical assembly process.

Limitorque's failure to accurately document activities affecting quality in quality procedures and assembly instructions is not consistent with the requirements of Criterion V of Appendix B to 10 CFR Part 50 and the Flowserve QMSM. This issue has been identified as another example of Nonconformance 99900100/2011-201-06.

c. Conclusions

With the exception of Nonconformance 99900100/2011-201-05 and Nonconformance 99900100/2011-201-06, the portions of the Limitorque program for procurement document control that were reviewed as part of this inspection met the requirement of Criterion IV of Appendix B to 10 CFR Part 50.

The NRC inspection team issued Nonconformance 99900100/2011-201-05 for Limitorque's failure to require a QA program to assure adequate quality for the procurement of SR components and services consistent with Criterion IV of Appendix B to 10 CFR Part 50; the QMSM; and the applicable implementing procedures. Specifically, Limitorque issued safety related POs without imposing the requirement of Appendix B to 10 CFR Part 50. In addition, Limitorque used an "open" PO to procure SR services without imposing the requirement of Appendix B to 10 CFR Part 50.

The NRC inspection team issued Nonconformance 99900100/2011-201-06 for Limitorque's failure to provide instructions and procedures for certain activities affecting quality. Specifically, Limitorque used uncontrolled information (entitled "Additional QC Checks for SMB-000 Torque Switches") to provide additional quality controls checks for the evaluation of SMB-000 torque switches not included in the applicable procedure. In addition, Limitorque failed to assure that applicable regulatory requirements and design basis are correctly translated into quality assurance and assembly procedures used to design and assemble safety related actuators.

5. Control of Purchased Material, Equipment, and Services

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures that governs Limitorque's process for controlling purchased material, equipment, and services to verify compliance with Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. In addition, the inspection team reviewed the Limitorque commercial grade dedication process, observed commercial grade dedication activities, reviewed Limitorque's sales order process, and observed the assembly of a SR actuator.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, POs, and supporting documentation:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011
- QAP 2.1, "Creating and Revising Quality Documents," Revision 4, dated June 01, 2004
- QAP 6.1, "Purchasing Procedure," Revision 19, dated August 28, 2007
- QAP 6.2, "Qualification of Vendors and Suppliers," Revision 15, dated February 22, 2011
- QAP 10.2 "Safety Related Nuclear Service Procedure," Revision 7, dated July 06, 2010
- QAP 10.3, "Assembly Inspection Procedure," Revision 9, dated January 23, 2008
- QAP 13.3, "Discrepant Material Report Procedure," Revision 16, dated June 01, 2010
- QAP 16.1, "Handling and Storing Quality Records," Revision 18, dated November 24, 2010
- QCP 10.1, "Receipt Inspection Procedure," Revision 28, dated February 15, 2011
- QCP 10.5, "Inspection of Safety Related Nuclear Service Units and Parts Orders," Revision 11, dated September 23, 2010
- QCP 10.10, "Commercial Grade Dedication," Revision 7, dated February 22, 2011
- Inspection Plan (IP) 10.23, "Bar Stock & Tubing," Revision 9, dated June 11,2003
- IP 10.141, "Inspection Plan for Marathon 300 Terminal Block," Revision 0, dated August 05, 2004
- IP 10.106, "Grease," Revision 6, dated December 17, 2009
- IP 10.10, "Belleville Spring," Revision 3, dated May 24, 1993
- IP 10.15, "Keys," Revision 4, dated February 06, 2006
- IP 10.21, "Ball Bearing, Bearing Cup, Bearing Cone," Revision 2, dated May 24, 1993
- ECC-0001, "Safety Related Actuator Critical Components Evaluation and Listing," Revision 5, dated January 18, 2005
- Flowserve Order 104292.002 for a Safety Related SMB-3 Actuator, dated March 01, 2011
- DMR 21667, "Material Deficiency," dated March 01, 2011
- DMR 21668, "Material Deficiency," dated March 01, 2011
- DMR 21669, "Material Deficiency," dated March 01, 2011
- In addition, the NRC inspection team reviewed the following Limitorque POs:

    - Limitorque Purchase Order (PO) 97422 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 97423 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the Vogtle Nuclear Power Plant, dated October 13, 2009
    - Limitorque PO 95802 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009

- Limitorque PO 95803 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009
- Limitorque PO 95805 - from Flowserve Raleigh Division to supply SR Limitorque actuators for the VC Summer Nuclear Power Plant, dated September 21, 2009.

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed implementing procedures QAP 6.1 which establishes the process for entering and maintaining POs; and QAP 6.2 used to evaluate and control various procurement sources. The inspection team reviewed the quality procedures (QCPs) that are used to implement and control Limitorque's commercial dedication process and activities. The NRC inspection team reviewed a series of IPs used to control the inspection of component parts, reviewed a sample of DMRs, observed commercial grade dedication activities, reviewed a Limitorque sales order process, and observed the assembly of a SR actuator and verified that Limitorque process for procuring material, equipment, and services was consistent with Criterion VII of Appendix B to 10 CFR Part 50 and the applicable implementing procedures.

b.2 Implementation of Limitorque Purchase Orders

The NRC inspection team reviewed the following Limitorque procurement documents:

Limitorque PO 182301, Earle M. Jorgensen Company

While observing the manufacturing process for a Limitorque SMB-3 SR actuator (Order Number 104292.002), the NRC inspection team noted that one of the SR parts used in the actuator was machined from raw bar stock (Limitorque part number BC2-05.25). The inspection team reviewed PO 182301, the most recent Limitorque PO for BC2-05.25 material.

BC2-05.25 was purchased as non SR, and PO 182301 required material test reports for the materials provided. Upon receipt, Limitorque performed material tests using a calibrated optical emission spectrometer to confirm that the chemical properties met the applicable material specification; and used the supplier's material test reports to verify the material mechanical properties.

The NRC inspection team determined that neither the laboratory performing the mechanical test nor the material supplier was an approved Appendix B vendor. In addition, Limitorque did not perform commercial grade surveys of the mechanical testing laboratory. The inspection team determined that none of the mechanical tests performed on the raw bar stock for BC2-05.25 were conducted in accordance with the applicable provisions of Appendix B. Limitorque informed the NRC inspection team that all raw bar stock and tubing was procured in a similar manner to BC2-05.25 and had always been procured that way. Therefore, the NRC

inspection team determined that this issue applies to all raw bar stock and tubing used to fabricate SR actuator parts.

Limitorque's failure to establish measures that include provisions, as appropriate, for objective evidence of quality is not consistent with the requirements of Criterion IV of Appendix B to 10 CFR Part 50; the QMSM; and the applicable implementing procedures. This issue has been identified as Nonconformance 99900100/2011-201-07.

b.3 Commercial Grade Dedication

The NRC inspection team reviewed Limitorque's procurement and assembling process and determined SR actuators typically consist of SR and non SR parts and components. The NRC inspection team verified that the parts, components, and services purchased as SR that were reviewed as part of this inspection were purchased from approved suppliers that are periodically audited by Limitorque to verify compliance with Appendix B to 10 CFR Part 50. The inspection team determined that the remainder of the SR parts and components are purchased commercial grade and dedicated for SR application.

The NRC inspection team reviewed implementing procedures QCP 10.1, QCP 10.5, and QCP 10.10, which are used to control and implement the commercial dedication process. The inspection team reviewed ECC-001 to identify the scope of commercial grade dedication activities being used and to evaluate the critical characteristics to verify that they are being properly identified. The inspection team reviewed the commercial grade dedication activities, a sample of critical characteristics determined by Limitorque, and the inspection and commercial grade survey activities performed by Limitorque to commercially dedicate actuator parts and components.

QCP 10.1 describes the receipt inspection process and provides guidance for inspection activities required during receipt inspection. QCP 10.5 primarily describes the inspection requirements for items fabricated by Limitorque. QCP 10.10 identifies each critical actuator component, describes the required inspection activities, and specifies when those inspections are needed to be performed. The NRC inspection team verified that components without dedicated inspection plans were either noncritical components (i.e. a failure of the part would not prevent the actuator from functioning) or were adequately addressed in other Limitorque procedures. The inspection team also verified that the components identified in QCP 10.10 aligned with those components identified in ECC-001. In addition, the NRC inspection team verified that inspections were performed to verify applicable critical characteristics.

The NRC inspection team witnessed portions of a receipt inspection and a QC inspection of parts machined by Limitorque for a safety related SMB-3 actuator for sales order 104292.002. The NRC inspection team noted that QCP 10.5 provided detailed steps and requirements but observed that the QC inspector did not reference the procedure during the inspection. The inspection team observed that the procedural requirements were basically being met due to the skill and knowledge of the inspector. However, in accordance with QCP 10.5, Step 4.1.2.2, the QC inspector inspected the applicable items listed on Inspection Form L613

and recorded the results but failed to document other measurements required by procedure.

The NRC inspection team identified some items fabricated by Limitorque, such as the motor pinion, motor clutch or worm shaft gear, worm, drive sleeve, and worm gear did not have dedicated inspection plans. The required inspection activities for those items were described in QCP 10.5; however, the procedure did not provide or reference acceptance criteria. For example, QCP 10.5 requires inspection of bushing diameters and number of gear teeth but does not provide acceptance criteria, acceptable tolerances, or guidance as to where to find the requirements. The NRC inspection team observed that the QC inspector used a fabrication drawing for each part, however, the use of fabrication drawings were not specified by procedure. Limitorque's failure to establish measures that include provisions, as appropriate, for objective evidence of quality is not consistent with the requirements of Criterion VII of Appendix B to 10 CFR Part 50; the QMSM; and the applicable implementing procedures. This issue is another example of Nonconformance 99900100/2011-201-07.

c. Conclusions

With the exception of Nonconformance 99900100/2011-201-07, the portions of the Limitorque process for controlling the purchase of materials, equipments, and services reviewed as part of this inspection met the requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 and was effectively implemented. The NRC inspection team issued Nonconformance 99900100/2011-201-07 for Limitorque's failure to establish measures to assure that the purchase of material, equipment, and services conform to procurement documents and for these measures not to include objective evidence of quality furnished. Specifically, Limitorque used material test reports for components and materials used in SR actuators provided by a non Appendix B subcontractor. In addition, Limitorque failed to identify or reference acceptance criteria for receipt inspection to verify that purchased equipment conformed to procurement documents.

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

a. Inspection Scope

The NRC inspection team reviewed the Limitorque policies and procedures for external and internal audits to verify compliance with Criterion VII and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of POs and associated internal and external audit reports to evaluate compliance with program requirements and adequate implementation of those requirements. In addition, the NRC inspection team reviewed corrective actions that address deficiencies identified by the audit findings for adequacy and timeliness.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, POs, and supporting documentation:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011

- QAP 6.2, “Qualification of Vendors and Suppliers,” Revision 15, dated February 22, 2011
- QAP 17.1, “Audit Procedures,” Revision 17, dated July 14, 2008

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures QAP 6.2 and QAP 17.1 that provides guidance for internal and external audits including planning, scheduling, and performing audits and auditor qualifications. QAP 6.2 provides guidance for the methods used to evaluate and control various procurement sources. The NRC inspection team verified that this procedure applies to suppliers and vendors that provide raw, semi-finished, finished items and or services used in the manufacture of Limitorque actuators. QAP 17.1 which provides the programmatic guidance for planning and scheduling audits, and the controls for auditor qualifications for both, internal and external audits.

b.2 Review of Audit Activities

Limitorque Internal Audits

The NRC inspection team reviewed three internal audits. The inspection team reviewed the audit plan that identified the audit scope, focus, and applicable criteria that was prepared and approved before beginning audit activities. Each audit report described the audit activities performed, and the results of each audit activity including identified audit findings and the corrective actions implemented to address each finding. The NRC inspection team noted that corrective actions for the audit findings reviewed were taken promptly and that the reports included adequate objective evidence to support closing the audit finding. The inspection team verified that the internal audits reviewed were performed within the annual periodicity required by Limitorque’s audit process. In addition, the NRC inspection team verified that the audit was performed in accordance with Limitorque policy and procedures and regulatory requirements.

The NRC inspection team also reviewed the audit schedule to maintain nuclear SR suppliers on the Limitorque AVL and determined that the schedule for the required audits were within the required triennial periodicity. With the exception noted below, the suppliers and vendors on the Limitorque AVL that were reviewed as part of this inspection were verified to be in compliance with Appendix B to 10 CFR Part 50.

The following is a summary of the inspection results from the inspection team’s review of external audits:

External Audit: Rockbestos-Suprenant Cable Corporation

The NRC inspection team reviewed Limitorque Audit Report No 2007-04-E, which is a triennial audit of Rockbestos-Suprenant Cable Corporation (Rockbestos) to

allow this vendor to remain on the Limitorque AVL to provide SR components. The audit was conducted at the Rockbestos facility in East Granby, CT on July 19, 2007. Rockbestos supplies nuclear SR firewall switchboard cables used in Limitorque valve actuators. The audit evaluated program compliance and implementation of the Rockbestos' quality program for the design, manufacture, and shipment of SR firewall switch wire to verify compliance with the quality requirements of Appendix B to 10 CFR Part 50, and the reporting requirements of 10 CFR Part 21. The NRC inspection team verified that the audit was performed in accordance with Limitorque policy and procedures and applicable regulatory requirements.

Note: Limitorque performed a triennial audit of Rockbestos in 2010 but the audit report was still in draft form during this inspection.

External Audit: Carboline Company

The NRC inspection team reviewed Limitorque Audit Report No 2009-07-A-E/ 2009-07-B-E, which is a triennial audit of Carboline Company (Carboline) to allow this vendor to remain on the Limitorque AVL to provide nuclear SR components. The audit was conducted at Carboline's facility in St Louis, MO and Lake Charles, LA on March 16, 2010. Carboline supplies SR protective coatings applied to Limitorque valve actuators. The audit evaluated program compliance and implementation of Carboline's quality program for the design, manufacture, and shipment of coating material to verify compliance with the quality requirements of Appendix B to 10 CFR Part 50 and the reporting requirements of 10 CFR Part 21. The NRC inspection team verified that the audit was performed in accordance with Limitorque policy and procedures and applicable regulatory requirements.

External Audit: AREVA NP, Inc.

The NRC inspection team reviewed Limitorque Audit Report No 2009-06-E, which is a triennial audit of AREVA NP, Inc. (AREVA) to allow this vendor to remain on the Limitorque AVL to provide nuclear SR components. The audit was conducted at AREVA's facility in Lynchburg, VA, on January 5, 2009. AREVA supplies SR actuator components. The audit evaluated program compliance and implementation of AREVA's quality program for the design, manufacture, and shipment of actuator SR components to verify compliance with the quality requirements of Appendix B to 10 CFR Part 50 and the reporting requirements of 10 CFR Part 21. The NRC inspection team verified that the audit was performed in accordance with Limitorque policy and procedures and applicable regulatory requirements.

External Audit: Instrument Calibration and Technical Services (ICTS)

The NRC inspection team reviewed Limitorque Audit Report No 2009-07-E, which is a triennial audit of ICTS to allow this vendor to remain on the Limitorque AVL to provide SR services. ICTS supplies SR actuator products and services including testing and calibration services for equipment used to manufacture and test SR components. In June 2009, Limitorque completed its audit of ICTS used to evaluated applicable requirements of International Standardization Organization (ISO) 9001:2000 and International Standardization Organization/International

Electrotechnical Commission (ISO/IEC) 1725 for calibration services but did not include the QA requirements of Appendix B to 10 CFR Part 50. The NRC inspection team also identified that Limitorque completed an "open" PO credit card purchase for ICTS SR calibration services. The NRC inspection team determined that Limitorque retained ICTS on the AVL as an Appendix B supplier but failed to perform the external audit necessary to qualify ICTS as an Appendix B provider for SR services consistent with Criterion VII of Appendix B to 10 CFR Part 50 and the applicable implementing procedures. This issue has been identified as Nonconformance 99900100/2011-201-08.

c. Conclusions

With the exception of Nonconformance 99900100/2011-201-08, the portions of the Limitorque external and internal audit processes reviewed as part of this inspection met the requirements of Criterion VII and Criterion XVIII of Appendix B to 10 CFR Part 50 and implemented in accordance to Limitorque policies and procedures. The NRC inspection team issued Nonconformance 99900100/2011-201-08 because Limitorque performed an external audit of a SR supplier that failed to assure that purchased material, equipment and services will conform to procurement documents for SR components and services. Specifically, Limitorque performed an audit of a qualified supplier of SR actuator products and services including testing and calibration services. The audit evaluated the applicable requirements of International Standardization Organization (ISO) 9001:2000 and International Standardization Organization/International Electrotechnical Commission (ISO/IEC) 1725 for calibration services but did not include an evaluation of the applicable requirements for Appendix B to 10 CFR Part 50.

7. Control of Special Processes

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and applicable implementing procedures that govern Limitorque's control of special processes to verify compliance with the requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. Limitorque special processes include welding, heat treatment, nondestructive testing (NDT), and painting.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

- QMSM, "Flowserve Quality Management System Manual ISO9001:2008," Revision 3, dated February 15, 2011
- QAP 9.1, "Paint Procedure," Revision 16, dated October 21, 2009
- QAP 9.2, "Metallurgical Processing Procedure," Revision 19, dated February 17, 2009
- QAP 15.3, "Electrostatic Discharge Control Procedure," Revision 3, dated July 16, 2004
- QAP 18.1, "Indoctrination and Training Procedure," Revision 13, dated April 30, 2010
- QCP 10.6, "Non Destructive Test Procedure," Revision 19, February 18, 2011

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the QMSM, "Validation of Processes for Production and Service Provision," which documents the policies relating to special processes include painting, heat treatment, and NDT. The QMSM prescribes that procedures shall be established, maintained, and qualified, where applicable, to control special processes performed by Limitorque that include painting, NDT, heat treatment, and welding. The procedures or the associated drawings for these processes shall specify necessary acceptance criteria and will be used to determine the acceptability. Quality records shall be maintained for special processes to the extent necessary to demonstrate that the process was satisfactorily performed, and to enable verification of the qualifications of the individual performing the activity.

The NRC inspection team reviewed the implementing procedures for special process activities performed by Limitorque including QAP 9.1, QAP 9.2, QCP 10.6, QAP 15.3, and QAP 18.1. The inspection team verified that these implementing procedures provided guidance for personnel qualifications, equipment qualification, and material conditions for painting, heat treatment activities, NDT, and applicable acceptance criteria. The NRC inspection team also verified that Limitorque's implementing procedures provide guidance for performing dimensional checks, heat treatment, setup activities for each NDT, calibration checks, and acceptance criteria for NDT, personnel qualification, reporting, record keeping and archiving of samples.

The NRC inspection team verified that Limitorque established and implemented procedures for the control of special processes. The inspection team verified that these procedures provided measures for the generation of QA records that include QA/QC customer witness and holdpoints, provided instructions to be used at each process step; and allowed for the use and storage of electronic router and shop traveler. Special process procedures require qualified Level II personnel to examine actuator parts and verify that they meet applicable acceptance criteria. In addition, the procedures require an independent review of the results from the Level II examination by QC inspectors and engineering staff to make the final determination to accept, reject, or use a part as-is. The NRC inspection team also verified that process control documents include personnel and equipment requirements, conditions for completing special processes, acceptance criteria, results of inspections, and approval requirements.

b.2 Nondestructive Testing

The NRC inspection team reviewed QCP 10.6 and observed the performance of a liquid penetrant test (LPT) and a magnetic particle test (MPT). In addition, the inspection team examined a defective worm that had already been placed on hold and discussed the defects, acceptance criteria and process with a Level II examiner. The NRC inspection team witnessed and verified that a LPT and MPT were performed in accordance with QCP 10.6. The inspection team verified that the Level II examiner used black lights with the minimum required light intensity, as

noted in QCP 10.6, to verify indications of defects in the samples. The inspection team observed the Level II examiner segregate an actuator worm that failed to meet specified acceptance criteria.

The Level II examiner discussed the acceptance criteria and his justification for failing the applicable worm. He used the segregated worm and compared the results to a second NDT being performed on an SB-03 actuator worm for Limitorque work order (WO) 104492.002. He scanned the worm part with a filtered black light looking for indications of fluorescent particles in defects to identify any defects in the metal surface. No defects were identified. The Level II examiner discussed the difference between the defective worm LPT and MPT indications and the SB-03 actuator worm. The NRC inspection team verified that the SB-03 worm LPT and MPT did not reveal any defects based on the absence of any observable fluorescent particles under the filtered black light. The Level II examiner documented the results of his inspections as prescribed by the implementing procedure.

b.3 Qualification of NDT Personnel

The NRC inspection team reviewed Limitorque QCP 10.6 for administrative guidance necessary for training, qualification, and certification of NDE personnel and the performance of wet fluorescent MPT and solvent removal color contrast LPT. Limitorque personnel are qualified to American Society of Nondestructive Testing SNT-TC-1A, 2001 Edition.

The QA manager has overall responsibility for qualification and certification of NDT personnel. The NDT personnel are qualified as Level I, Level II, or Level III examiners to perform LPT and MPT. The individuals must be able to setup and calibrate equipment, read and interpret indications, and evaluate indications with reference to the applicable codes and specifications. The Level III individual shall be able to establish techniques, interpret specifications and codes, and designate the particular test method and techniques to be used. A Level III examiner shall have the responsibility of implementing the Limitorque NDE Training, Qualification, and Certification Program and reporting to the Limitorque QA manager.

c. Conclusions

The NRC inspection team concluded that the portions of the Limitorque program for control of special processes that were reviewed as part of this inspection met the requirements of Criterion IX of Appendix B to 10 CFR Part 50. The NRC inspection team concluded that qualified personnel are using qualified equipment to effectively implement the Flowserve QMSM and special processes implementing procedures are effectively implementing painting, NDT, heat treatment, and welding requirements.

8. Test Control

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and applicable implementing procedures that govern the Limitorque test control process to verify compliance with the requirements of Criterion XI, “Test Control,” of Appendix B to 10 CFR Part 50.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

- QMSM, "Quality Management System Manual," Revision 3, dated February 15, 2011
- QAP 10.1, "Test Laboratory Procedure," Revision 6, dated November 20, 2008
- QAP 10.2, "Safety Related Nuclear Service Procedure," Revision 7, dated March 20, 2003
- QAP 10.3, "Assembly Inspection Procedure," Revision 9, dated January 23, 2008
- QAP 10.4, "Procedure for Certificate of Compliance," Revision 4, dated July 09, 2004
- QAP 10.5, "Inspection of Safety Related Nuclear Service Units and Part Orders," Revision 9, dated September 23, 2010
- QAP 15.3, "Electrostatic Discharge Control Procedure," Revision 3, dated July 16, 2004
- QAP 18.1, "Indoctrination and Training Procedure," Revision 13, dated December 11, 2009
- QAP 19.1, "Actuators Performance Data Verification Procedure," Revision 2, dated February 07, 1997
- QAP 19.2, "Return Material Authorization Procedure," Revision 7, dated August 25, 2010
- QAP 19.3, "Servicing," Revision 1, dated April 13, 2004
- QAP 19.4, "Returning Goods Procedure," Revision 0, dated November 05, 2002
- Engineering Instruction Procedure (EIP) 373, **"**Production Test Procedure for SMB/SB Series Units Built for Westinghouse Project AP1000 Per Specification APP-PV95-Z-001,**"** Revision 0, dated June 16, 2009

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the Flowserve QMSM, "Production and Service Provisions," which identifies the test control activities performed by Limitorque. The inspection team reviewed test control implementing procedures and supporting documentation. The inspection team determined that QAP 10.1 and EIP 373 provide guidance for performing the following testing activities for Limitorque actuator performance testing:

- no load test
- stall test
- maximum torque switch test
- torque switch calibration test
- nominal set trip test

The NRC inspection team verified that QAP 10.1 and EIP 373 contain guidance for test authorization and responsibility; qualification of test personnel; test report

forms; identification of SR actuators to be tested; calibration of test equipment; and disposition of test data, test equipment, test failure, and routine motor tests.

The NRC inspection team determined that QAP 10.1 and EIP 373 are supported by a series of QAPs that provide guidance for key activities associated with inspection and test control. A sample of the implementing procedures reviewed by the inspection team and the general guidance provided by these procedures relating to the inspection and test control process as verified by the NRC inspection team include the following:

- QAP 10.3 provides the necessary guidance for inspection of actuator assemblies
- QAP 10.4 provides the necessary guidance for determining that Limitorque actuators comply with quality and specification requirements
- QAP 10.5 provides the necessary guidance for the inspection of SR actuators and part orders
- QAP 19.1 provides the necessary guidance for final verification of actuator performance data

The NRC inspection team verified that the Flowserve QMSM, and the implementing procedures and supporting documentation provide the necessary guidance for performing inspection and test control activities consistent with the requirements of Criterion X of Appendix B to 10 CFR Part 50.

b.2 Limitorque Actuator Full Performance Tests

The NRC inspection team reviewed the implementing procedures and supporting documentation for Limitorque actuator full performance testing, including QAP 10.1 and EIP 373. The inspection team observed a full performance test on one motor-operated valve SB-00 actuator, 250-volt direct current motor for Limitorque WO 1207382 (sales order 101854 for customer Flowserve Raleigh) for an AP1000 plant being built in China. The NRC inspection team observed that the required data collection was being recorded on a blank sheet of paper and not on the form, “Production Test Data Sheet,” provided in EIP 373. The information was then entered into the corresponding computerized data sheet.

The NRC inspection team observed a torque switch calibration test performed in accordance with EIP 373. The inspection team noted that the test was not performed in the sequence required by EIP 373 during a full performance test of an SR SB-00 actuator. The procedure requires an initial torque switch setting of 1.0. Testing continues by progressively increasing the torque switch setting by half increments until the maximum torque switch setting is reached. The maximum torque switch setting is estimated to be approximately 2.5 for this actuator design by Limitorque. Contrary to these instructions, technicians used an initial test setting of 2.75, and subsequently decreased torque switch setting by half increments until reaching a torque switch setting of 1.0. The NRC inspection team determined that Limitorque’s failure to perform testing in accordance with written test procedures is not consistent with the requirements of Criterion XI of Appendix B to 10 CFR Part 50. This issue has been identified as Nonconformance 99900100/2011-201-09.

c. Conclusions

With the exception of Nonconformance 99900100/2011-201-09, the portions of the Limitorque Test Control processes reviewed as part of this inspection met the requirements of Criterion XI of Appendix B to 10 CFR Part 50 and were implemented in accordance to Limitorque policies and procedures. The NRC inspection team issued Nonconformance 99900100/2011-201-09 for Limitorque's failure to perform quality- related testing activities in accordance with written test procedures. Specifically, the NRC inspection team determined that Limitorque failed to perform torque switch calibration testing in accordance with EIP-373 during a full performance test of an SR SB-00 actuator.

9. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and applicable implementing procedures that govern the Limitorque Measuring and Test Equipment Program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

- QMSM, "Quality Management System Manual," Revision 3, dated February 15, 2011
- QAP 10.1, "Test Laboratory Procedure," Revision 12, dated November 20, 2011
- QCP 11.1, "Calibration of Inspection Equipment," Revision 25, dated January 05, 2009
- QCP 11.2, "Calibrated Procedure for M&TE Individually Calibrated Components," Revision 0, dated October 17, 2002
- Quality Control Instruction (QCI) 11.1, "Calibration Status Labels," Revision 1, dated February 07, 2011
- QCI 11.2, "Application of Calibrated Timing Devices," Revision 0, dated August 05, 1993
- QCI 11.3, "Guidelines for Tamper Resistant Seals," Revision 0, dated August 03, 2011

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the Flowserve QMSM, which identifies the responsibilities and requirements for the control of measuring and test equipment (MTE). The MTE program is designed to ensure that applicable equipment will perform according to established criteria. In addition, the NRC inspection team reviewed MTE related implementing procedures and supporting documentation including the list of QCPs and QCIs noted above that specify the process and characteristics to be examined and the data that needs to be gathered. The

inspection team also reviewed calibration status labels on various measuring devices used throughout the manufacturing and testing activities.

The inspection team reviewed Sales Order 1025601 for Flowserve WO 104292.002 for a commercial grade SB-03 actuator being dedicated for SR use at Plant Hatch. The inspection team also observed Limitorque's implementation of QCP 10.5 and QCP 10.6 used to check dimensions and support testing of actuator parts and components. The NRC inspection team verified that the equipment used was properly calibrated and measurements were taken in accordance with applicable procedures. The inspection team verified that critical characteristics of actuator piece parts (e.g., motor pinion, worm, worm gear motor clutch or worm shaft gear, drive sleeve, etc.) were correctly verified. The inspection team verified that the QC technician performed all the necessary dimensional checks on various piece parts in accordance with Inspection Form L-613, "Dimensional Checks," using the following micrometers:

- QC-1620, Starett 1 inch Micrometer, Calibration Date: 01/18/2011, Calibration Due date: 04/18/2011
- QC-1621, Starett 2 inch Micrometer, Calibration Date: 01/18/2011, Calibration Due date: 04/18/2011
- QC-2280, Starett 6 inch Micrometer, Calibration Date: 01/18/2011, Calibration Due date: 04/18/2011

The NRC inspection team observed the technician check the calibration status label for each of the micrometers, including the latest calibration dates and the next calibration due dates. The inspection team verified that all three micrometers were within the 3-month calibration due date intervals. The NRC inspection team also reviewed the calibration log book for daily calibrations using gauge-tree-calibrated devices that meet the National Institute of Standards and Technology standards and verified that each device was properly calibrated.

The NRC inspection team observed worm gear hardness testing. The inspection team observed that one of three test locations failed the hardness test and verified that the technician recorded the correct values and placed the worm gear on "Hold" for further engineering evaluation to determine whether the worm should be accepted, rejected or used as-is

The NRC inspection team checked the following calibrated devices used to verify the settings on the SB-03 actuator:

- QC-4124, Dynapar Hand Tachometer Model Number: HT100. Calibration Date: 11/10/2010, Calibration Due Date: 11/10/2011
- QC-4164, Tokogowa Frequency Gage, Calibration Date: 6/7/2010, Calibration Due Date: 6/7/2011
- QC-2323, Frequency Gage, Calibration Date: 4/15/2010, Calibration Due Date: 4/15/2011

The NRC inspection team also checked the following calibration devices used for torque testing and full functional testing of an SB-00 actuator:

- QC-3374, Fluke 89 Multimeter, Calibration Date: 6/07/2010, Calibration Due Date: 6/07/2011
- QC-2337, Wide Band Strain Gage 3B18, Calibration Date: 11/10/2010, Calibration Due Date: 11/10/2011

The NRC inspection team observed LPT and MPT performed in accordance with QCP 10.6, on a worm for WO 104292.002. The technician checked the calibration stickers on the following MTE devices used to perform the NDT:

- QC -1144, Magnetic Flux Device
- QC -1628, Model DSE 100-X, Radiometer/Photometer
- QC -2167, Model DIX-555A, Visible Light Meter

The NRC inspection team verified that all MTE devices had calibration status label dates and calibration due dates within the date range for conducting the LPT and MPT. The LPT and MPT were performed in accordance with QCP 10.6, Steps 7.6.1 and 7.6.2. The team verified that the technician confirmed the calibration status label due dates for the next calibration.

The NRC inspection team reviewed records for 25 out-of-calibration MTE devices. The inspection team verified that the MTE devices were properly logged, segregated, and evaluated for effects on Limitorque actuators. Limitorque used ICTS to subsequently recalibrate the devices and return them to service. It was later determined that ICTS was not qualified to perform SR calibration services, which Section 6 of this report further evaluates and documents.

The inspection team reviewed a sample of Limitorque evaluations of segregated devices to determine whether any out-of-calibration MTE devices were used to test actuators sent to Limitorque customers. The inspection team did not identify any MTE devices that may have potentially affected the functionality of an actuator sent to a customer.

c. Conclusions

The NRC inspection team concluded that the portions of the Limitorque program for the control of MTE that were reviewed as part of this inspection met the requirements of Criterion XII of Appendix B to 10 CFR Part 50. For the limited scope of this inspection, the NRC inspection team concluded that MTE are being properly maintained and used consistent with Limitorque's QMSM and applicable implementing procedures.

10. Control of Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures that govern Limitorque's process for the 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. The NRC inspection team reviewed Limitorque nonconformance documentation and records and discussed the nonconformance process with responsible Limitorque management and staff.

Specifically, the NRC inspection team reviewed the following Limitorque policies, procedures, and supporting documentation:

- QAP 6.1, "Purchasing Procedure," Revision 19, January 27, 2001
- QAP 10.3, "Assembly Inspection Procedure," Revision 9, August 10, 2009
- QAP 13.2, "Reporting of Defects of Safety Related Equipment," Revision 15, October 4, 2010
- QAP 13.3, "Discrepant Material Report Procedure (DMR)," Revision 16, May 12, 2010
- LCAR 10-2 "Part returned from Brunswick plant", dated March 11, 2010
- LCAR 10-6 "Casting Vendor requested to provide cause, corrective and preventive actions for GLS Cartridge with misaligned Bore center and Bearing Bore", dated November 4, 2010
- LCAR 8-2 "NQA Opportunity for improvement on Quality Manual", dated February 15, 2008
- LCAR 8-9 "NQA Finding #3: The organization shall conduct training under controlled conditions", dated August 14, 2008
- LCAR 8-10 "NQA Finding #2: The organization shall provide training, evaluate the effectiveness of the training and maintain appropriate records of the training", dated August 14, 2008
- LCAR 8-11 "NQA Minor Finding #1: The organization shall ensure that they have the ability to meet the requirements of the customer", dated August 14, 2008
- LCAR 8-12 "NQA Finding #4: The organization shall identify the processes within the organization and monitor measure and analyze these processes", dated August 14, 2008
- CC 10-29 "AREVA CR: Flowserve receipt/inspection process did not identify the discrepancies between the motor insulation shown on the motor nameplates and routine motor tests as 'B' and what was ordered. The motors were ordered with 'F' class insulation(commercial AC motors)", dated December 30, 2010
- CC 10-30 "AREVA CR: Issues identified by Progress Energy, concerning corrosion and other problems found during video-scope (borescope) inspection of in-service and new Reliance AC motors used with Limitorque actuators", dated December 30, 2010
- SCAR 74 Sent to Peerless-Winsmith "O-ring material tested at Bodycote Materials Testing indicated material not consistent with Viton (as required)" , dated August 1, 2008
- SCAR 182 Sent to Southern Casting "GLS cartridge .875 Bore is not centered and Bearing Bore is all to one side. 38 parts in total", dated November 9, 2010
- Numerous DMRs reviewed, with focus on those resulting in LCARs. DMRs reviewed while inspectors observed manufacturing process of one safety related actuator while onsite.

b. Observations and Findings

The NRC inspection team reviewed the Flowserve QMSM and implementing procedure QAP 13.2 which documents the general requirements for implementing the Limitorque nonconforming material control system, including identification, documentation, evaluation, reinspection of repair or reworked items, and notification to affected organizations of nonconforming conditions. QAP 13.2 also specifies the responsibility and authority for

reviewing and the disposition of nonconforming items. The NRC inspection team reviewed QAP 13.3, which describes the initial tagging process and related segregation, and reinspection activities. In addition, the inspection team reviewed a sample of nonconformance reports that were written for nonconforming materials, parts, or components received at the Limitorque facility. The NRC inspection team verified that nonconforming items were reviewed and dispositioned in accordance with Limitorque implementing procedures. The NRC inspection team verified that the disposition documentation for repaired or use-as-is items contained adequate justifications for items that were repaired or dispositioned to use-as-is and that repaired or use-as-is items were subject to design control measures commensurate with those applied to the original design specification.

The NRC inspection team verified that Limitorque's process for controlling nonconforming materials provides guidance to evaluate nonconformances for 10 CFR Part 21 reporting. The nonconformance process is also linked to the corrective action program. The NRC inspection team verified that Limitorque's nonconformance process does include guidance to evaluate nonconformances for reportability under 10 CFR Part 21.

As part of their nonconformance process, Limitorque reviews nonconformance reports to identify conditions adverse to quality and opens corrective action reports for those items that are categorized as conditions adverse to quality. The inspectors observed QC inspectors entering DMRs into the system, with specifics discussed in the Test Control section of this report. The team also reviewed corrective action reports that were created after multiple DMRs were written on nonconforming parts. None of the corrective action reports created by internal DMRs involved SR components.

c. Conclusions

The NRC inspection team concluded that the portions of the Limitorque program for the control of nonconforming materials, parts, or components, that were reviewed as part of this inspection met the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. For the limited scope of this inspection, the NRC inspection team concluded that nonconformances are being properly controlled consistent with the applicable implementing procedures.

11. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed Limitorque'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 Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed Limitorque's corrective action program and activities including documentation and records and discussed the corrective action process with responsible Limitorque management and staff.

Specifically, the NRC inspection team reviewed the following Limitorque documents:

- QAP 13.3, "Discrepant Material Report Procedure (DMR)," Revision 16, dated May 12, 2010

- QAP 14.1, “Corrective and Preventive Action Procedure,” Revision 13, dated November 6, 2010
- QAP 14.2, “Customer Complaint Procedure,” Revision 10, dated August 27, 2009
- LCAR 10-2 “Part returned from Brunswick plant”, dated March 11, 2010
- LCAR 10-6 “Casting Vendor requested to provide cause, corrective and preventive actions for GLS Cartridge with misaligned Bore center and Bearing Bore”, dated November 4, 2010
- LCAR 8-2 “NQA Opportunity for improvement on Quality Manual”, dated February 15, 2008
- LCAR 8-9 “NQA Finding #3: The organization shall conduct training under controlled conditions”, dated August 14, 2008
- LCAR 8-10 “NQA Finding #2: The organization shall provide training, evaluate the effectiveness of the training and maintain appropriate records of the training”, dated August 14, 2008
- LCAR 8-11 “NQA Minor Finding #1: The organization shall ensure that they have the ability to meet the requirements of the customer”, dated August 14, 2008
- LCAR 8-12 “NQA Finding #4: The organization shall identify the processes within the organization and monitor measure and analyze these processes”, dated August 14, 2008
- Customer Complaints (CC) 10-29 “AREVA CR: Flowserve receipt/inspection process did not identify the discrepancies between the motor insulation shown on the motor nameplates and routine motor tests as ‘B’ and what was ordered. The motors were ordered with ‘F’ class insulation(commercial AC motors)”, dated December 30, 2010
- CC 10-30 “AREVA CR: Issues identified by Progress Energy, concerning corrosion and other problems found during video-scope (borescope) inspection of in-service and new Reliance AC motors used with Limitorque actuators”, dated December 30, 2010
- Supplier Corrective Action Requests (SCAR) 74 Sent to Peerless-Winsmith “O-ring material tested at Bodycote Materials Testing indicated material not consistent with Viton (as required)” , dated August 1, 2008
- SCAR 182 Sent to Southern Casting “GLS cartridge .875 Bore is not centered and Bearing Bore is all to one side. 38 parts in total”, dated November 9, 2010
- Numerous DMRs reviewed, with focus on those resulting in LCARs. DMRs reviewed while inspectors observed manufacturing process of one safety related actuator while onsite.
- ADN 2010-13-I-1 “ATEX Internal Audit Finding #1”,dated December 16, 2010
- ADN 2010-13-I-4 “ATEX Internal Audit Finding #4”, dated December 16, 2010
- ADN 2010-07-E-01 “Supplier Audit Finding #1 Carboline(Green Bay)”, dated September 15, 2010
- ADN 2010-03-E-1 “Peerless-Winsmith Audit issue”, dated September 16, 2010
- ADN 2009-07-B-E-1 “Supplier Audit Finding #1 Carboline (Lake Charles)”, dated March 23, 2010

b. Observations and Findings

The NRC inspection team reviewed the Flowserve QMSM and implementing procedures QAP 14.1 which describes the general requirements for implementing the Limitorque Corrective Action Program, including identification, documentation, tracking, evaluation, and closeout of nonconforming conditions. The NRC inspection team also reviewed a sample of LCARs, SCARs, CCs, and ADNs to determine whether they were properly

documented and adequately described conditions adverse to quality, the cause of these conditions, and the corrective actions taken.

The NRC inspection team reviewed samples of the different corrective action documents and verified that they describe the conditions adverse to quality, discussed the causes and corrective actions taken, included review and approval by the responsible authority, detailed follow-up action if needed, and identified the completion date.

The NRC inspection team reviewed numerous ADNs from the past 3 years involving SR services and verified that corrective actions were being completed in accordance with the QMSM and applicable implementing procedures. In addition, the inspection team reviewed findings from the most recent Nuclear Industry Assessment Committee (NIAC) audit that were in various stages of being processed with corrective actions being developed and implemented. The inspection team verified that the NIAC audit findings were being processed in accordance with the QMSM and applicable implementing procedures.

The NRC inspection team reviewed SCAR 74, which documents the use of nonqualified O-rings in direct current (DC) motor-operated actuators purchased for an SR actuator. Limitorque determined that two batches of O-rings shipped from its direct current motor vendor were of a different material than requested. The NRC inspection team verified that this condition was identified by Limitorque's inspection activities and that appropriate corrective actions were implemented.

The inspectors noted that the QA engineer did not identify this material discrepancy from the test results performed on the first batch of O-rings, but did identify the discrepancy from the second batch test results. The QA engineer that performed the reviews took immediate actions to prevent reoccurrence of the missed nonconforming condition. He changed the format of the test report, making it easier for reviewing QA personnel to identify test results and any resulting discrepancies.

c. Conclusions

The NRC inspection team concluded that the portions of the Limitorque Corrective Action Program that were reviewed as part of this inspection met the requirements of Criterion XVI, "Corrective Actions," of Appendix B to 10 CFR Part 50. For the limited scope of this inspection, the NRC inspection team concluded that corrective actions are being properly implemented and controlled consistent with Flowserve QMSM and applicable implementing procedures.

12. Entrance and Exit Meetings

On February 28, 2011, the NRC inspection team discussed the scope of the inspection with Mr. Lynn White, Limitorque General Manager, and with the Limitorque management, engineering, and administrative staff. On March 4, 2011, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Lynn White, Limitorque General Manager, and other Limitorque management and engineering staff. Lists of entrance and exit meeting attendees are listed in the Attachment to this report.

ATTACHMENT

1. Points of Contact - Limitorque

Name	Title	Affiliation	Interviewed
Jeff McConkey	Director, Quality Assurance, Flow Control Division	Flowserve Corporation	X
Anne Burton	Engineer	Flowserve Corporation	X
Stacey Clark	Electrical Assembler	Flowserve Corporation	X
Fred Cox	Mechanical Assembler	Flowserve Corporation	X
Gail Dube	Engineer	Flowserve Corporation	X
Manley Ferguson	Engineer	Flowserve Corporation	X
Samuel Ferguson	LFF Assembly Supervisor	Flowserve Corporation	X
Andrew Guthrie	Mechanical Assembler	Flowserve Corporation	X
Ray Hawkins	SLS Manager	Flowserve Corporation	X
John Goin	Large Focus Factor Factory Manager	Flowserve Corporation	X
Richard Gilliam	Supply Chain Manager	Flowserve Corporation	X
Ken Horton	Inside Sales-Nuclear Manager, Flow Control Division	Flowserve Corporation	X
Hugh Jackson	QC Inspector	Flowserve Corporation	X
Chip Justice	Electrical Assembler	Flowserve Corporation	X
Greg Mason	QC Inspector	Flowserve Corporation	X
Ronald Moneyham	QA Engineer	Flowserve Corporation	X
Dan Martin	Navy/Nuclear Contract Administration, Flow Control Division	Flowserve Corporation	X
Maddie Pritchett	QA Engineer	Flowserve Corporation	X
Ricky Pritt	QA Engineer	Flowserve Corporation	X
Kyle Ramsey	Chief Mechanical Engineer, Lynchburg Operations, Flow Control Division	Flowserve Corporation	X
Sukhamee Sohi	QA Engineer	Flowserve Corporation	X
Melvin Tucker	Laboratory Technician	Flowserve Corporation	X

2. INSPECTION PROCEDURES USED

IP 43002, “Routine Inspections of Nuclear Vendors”

IP 36100, “Inspection of 10 CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance”

3. LIST OF ISSUES OPENED, CLOSED, AND DISCUSSED

The previous NRC inspection of the Limitorque facility in Lynchburg, Virginia, was performed in 1993.

The following issues were found during this inspection:

Issue Number	Status	Type	Description
99900100/2011-201-01	Open	NOV	10 CFR 21.21
99900100/2011-201-02	Open	NOV	10 CFR 21.21
99900100/2011-201-03	Open	NOV	10 CFR 21.31
99900100/2011-201-04	Open	NON	10 CFR Part 50, Appendex B, Criterion III
99900100/2011-201-05	Open	NON	10 CFR Part 50, Appendex B, Criterion IV
99900100/2011-201-06	Open	NON	10 CFR Part 50, Appendex B, Criterion V
99900100/2011-201-07	Open	NON	10 CFR Part 50, Appendex B, Criterion VII
99900100/2011-201-08	Open	NON	10 CFR Part 50, Appendex B, Criteriion VII
99900100/2011-201-09	Open	NON	10 CFR Part 50, Appendex B, Criterion XVI

ENTRANCE MTG
2/28/11

NAME	POSITION	AFF
ROBERT J. PRATO	TEAM LEADER	U.S. NRC
Jeff McCaskey	QA mgr	Flowserve
Ricky Pruett	QA - ENG.	FLOWSERVE
Ray Hawk-NS	SCS mgr	FLOWSERVE
John Goin	LFF mgr	Flowserve
Drexel Collins	Shipping Mgr.	Flowserve.
Dick Gilliam	Supply Chain Mgr	Flowserve
GREG PRUCE	ENR MGR	FLOWSERVE
Ernie Carey	B&PD Portfolio Mgr.	Flowserve
RONALD MOONEYHAN	QA - ENG.	FLOWSERVE
Francis X. Talbot	~~NRC Team~~ Reactor Engineer	NRC
Thomas G. Scarbrough	Sr. Mech Engr	NRC
Thomas Kendzia	Reactor Engineer	NRC
Masao Nagai	Foreign Assignee	NRC
Doug Bollock	Reactor Engineer	NRC
Paul Coco	Reactor Engineer	NRC

Exit Attendance

Name	Title	Organization
Thomas G. Scarbrough	SR. Mech. Engineer	NRC/NRO/DE/CIB2
Doug Bollock	Reactor Operations Engineer	NRC
Paul Coco	Reactor Operations Engineer	NRC
Masao Nagai	Foreign Assignee	NRC
RONALD MOORE/HAN	QUALITY ENGINEER	FLOWSERVE
Ricky Truitt	QUALITY ENGINEER	FLOWSERVE
GREG PENCE	ENGR MGR	"
Dick Gilliam	Supply Chain Mgr.	Flowserve
Drexel Collins	Shipping/Receiving Mgr.	"
John Goin	LFF mgr.	Flowserve
RAY HAWKINS	S&S Mgr.	FLOWSERVE
Louis BESSIERE	Financial Controller	"
Lynn White	GENERAL MANAGER	FLOWSERVE
Jeff McConkey	QA mgr	Flowserve
KYLE RAMSEY	CHIEF MECH. ENGR	FLOWSERVE
L. McQuirk/Jan	Nuclear Prod Lead Mgr.	"
Francis X. Talbot	Reactor Engineer	NRC
Tim Steadham	Construction Inspector	NRC
Thomas Kendzia	Reactor Engineer	NRC