October 17, 2012

Mr. Robert D. Barry, Quality Assurance Manager
Flowserve Corporation
1900 South Saunders Street
Raleigh, NC 27603

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 99901356/2012-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Barry:

From September 10-14, 2012, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Flowserve Corporation (hereafter referred to as Flowserve) facility in Raleigh, NC. The purpose of this limited-scope routine inspection was to assess Flowserve'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 portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

This technically focused inspection evaluated Flowserve's quality assurance activities associated with the design, fabrication, assembly, and testing of the main steam isolation valves and operators and main feedwater isolation valves and operators for the Westinghouse Electric Company AP1000 reactor design, as well as numerous other valve types and their associated components manufactured by Flowserve for both the AP1000 projects and the operating fleet of nuclear plants, including gate valves, globe valves, stop valves, check valves, motor operated valves, and various valve actuators. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of Flowserve's overall quality assurance or 10 CFR Part 21 programs.

During this inspection, the NRC inspection team found that the implementation of your quality assurance program did not meet certain NRC requirements imposed on Flowserve by its customers or by NRC licensees. Specifically, Flowserve (1) did not provide objective evidence that technical evaluations had been performed to justify that the critical characteristics selected for certain valve components would provide reasonable assurance that the valves would perform their intended safety-related functions; and (2) in several instances, failed to adhere to procedures for special process control including welding activities, liquid penetrant examinations, magnetic particle examinations, and ultrasonic examinations. The enclosed Notice of Nonconformance (NON) cites these nonconformances, and the circumstances surrounding them are detailed 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. The NRC will consider extending the response time if Flowserve shows good cause for the agency to do so.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Document 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 (and if applicable), 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, please provide a bracketed copy of your response that identifies the information that should be protected, as well as a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If SGI 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/

Edward H. Roach, Chief
Mechanical Vendor Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901356

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901356/2012-201
and Attachment

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 the NRC's Agencywide Document Access and Management System, which is accessible from the NRC Web site at: http://www.nrc.gov/reading-rm/adams.html.

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Sincerely,

/RA/

Edward H. Roach, Chief
Mechanical Vendor Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901356

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901356/2012-201
   and Attachment

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DATE	10/11/2012	10/11/2012	10/11/2012	10/11/2012	10/11/2012
OFFICE	NRR/DE/EPTB	RIII/DRS/EB1	RII/EICS	NRO/DCIP/CAEB	NRO/DCIP/CMVB
NAME	MFarnan	TBilik	AAllen	TFrye	ERoach
DATE	10/11/2012	10/11/2012	10/11/2012	10/11/2012	10/17/2012

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NOTICE OF NONCONFORMANCE

Flowserve Corporation
1900 South Saunders Street
Raleigh, NC 27603

Docket No. 99901356
Report No. 2012-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Flowserve Corporation (hereafter referred to as Flowserve) facility in Raleigh, NC, from September 10 through September 14, 2012, it appears that Flowserve did not conduct certain activities in accordance with NRC requirements that were contractually imposed upon Flowserve by its customers or by NRC licensees.

A. Criterion III, "Design Control," of Appendix B "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that, "measures shall…be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems and components."

   Flowserve Quality Assurance Manual, Revision 38, dated August 16, 2012, Section 7.6, "Commercial Grade Items," states, in part, that "records of the 'dedication' process are maintained," and that "the detailed requirements of the commercial grade item dedication subsystem are contained in Plant Internal Operating Procedure (PIOP) 36-41-09."

   Flowserve's PIOP 36-41-09-08, "Dedication of Commercial Grade Items," Revision 8, dated June 3, 2009, Procedure Section Item 3, states, in part, that "a cognizant engineer must assure, through a technical evaluation, that the correct part number and description are specified in the Bill of Material. This process normally occurs through an investigation/evaluation of the previous like-product manufacture…[and] if changes have occurred, the evaluation must assure that the changes do not affect the form, fit, and function of the part and adequate documentation must be prepared to attest to that fact."

   Contrary to the above, as of September 13, 2012, Flowserve failed to establish adequate measures for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of certain structures, systems, and components. Specifically, for eight dedication packages, Flowserve did not provide objective evidence that technical evaluations had been performed to justify that the critical characteristics selected for valve components would provide reasonable assurance that the valves would perform their intended safety-related functions.

   This issue has been identified as Nonconformance 99901356/2012-201-01.

B. Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50 states that "measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements."

Contrary to the above, as of September 13, 2012, Flowserve failed to control special processes in accordance with qualified procedures. Specifically:

1. Flowserve exceeded the maximum weld bead thickness of 1/8-inch specified in Welding Procedure Specification (WPS) P8-123, "Fillet, Groove, and Repair Welding of P8 Materials per [American Society of Mechanical Engineers] (ASME) III Without [Post-Weld Heat Treatment]," Revision 2, dated May 15, 2009, for a base-metal weld repair to an 8-inch swing check-valve body machined surface. In addition, foreign material in the form of a calcium carbonate based material designed to reduce weld spatter was present within the 2-inch weld exclusion zone, contrary to the requirements specified in WPS P8-123.

2. Flowserve's nondestructive evaluation (NDE) examiner failed to perform a post-emulsification liquid penetrant examination on the correct area of interest for an 8-inch gate valve body casting, as specified by Method Specification (MS) 1151NW, "Liquid Penetrant Examination of Materials Used in Valve Applications for ASME Code," Revision 1, dated February 3, 2011.

3. Flowserve's NDE examiner failed to use a "gentle air stream" during a magnetic particle examination (MT) for a hemispherical head and weld of a 24-inch gate valve, as specified by MS 1025EN, "Dry Magnetic Particle of Ferro Magnetic Materials - Prod and Yoke Methods," Revision 3, dated April 13, 2010. The excessive air pressure used removed the lightly held magnetic particles that could have revealed rejectable indications.

   In addition, the NDE examiner set up the MT equipment to meet the minimum amperage for the prod spacing (700 amps), but the amperage decreased to 650 amps of that required by MS 1025EN by the conclusion of the examination as a result of the failure to clean and dress the prod tips.

4. Flowserve's NDE examiner failed to perform an ultrasonic examination on the entire volume for four, 8-inch feedwater valve stems, as specified by MS 1029NE-B, "Ultrasonic Examination of Forgings and Bars for Use in Nuclear ASME Section III Applications," Revision 9, dated January 11, 2007, where the valve stems were not prepped for the required full straight-beam ultrasonic examination and the inspection was performed on an unacceptable surface, which prevented an inspection of the entire volume of the valve stems.

These issues have been identified as Nonconformance 99901356/2012-201-02.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Construction Mechanical Vendor Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance or, if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid further noncompliance; and (4) the date when the 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 (SGI) so that the agency can make it 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 would 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 SGI 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 17th day of October 2012.

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

Docket No.:	99901356	
Report No.:	99901356/2012-201	
Vendor:	Flowserve Corporation 1900 South Saunders Street Raleigh, NC 27603	
Vendor Contact:	Mr. Robert D. Barry Quality Assurance Manager Telephone: (919) 831-3366 E-mail: bbarry@flowserve.com	
Nuclear Industry Activity:	The Flowserve Corporation is an American Society of Mechanical Engineers certificate holder with a scope of supply that includes design, fabrication, assembly and testing of valves, and flow control devices for safety-related applications, including commercial grade dedication activities for parts, repairs, and services for existing installations. Flowserve has been contracted by the Westinghouse Electric Company to design and fabricate main steam isolation valves, and main feed water isolation valves, as well as the associated operators for the AP1000 reactor design, and provides numerous other valve types and components to both the AP1000 projects and the operating fleet of nuclear plants.	
Inspection Dates:	September 10-14, 2012	
Inspection Team Leader:	Yamir Diaz-Castillo	NRO/DCIP/CMVB
Inspection Team Members:	Aaron Armstrong	NRO/DCIP/CMVB
	Jonathan Ortega-Luciano	NRO/DCIP/CMVB
	Marlayna Vaaler	NRO/DCIP/CMVB
	Frank Talbot	NRO/DCIP/CQAB
	Michael Farnan	NRR/DE/EPTB
	Tom Bilik	RGN III/DRS/EB1
	Alma Allen	RGN II/EICS
Approved by:	Edward H. Roach, Chief Mechanical Vendor Branch Division of Construction Inspection and Operational Programs Office of New Reactors	

EXECUTIVE SUMMARY

Flowserve Corporation
99901356/2012-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to verify that the Flowserve Corporation (hereafter referred to as Flowserve) implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, the NRC inspection also verified that Flowserve implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that met the NRC's regulatory requirements. The NRC inspection team conducted the inspection at the Flowserve facility in Raleigh, NC from September 10-14, 2012.

This technically focused inspection evaluated Flowserve's quality assurance activities associated with the design, fabrication, assembly, and testing of the main steam isolation valves (MSIVs) and operators, and main feedwater isolation valves (MFIVs) and operators for the Westinghouse Electric Company (WEC) AP1000 reactor design, as well as numerous other valve types and their associated components manufactured by Flowserve for both the AP1000 projects and the operating fleet of nuclear plants, including gate valves, globe valves, stop valves, check valves, motor operated valves, and various valve actuators. There were no Inspections, Tests, Analyses, and Acceptance Criteria associated with the valves evaluated during this inspection.

During the inspection, the NRC inspection team specifically observed:

- Commercial grade dedication (CGD) activities for an 1215 steel threaded shaft collar and 50 stainless steel Belleville springs, including dimensional verification, strength testing, the positive material identification (PMI) technique, and hardness testing.

- Hydrostatic and functional testing for WEC AP1000 PV03 - NPS 3 manually operated gate, stop, check, and swing check valves.

- Hydrostatic, pneumatic, and functional testing for an A-180 actuator.

- Valve BK-486 being tested in accordance with the Flowserve procedures, as well as Flowserve's implementation of its nonconformance and corrective action process for issues identified during this testing activity.

- Various welding activities, including shielded metal arc welding of a base-metal weld repair to an 8-inch swing check-valve body machined surface and hard facing gas tungsten arc welding on the guide rails of a 4-inch flex wedge gate valve.

- Numerous nondestructive testing activities, including a liquid dye penetrant (PT) examination on the machined surfaces of an 8-inch gate valve body casting, a magnetic particle (MT) examination on the hemispherical head and weld of a 24-inch gate valve (MSIV), and an ultrasonic (UT) examination on four 8-inch feedwater valve stems.

- Receipt inspection activities associated with a 3-inch check valve seat, a gate valve casting, and two valve bonnet castings.

- Verification activities for various measuring and test equipment (M&TE) devices at the Flowserve calibration laboratory, the physical inspection receiving station, various test work stations, the forge steel work station, and the small and large cast work stations. The M&TE devices examined included a Mitutoyo caliper, a Honeywell Scale Potentiometer, a digital caliper, three heat treatment furnaces and two vacuum furnaces.

- Flowserve's process for categorizing and dispositioning nonconformances and corrective actions during the daily Material Review Board meeting.

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

- Appendix B to 10 CFR Part 50

- 10 CFR Part 21

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated April 25, 2011, IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated April 25, 2011, and IP 36100, "Inspection of 10 CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

The NRC conducted its last inspection at Flowserve's facility in Raleigh, NC, in July 2009, and it documented the results in Inspection Report 99901356/2009-201, dated August 18, 2009. The report documented one violation of NRC requirements and one nonconformance to NRC requirements that were contractually imposed upon Flowserve by its customers. This inspection report documents the NRC's follow-up on Flowserve's implementation of corrective actions for these issues.

With the exception of the nonconformances described below, the NRC inspection team concluded that Flowserve's quality assurance policies and procedures comply with the applicable requirements of 10 CFR Part 21 and Appendix B to 10 CFR Part 50, and that Flowserve personnel are implementing these policies and procedures effectively. The results of this inspection are summarized below.

10 CFR Part 21 Program

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

Training and Qualification of Personnel

The NRC inspection team concluded that Flowserve is implementing its training and qualification program in accordance with the regulatory requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. Based on the limited sample of

documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the training and qualification program. No findings of significance were identified.

Design Control

The NRC inspection team issued Nonconformance 99901356/2012-201-01 in association with Flowserve's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 9901356/2012-201-01 cites Flowserve for failing to establish adequate measures for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of certain structures, systems, and components. Specifically, the NRC inspection team identified that for the eight CGD packages reviewed, Flowserve did not provide objective evidence that technical evaluations had been performed to justify that the critical characteristics selected for valve components would provide reasonable assurance that the valves would perform their intended safety-related functions.

Oversight of Contracted Activities

The NRC inspection team concluded that Flowserve is implementing its oversight of contracted activities in accordance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the oversight of contracted activities. No findings of significance were identified.

Control of Special Processes

The NRC inspection team issued Nonconformance 99901356/2012-201-02 in association with four examples of Flowserve's failure to implement the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. Specifically, Nonconformance 9901356/2012-201-02 cites Flowserve for failing to assure that workers (1) welded per established parameters; (2) performed a PT examination on the correct area of interest; (3) performed a MT examination with adequate amperes; and (4) performed a UT examination on an acceptable surface, as specified by the associated Flowserve procedures.

Test Control

The NRC inspection team concluded that Flowserve is implementing its test control program in accordance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the test control program. No findings of significance were identified.

Control of Measuring and Test Equipment

The NRC inspection team concluded that Flowserve is implementing its measuring and test equipment (M&TE) program in accordance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. Based on the

limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the M&TE program. No findings of significance were identified.

Nonconforming Materials, Parts, or Components

The NRC inspection team concluded that Flowserve is implementing its nonconforming materials, parts, or components program in accordance with the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the control of nonconforming materials, parts, or components. No findings of significance were identified.

Corrective Action

The NRC inspection team concluded that Flowserve is implementing its corrective action program in accordance with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the corrective action program. No findings of significance were identified.

REPORT DETAILS

The Nuclear Regulatory Commission (NRC) inspection team observed various activities related to Flowserve's quality assurance activities associated with the design, fabrication, assembly, and testing of the main steam isolation valves (MSIV) and operators, and main feedwater isolation valves (MFIV) and operators for the Westinghouse Electric Company (WEC) AP1000 pressurized water reactor design, as well as numerous other valve types and their associated components manufactured by Flowserve for both the AP1000 projects and the operating fleet of nuclear plants, including gate and globe valves, stop and check valves, motor operated valves, and various valve actuators. There were no Inspections, Tests, Analyses, and Acceptance Criteria associated with the valves evaluated during this inspection.

During the inspection, the NRC inspection team specifically observed:

- Commercial grade dedication (CGD) activities for an 1215 steel threaded shaft collar and 50 stainless steel Belleville springs, including dimensional verification, strength testing, the positive material identification (PMI) technique, and hardness testing.

- Hydrostatic and functional testing for WEC AP1000 PV03 - NPS 3 manually operated gate, stop, check, and swing check valves.

- Hydrostatic, pneumatic, and functional testing for an A-180 actuator.

- Valve BK-486 being tested in accordance with the Flowserve procedures, as well as Flowserve's implementation of its nonconformance and corrective action process for issues identified during this testing activity.

- Various welding activities, including shielded metal arc welding (SMAW) of a base-metal weld repair to an 8-inch swing check-valve body machined surface and hard facing (GTAW) on the guide rails of a 4-inch flex wedge gate valve.

- Numerous nondestructive testing activities, including a penetrant examination (PT) examination on the machined surfaces of an 8-inch gate valve body casting, a magnetic particle examination (MT) examination on the hemispherical head and weld of a 24-inch gate valve, and a ultrasonic (UT) examination on four, 8-inch feedwater valve stems.

- Receipt inspection activities associated with a 3-inch check valve seat, a gate valve casting, and two valve bonnet castings.

- Verification activities for various measuring and test equipment (M&TE) devices at the Flowserve calibration laboratory, the physical inspection receiving station, various test work stations, the forge steel work station, and the small and large cast work stations. The M&TE devices examined included a Mitutoyo caliper, a Honeywell Scale Potentiometer, a digital caliper, three heat treatment furnaces and two vacuum furnaces.

- Flowserve's process for categorizing and dispositioning nonconformances and corrective actions during the daily MRB meeting.

1. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the Flowserve to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21 program in order to verify compliance with the regulatory requirements. In addition, the NRC inspection team evaluated the 10 CFR Part 21 postings and a sample of Flowserve's purchase orders (PO) for compliance with the requirements of 10 CFR 21.6, "Posting Requirements," 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents." Furthermore, the NRC inspection team discussed the 10 CFR Part 21 program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 10 CFR Part 21 Policies and Procedures

The NRC inspection verified that Flowserve had effectively implemented the requirements in 10 CFR 21.21(a)(1) for evaluating deviations and failures to comply associated with substantial safety hazards and that Flowserve's procedures incorporated the appropriate timelines for evaluation and reporting identified in 10 CFR Part 21. In addition, the NRC inspection team verified that (1) Flowserve's nonconformance and corrective action procedures provided a link to the 10 CFR Part 21 program, and (2) Flowserve's 10 CFR Part 21 procedures implemented the requirements in 10 CFR 21.21(d) in regard to directors or responsible officers notifying the NRC of identified defects or failures to comply associated with substantial safety hazards.

Flowserve's Quality Assurance Manual (QAM) provides for the evaluation of deviations and notification to customers regarding any deviation that might reasonably result in a substantial safety hazard. The QAM also requires that the quality assurance program identify the items and activities affecting quality to which the Flowserve quality assurance program applies and prescribes controls over the items and activities to an extent consistent with the items' importance to safety and/or the applicable requirements of Appendix B to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

The NRC inspection team verified that Flowserve's procedures provide the guidance and organizational structure necessary to implement the requirements of 10 CFR Part 21 associated with timely identification, evaluation, and reporting of defects and failures to comply that could create a substantial safety hazard. The NRC inspection team also verified that the procedures define applicable terms consistent with the terminology defined in 10 CFR 21.3, "Definitions," provide the necessary guidance to assess deviations and failures to comply in an effective and timely manner in accordance with 10 CFR 21.21(a)(1), (a)(3), (b), and (d), and provide appropriate guidance for interim reports in accordance with 10 CFR 21.21(a)(2).

The NRC inspection team reviewed a sample of reject tickets and corrective action reports to verify that each of the programs which can be used to identify defects and failures to comply are being implemented consistent with the requirements of 10 CFR Part 21. The NRC inspection team noted that reject tickets and the associated Flowserve procedure did not have a direct link to the 10 CFR Part 21 process. During subsequent discussions with Flowserve personnel regarding this issue, the Flowserve personnel explained that because all reject tickets must be

dispositioned and closed before a component is shipped, there is no risk of a component being supplied to a facility containing a known nonconformance. As such, Flowserve does not evaluate individual reject tickets for 10 CFR Part 21 applicability since no nonconformances identified during this process would be supplied to a customer, thereby negating the need to evaluate their potential for creating a substantial safety hazard. Any nonconformances identified by customers or discovered after a component has been shipped are automatically placed into the corrective action program, which does provide for appropriate 10 CFR Part 21 screening and evaluation, as applicable.

In addition, the NRC inspection team reviewed Flowserve's procurement procedures, as well as a sample of POs, and verified that the procurement process and each procurement document specified, when applicable, included the provisions for reporting of defects and noncompliances as required in accordance with 10 CFR 21.31.

b.2 10 CFR Part 21 Evaluations

The NRC inspection team reviewed the 10 CFR Part 21 reports submitted to the NRC and determined that Flowserve had reported two potential defects or failures to comply that could create a substantial safety hazard since the 2009 NRC inspection. In both cases, Flowserve submitted the reports within the notification timeframes specified in 10 CFR Part 21 and the reports contained the required level of information. The NRC inspection team reviewed the QAM and the implementing procedures for the corrective action and customer complaint programs and it verified that each of these programs provide adequate instructions to identify any defects or failures to comply that could create a substantial safety hazard.

b.3 10 CFR Part 21 Postings

The NRC inspection team verified the content of the Flowserve 10 CFR Part 21 postings, as well as the location of each posting. The NRC inspection team verified that the information required by 10 CFR 21.6 was included on the three postings distributed throughout the Raleigh, NC, complex. The NRC inspection team walked down each of the locations and also verified that Flowserve posted the required documents in conspicuous locations consistent with the intent of 10 CFR 21.6(2).

c. Conclusion

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

2. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the implementation of Flowserve's training and qualification of personnel to verify compliance with the regulatory requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the personnel

training and qualification process with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Personnel Indoctrination and Training

The NRC inspection team verified that Flowserve had established and implemented a training and qualification program for the training and qualification of all personnel involved in safety-related activities. The QAM provides for the extent of indoctrination and training to be commensurate with the scope, complexity, and importance of the activity and the education, experience, and proficiency of the person, and it requires that personnel be indoctrinated and trained prior to assuming full, unsupervised responsibility for their job functions.

The NRC inspection team reviewed a sample of training and qualification records for auditors, lead auditors, inspection and test personnel, and it verified that the training requirements for these employees had been met.

b.2 Qualification and Training of Auditors and Lead Auditors

The NRC inspection team verified that Flowserve's QAM and associated procedures provide guidance for the indoctrination and training of auditors and lead auditors. These documents prescribe the minimum experience and training requirements for auditors and lead auditors and provide that they be certified based on education, experience, training, examination, audit participation, and communication skills. Each auditor is trained to the applicable QA procedures, the American Society of Mechanical Engineers Boiler (ASME) and Pressure Vessel Code, and other nuclear related codes, standards, regulations, and regulatory guides, as applicable An auditor maintains proficiency by participating in audits on a regular basis, by reviewing procedures, and by participating in auditor training programs.

The NRC inspection team reviewed a sample of the training and qualification records of Flowserve's auditors and lead auditors and confirmed that auditing personnel had completed all required training and maintained qualification and certification in accordance with Flowserve's policies and procedures. The NRC inspection team also verified that audit teams selected by Flowserve were sufficiently qualified to evaluate areas within the scope of the audit. In addition, the NRC inspection team verified that the qualification requirements for lead auditors and other auditors are consistent with Supplement 2S-3, "Supplementary Requirements for the Qualification of Quality Assurance Program Audit Personnel," and Nonmandatory Appendix 2A-3, "Nonmandatory Guidance on the Education and Experience of Lead Auditors," to ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications."

b.3 Qualification and Training of Inspection and Test Personnel

The NRC inspection team verified that Flowserve had established and implemented a training and qualification program for the training and qualification of inspection and test personnel. The QAM requires that personnel selected to perform inspection and test activities have the experience or training commensurate with the scope, complexity, or special nature of the activities they will perform. The indoctrination and training consists of on-the-job training with an emphasis on firsthand experience gained through actual performance of inspections and tests. The QAM also specifies that the qualification of inspection and test personnel be certified by a Level III examiner on an appropriate certification record.

The NRC inspection team reviewed sample training and qualification records for inspection and test personnel, including calibration personnel. The records reviewed included education, experience, classroom and on-the job training information, initial capability demonstration results, and triennial performance evaluations reviewed and approved by the Level III examiner. The NRC inspection team also reviewed eye examination records, which the team found to be current and in conformance with procedural requirements. The NRC inspection team confirmed that the qualification records of the inspection and test personnel were complete, current, and in accordance with the Flowserve procedural requirements.

b.4 Qualification and Training of Nondestructive Testing Personnel

The Flowserve QAM states that the training, qualification, and certification of nondestructive examination (NDE) personnel will be accomplished in accordance with the American Society for Nondestructive Testing (SNT)-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing," 1992 edition, and the applicable requirements of the ASME Code. The QAM describes the administration, education, training, examination, and certification requirements for Flowserve NDT personnel associated with the ASME Code, Sections I, III, V, and VIII, as well as the specifications of SNT-TC-1A.

The NRC inspection team reviewed the training and qualification records for a sample of NDE personnel. The qualification records included on-the-job minimum hours, written examination results, and annual eye examination records. The records reviewed were accurate, complete, current, and met the requirements of the ASME Code, Section III, as well as SNT-TC-1A. The eye examination records of NDE personnel were current and conformed with the requirements of the Flowserve implementing procedures.

b.5 Qualification and Training of Welding Personnel

The NRC inspection team interviewed the lead welding engineer regarding the process for qualifying and maintaining welding operator qualifications in accordance with the requirements of the ASME Code, and Flowserve Plant Internal Operating Procedure 36-40-15-09, "Welding Qualifications per ASME Section III & IX" and PIOP 36-41-07-13, "Welder Performance Qualification Status." The NRC inspection team selected a sample of training and qualification records for Flowserve welders and welding operators who performed welding activities on safety-related components, including those who performed the welding activities observed by the NRC inspection team, and compared them to the applicable ASME Code acceptance criteria. The NRC inspection team confirmed that these individuals had completed all required training and maintained qualification and certification in accordance with Flowserve's policies and procedures, and that the welding operators were qualified in accordance with the applicable acceptance criteria of the ASME Code, Section IX, "Welding and Brazing Qualification," and Section III, "Rules for Construction of Nuclear Facility Components." The NRC inspection team also verified that welding engineering adequately maintained the welder performance qualification list.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its training and qualification program in accordance with the regulatory requirements of Criterion II of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the training and qualification program. No findings of significance were identified.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the implementation Flowserve's design control program to verify compliance with the requirements of (1) Criterion III, "Design Control," of Appendix B to 10 CFR Part 50; (2) ASME Section III, Subsection NCA, "General Requirements for Division 1 and Division 2 Rules for Construction of Nuclear Facility Components;" (3) ASME Section III, Subsection NCB, "Division 1 – Subsection NB Rules – Class 1 Components – Construction of Nuclear Facility Components;" and (4) American National Standards Institute (ANSI) B16.34, "Valves – Flanged, Threaded, and Welding End."

In addition, the NRC inspection team reviewed Flowserve's program for the dedication of commercial grade items (CGIs) for use in safety-related applications to verify compliance with the applicable regulatory requirements. The NRC inspection team reviewed several dedication packages, including dedication plans, the criteria for the selection of critical characteristics, the basis for sampling plan selection, and the selection of verification methods to verify effective implementation of Flowserve's CGI dedication process. The NRC inspection team observed the dedication of an AISI 1215 threaded shaft collar and a stainless steel Belleville spring by Flowserve staff. The NRC inspection team also discussed the design control program and the CGI dedication process with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Implementation of Flowserve's Design Control Process

Flowserve has been awarded several contracts from WEC to design and fabricate MSIVs, MFIVs, and the associated operators, as well as several other valve types and components, for the AP1000 reactor design, and continues to provide numerous other valves and components to the operating nuclear fleet. The NRC inspection team reviewed Flowserve sales order (SO) 91154, "Valve Package PV03 (3-inch – 14-inch Manual Gates and Checks)," and SO 91175 "Valve Package PV01 (3-inch – 14-inch [Motor Operated Valves] (MOVs), Gates and Globes)," for the Virgil C. (V.C.) Summer, Units 2 and 3 project, and evaluated the associated design control process.

Flowserve's QAM describes the program and controls for implementation of the design control program in accordance with the applicable regulatory, ASME, and ANSI requirements. The NRC inspection team confirmed that the Flowserve design control process provides controls for design inputs, outputs, design analyses, records, and organizational interfaces. The NRC inspection team also verified that the Flowserve Quality Assurance Plans (QAPs), which govern governing specifications for traceable components, included the appropriate specifications, codes, and Authorized Nuclear Inspector (ANI) review requirements.

The NRC inspection team verified that the WEC AP1000 procurement specifications were properly translated into Flowserve specification sheets, drawings, procedures, analyses, calculations, and instructions and that engineering data supported this information. The specifications verified included material specifications, applicable AMSE Code construction requirements, qualification reports, test requirements, and test reports. The associated documentation reviewed included design and seismic analysis reports, valve drawings, SO,

sales order control sheets, and various method specification test procedures. All documents reviewed contained the appropriate technical details and met the WEC AP1000 procurement specifications. The NRC inspection team concluded that the Flowserve documentation for the design control process met the QAM and associated procedures.

The NRC inspection team also reviewed a WEC design change request for Flowserve SO 91175 associated with minor changes to the technical specifications for several valves encompassed by the SO. The request followed the processes delineated in the Flowserve design control procedure, Plant Internal Operating Procedure (PIOP) 36-70-03, "Design Control." The NRC inspection team verified that the design change request received a level of review commensurate with that applied to the original design by a qualified design engineer, which included an analysis of the acceptability of the change request in relation to the associated requirements of the ASME Code and Appendix B to 10 CFR Part 50. The NRC inspection team verified that the Flowserve design change process effectively translated the customer's request into the affected Flowserve documentation. Specifically, the Flowserve design engineer identified the applicable procedures, analyses, reports, drawings, and components affected by the design change request and verified that the revised design documentation continued to meet the necessary requirements.

The NRC inspection team concluded that the Flowserve engineering document change control process was consistent with the applicable regulatory requirements, and that Flowserve had correctly translated the WEC AP1000 design bases into the applicable specifications, drawings, procedures, and instructions. The NRC inspection team confirmed that design documents specified and included the appropriate quality standards; that WEC and Flowserve were coordinating sufficiently on the AP1000 MSIV and MFIV design; that Flowserve was integrating and performing independent verifications and checks into the process; that it was performing required qualification tests; and that it was effectively controlling and implementing design changes.

b.2 Technical Evaluations and Identification of Critical Characteristics

Flowserve PIOP 36-41-09-08, "Dedication of Commercial Grade Items," identifies the methodology for performing commercial-grade dedication of items to be used in safety-related applications, as well as the specific process to be followed by Flowserve as part of its dedication program. PIOP 36-41-09-08 provides adequate controls for dedication activities, including CGI evaluation criteria, procurement controls, acceptance and rejection criteria, material traceability controls, controls for receipt inspection and test activities, and controls for documenting the activities performed as part of the Flowserve dedication program.

PIOP 36-41-09-08 requires that for all CGI, a technical evaluation be performed to verify that the correct part number and description are specified in the Bill of Material. As part of this process, an investigation or evaluation is performed against previous like-product manufactured items to identify any potential changes. If personnel identify changes, they must perform an evaluation performed to ensure that the changes do not affect the form, fit, or function of the part, and that adequate documentation is prepared to support this conclusion.

For each part dedicated by Flowserve, an engineer prepares a "Dedication of Commercial Grade Item" form (Form 36-Q-657). This form contains the information relevant to the part/material being dedicated (i.e., part number, description, purchase order number, etc.), and also includes the critical characteristics of the particular part. In addition, the form provides instruction on what CGI acceptance method needs to be used by the Flowserve staff.

Flowserve Standard Operating Procedure (SOI) 70-14-12, "Identification of Basic Components Under 10 CFR 21," provides guidance for classifying valve parts and accessories that are critical to the overall function of the valve. This procedure is used to identify essential-to-function parts that will need to be dedicated or procured as safety-related components. The procedure gives examples of which piece parts of the various valves and actuators manufactured by Flowserve must be procured as ASME Section III safety-related components, and which may be procured as purely commercial-grade items.

Flowserve Report No. RAL-7487, "Raleigh Critical Attribute Identification for 10 CFR Part 21 Commercial Grade Dedication," identifies potential critical attributes for essential-to-function valve parts. These parts are to be selected for use in nuclear safety-related applications. This report is the result of Flowserve's technical evaluations of its standard valves and actuator assemblies, and it provides a representative list of critical characteristics for certain types of parts. Verification of the critical attributes listed in this report provides reasonable assurance that the associated commercial-grade item will perform its intended safety-related function.

b.3 Acceptance of Commercial Grade Items

Flowserve SOI 70-39-09, "Dedication of Commercial Grade Components to 10 CFR 21," describes the controls necessary to verify the critical characteristics of CGIs. The NRC inspection team confirmed that the controls described in SOI 70-39-09 are patterned after Electric Power Research Institute (EPRI) 5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety-Related Applications," for dedication activities. EPRI 5652 provides four methods of accepting a CGI for use in safety-related applications: Method 1, "Special Tests and Inspection;" Method 2, "Commercial Grade Survey of Supplier;" Method 3, "Source Verification;" and Method 4, "Acceptable Supplier/Item Performance Record."

b.4 Implementation of Flowserve's Commercial Grade Item Dedication Program

The NRC inspection team observed dedication activities and reviewed completed dedication packages to verify that Flowserve properly developed and implemented a plan for CGIs. For safety-related valves manufactured by Flowserve for the AP1000 reactor design, as well as for the current fleet of operating nuclear power plants, the NRC inspection team performed a sample review of dedication packages to verify that Flowserve appropriately identified basic components and their critical characteristics. Specifically, the NRC inspection team selected a sample of valve subcomponents (e.g., base, bonnet, spring assembly, disc holder, guide, cap, gasket, screws, locknuts, plugs, etc.) that Flowserve procured as CGIs and dedicated for use in safety-related applications. The NRC inspection team reviewed the dedication packages, associated drawings and inspection reports to verify that the critical characteristics and verification methods were correctly specified in Form 36-Q-657, that the drawings and material specifications containing the associated acceptance criteria for each critical characteristic were referenced, and that the inspection reports adequately documented the acceptance of the critical characteristics.

During the review of an AP1000 reactor design air solenoid valve dedication package, the NRC inspection team verified that the package contained the required documentation, including the route card, engineering drawing of the ASCO air solenoid valve, evidence of the test data sheets, and a copy of the functional test procedure (Method Specification (MS) 7899, "Functional Test Procedure for the Air Solenoid Valves to be Used on the Type A Actuator"). While reviewing the test data sheet, the NRC inspection team noted that MS 7899 required testing the voltage, pressure, and leakage of the air solenoid valve. However, the test data

sheet did not contain any acceptance criteria to assist the Flowserve inspector determining if the voltage obtained during the test was adequate or not.

The NRC inspection team also noted that MS 7899, Section 3, "General Requirements," Step 3.5, states that the "voltage supply shall be the minimum required voltage (-5 / +0 volts) and shall be stated on the dedication sheet [Form 36-Q-657]." However, the Form 36-Q-657 for the air solenoid valve did not specify the critical characteristic that needed to be verified or the minimum necessary voltage as required by MS 7899. For the dedication package reviewed, workers recorded a value of 38 volts as the actual voltage tested, and the same voltage value was recorded as the required value. The NRC inspection team questioned the Flowserve inspector regarding the origin of the required voltage value recorded on the test data sheet. The Flowserve inspector indicated that when a minimum required voltage is not specified in the dedication sheet it is customary to use 90 percent of the rated voltage of the solenoid valve. The NRC inspection team also questioned the responsible Flowserve engineer about the test and acceptance criteria being used by the Flowserve inspector, who indicated that it was adequate to use 90 percent of the rated voltage of the solenoid valve as the appropriate acceptance criteria.

The NRC inspection team requested that Flowserve provide the technical evaluation performed by the engineering group to dedicate this type of air solenoid valve. During discussions with Flowserve personnel, the NRC inspection team learned that Flowserve did not document the technical evaluation or the engineering justification performed to select the critical characteristics associated with the air solenoid valve. These measures provide reasonable assurance that the commercial-grade valve will perform its intended safety-related function. Technical evaluations identify the necessary technical and quality requirements to ensure that the item will meet the intended design function. In addition to the air solenoid valve dedication package, Flowserve was not able to provide objective evidence that a technical evaluation had been performed for the other seven dedication packages reviewed, which included two flow control valves, a peerless motor, a metering orifice, a four way valve, an O-ring, and a two way Metrex valve. The NRC inspection team identified this issue as an example of Nonconformance 99901356/2012-201-01 for Flowserve's failure to provide objective evidence that technical evaluations had been performed to provide reasonable assurance that the commercial-grade items to be used as basic components will perform their intended safety-related function. Flowserve initiated Corrective Action Report (CAR) No. 943 to address this issue.

The NRC inspection team observed special tests and inspections, including dimensional verification, strength testing, the positive material identification (PMI) technique, and hardness testing for commercial-grade dedication of two AISI 1215 threaded shaft collars and 50 stainless steel Belleville springs. The NRC inspection team verified that the Flowserve inspectors were qualified, chose the correct item for testing, and used qualified equipment. The NRC inspection team also verified that the associated Forms 36-Q-657 specified the critical characteristics and verification methods, as well as referenced the drawings and material specifications that contained the associated acceptance criteria for each critical characteristic. The Flowserve inspectors verified the part numbers, dimensional critical characteristics, and chemical critical characteristics according to the applicable Form 36-Q-657 and the associated drawings for each CGI, and they documented them on the inspection record or Form 36-Q-657, as necessary.

As a part of the dedication activities for the stainless steel Belleville springs, the Flowserve inspector selected a sample of five items in accordance with Table 1, "Normal Sampling," of SOI 40-01-22, "Inspection Instructions for Incoming Material." During the dimensional verification, the Flowserve inspector found that one of the five items sampled did not conform to

the required dimension. The Flowserve inspector then inspected all of the remaining springs (50) as required by SOI 40-01-22. During this subsequent inspection, the Flowserve inspector identified two additional nonconforming springs and opened Reject Ticket No. R138706 to address these dimensional nonconformities.

After the springs were dedicated, the NRC inspection team requested that Flowserve engineering provide the technical evaluation associated with the commercial-grade dedication activities for the stainless steel Belleville springs to compare the critical characteristics and acceptance methods listed in Form 36-Q-657. Flowserve could not provide objective evidence of a technical evaluation to support the CGD of the stainless steel Belleville springs. The NRC inspection team identified this issue as another example of Nonconformance 99901356/2012-201-01 for Flowserve's failure to provide objective evidence that technical evaluations had been performed to provide reasonable assurance that the commercial-grade items to be used as basic components will perform their intended safety-related function.

c. Conclusion

The NRC inspection team issued Nonconformance 99901356/2012-201-01 in association with Flowserve's failure to implement the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Nonconformance 9901356/2012-201-01 cites Flowserve for failing to establish adequate measures for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of certain structures, systems, and components. Specifically, the NRC inspection team identified that for the eight commercial grade dedication packages reviewed, Flowserve did not provide objective evidence that technical evaluations had been performed to justify that the critical characteristics selected for valve components would provide reasonable assurance that the valves would perform their intended safety-related functions.

4. Oversight of Contracted Activities

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the implementation of Flowserve's oversight of contracted activities to verify compliance with the requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of POs and receipt inspection records to evaluate compliance with Flowserve's oversight program and technical requirements. In addition, the NRC inspection team reviewed the disposition of corrective actions to resolve deficiencies identified by audit findings for adequacy and timeliness. Furthermore, the NRC inspection team discussed the oversight of contracted activities with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Procurement Document Control

The NRC inspection team verified that the POs adequately documented the procurement requirements as established by Flowserve's governing policies and implementing procedures, which include (1) task definitions and responsibilities, (2) imposition of appropriate quality,

technical, and regulatory requirements, and (3) identification of applicable codes and standards. The NRC inspection team also found that these POs adequately defined contract deliverables, instructions for the disposition of nonconformances, access rights, and provisions for the extension of contractual requirements to subcontractors. The NRC inspection team also verified that when changes to approved procurement documents were needed, they received the same level of review and approval as the original documents. In addition, the NRC inspection team confirmed that all of the safety-related POs reviewed included clauses invoking the provisions of 10 CFR Part 21 and requiring the vendor or supplier to conduct safety-related work under its approved quality assurance program.

b.2 Maintenance of the Approved Vendors List

The NRC inspection team reviewed Flowserve's approved vendors list (AVL), to ensure (1) that qualified and approved suppliers were listed, (2) that authorized personnel maintained, distributed, and periodically updated the list, and (3) that any revisions to the list were implemented following the process specified in the QAM and the applicable procedures. The NRC inspection team confirmed that the AVL documented (1) the vendor name, (2) the scope of qualification, (3) limitations and restrictions, if necessary, (4) the date that re-approval is due, and (5) the vendor's quality program. The NRC inspection team also confirmed that, for the sample of vendors selected, Flowserve performed supplier audits and surveys as required and that the corrective actions related to these audits were implemented in a timely manner.

b.3 Receiving Inspections

The NRC inspection team reviewed the receiving inspection guidance provided in the Flowserve QAM and associated procedures, which provide a system for the inspection and control of incoming traceable materials received at the Flowserve facility. The NRC inspection team verified that Flowserve is using appropriate methods to accept a basic component from a supplier, such as Certificates of Conformance (CoCs) and receipt inspections.

The NRC inspection team reviewed Flowserve PO 111595 and SO 91154 for WEC globe and gate valves, and verified that Flowserve performed physical receipt inspections and Certified Material Test Report (CMTR) checks of the chemical and physical characteristics against the required Material Specifications for each valve part. After completion of receipt inspections, Flowserve completed numerous Quality Release (QR) and CoC documents to specify the quality attributes that must be verified for each component, such as heat trace records, NDE examinations, material handling and packaging requirements, etc.

The NRC inspection team also verified that Flowserve ensures CoCs (1) correctly identify the material, equipment, or service being supplied, (2) identify specific procurement requirements that have been met and those that have not been met, and (3) identify the quality program used to control the product or service. The NRC inspection team confirmed that suppliers submitted deviations from POs and SOs and that Flowserve appropriately dispositioned the deviations. The NRC inspection team also verified that receipt items to-be-inspected and reject ticket items were being stored in accordance with the Flowserve procedures.

In addition, the NRC inspection team confirmed that, for the sample of documents reviewed and where required by the Flowserve procedures, each incoming item received an appropriate level of review and approval from the Flowserve quality control inspectors, the ANI, or the Flowserve quality assurance engineers. This included a review of any weld repairs, dimensional checks, cast body minimum wall thickness reports, body dimension inspection reports, etc.

b.4 External Audits

The NRC inspection team reviewed a sample of external audits to verify the implementation of the Flowserve audit program. The NRC inspection team confirmed that the audit reports contained a review of the relevant quality assurance criteria in Appendix B to 10 CFR Part 50 for the activities performed by individual suppliers, as well as documentation of pertinent supplier guidance associated with each criterion. For audits that resulted in findings, the NRC inspection team verified that the supplier had established a plan for corrective action and that Flowserve had reviewed and approved the corrective action(s) and verified satisfactory completion and proper documentation in a timely manner.

The NRC inspection team also confirmed that Flowserve performed external audits commensurate with the required frequencies specified in the Flowserve QAM, associated procedures and the applicable section of the ASME Code. In the case of third-party audits, the NRC inspection team verified that Flowserve reviewed and accepted the supplied third-party audit documentation before taking credit for the audit results.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its oversight of contracted activities in accordance with the regulatory requirements of Criterion IV and Criterion VII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the oversight of contracted activities. No findings of significance were identified.

5. Control of Special Processes

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the control of special processes to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50, as well as the requirements of Section V, "Nondestructive Examination," of the ASME Code. Specifically, the NRC inspection team reviewed a sample of activities related to special processes, including welding and nondestructive testing. In addition, the NRC inspection team discussed the control of special processes program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Welding Process

The NRC inspection team observed Flowserve's production welding activities, which included SMAW of a base-metal weld repair to an 8-inch swing check-valve body machined surface and hard facing GTAW on the guide rails of a 4-inch flex wedge gate valve. The GTAW activities were performed to Welding Procedure Specification (WPS) P8-341N, "Hardfacing and Repair of P-8 Materials per ASME Section IX," Revision 5, on a calibrated, Miller Max Star 350 welding machine. The NRC inspection team reviewed WPS P8-341N and the accompanying Procedure Qualification Record (PQR) No. B160, "Manufacturers Record of Welding Procedure Qualification for Hardsurfacing Overlay Welding." The NRC inspection team did not note any deficiencies.

Flowserve staff performed SMAW activities to WPS P8-123N, “Fillet, Groove, and Repair Welding of P8 Materials per ASME III Without [Post-Weld Heat Treatment] (PWHT),” Revision 2, on a calibrated, Lincoln Electric IDEAL ARC DC-600 welding machine. The NRC inspection team reviewed WPS P8-123N and the accompanying PQR No. B316, “Fillet and Groove Welds,” and noted that the Flowserve weld technician failed to perform the welding in accordance with the WPS as required by the ASME Code, Section IX. Specifically, the welder had deposited the weld beads 3/16-inch thick, in excess of the specified maximum allowable bead height of 1/8-inch, which would result in an increased heat input. Heat input, in conjunction with interpass temperature, was being controlled per the WPS to eliminate “sensitization” of the material during the welding activities.

The NRC inspection team also noted that the Flowserve weld technician failed to remove all foreign material within 2 inches of the weld area as required by the WPS. The foreign material, an anti-spatter compound, had been applied to protect the finished surface from the weld materials. The application of the “Protect-O-Metal” material was not dictated by any Flowserve instruction or procedure. As a result of this issue, Flowserve generated a new procedure, PIOP 36-40-41-01, “Use of Anti-Spatter Compound to Protect Surfaces during Welding and Heat Treating,” to address the use of the compound. The NRC inspection team identified this issue as an example of Nonconformance 99901356/2012-201-02 for Flowserve’s failure to control special processes in accordance with the qualified procedures. Flowserve initiated CAR No.935 to address this issue.

b.2 Control of Weld Material

The NRC inspection team observed that Flowserve clearly identified welding materials at all times, and that it retained identification of acceptable material throughout storage, handling, and use until the material was actually consumed in the welding process. The NRC inspection team also observed that covered weld electrodes and flux were stored in moisture controlled environments, and that the process for conditioning of electrodes was being implemented. Based on interviews with welding operators, a welding technician, and a lead welding engineer, as well as direct observation and review of Flowserve PIOP 36-40-14-11, “Control of Welding Materials,” the NRC inspection team determined that Flowserve was effectively implementing its weld material control program in accordance with its quality assurance program and the associated procedural requirements.

b.3 Nondestructive Examination

The NRC inspection team confirmed Flowserve performed NDE processes observed using qualified procedures, certified NDE inspectors, approved NDE materials, and calibrated measuring and test equipment. The NRC inspection team witnessed a number of NDE processes, including a liquid dye PT examination on the machined surfaces of an 8-inch gate valve body casting, a MT examination on the hemispherical head and weld of a 24-inch gate valve / MSIV, and a UT examination on four, 8-inch feedwater valve stems.

The post-emulsification PT examination was performed in accordance with Flowserve MS 1151NW, Revision 1, “Liquid Penetrant Examination of Materials Used in Valve Applications for ASME Code.” Step 7.1 of this procedure states, in part, that “the penetrant is applied to the clean surface.” The NRC inspection team initially observed that the penetrant did not appear to adequately adhere to or wet the surface of the machined “area of interest,” which would be indicative of poor cleaning and could compromise the overall quality of the examination. After a discussion with the Flowserve NDE examiner, the NRC inspection team discovered that the

examiner had actually been in the process of performing the PT on the wrong area of interest. Specifically, Step 4.1 of the PT procedure states, in part, that "the material to be examined and the specific areas requiring examination will be designated on the route card." Sequence 90 on the route card for the associated SO delineated the areas required for PT examination, but the Flowserve NDE examiner failed to identify the correct areas of interest and rather was performing the PT on the area of interest associated with a different valve body. The NRC inspection team identified this issue as an example of Nonconformance 99901356/2012-201-02 for Flowserve's failure to control special processes in accordance with the qualified procedures. Flowserve initiated CAR No. 936 to address this issue.

The prod method of MT examination was performed in accordance with Flowserve MS 1025EN, Revision 3, "Dry Magnetic Particle of Ferro Magnetic Materials – Prod and Yoke Methods." The examination uses ferro-magnetic particles (powder) for detection of discontinuities. Step 8.1.3 of the procedure states, in part, that "the powder shall be applied by lightly spraying a small quantity over the surface. The excess shall be removed with a gentle air stream so as not to disturb the lightly held powder patterns." However, the NRC inspection team noted that the Flowserve NDE examiner was instead applying and removing the ferro-magnetic particles with a pressure set at 50 pounds per square inch, which exceeded the defined "gentle air stream." Specifically, the excessive air pressure used by the NDE examiner would have removed the lightly held magnetic particles that could have revealed rejectable indications. The NRC inspection team identified this issue as another example of Nonconformance 99901356/2012-201-02 for Flowserve's failure to control special processes in accordance with the qualified procedures. Flowserve initiated CAR No. 937 to address this issue.

In addition, Step 8.1.4 of MS 1025EN states, in part, that "the prod tips should be kept clean and dressed to minimize electrical arcing." Furthermore, Step 8.1.5 states, in part, that "the magnetizing current shall be used at a minimum of 100 amperes per inch of prod spacing for sections 3/4-inch thick or greater." The required amperage used to perform the examination is affected and/or reduced by both of these factors (i.e., oxidation of the tips and spacing of the prods). The NRC inspection team noted that the Flowserve NDE examiner set up the Magnaflux MT machine to 770 amperes, thereby meeting the minimum amperage requirements for the associated SO. However, when the NRC inspection team asked the examiner to verify the amperage at the conclusion of the MT examination, it was measured at only 650 amperes, which was below the required amperage. Failure to dress the prod tips periodically during the examination, as well as the use of a prod spacing greater than that limited administratively (i.e., 7 inches versus 6.25 inches), resulted in numerous arc strikes during the test, which led to a reduction in amperage output. The NRC inspection team identified this issue as another example of Nonconformance 99901356/2012-201-02 for Flowserve's failure to control special processes in accordance with the qualified procedures. Flowserve also addressed this issue in CAR No. 937.

The straight beam method of UT examination was performed in accordance with Flowserve MS 1029NE-B, Revision 9, "Ultrasonic Examination of Forgings and Bars for Use in Nuclear ASME Section III Applications." Section 9.1 of the procedure states, in part, that "parts shall be examined over the entire volume." The NRC inspection team noted that for SO 91175-13, items were not prepped for the required full straight beam examination, thereby rendering it impossible to achieve meaningful test results. However, the Flowserve NDE examiner elected to perform a UT examination on an unacceptable surface that prevented the inspection of the entire volume as required. The NRC inspection team identified this issue as another example of Nonconformance 99901356/2012-201-02 for Flowserve's failure to control special processes in

accordance with the qualified procedures. Flowserve initiated CAR No. 939 to address this issue.

Flowserve further captured the preceding Nonconformance 99901356/2012-201-02 examples as an overall issue in CAR No. 942, which addressed the specific incidents identified in CAR Nos. 935, 936, 937, and 939.

c. Conclusion

The NRC inspection team issued Nonconformance 99901356/2012-201-02 in association with four examples of Flowserve's failure to implement the regulatory requirements of Criterion IX of Appendix B to 10 CFR Part 50. Specifically, Nonconformance 9901356/2012-201-02 cites Flowserve for failing to assure that workers (1) welded per established parameters; (2) performed a PT examination on the correct area of interest; (3) performed a MT examination with adequate amperes; and (4) performed a UT examination on an acceptable surface, as specified by the associated Flowserve procedures.

6. Test Control

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the test control program to verify compliance with the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of Flowserve test control activities related to the AP1000 MSIV and MFIV assemblies and observed various testing activities. The NRC inspection team also reviewed a sample of Flowserve's Type "A" actuator testing results for orders supplied to operating reactors and observed associated testing activities. In addition, the NRC inspection team discussed the test control program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Test Plan

The NRC inspection team observed and verified testing activities and results for: (1) SO 91154; (2) SO 91173 for WEC - V.C. Summer, Units 2 and 3 to test the 20-inch MFIVs; (3) SO 91175; and (4) SO 91178 for WEC - Vogtle Units 3 and 4 to test the 20-inch MFIVs. In addition, the NRC inspection team reviewed a sample of hydrostatic, pneumatic, and functional testing data for Flowserve's Type "A" actuators in order to evaluate the Flowserve test control activities associated with these components. The NRC inspection team also observed a portion of testing activities for Flowserve Type "A" actuators in accordance with testing procedure MS 7120, "Hydrostatic, Pneumatic and Functional Test Procedure for the Electronic Comanche Peak SES A-180 Actuator." The NRC inspection team concluded that Flowserve adequately implemented its test methodology, test equipment, and data evaluation for these SOs in accordance with the required technical standards.

b.2 Test Procedures

The NRC inspection team evaluated the following Flowserve test procedures:

- MS 7210, “Hydrostatic, Pneumatic and Functional Test Procedure for the TU Electric Comanche Peak SES A-180 Actuator,” Revision 2.

- MS 9088, “Hydrostatic and Functional Test Procedure for the Six 20x16x20 MFIV Equiwedge Gate Valves Supplied to Westinghouse for Sales Orders Numbers 91173 and 91178,” Revision 1.

- MS 9089, “Hydrostatic and Functional Test Procedure For the 8-290 Gas/Hydraulic Actuator Supplied to Westinghouse For Sales Orders Numbers 91173 and 91178,” Revision 1.

- MS 9048, “Assembly, Hydrostatic, and Functional Test Procedure for Westinghouse AP1000 PV03 - NPS 3 and Larger Manually Operated Gate, Stop Check & Swing Check Valves,” Revision 6.

- MS 9424, “Bolt Torque Procedure,” Revision 1.

The NRC inspection team verified that Flowserve’s test procedures adequately included the technical, quality, and regulatory requirements identified in the associated SOs. The NRC inspection team also verified that Flowserve’s test procedures provided an adequate description of the test objectives, test sequences, test instructions, test parameters, measuring and test equipment usage, acceptance criteria, and post-test activities, and that they meet the requirements of the ASME Code, Section III, Subsection NB, “Class 1 Components.”

b.3 Test Program Implementation

The NRC inspection team observed testing activities for valve BK-486 from WEC SO 91154, which was a 4-inch wedge gate valve being tested to MS 9048. During the MS 9048 valve closure test, Valve BK-486 failed because of leakage indications in excess of the amount allowed by MS 9048. After the failed test, onsite WEC personnel noted that the required bonnet bolt torque values for valve BK-486 were incorrectly transferred from the valve assembly drawing and the values specified in MS 9424 into the test procedure. Flowserve personnel documented these findings on Reject Tickets R13920 and R13921.

As a result of these findings, Flowserve re-torqued valve BK-486 and inspected it to the correct values in MS 9424. During the subsequent retesting activities, valve BK-486 completed the hydrostatic shell test, but again failed the seat leakage test. Flowserve documented the results of this testing evolution on Reject Ticket R13922, and disassembled valve BK-486. As a next step, Flowserve personnel lapped the gate and body seats, and it reassembled the valve. The testing of valve BK-486 was restarted, but the valve again failed the seat leakage test. Flowserve documented the results of this additional testing evolution on another Reject Ticket and valve BK-486 was once again disassembled and inspected.

During these inspection activities, Flowserve and WEC personnel observed a small ledge near the valve body seat that was identified as a nonconformance to the valve specifications. Flowserve generated a reject ticket identifying the nonconforming condition and the testing

activities for valve BK-486 were suspended until the Flowserve engineering staff could evaluate the nonconformance. As a result of these observations, the NRC inspection team concluded that the observed testing activities provided for adequate implementation of the technical standards and regulatory requirements associated with the Flowserve test program.
The NRC inspection team confirmed that the following testing elements were satisfied, verified, and recorded, as appropriate, for the AP1000 and Type "A" actuator SOs and MSs reviewed: (1) test parameters and initial conditions, (2) test acceptance criteria, (3) test prerequisites, (4) test instrument range, accuracy, and uncertainty appropriate for the test; (5) current calibration, and (6) proper procedure sequence followed and any deviations documented and evaluated.

b.4 Test Results and Data Evaluation

As a part of its review, the NRC inspection team verified the test data results for the completed valves associated with WEC SO 91154. The NRC inspection team noted that the test data sheet for valve BL-575 stated that an A-193 Grade B7 stud adapter plate was required, with a tested torque value of 287 to 359 foot pounds (ft-lbs). The test results associated with this valve indicated that Flowserve personnel torqued the stud adapter plate to 300 ft-lbs measured. The NRC inspection team checked the torque requirements for the stud adapter plate against the requirements listed in MS 9424, which states that an A-193 Grade B7 stud adapter plate must have a torque value between 337 and 421 ft-lbs. The NRC inspection team verified the grade of the stud adapter plate on the valve's assembly drawing (No. 09-91154-18, Item 16) and found that the stud adapter plate was a critical valve part to which 10 CFR Part 21 applies.

The NRC inspection team discussed the difference in the torque values associated with the test data sheet, the actual measured torque for valve BL-575, the requirements of MS 9242, and the notes for assembly drawing No. 09-91154-18 with Flowserve personnel. Flowserve stated that the stud adapter plate was in fact under torque by 37 ft-lbs, and that Flowserve personnel had inadvertently transferred the incorrect values from MS 9242 into the test data sheet. As a result of this issue, Flowserve initiated its corrective action and 10 CFR Part 21 processes and preformed an evaluation of the deviations potentially associated with a substantial safety hazard. The Flowserve evaluation determined that the 37 ft-lbs under torque condition was within acceptable limits to the ASME Code requirements and did not represent a substantial safety hazard. Flowserve documented the evaluation of the deviations and the results in CAR No. 938. As a result of these observations, the NRC inspection team concluded that Flowserve was adequately implementing the evaluation requirements, technical standards, and regulatory requirements associated with the test program.

In addition, the NRC inspection team verified that Flowserve implemented suitable requirements for recording data during testing and had established a process with functional responsibilities for effective evaluation of test results. The NRC inspection team reviewed Flowserve's controls applicable to test log documentation and data acquisition to assess the completeness of the requirements with regard to traceable and verifiable data, and to the documentation of the accuracy of instruments used to collect data.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its test control program in accordance with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the test control program. No findings of significance were identified.

7. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the M&TE program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the M&TE program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team reviewed the M&TE requirements provided in the Flowserve QAM and associated procedures, which provide a system for the control of measuring and testing equipment and devices. The M&TE program ensures that tools, gauges, instruments, and other devices used in activities that affect quality are of the proper range, type, and accuracy to verify conformance with the established requirements.

The NRC inspection team reviewed the Flowserve database used for tracking calibration completion and due dates for each of approximately 1,200 M&TE devices used at the Flowserve Raleigh facility. The NRC inspection team also performed a visual sample inspection of several M&TE devices at the Flowserve calibration laboratory, the Flowserve physical inspection receiving station, various test work stations, the forge steel work station, and the small and large cast work stations. The NRC inspection team found that the sampled M&TE devices all had appropriate calibration stickers and current calibration dates, including the calibration due date. In addition, the calibration records reviewed by the NRC inspection team indicated the as-found or as-left conditions, accuracy required, calibration results, calibration dates, due date for recalibration and the applicable National Institute of Standards and Technology reference for the equipment used in the calibration. The NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards.

The NRC inspection team verified that the gage laboratory M&TE was calibrated using procedures and standards traceable to known industry standards. In addition, through interviews with several calibration personnel and reviews of their qualification records, the NRC inspection team concluded that the calibration personnel were knowledgeable and qualified. The NRC inspection team also reviewed a sample of records for out of-tolerance equipment that was documented on reject tickets. At the time of this inspection, the out-of-tolerance equipment was under review by the Flowserve Materials Review Board (MRB) and being evaluated for validity of the previous inspection or test results and for acceptability of those items previously inspected or tested. Flowserve quarantined the rejected equipment in its gage calibration laboratory until the MRB evaluations are complete and the devices are repaired.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the M&TE program. No findings of significance were identified.

8. Control of Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed Flowserve's policies and implementing procedures that govern the control of nonconformances to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of reject tickets and verified that the disposition and control of nonconformances was in accordance with the Flowserve procedural guidelines. In addition, the NRC inspection team discussed the nonconformance program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team reviewed Section 15 of the Flowserve QAM and the procedures associated with the processing of nonconformances and reject tickets, as well as approximately 15 AP1000 project related reject tickets. This review included a dispositioned reject ticket involving an ASME Code item to confirm the appropriate ANI signatures were obtained.

The NRC inspection team also verified that the applicable Flowserve procedures provide for (1) reference to instructions or procedures for repair and rework activities (where required), re-inspection of repaired and reworked items, and notification to affected organizations of nonconforming conditions, (2) deficiencies or nonconformances identified by customers to be entered into the corrective action program, adequately assessed, and properly dispositioned, and (3) the applicable procedures to appropriately identify the responsibility and authority for review and disposition of nonconforming items, and control further processing, delivery, and installation of nonconforming items until disposition is completed.

The NRC inspection team witnessed a receipt inspection and verified the procedures used when a nonconformance is present, and also toured the shop floor to verify that there are designated areas to segregate and control the various classes of nonconforming materials. This process also properly applies the principles of acceptable, reject, rework, hold, scrap, or use-as-is, and provides for the applicable technical justifications to be adequately supported and properly documented, including the need for additional design control measures as necessary, commensurate with those applied to the original design.

For the sample of reject tickets reviewed, the NRC inspection team verified that Flowserve implemented an adequate program to assess and control nonconforming items, including appropriate identification, documentation, segregation, evaluation, and disposition of these items. Each reject ticket receives a review during the daily MRB meeting, which consists of quality assurance, engineering, and inspection personnel touring the shop floor, evaluating all reject tickets created since the last MRB or any reject tickets with a changed status, dispositioning the reject tickets in accordance with the Flowserve process, and documenting the bases for these decisions, as needed. For any reject tickets requiring a more in depth review, the MRB assigns engineering or inspection personnel, as necessary, to evaluate and disposition the nonconformance and provide adequate documentation of the evaluation. The NRC inspection team attended an MRB meeting to verify implementation of the reject ticket process.

The NRC inspection team also conducted numerous discussions with Flowserve personnel, including design engineers, quality assurance engineers, and shop floor technicians, to verify

that all Flowserve personnel are aware of the reject ticket process, recognize when and how to enter into the process, and understand the types of disposition that can result from a reject ticket. The NRC inspection team concluded that all of the Flowserve personnel interviewed had adequate knowledge of the Flowserve reject ticket and nonconformance process.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its nonconforming materials, parts, or components program in accordance with the regulatory requirements of Criterion XV of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the control of nonconforming materials, parts, or components. No findings of significance were identified.

9. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed the current status of the corrective actions implemented in response to the findings from the 2009 NRC inspection. The NRC inspection team also reviewed Flowserve's policies and implementing procedures that govern the corrective action program to verify compliance with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of CARs and verified that the CARs' disposition and control provide adequate documentation and description of conditions adverse to quality, as well as specifying the cause of these conditions and the corrective actions taken to prevent recurrence. In addition, the NRC inspection team discussed the corrective action program with Flowserve's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

b.1 Corrective Action Associated with Violation 99901356/2009-201-01

The NRC issued Violation 99901356/2009-201-01 for Flowserve's failure to complete an evaluation of a deviation or failure to comply within 60 days of discovery and failure to submit an interim report in writing to the NRC when the evaluation of an identified deviation or failure to comply could not be completed within 60 days, as required by 10 CFR Part 21.21, "Notification of Failure To Comply or Existence of a Defect and its Evaluation."

In its response to the NRC, Flowserve stated that its PIOP 36-40-03, "Methods for Reporting to NRC Defects Creating Substantial Safety Hazards," was revised on February 16, 2009, to include a timeline checklist within the 10 CFR Part 21 evaluation form. Flowserve noted that the checklist is used by the Part 21 Evaluation Committee to complete the evaluation process, and it added that the Part 21 Evaluation Committee received training on the new timeline checklist. In addition, a review of the 10 CFR Part 21 evaluations conducted since PIOP 36-40-03 was revised revealed no further deviations from the timeliness requirements.

The NRC inspection team reviewed Quality Program Corrective Action Plan (QPCAP) 517, which Flowserve opened to address Violation 99901356/2009-201-01. QPCAP 517 described the corrective actions detailed above and provided objective evidence of the completion of corrective actions. The action plan was closed on July 9, 2009.

The NRC inspection team reviewed the documentation that provided the objective evidence for the completion of the corrective actions. The NRC inspection team confirmed that Flowserve revised PIOP 36-40-03 and provided the associated training to address Violation 99901356/2009-201-01, and that no further deviations from the 10 CFR Part 21 notification and timeliness requirements had occurred. The NRC inspection team determined that Flowserve's corrective actions were adequate to address the identified finding. Based on its review, the NRC inspection team closed Violation 99901356/2009-201-01.

b.2 Corrective Action Associated with Nonconformance 99901356/2009-201-02

The NRC issued Nonconformance 99901356/2009-201-02 for Flowserve's failure to retrieve the applicable drawings and specifications pertinent to three nonconforming valve bodies, as required by Section 15.1.4 of the Flowserve QAM. This failure resulted in the wrong weld procedure being documented on Reject Ticket No. 120445 and implemented during weld repairs of three nonconforming valve bodies, which does not comply with the requirements of Criterion XV of Appendix B 10 CFR Part 50.

In its response to the NRC, Flowserve stated that PIOP 36-40-10, "Nonconforming Material Control – Rejection Procedure, Material Review Board Involvement," was revised to include specific instructions for responsible personnel to consult the applicable QAP for selection of applicable drawings and method specifications, including welding procedures, and that affected personnel received training on the revisions to PIOP 36-40-10.

The NRC inspection team reviewed QPCAP 516, which Flowserve opened to address Nonconformance 99901356/2009-201-02. QPCAP 516 described the corrective actions detailed above, provided objective evidence of the completion of corrective actions, and was closed on July 9, 2009.

The NRC inspection team reviewed the documentation that provided objective the evidence for the completion of the corrective actions. The NRC inspection team confirmed that Flowserve revised PIOP 36-40-10 and provided the associated training to address Nonconformance 99901356/2009-201-02. The NRC inspection team determined that Flowserve's corrective actions were adequate to address the identified finding. Based on its review, the NRC inspection team closed Nonconformance 99901356/2009-201-02.

b.3 Implementation of Flowserve's Corrective Action Program

The NRC inspection team verified that Flowserve's established implementing procedures provide assurance that significant conditions adverse to quality are promptly identified, documented and corrected or otherwise handled in accordance with the established requirements. The procedures also ensure that the causes of the conditions adverse to quality are identified and that corrective or preventive action is taken to preclude recurrence.

The NRC inspection team verified that Flowserve's subcontractors must submit nonconformance reports and proposed corrective actions for approval before implementing corrective actions, and Flowserve adequately assesses deficiencies identified or reported by its customers and enters them into the corrective action program. The NRC inspection team also verified that the corrective action process provides an effective interface to Flowserve's 10 CFR Part 21 program and procedure, and that a management system has been established for the overview of CARs and identification of trends for significant conditions adverse to quality.

The NRC inspection team reviewed a sample of Flowserve CARs related to both internal and vendor conditions adverse to quality. The NRC inspection team noted that Flowserve manufactures approximately 2,000 to 2,500 components per month and that the number of CARs issued was relatively low in comparison to the number of components manufactured in a year. The NRC inspection team verified that the CARs provide (1) adequate documentation and description of significant conditions adverse to quality; (2) an appropriate analysis of the cause of these conditions and the corrective actions taken to prevent recurrence; (3) direction for review and approval by the responsible authority; (4) a description of the current status of the corrective actions; and (5) the follow-up actions taken to verify timely and effective implementation of the corrective actions.

Each CAR receives a review during the daily MRB meeting, which consists of quality assurance, engineering, and inspection personnel evaluating and dispositioning the CARs in accordance with the Flowserve process, and documenting the bases for these decisions, as needed. For all CARs, the MRB assigns appropriate personnel to evaluate and disposition the CAR, including evaluation for potential 10 CFR Part 21 applicability, and provide adequate documentation of these evaluations. The NRC inspection team attended an MRB meeting to verify implementation of the CAR program.

The NRC inspection team also conducted numerous discussions with Flowserve personnel, including design engineers, quality assurance engineers, and shop floor technicians, to verify that all Flowserve personnel are aware of the CAR process, recognize when and how to enter into the process, and understand the types of disposition that can result from a CAR. The NRC inspection team concluded that all of the Flowserve personnel interviewed had adequate knowledge of the Flowserve CAR program.

c. Conclusion

The NRC inspection team concluded that Flowserve is implementing its corrective action program in accordance with the regulatory requirements of Criterion XVI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Flowserve is implementing its policies and procedures associated with the corrective action program. No findings of significance were identified.

10. Entrance and Exit Meetings

On September 10, 2012, the NRC inspection team discussed the scope of the inspection with Mr. James McGeehin, Flowserve Raleigh Operations General Manager, and other members of the Flowserve management and staff. On September 14, 2012, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. McGeehin and other Flowserve staff. The attachment to this report lists the entrance and exit meeting attendees, as well as those individuals interviewed by the NRC inspection team.

ATTACHMENT

1. ENTRANCE AND EXIT MEETING ATTENDEES AND PERSONS CONTACTED

Name	Title	Affiliation	Entrance	Exit	Interviewed
Andy Sizemore	Design Engineering Manager	Flowserve		X	X
Bernie Carothers	Metallurgical Process Control Supervisor	Flowserve	X	X	X
Dave Osbourne	Team Manager - Inside Sales	Flowserve	X	X	
David Craddock	Level II Quality Inspector	Flowserve			X
David Godwin	Testing	Flowserve			X
David Sheckler	Purchasing Supervisor	Flowserve	X	X	
Donald Raby	Level II Quality Inspector	Flowserve			X
Gary Shaw	Team Manager - Inside Sales	Flowserve	X	X	
James Cobb	Welding Technician	Flowserve			X
James Haithcox	WC / NDE Supervisor	Flowserve	X	X	X
Jeremy Streby	Quality Assurance Engineer	Flowserve			X
Jim McGeehin	General Manager	Flowserve	X	X	
Jim Tucker	Engineering Manager	Flowserve	X	X	X
John Chappoll	Principal Engineer	Flowserve	X	X	
Karen Hay	Calibration Lab QC inspector	Flowserve			X
Keith Boucher	Design Engineering Manager	Flowserve		X	X
Larry Brown	Assembly / Testing	Flowserve			X
Leslie Capps	Lead Man / Certification Testing	Flowserve			X
Mark Cowell	Senior Product Engineer	Flowserve			X
Mark Rain	Engineering	Flowserve			X
Matt Hobb	Product Engineer	Flowserve			X
Mike Kinder	Small Cast Supervisor	Flowserve			X
Randall Slomski	QA Engineering Supervisor	Flowserve	X	X	X
Richard Gradle	Research & Development Manager	Flowserve			X
Rick Sharp	Human Resources Manager	Flowserve	X		
Rob Sherman	Operations Manager	Flowserve	X	X	
Robbie Coats	Lead Man Assembly / Testing	Flowserve			X
Robert Barry	QA Manager	Flowserve	X	X	X

Name	Title	Affiliation	Entrance	Exit	Interviewed
Sheila Cawley	Lead Auditor; QA Engineer – Vendor Compliance	Flowserve	X		X
Victor Safarian	Quality Engineer	Flowserve			X
Wade Sheppard	Unknown	Flowserve			X
Dale Lerjuntharangool	Principal Quality Engineer Supplier Quality Oversight – Americas Westinghouse	WEC			X
Justin Loy	Authorized Nuclear Inspector	HSB Global Standards			X
Mark Lenheart	Authorized Nuclear Inspector	HSB Global Standards			X
Yamir Diaz-Castillo	Inspection Team Leader	NRC	X	X	
Aaron Armstrong	NRC Inspector	NRC	X	X	
Alma Allen	NRC Inspector	NRC	X	X	
Frank Talbot	NRC Inspector	NRC	X	X	
Jonathan Ortega	NRC Inspector	NRC	X	X	
Marlayna Vaaler	NRC Inspector	NRC	X	X	
Michael Farnan	NRC Inspector	NRC	X	X	
Tom Bilik	NRC Inspector	NRC	X	X	

2. INSPECTION PROCEDURES USED

Inspection Procedure 43002, “Routine Inspections of Nuclear Vendors,” dated April 25, 2011.

Inspection Procedure 43004, “Inspection of Commercial-Grade Dedication Programs,” dated April 25, 2011.

Inspection Procedure 36100, “Inspection of 10 CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance,” dated February 13, 2012.

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description	Applicable Inspections, tests, Analyses, and Acceptance Criteria (ITAAC) from the AP1000 Design Control Document, Tier 1, Revision 19*
99901356/2009-201-01	Closed	NOV	10 CFR Part 21	N/A
99901356/2099-201-02	Closed	NON	Criterion XVI	N/A
99901356/2012-201-01	Opened	NON	Criterion III	N/A
99901356/2012/201-02	Opened	NON	Criterion IX	N/A

*Note: there were no ITAACs associated with the valves evaluated during this inspection.

4. DOCUMENTS REVIEWED

Quality Assurance Manual

- Flowserve's Corporation Quality Assurance Manual, Revision 38, dated August 16, 2012

Standard Operating Instructions (SOIs)

- SOI 40-01-22, "Inspection Instructions for Incoming Material," Revision 22, dated August 24, 2009
- SOI 40-23-12, "Qualification and Training of Quality Assurance Auditors," Revision 16, dated April 16, 2012
- SOI 40-53-03, "Using Chromel-Alumel Thermocouples and Leeds and Notherrup Potentiometer," Revision 3, dated March 16, 2009
- SOI 40-78-01, "Material Verification for Commercial Grade Dedication Purposes," Revision 1, September 12, 2012
- SOI 70-14-12, "Identification of Basic Components Under 10CFR21," Revision 12, dated June 8, 2009
- SOI 70-23-09, "Granting Authorization To Certify Design Reports and Design Specifications," Revision 9, dated November 19, 2011

- SOI 70-39-09, “Dedication of Commercial Grade Components to 10CFR21,” Revision 9, dated June 6, 2009

Plant Internal Operating Procedures (PIOPs)

- PIOP 36-23-01-14, “Disposition of Rejected or Non-Conforming Material,” Revision 14, dated May 13, 2009
- PIOP 36-25-04-09, “Software Tracking (SOFTRACK),” Revision 9, dated May 5, 2009
- PIOP 36-40-02-25, “Training, Qualification and Certification of NDT Personnel,” Revision 25, dated April 20, 2012
- PIOP 36-40-03-10, “Methods for Reporting to NRC Defects Creating Substantial Safety Hazards,” Revision 10, dated October 18, 2011
- PIOP 36-40-05-12, “Qualification and Certification of Quality Assurance and Test Personnel,” Revision 12, dated July 1, 2006
- PIOP 36-40-07-16, “Development of Quality Assurance Plans,” Revision 16, dated June 14, 2012
- PIOP 36-40-10-16, “Nonconforming Material Control – Rejection Procedure, Material Review Board Involvement,” Revision 16, dated January 24, 2012
- PIOP 36-40-13-20, “Controlled Materials for NR/R/N/U/PP Stamps and Traceable Components,” Revision 20, dated July 6, 2009
- PIOP 36-40-14-12, “Control of Welding Material,” Revision 12, dated September 12, 2012
- PIOP 36-40-15-09, “Welding Qualifications per ASME Sections III and IX,” Revision 9, dated July 31, 2006
- PIOP 36-40-23-17, “Internal Quality Audit Plan,” Revision 17, dated April 16, 2010
- PIOP 36-40-28-05, “Deviation Disposition Request,” Revision 5, dated October 26, 2005
- PIOP 36-40-41-01, “Use of Anti-Spatter Compound to Protect Surfaces During Welding and Heat Treatment” Revision 1, dated September 14, 2012
- PIOP 36-41-01-21, “Procedure for Performance of Vendor Audits and Assessments,” Revision 21, dated November 4, 2009
- PIOP 36-41-07-13, “Welder Performance Qualification Status,” Revision 13, dated September 13, 2012
- PIOP 36-41-09-08, “Dedication of Commercial Grade Items,” Revision 8, dated June 6, 2009
- PIOP 36-41-13-06, “Corrective Action Procedure,” Revision 6, dated March 23, 2012

- PIOP 36-70-03-28, “Design Control,” Revision 28, dated September 9, 2011

- PIOP 36-70-18-00, “Method 2 Commercial Grade Dedication Plan for Services Provided by NVLAP/A2LA Accredited Calibration Laboratories,” Revision 0, dated August 3, 2012

Method Specifications (MSs)

- MS P1-123N, “Fillet, Groove, and Repair Welding of P-1 w/o Impacts or PWHT,” Revision 1, dated April 16, 2004

- MS P8-123N, “Fillet, Groove, and Repair Welding of P8 Materials per ASME III w/o PWHT,” Revision 2, dated May 15, 2009

- MS P8-323N, “Fillet, Groove, and Repair Welding of P-8 Materials w/o PWHT for Nuclear Applications,” Revision 4, dated May 15, 2009

- MS P8-341N, “Hardfacing and Repair of P-8 Materials per ASME Section IX,” Revision 5, dated June 29, 2007

- MS 1025EN, “Dry Magnetic Particle of Ferro Magnetic Materials – Prod and Yoke Methods,” Revision 3, dated April 13, 2010

- MS 1025NE, “Dry Magnetic Particle of Ferro Magnetic Materials – Prod and Yoke Methods,” Revision 14, dated December 14, 2010

- MS 1029NE-B, “Ultrasonic Examination of Forgings and Bars for Use in Nuclear ASME Section III Applications,” Revision 9, dated January 11, 2007

- MS 1094, “Alloy Verification Using the Niton Model XLp 868 XFR Alloy Analyzer,” Revision 3, dated March 6, 2009

- MS 7210, “Hydrostatic, Pneumatic and Functional Test Procedure for the TU Electronic Comanche Peak SES A-180 Actuator,” Revision 2, dated July 10, 1996.

- MS 7480, “Nitrogen and Hydraulic Leakage Test For A-180 Actuator For TXU Generation Company LP, Comanche Peak Station,” Revision 2, dated June 19, 2006

- MS 7942, “Actuator Cylinder Inspection and Pre-Test,” Revision 0, dated May 17, 2011

- MS 9034, “Hydrostatic and Functional Test Procedure for Motor Operated Gate and Globe Valves – Westinghouse AP1000 PV01,” Revision 9, dated July 25, 2012

- MS 9048, “Assembly, Hydrostatic, and Functional Test Procedure for Westinghouse AP1000 PV03 - NPS 3 and Larger Manually Operated Gate, Stop Check and Swing Check Valves,” Revision 6, dated October 10, 2011

- MS 9062, “Hydrostatic and Functional Test Procedure for the Size 20x16x20 MFFLIV Equiwedge Gate Valve Supplied to CNPEC for the Taishan 1 and 2 Nuclear Power Stations, Sales Order Number 91205,” Revision 1, dated July 17, 2012

- MS 9064, “Hydrostatic Test Procedure for the DN 25 (Size 1) MFFLIV Equalizer Valve Supplied to CNPEC for the Taishan 1 and 2 Nuclear Power Stations, Sales Order Number 91205,” Revision 0, dated August 31, 2010

- MS 9066, “Hydrostatic and Functional Test Procedure for the A-260 Gas/Hydraulic Actuator Supplied to CNPEC for Taishan 1 and 2 Nuclear Power Stations, SO 91205,” Revision 0, dated August 31, 2010

- MS 9088, “Hydrostatic and Functional Test Procedure for the Size 20x16x20 MFIV Equiwedge Gate Valve Supplied to Westinghouse for Sales Orders Numbers 91173 and 91178,” Revision 1, dated November 30, 2011

- MS 9089, “Hydrostatic and Functional Test Procedure for the 8-290 Gas/Hydraulic Actuator Supplied to Westinghouse for Sales Orders Numbers 91173 and 91178,” Revision 1, dated January 6, 2012

- MS 9424, “Bolt Torque Procedure,” Revision 1, dated June 2, 2011

10 CFR Part 21 Documents

- 10 CFR 21 File No 45, RMA 8363, Complaint Report 5074, CAR 518, dated July 14, 2009

- 10 CFR 21 File No 55, “DC Motors Used in Safety Related Limitorque Actuators,” CAR 631, dated May 12, 2010

- 10 CFR 21 File No 62, “Review of 8’ – 150 TDC Check Valves,” dated August 1, 2011

- 10 CFR 21 File No 63, “Disk and Seat Ring Material for 3’-150-SC,” CAR 812, dated September 8, 2011

- 10 CFR 21 File No 66, “Peerless Motor Failure,” dated March 7, 2012

- 10 CFR 21 File No 68, “Kerotest ¾ and 1 Y – Type Globe Valve Seal Cap,” dated July 27, 2012

Corrective Action Reports (CARs)

- Quality Program Correction Action Plan (QPCAP) Nos. 800 – 939, dated September 2, 2011 through September 12, 2012

- CAR 918, “Flowserve does not identify in operating procedures all the requirements for commercially dedicating measurements and test equipment calibration services,” dated August 8, 2012

- CAR 920, “Commercial Grade Dedication of Bellows,” dated August 10, 2012

- CAR 935, “Failure to Follow Weld Procedure,” dated September 10, 2012

- CAR 936, PT Examination of Wrong Area of Interest, dated September 11, 2012

- CAR 937, MT Examination with Inadequate Amperage, dated September 11, 2012
- CAR 939, UT of Less Than Entire Volume, dated September 12, 2012
- CAR 942, Criterion IX – Control of Special Processes, dated September 12, 2012

Reject Tickets

- Reject Ticket No. 126867, dated October 25, 2008
- Reject Ticket No. 132113, dated January 7, 2011
- Reject Ticket No. 132144, dated January 14, 2011
- Reject Ticket No. 132436, dated April 13, 2011
- Reject Ticket No. 132776, dated October 20, 2011
- Reject Ticket No. 132887, dated July 26, 2012
- Reject Ticket No. 132894, dated August 14, 2012
- Reject Ticket No. 133885, dated June 21, 2011
- Reject Ticket No. 138087, dated April 16, 2012
- Reject Ticket No. 138559, dated July 3, 2012
- Reject Ticket No. 139320, dated September 11, 2012
- Reject Ticket No. 140680, dated June 7, 2012
- Reject Ticket No. 140757, dated June 19, 2012

Commercial Grade Dedication Packages

- Flowserve F.O. Number 325707, Dedication Package, Valve Air Solenoid, Part Number 00658529 9122801, dated January 12, 2012
- Flowserve F.O. Number 325719, Dedication Package, Valve Flow Control, Part Number 00872542 9122801, dated February 1, 2012
- Flowserve Number 108470-01/226086, Dedication Package, Motor Peerless, Part Number 04106842 DEDCATD, dated January 4, 2006
- Flowserve Number 111739-01/226088, Dedication Package, Orifice Metrex, Part Number 04131470 DEDCATD, dated December 19, 2011

- Flowserve Number 108945-01/226423, Dedication Package, Body Flow Control Valve, Part Number 01316170 DEDCATD, dated December 3, 2009

- Flowserve F.O. number 340609, Dedication Package, Valve HYD 4-Way 25 GPM, Part Number 04107985 6736401, dated March 19, 2012

- Flowserve Number MS 56979, Dedication Package, O-Ring, Part Number 04101576 DEDCATD, dated May 15, 2009

- Flowserve F.O. Number 345268, Valve Metrex, Part Number 04002320 6646301, dated March 3, 2012

- Flowserve Number 117938-01/235229, Thread Shaft Collar, Part Number 04130818 DEDCATD, dated September 11, 2012

- Flowserve Number 117410-01/236067, Washer Belleville, Part Number 01316805 DEDCATD, dated September 18, 2009

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for Stop Watch Cert Gage ID# SRL-365515-4, dated August 14, 2012

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for Rubber Test Block Kit Shore M scale, Gage ID# M000234, dated August 22, 2012

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for Length Standards, Gage ID# TMS-1A, 2A, 3A, 4A,5A and 2B, dated August 3, 2012

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for Surface Plate, Gage ID# SRL# 1550, dated September 7, 2012

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for ¼-18 NPT, Gage ID# QB-604, dated August 22, 2012

- Form 36-Q-1270, 10CFR21 Dedication of Calibration Services for Gas Leak (Helium), Gage ID# 7114, dated August 22, 2012

Flowserve Purchase Orders (POs)

- PO 110813, SO 911175, Westinghouse PO 4500319052, Supplier Code: 103250, Supplier: Aruna Alloy Steels, Madurai, India, dated November 29, 2011

- Flowserve Receiving Document, PO 110813, Receiver Number: 234167, Item SO Number 911175-11, Gate Casting, dated July 19, 2012

- Flowserve Receiving Document, PO 110813, Receiver Number: 234606, Item SO Number 911175-11, Two Bonnet Castings, dated July 28, 2012

- PO 111595, SO 91154-03, Supplier Code: 103250, Supplier: Aruna Alloy Steels, 2 Gate Castings, -14, 8 Body Casting, -14, 16 Gate Castings, Madurai, India, dated December 28, 2011

- Flowserve Receiving Document, PO 111595, Receiver Number: 234618, Item SO Number 911154-14, Gate Casting, dated September 10, 2012

- PO 111595 and SO 91154, Quality Assurance Plan, Revision 13, dated August 23, 2012

- Aruna Alloy Steel PVT Limited (Unit 1), Material Test Certificate, Flowserve PO 111595, Flowserve Valve SO 91154-14, Test Certificate, dated May 24, 2012

- Aruna Alloy Steel PVT Limited (Unit 1), Material Test Certificate, Flowserve PO 111813, Flowserve Valve SO 91175-11, Gate Valve, Traceability Code: M4393, SRL7, Test Certificate, dated April 30, 2012

- Aruna Alloy Steel PVT Limited (Unit 1), Radiograph Test Report, dated May 5, 2012

Flowserve Sales Orders (SOs)

- SO 91216-01, "Liquid Penetrant Examination – Machined BWE's," dated September 11, 2012

- SO 91154-25, "Flowserve Radiographic Inspection and Technique Report-Valve BWE Repair," dated November 9, 2011

- SO 91154-32, "Flowserve Liquid Penetrant Examination-Seat Ring Hardfacing and ¼-inch Base Metal," dated August 17, 2011

- SO 91154-01, "Flowserve Ultrasonic Examination-Bonnets 100 Percent of Parts," dated August 17, 2012

- SO 91154-01, "Flowserve Liquid Penetrant Examination-Body Pre-Weld Guide Rails," dated September 8, 2011

- SO 91176-31, "Flowserve Magnetic Particle Examination-Valve WE'S and Lug Removal Areas," dated May 14, 2012

- SO 91176-06, "Flowserve Radiographic Inspection and Technique Report-Valve BWE," dated October 25, 2011

- SO 91176-06, "Flowserve Liquid Penetrant Examination-Gate Cavities," dated November 14, 2011

- SO 91175-12, "Flowserve Liquid Penetrant Examination-Body Root Pass," dated June 6, 2011

- SO 91175-15, "Flowserve Liquid Penetrant Examination-Body Weld Surface," dated May 3, 2011

- SO 91175-20, "Flowserve Liquid Penetrant Examination-Disk Hardfacing and ¼-inch Base Metal," dated June 15, 2011

- SO 91175-20, “Flowserve Ultrasonic Examination-Stem 100 Percent of Parts,” dated May 24, 2011

- SO 91154, “Quality Assurance Plan,” Revision 13, dated August 23, 2012

- SO 91175, “Quality Assurance Plan,” Revision 12, dated July 28, 2012

- SO QAP 09-91154, “Nuclear Valve Order Finalized, Customer: WEC,” Revision 12, dated May 30, 2012

- SO QAP 09-91175, “Nuclear Valve Order Finalized, Customer: WEC”, Revision 12, dated August 23, 2012

- QR 12-842, Revision 0, SO 91154-01, 4” Gate Valve - V.C. Summer Unit 2

- QR 12-843, Revision 0, SO 91194-10, 8” Check Valve - V.C. Summer Unit 2

- QR 12-844, Revision 0, SO 91154-39, 14” Gate Valve - V.C. Summer Unit 3

- QR 12-1698, Revision 0, SO 91154-05, 4” Check Valve - V. C. Summer Unit 2

- SOC 54, Sales Order Control Sheet No. 54 for SO 91175 Sheet K, dated June 19, 2012

Flowserve MT&E Calibration Labels

- Mitatoya Caliper 500-505-10, Model: CD-10” C, Serial Number 0019956, Do not use gage after: October 12, 2012, Man&IE ID: Q1B-760

- Honey Well Scale Potentiometer, Serial Number 1008737, Calibrated: February 24, 2012, Due Date: February 28, 2013, Calibrated: D. Amshay

- Heat Treat Equipment Name 882-2, Instrument Location, Furnace 882 Over-Temperature, Serial Number 0951, Model: CN 271-R1, Next Calibration Due Date: February 28, 2013

- Heat Treat Equipment Name 884-1, Instrument Location, Furnace 884 Recorder, Serial Number 927Y982150100001, Manufacturer: Honeywell, Model DR4301-0000-G0100-0000, Next Calibration Due Date: February 28, 2013

- Heat Treat Equipment Name 884-2, Instrument Location, Furnace 884 Over-Temperature, Serial Number ITI50000295, Model: CN327-1, Next Calibration Due Date: February 28, 2013

- Heat Treat Equipment Name 885-1, Instrument Location, Vacuum Furnace 885 Remote Building, Serial Number 10202, Model: PLC205, Due Date: February 28, 2013

- Heat Treat Equipment Name 885-2, Instrument Location, Vacuum Furnace 885 Over Temperature - Remote Building, Serial Number 0233Y256073900006, Model: 230L-E0-00-10-0A000-0, Due Date: February 28, 2013

- Heat Treat Equipment Name 877-1, Instrument Location, Furnace 877 Recorder, Serial Number 0130Y151561200004, Model: DR4301-0000-g01000-0000, Due Date: February 28, 2013

- Heat Treat Equipment Name 877-2, Instrument Location, Furnace 877 Over Temperature, Serial Number IT1150000299, Model: CN3271, Due Date: February 28, 2013

- 0-12 Inch Digital Caliper, QIB-696, Calibration Date: August 16, 2012, Due Date: February 12, 2013, Gage Inspector: K. Hay

Audit of Tyco Valves

- Flowserve Vendor (Tyco) Quality Audit Plan, dated January 16, 2012

- Flowserve Audit Checklist of Tyco Valves and Controls, dated January 31, 2012

- Flowserve Vendor (Tyco) Quality Problem Corrective Action Plan, dated January 31, 2012

- Flowserve Audit Report of Tyco Valves and Controls, dated February 2, 2012

Nuclear Industry Assessment Committee (NIAC) Assessment of NAMCO/Danaher Controls

- NIAC Vendor (NAMCO/Danaher Controls) Letter with Audit Plan, dated March 27, 2012

- NIAC Audit Checklist, dated May 18, 2012

- NIAC Audit Report, dated May 17, 2012

- Deficiency Report/Supplier Corrective Action Request (Form 0181), dated May 10, 2012

- Flowserve PO 112174, NAMCO Controls Corporation, 10 CFR 50, Appendix B and 10 CFR Part 21 applies

- Flowserve Receipt Inspection of NAMCO Limit Switches, dated March 28, 2012

- NAMCO Certificate of Compliance for Limit Switches, dated March 22, 2012

Quality Audit of Aruna Steel Castings, LTD

- Flowserve Vendor (Aruna Steel Castings) Quality Audit Plan, dated July 11, 2011

- Flowserve Vendor Quality Problem Six Corrective Action Plans, dated February 13 and February 14, 2012

- Flowserve Supplier Audit Report of Aruna Steel Castings, dated February 2012

- Flowserve QA Audit Checklist 36-Q-1, Revision 5, dated August 20, 2010

NIAC Assessment of Rex Heat Treatment and Flowserve CGI Dedication of a Diaphragm

- Dubose National Energy Services (NIAC) Commercial Grade Survey of Rex Heat Treatment, dated June 22, 2011
- NIAC Standard Audit Checklist, Revision 9, dated November 4, 2010
- Dubose Quality Assurance Survey Report (NIAC No. 16020), dated July 26, 2011
- Flowserve 10CFR21 Dedication of Commercial Grade Items of Rex Heat Treatment, dated September 7, 2012, Part Name: Diaphragm, Part Number: 04105356
- Flowserve PO V-39406, Rex Heat Treat, July 26, 2012

Assessment of North Carolina Manufacturing (NCM) – Flowserve Dedication of NCM Machined Commercial Grade Parts

- Flowserve Commercial Grade Survey of North Carolina Manufacturing, dated June 2012

Miscellaneous Documents

- Flowserve Approved Vendor List (AVL), dated September 7, 2012
- Valve Tabulation QAP 09-91178, Customer: WEC – Georgia Power, dated February 10, 2010
- RMC-02261, Material Specification, Revision 6, dated May 2, 2012, and Revision 7, dated September 7, 2012
- RMC-02262, Material Specification, Revision 7, dated September 7, 2012
- RMC-02708, Material Specification, Revision 3, dated October 2, 1998
- RAL 20736, Design and Seismic Analysis Report – Westinghouse Electric Company, LLC AP1000, PV03 Valve Group, VC Summer Units 2 and 3, Size 4, Class 150 Flex Wedge Gate Valve With 10-inch Handwheel, Revision 3
- RAL 20754, Design and Seismic Analysis Report – Westinghouse Electric Company, LLC AP1000, PV03 Valve Group, VC Summer Units 2 and 3, Size 8, Class 900 Swing Check Valve, Revision 3
- RAL 7487, Raleigh Material Code Index for 10CFR21 Commercial Grade Dedication, Revision 2, dated August 1, 2006
- PQR B-160, Manufacturers Record of Welding Procedure Qualification for Hardsurfacing Overlay Welding, Revision 2, dated March 22, 2007
- PQR B-316, Fillet and Groove Welds, Revision 0, dated February 8, 1995
- PQR C-205, Fillet and Groove Welds, dated April 12, 1972

- 1151NW, Liquid Penetrant Examination of Materials Used in Valve Applications for ASME Code, Revision 1, dated February 3, 2011

- Valve Drawing 09-91154-32 sh1 and 2, Swing Check Valve Stainless Steel NPS 8 Class 900, Revision A, dated February 25, 2011

- Valve Drawing 09-91154-01 sh1, 2, 3,4, Flex Wedge Gate Valve Stainless Steel NPS 4 Class 150, Revision E, dated May 27, 2011

- Valve Drawing 09-91205-01 sheets 1 – 26, Main Feedwater Full Load Isolation Valve Size 20x16x20, Fig. B14311(WCC)BDD JMMTY With Model A-260 Actuator, Revision D, dated May 3, 2012

- APP-PV01-VFX-001, AP1000 PV01 3-inch and Larger Motor Operated Gate and Globe Valves

- APP-PV01-ZOR-001, 3-inch and Larger Motor Operated Gate and Globe Valves ASME Boiler and Pressure Vessel Code Section III Class 1, 2, and 3

- Certificate of Rework, EFH Corporate Services – Actuator A-180 BEX29 Texas Utility SRL. No. STAB-4 Repairable, Tag # 47567, National Board # 855, Trace Code: AB-04