UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 21, 2022

Mr. Christopher Shaffer
Quality Assurance Manager
Flowserve Flow Control Division - Limitorque
5114 Woodall Road
Lynchburg, VA 24502

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF FLOWSERVE FLOW CONTROL DIVISION - LIMITORQUE NO. 99900100/2022-201, AND NOTICE OF NONCONFORMANCE

Dear Mr. Shaffer:

From October 17 through October 21, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Flowserve Flow Control Division - Limitorque's (hereafter referred to as Flowserve Limitorque) facility in Lynchburg, VA. The purpose of the limited scope inspection was to assess Flowserve Limitorque's compliance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

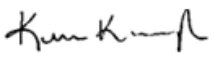
This technically focused inspection specifically evaluated Flowserve Limitorque's implementation of quality activities associated with the design, fabrication, and testing of safety-related Class 1E motor operated valve actuators and spare parts for U.S. nuclear power plants. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC inspection team determined that the implementation of your QA program did not meet certain regulatory requirements imposed on you by your customers or NRC licensees. Specifically, the NRC inspection team determined that Flowserve Limitorque was not fully implementing its QA program in the areas of design control, procurement document control, and corrective action. The specific findings and references to the pertinent requirements are identified in the enclosures to this letter. In response to the enclosed Notice of Nonconformance (NON), Flowserve Limitorque should document the results of the extent of condition review for these findings and determine if there are any effects on other safety-related components.

Please provide a written statement or explanation within 30 days of this letter in accordance with the instructions specified in the enclosed NON. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390, “Public Inspections, Exemptions, Requests for Withholding,” of the NRC’s “Rules of Practice,” the NRC will make available electronically for public inspection a copy of this letter, its enclosure, and your response through the NRC’s Public Document Room or from the NRC’s Agencywide Documents Access and Management System, which is accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response (and if applicable), should not include any personal privacy, proprietary, or Safeguards Information (SGI) 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 and a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information 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.”

Sincerely,


Signed by Kavanagh, Kerri
on 11/21/22

Kerri A. Kavanagh, Chief
Quality Assurance and Vendor Inspection Branch
Division of Reactor Oversight
Office of Nuclear Reactor Regulation

Docket No.: 99900100

EPID No.: I-2022-201-0036

Enclosures:

1. Notice of Nonconformance
2. Inspection Report No. 99900100/2022-201 and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION REPORT OF
FLOWSERVE FLOW CONTROL DIVISION - LIMITORQUE NO. 99900100/2022-201, AND NOTICE OF NONCONFORMANCE
DATED: November 21, 2022

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NAME	YDiaz-Castillo	EBrown	VVoltaggio	TScarbrough
DATE	11/8/2022	11/14/2022	11/14/2022	11/14/2022
OFFICE	NRR/DRO/IQVB	NRR/DRO/IRAB	NRR/DRO/IQVB	
NAME	YLaw	BHughes	KKavanagh	
DATE	11/15/2022	11/15/2022	11/21/2022	

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NOTICE OF NONCONFORMANCE

Flowserve Limitorque
5114 Woodall Road
Lynchburg, VA 24502

Docket No. 99900100
Report No. 2022-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Flowserve Flow Control Division - Limitorque's (hereafter referred to as Flowserve Limitorque) facility in Lynchburg, VA, from October 17, 2022, through October 21, 2022, Flowserve Limitorque did not conduct certain activities in accordance with NRC requirements that were contractually imposed upon Flowserve Limitorque by its customers or 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 also 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. […] Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design and be approved by the organization that performed the original design unless the applicant designates another responsible organization."

   Flowserve Limitorque's procedure No. LYB-EDP-005.001, "Procedure for Engineering Design Documents," Revision 3, dated July 31, 2019, defines the requirements for the issuance of an Engineering Design Document (EDD). An EDD is a document used to substantiate a change in a design where the change is determined to affect equipment qualification.

   Contrary to the above, as of October 21, 2022, Flowserve Limitorque failed to review the suitability of application of equipment that are essential to the safety-related functions by subjecting design changes to design control measures commensurate with those applied to the original design. Specifically, Flowserve Limitorque implemented a material change from 1144 and 1141 steel bar to 4140 steel bar for several internal components of the Limitorque actuators including the stem nut and the drive sleeve. Flowserve Limitorque concluded that the material change had no adverse effect on the existing environmental qualifications. However, the NRC inspection team identified that Flowserve Limitorque did not evaluate how the thermal properties of the material, such as the thermal coefficient of expansion, might impact the performance of the internal components.

   This issue has been identified as Nonconformance 99900100/2022-201-01.

B. Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50 states, in part, that "Measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the applicant or by its contractors or subcontractors."

Subsection 4.9.4 of Flowserve Limitorque procedure No. LYB-QAP-0006, “Purchasing Procedure,” Revision 4, dated June 2, 2020, states that “Gage Calibration will use form L828, manual shipper to request calibration services from all outside sources, including calibration being performed in-house by an outside source. The gage lab technician shall make the statement ‘The quality requirements of POL40, Rev (fill in revision number) attached are invoked for this procurement/service.’”

Contrary to the above, as of October 21, 2022, Flowserve Limitorque failed to ensure that applicable regulatory requirements, design bases, and other requirements, which are necessary to assure adequate quality, are suitably included or referenced in the documents for procurement of services. Specifically, the NRC inspection team identified that Flowserve Limitorque did not issue procurement documents with the applicable technical, quality, and regulatory requirements to the vendors that perform calibration services at Flowserve Limitorque’s facility for measuring and test equipment that will be used in safety-related activities.

This issue has been identified as Nonconformance 99900100/2022-201-02.

C. Criterion XVI, “Corrective Action,” of Appendix B to 10 CFR Part 50 states, in part, that “Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.”

   Flowserve Limitorque procedure No. LYB-QAP-14.1, “Corrective and Preventive Action Procedure,” Revision 18, dated September 19, 2022, defines the various measures to identify cause, determine and implement corrective and preventive action, as a result of either hardware or programmatic deficiency.

   Contrary to the above, as of October 21, 2022, Flowserve Limitorque failed to promptly correct conditions adverse to quality. Specifically, Flowserve Limitorque did not implement all of the corrective actions initiated to address Nonconformance 99900100/2018-201-01 as documented in Audit Deficiency Notification (ADN) No. 99900100/2018-201-E-1. Both Flowserve Limitorque’s official response to the NRC and ADN No. 99900100/2018-201-E-1 stated that Flowserve Limitorque would ensure critical motor performance characteristics are adequately verified by the review of Routine Motor Test (RMT) data and by commercial-grade surveys of the motor original equipment manufacturer (OEM) test facility. The NRC inspection team identified that while Flowserve Limitorque performed a commercial-grade survey of the OEM’s test facility, Flowserve Limitorque’s revised documentation did not identify motor torque as a critical characteristic to be measured and did not verify the motor output torque conformed to the associated speed-torque curves for DC motors. Ensuring the motors conform to published speed-torque curves is necessary to ensure the motors can deliver the relied upon torque to operate the motor-operated valve actuators.

   This issue has been identified as Nonconformance 99900100/2022-201-03.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Quality Assurance and Vendor Inspection Branch, Division of Reactor Oversight, Office of Nuclear Reactor Regulation, 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's Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible from the NRC's 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 NRC 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 21st day of November 2022.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REACTOR OVERSIGHT
VENDOR INSPECTION REPORT

Docket No.:	99900100
Report No.:	99900100/2022-201
Vendor:	Flowserve Flow Control Division - Limitorque 5114 Woodall Road Lynchburg, VA 24502
Vendor Contact:	Mr. Christopher Shaffer Quality Assurance Manager Email: cshaffer@flowserve.com Phone: 434-522-4136
Nuclear Industry Activity:	Flowserve Flow Control Division - Limitorque's scope of supply includes safety-related Class 1E motor operated valve actuators and spare parts for U.S. nuclear power plants.
Inspection Dates:	October 17- 21, 2022

Inspectors:			
	Yamir Diaz-Castillo	NRR/DRO/IQVB	Team Leader
	Yiu Law	NRR/DRO/IQVB	Remote
	Eva Brown	NRR/DRO/IQVB	Trainee
	Vince Voltaggio	NRR/DRO/IQVB	Trainee
	Thomas Scarbrough	NRR/DEX/EMIB	Technical Specialist

Approved by:	Kerri A. Kavanagh, Chief Quality Assurance and Vendor Inspection Branch Division of Reactor Oversight Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Flowserve Flow Control Division - Limitorque
99900100/2022-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Flowserve Flow Control Division - Limitorque's (hereafter referred to as Flowserve Limitorque) facility in Lynchburg, VA, to verify that it had 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 Limitorque implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance." This was the fourth NRC inspection of Flowserve Limitorque at their Lynchburg facility.

This technically focused inspection specifically evaluated Flowserve Limitorque's implementation of quality activities associated with the design, fabrication, and testing of safety-related Class 1E motor operated valve actuators and spare parts for U.S. nuclear power plants. Specific activities observed by the NRC inspection team included:

- Final inspection of a spline adapter, Part No. 60-245-0115-3, Heat No. MM21100170
- Torque test of an SMB-0 actuator on a Limitorque torque stand (the SMB-0 actuator was not safety-related, but the process used by Flowserve Limitorque for testing actuators is the same for both safety-related and not safety-related)
- Calibration of several instruments for use in safety-related activities

These 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 the following inspection procedures (IP): IP 43002, "Routine Inspections of Nuclear Vendors," dated April 5, 2022; IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated April 5, 2022; and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated May 16, 2019.

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

Design Control

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its design control program to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The

NRC inspection team focused its review on evaluating the implementation of completed design changes. Flowserve Limitorque is the original equipment manufacturer (OEM) and indicated that there were no original design activities underway for safety-related Limitorque actuators, and that current design control activities are limited to design changes to the safety-related Limitorque actuators. The NRC inspection team issued one nonconformance associated with Flowserve Limitorque's implementation of its design control program.

The NRC inspection team issued Nonconformance 99900100/2022-201-01 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-01 cites Flowserve Limitorque for failing to review the suitability of application of equipment that are essential to the safety-related functions by subjecting design changes to design control measures commensurate with those applied to the original design. Specifically, Flowserve Limitorque implemented a material change which affected several internal components of the Limitorque actuators including the stem nut and the drive sleeve. Flowserve Limitorque concluded that there was no adverse effect on existing environmental qualifications; however, the NRC inspection team noted that Flowserve Limitorque did not evaluate how the thermal properties of the material, such as the thermal coefficient of expansion, might impact the performance of the specific parts, such as the stem nut and drive sleeve. Flowserve Limitorque initiated corrective action report (CAR) No. 202210-63223 to address this issue.

Procurement Document Control and Supplier Oversight

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its procurement document control and supplier oversight programs 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 external audit reports and confirmed that the external audits were performed by qualified individuals using checklists and/or procedures, the checklists and/or procedures included an audit plan, documented objective evidence, audit results, and a review of audit results by responsible management. The NRC inspection team identified one minor issue and one nonconformance associated with Flowserve Limitorque's implementation of its supplier oversight and procurement document control programs, respectively.

The NRC inspection team noted that Flowserve Limitorque implemented the 25% audit frequency extension due to exigent conditions for one of their suppliers in their Approved Vendors List but did not document the evaluation required per Subsection 11.2.a of their procedure No. LYB-QAP-17.1, "Audit Procedure," Revision 32, dated June 9, 2022. The NRC inspection team determined this issue to be minor because Flowserve Limitorque: (1) did not procure any items from this supplier within the audit extension period; and (2) it performed a full scope audit of the supplier and no findings were identified. Flowserve Limitorque initiated CAR No. 202210-63451 to address this issue.

The NRC inspection team issued Nonconformance 99900100/2022-201-02 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion IV of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-02 cites Flowserve Limitorque for failing to ensure that applicable regulatory requirements, design bases, and other requirements, which are necessary to assure adequate quality, are suitably included or referenced in the documents for procurement of services. Specifically, Flowserve Limitorque did not issue purchase orders (POs) with the applicable technical and quality requirements to the

vendors that perform calibration services at Flowserve Limitorque's facility for measuring and test equipment (M&TE) that will be used in safety-related activities. Flowserve Limitorque initiated CAR No. 202210-63406 to address this issue.

Nonconforming Material, Parts, or Components and Corrective Action

The NRC inspection team reviewed Flowserve Limitorque's policies and procedures that govern the implementation of its nonconforming material, parts, or components and corrective action programs to verify compliance with the regulatory requirements of Criterion XV, "Nonconforming Materials, Parts or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team reviewed the implementation and closure of the corrective actions initiated by Flowserve Limitorque to address Nonconformances 99900100/2018-201-01, 99900100/2018-201-02, and 99900100/2018-201-03, documented in the NRC's inspection report No. 99900100/2018-201, dated March 7, 2018 (Agency Documents Access and Management System Accession No. ML18043A150). The NRC inspection team identified one nonconformance with Flowserve Limitorque's implementation of its corrective action program.

The NRC inspection team issued Nonconformance 99900100/2022-201-03 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion XVI of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-03 cites Flowserve Limitorque for failing to promptly correct conditions adverse to quality. Specifically, Flowserve Limitorque did not implement all of the corrective actions initiated to address Nonconformance 99900100/2018-201-01 as documented in Audit Deficiency Notification (ADN) No. 99900100/2018-201-E-1. Both Flowserve Limitorque's official response to the NRC and ADN No. 99900100/2018-201-E-1 stated that Flowserve Limitorque would ensure critical motor performance characteristics are adequately verified by the review of Routine Motor Test (RMT) data and by commercial-grade surveys of the motor OEM test facility. The NRC inspection team identified that while Flowserve Limitorque performed a commercial-grade survey of the OEM's test facility, Flowserve Limitorque's revised documentation did not identify motor torque as a critical characteristic to be measured and did not verify the motor output torque conformed to the associated speed-torque curves for DC motors. Ensuring the motors conform to published speed-torque curves is necessary to ensure the motors can deliver the relied upon torque to operate the motor-operated valve actuators. Flowserve Limitorque initiated CAR No. 202210-63407 to address this issue.

Commercial-Grade Dedication

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its commercial-grade dedication (CGD) program to verify compliance with the requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of CGD packages for components and services including the technical evaluations used to identify the critical characteristics and acceptance criteria. The NRC inspection team identified two minor issues associated with Flowserve Limitorque's implementation of its CGD program.

Flowserve Limitorque implements the process for using accreditation in lieu of performing commercial-grade surveys for calibration services as part of the CGD process in accordance with the Nuclear Energy Institute (NEI) document No. 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial-Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1, dated September 2020. The NRC inspection team noted that

Flowserve Limitorque was not adequately implementing the process as delineated in NEI 14-05A. Specifically, Flowserve Limitorque: (1) incorrectly identified the conditions from NEI 14-05A as critical characteristics; (2) did not adequately verify the calibration certificates included the required information from the POs; and (3) did not include one of the conditions in the POs. The NRC inspection team determined these issues to be minor because there was no impact on the calibration of the M&TE. Flowserve Limitorque initiated CAR No. 202210-63406 to address this issue. No findings of significance were identified.

During the review of a sample of CGD documents for bar stock and castings, the NRC inspection team noted that Flowserve Limitorque identified heat number and material composition as critical characteristics. The acceptance method for the verification of the heat number is visual inspection, and for the material verification, a sample is sent to a qualified laboratory for testing. The NRC inspection team identified that Flowserve Limitorque: (1) did not verify whether the commercial suppliers had adequately established heat traceability and lot and batch control; and (2) did not develop and document a technical basis for the selection of the sampling plans' sample size. The NRC inspection team determined this issue to be minor because Flowserve Limitorque performs testing on the material and conducts operational tests of the final components. Flowserve Limitorque initiated CAR No. 202210-63404 to address this issue. No findings of significance were identified.

Control of Special Processes

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its control of special processes program to verify compliance with the requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50, and the American Society for Nondestructive Testing (ASNT) SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing." Flowserve Limitorque's special processes activities are limited to wet fluorescent magnetic particle testing (MT) and coating (painting). The NRC inspection team reviewed a sample of procedures, instructions, test reports, coating certifications, and training and qualification records associated with these two activities. No findings of significance were identified.

Test Control

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its 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 test procedures and test reports, and confirmed that the testing was performed in accordance with Flowserve Limitorque's test procedures using calibrated M&TE and performed by qualified personnel. The NRC inspection team also observed the torque test of an SMB-0 actuator on a Limitorque torque stand (the SMB-0 actuator was not safety-related, but the process used by Flowserve Limitorque for testing actuators is the same for both safety-related and not safety-related). No findings of significance were identified.

Control of Measuring and Test Equipment

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its control of 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. The NRC inspection team witnessed the calibration of various

instruments. The NRC inspection team also observed that M&TE was adequately calibrated, labeled, tagged, handled, and stored. The NRC inspection team noted that M&TE were being appropriately controlled to indicate the calibration status and its traceability to nationally recognized standards. The NRC inspection team identified one minor issue associated with Flowserve Limitorque's implementation of its M&TE program.

During a walkthrough of the manufacturing floor, the NRC inspection team observed that a multimeter in a work area was past the calibration due date and had not been sent for calibration nor segregated to prohibit its use. The NRC inspection team determined this issue to be minor because the multimeter was not currently in use at the time, and this was the only example of M&TE discovered out of calibration on the manufacturing floor. Flowserve Limitorque initiated CAR No. 202210-63408 to address this issue. No findings of significance were identified.

10 CFR Part 21 Program

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its 10 CFR Part 21 program to verify compliance with 10 CFR Part 21. The NRC inspection team: (1) reviewed the 10 CFR Part 21 postings; (2) reviewed a sample of POs; (3) verified that Flowserve Limitorque's nonconformance and corrective action programs provide a link to the 10 CFR Part 21 program; and (4) reviewed a sample of 10 CFR Part 21 evaluations performed by Flowserve Limitorque. No findings of significance were identified.

REPORT DETAILS

1. Design Control

   a. Inspection Scope

   The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its design control program to verify compliance with the regulatory requirements of Criterion III, "Design Control," 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." Flowserve Limitorque is the original equipment manufacturer (OEM) of the safety-related Limitorque Class 1E motor operated valve (MOV) actuators. Flowserve Limitorque indicated that there are currently no new design activities for its safety-related MOV actuators, and that design control activities are limited to design changes to the safety-related MOV actuators.

   The NRC inspection team focused its review on Flowserve Limitorque's processes for performing design reviews and design changes. The NRC inspection team reviewed a sample of design documentation including design procedures, drawings, and engineering design documents (EDDs). An EDD is a document used to substantiate a change in a design where the change is determined to affect equipment qualification.

   The NRC inspection team also discussed the design control program with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

   b. Observations and Findings

   Flowserve Limitorque's EDD-191, "Material Change from 1144 and 1141 Steel Bar to 4140 Steel Bar," Revision 0, dated May 6, 2016, described a comparative analysis of the material properties to support the use of 4140 steel bar in lieu of 1144/1141 steel bar in parts identified as nuclear safety-related. EDD-191 lists the component part types that are potentially affected by this proposed change. The list contains part types internal to the Limitorque actuators including the stem nut (torque only applications) and the drive sleeve (SMB-000 actuator). In EDD-191, Flowserve Limitorque concluded that there is no adverse effect on existing environmental and seismic qualifications by the use of the 4140 steel bar.

   EDD-191 addresses mechanical properties of the steel bar material, such as tensile strength, yield strength, elongation, and surface hardness. However, the NRC inspection team noted that EDD-191 did not address thermal properties of the steel bar material, such as the thermal coefficient of expansion, when concluding that there is no adverse effect on the environmental qualification by using the 4140 steel bar material. The thermal properties of the material might have an impact on the performance of some of the internal parts of the Limitorque actuators, such as the stem nut and the drive sleeve.

   The NRC inspection team identified this issue as Nonconformance 99900100/2022-201-01 for Flowserve Limitorque's failure to review the suitability of application of equipment that are essential to the safety-related functions by subjecting design changes to design control measures commensurate with those applied to the original design. Flowserve

Limitorque initiated corrective action report (CAR) No. 202210-63407 to address this issue.

c. Conclusion

The NRC inspection team issued Nonconformance 99900100/2022-201-01 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-01 cites Flowserve Limitorque for failing to apply design control measures for design changes commensurate with those applied to the original design. Specifically, Flowserve Limitorque did not evaluate how the thermal properties of the modified steel bar material might affect the performance of the Limitorque actuator internal parts.

2. Procurement Document Control and Supplier Oversight

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its procurement document control and supplier oversight programs 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 Flowserve Limitorque's Approved Vendors List (AVL) and a sample of purchase orders (POs), supplier audits, and receipt inspection records.

The NRC inspection team reviewed a sample of POs to verify the POs included, as appropriate: the scope of work, right of access to the suppliers' facilities, extension of contractual requirements to sub-suppliers, and the applicable technical, regulatory, and quality requirements.

For a sample of supplier audit reports reviewed, the NRC inspection team verified that the audit reports included an audit plan, any findings identified, adequate documented objective evidence of compliance with the applicable requirements, and a review by Flowserve Limitorque's responsible management. The NRC inspection team also verified that the supplier audits were performed by qualified auditors. In addition, the NRC inspection team reviewed a sample of training and qualification records of Flowserve Limitorque's lead auditors and confirmed that auditing personnel had completed all the required training and had maintained the applicable qualification and certification in accordance with Flowserve Limitorque's policies and procedures.

The NRC inspection team also discussed the receipt inspection process with Flowserve Limitorque's staff. Flowserve Limitorque's staff: (1) demonstrated how the procedures and receipt inspection documentation both supported validation of the requirements against component drawings; and (2) how drawings were controlled in a manner to ensure the status of the drawing could be determined.

The NRC inspection team also discussed the procurement document control and supplier oversight programs with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

During the review of a sample of external audits and discussions regarding the audit schedule for vendors on the AVL, the NRC inspection team noted that Flowserve Limitorque implemented the 25% audit frequency extension due to exigent conditions for one of their vendors. Subsection 11.2.a of Flowserve Limitorque's procedure No. LYB-QAP-17.1, "Audit Procedure," Revision 32, dated June 9, 2022, states that "A documented evaluation must be performed to summarize why the audit or survey could not be performed prior to the end of the 90-day grace period and to provide the basis for maintaining the supplier as an approved supplier during the 25% (9-month) grace period." The NRC inspection team requested the evaluation performed by Flowserve Limitorque to maintain this vendor on the AVL; however, Flowserve Limitorque was not able to provide objective evidence that an evaluation was performed. The NRC inspection team determined this issue to be minor because Flowserve Limitorque did not procure any items within the 25% grace period and Flowserve Limitorque performed a full scope audit of the supplier and no findings were identified. Flowserve Limitorque initiated CAR No. 202210-63451 to address this issue.

Some of the measuring and test equipment (M&TE) used by Flowserve Limitorque in safety-related activities is calibrated in-house by an outside vendor listed on their AVL. Subsection 4.9.4 of Flowserve Limitorque's procedure No. LYB-QAP-0006, "Purchasing Procedure," Revision 4, dated June 2, 2020, states that "Gage Calibration will use form L828, manual shipper to request calibration services from all outside sources, including calibration being performed in-house by an outside source. The gage lab technician shall make the statement 'The quality requirements of POL40, Rev (fill in revision number) attached are invoked for this procurement/service.'" When requesting a sample of the POs issued for calibration services performed at Flowserve Limitorque's facility to confirm that the applicable regulatory, technical and quality requirements were adequately invoked, the NRC inspection team discovered that Flowserve Limitorque does not issue a PO to these vendors. During discussions with Flowserve Limitorque's staff, the NRC inspection team learned that instead of issuing a PO, either Flowserve Limitorque notifies the vendor, or vice versa, that an M&TE is due for calibration. The vendor then proceeds to visit Flowserve Limitorque's facility to perform the calibration and the calibration services are charged to Flowserve Limitorque's credit card. The NRC inspection team identified this issue as Nonconformance 99900100/2022-201-02 for Flowserve Limitorque's failure to ensure that applicable regulatory requirements, which are necessary to assure adequate quality, are suitably included or referenced in the documents for procurement of services. Flowserve Limitorque initiated CAR No. 202210-63223 to address this issue.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque is implementing its supplier oversight program in accordance with the regulatory requirements of Criterion VII of Appendix B to 10 CFR Part 50. With the exception of the minor issue identified above, the NRC inspection team also determined that Flowserve Limitorque is implementing its policies and procedures associated with the supplier oversight program.

The NRC inspection team issued Nonconformance 99900100/2022-201-02 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion IV of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-

02 cites Flowserve Limitorque for failing to ensure that regulatory and other requirements, which are necessary to assure adequate quality, are suitably included or referenced in the documents for procurement of services. Specifically, Flowserve Limitorque did not issue POs with the applicable technical and quality requirements for the calibration services performed in-house for M&TE used in safety-related activities.

3. Nonconforming Materials, Parts, or Components and Corrective Action

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its nonconforming materials, parts, or components and corrective action programs to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed a sample of Discrepant Material Reports (DMRs) to verify that Flowserve Limitorque: (1) dispositioned the DMRs in accordance with the applicable procedures; (2) documented an appropriate technical justification for various dispositions; and (3) took adequate corrective action with regard to the nonconforming items. DMRs is how Flowserve Limitorque refers to nonconformances.

The NRC inspection team also reviewed a sample of CARs to verify: (1) adequate documentation and description of 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 actions taken to verify timely and effective implementation of the corrective actions. The NRC inspection team confirmed that the CARs provide a link to the 10 CFR Part 21, "Reporting of Defects and Noncompliance," program.

The NRC inspection team also reviewed Flowserve Limitorque's corrective actions in response to Nonconformances 99900100/2018-201-01, 99900100/2018-201-02, 99900100/2018-201-03 identified in the NRC's inspection report No. 99900100/2018-201, dated March 7, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18043A150).

The NRC inspection team also discussed the nonconforming materials, parts, or components and corrective action programs with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

Corrective Action Associated with Nonconformance 99900100/2018-201-01

Following the 2018 inspection of Flowserve Limitorque as documented in inspection report (IR) No. 99900100/2018-201, the NRC issued Nonconformance 99900100/2018-201-01 for Flowserve Limitorque's failure to ensure the suitability of materials, parts, equipment, and processes that are essential to the safety-related functions of the safety-related electric actuators. Specifically, as part of its CGD process, Flowserve Limitorque

failed to verify the validity of the Certificates of Compliance provided by a commercial sub-supplier, by performing a commercial-grade survey, source surveillance, independent testing, or other acceptable methods, as necessary for ensuring the proper material composition (hardness and tensile strength) of motor shafts used in DC motors and supplied by Flowserve Limitorque as either part of safety-related actuators or sold as replacement parts. In addition, Flowserve Limitorque failed to identify motor torque as a critical characteristic and failed to verify the motor output torque conformed to the associated speed-torque curves for DC motors procured from a commercial supplier and then supplied by Flowserve as a safety-related replacement part.

In its response dated April 17, 2018 (ADAMS Accession No. ML18109A036), Flowserve Limitorque stated it would impart new requirements on the motor OEM and their sub-suppliers to validate raw material certificates of compliance for critical components by laboratory analysis at an independent facility designated by Flowserve Limitorque. Flowserve Limitorque also stated that Quality Engineering Standard K-12028, “Peerless-Winsmith, Inc./Limitorque-Flowserve Critical Characteristic Selection Justification Table for All Nuclear Motor Applications,” would be revised to document the requirement for independent material testing of raw materials used in components critical to the motor's function. In addition, Flowserve Limitorque would revise its internal inspection procedure (IP) No. 10.111, “Peerless-Winsmith Critical Component Material Testing,” to add requirements for material properties verification of the motor shaft and other metallic components identified in the investigation. Quality Control inspectors would be trained in the requirements of the revised inspection procedure.

Furthermore, the response stated that Flowserve Limitorque’s engineering would generate a technical evaluation to document critical characteristics of motor performance and establish the requirements for verification of those attributes. Flowserve Limitorque would enhance the production test requirements for DC motors to include verification of motor performance at the maximum rated output torque required of the motor. The Routine Motor Test (RMT) review and approval section of Flowserve Limitorque procedure No. QAP 10.4, “Procedure for Certificates of Compliance,” would be revised to include additional acceptance criteria. The commercial-grade survey checklist contained in IP No. 10.111 would also be revised to include verification of any additional production testing.

Lastly, commercial-grade surveys of the motor OEM would verify that applicable controls are in place with their sub-suppliers to ensure compliance with the requirements for independent verification of material properties. Flowserve Limitorque would ensure critical motor performance characteristics are adequately verified by review of RMT data and by commercial-grade surveys of the motor OEM test facility.

The NRC inspection team reviewed the documentation that provided the objective evidence for the completion of the corrective actions. Flowserve Limitorque’s Audit Deficiency Notification (ADN) No. 2018-99900100/2018-201-E-1 describes the response to Nonconformance 99900100/2018-201-01. The NRC inspection team confirmed that Quality Engineering Standard K-12028 was updated to identify critical attributes for the motor construction, new requirements for independent verification of mechanical properties of raw materials, and critical attributes of motor performance. In addition, IP-10.111 was revised to add verification of the required material testing and motor performance testing, and LYB-QAP-10.4 was revised to include additional acceptance criteria for review of RMT reports (with the exception noted below). The NRC inspection

team also confirmed that Flowserve Limitorque performed a commercial-grade survey of the motor OEM test facility.

While most of the corrective actions in ADN No. 2018-99900100/2018-201-E-1 were adequately implemented, the NRC inspection team identified that the revised Flowserve Limitorque procedure No. LYB-QAP-10.40, "Procedure for Certificates of Compliance," Revision 8, dated April 23, 2020, did not include motor torque to be measured and verified to conform to the associated speed-torque curve. RMT Data Sheets for Peerless DC motors (such as an RMT report dated January 10, 2019) did not specify the measured motor torque or provide a comparison to the associated speed-torque curve. Ensuring the motors conform to published speed-torque curves is necessary to ensure the motors can deliver the relied upon torque to operate the motor-operated valve actuators. The NRC inspection team identified this issue as Nonconformance 99900100/2022-201-03 for Flowserve Limitorque's failure to promptly correct conditions adverse to quality. Flowserve Limitorque initiated CAR No. 202210-63407 to address this issue. The NRC inspection team closed Nonconformance 99900100/2018-201-01 but is tracking this issue under Nonconformance 99900100/2022-201-03.

Corrective Action Associated with Nonconformance 99900100/2018-201-02

Following the 2018 inspection of Flowserve Limitorque, the NRC issued Nonconformance 99900100/2018-201-02 for Flowserve Limitorque's failure to maintain sufficient records to furnish evidence of activities affecting quality. Specifically, Flowserve Limitorque failed to provide objective evidence covering a period of more than two years between January 2016 and January 2018 that showed that commercial dedicated fasteners procured from a commercial supplier were inspected, and critical characteristics from the items were verified.

In its response dated April 17, 2018, Flowserve Limitorque stated that its internal procedure, QAP 16.1, "Handling and Storing Quality Records," would be revised to require all receipt inspection records to be electronically scanned. Inspectors would be trained in use of the scanning sheets and the process for scanning, and verifying records would be properly scanned. In addition, Flowserve Limitorque's Quality Assurance (QA) would perform a process audit on receipt inspection files at a minimum of every three months to verify that inspection records are being scanned and are available as evidence that inspections have been performed in accordance with applicable inspection plans.

The NRC inspection team reviewed the documentation that provided the objective evidence for the completion of the corrective actions. Flowserve Limitorque's ADN No. 2018-99900100/2018-201-E-2 describes the response to Nonconformance 99900100/2018-201-02. The NRC inspection team confirmed that inspection records dating back to 2016 are retrievable in Flowserve Limitorque's electronic system. The NRC inspection team verified that Flowserve Limitorque's procedure, QAP 16.1, has been updated to require inspection records to be stored electronically and that Flowserve Limitorque inspectors are trained to the latest revision of QAP 16.1. The NRC inspection team also reviewed the documentation for the process audits conducted in 2018 to verify that inspection records were scanned electronically and were retrievable.

The NRC inspection team determined that Flowserve Limitorque's corrective actions were adequately implemented to address Nonconformance 99900100/2018-201-02.

Based on its review, the NRC inspection team closed Nonconformance 99900100/2018-201-02. No findings of significance were identified.

Corrective Action Associated with Nonconformance 99900100/2018-201-03

Following the 2018 inspection of Flowserve Limitorque, the NRC issued Nonconformance 99900100/2018-201-03 for Flowserve Limitorque's failure to perform material testing on commercially-dedicated hardware and fasteners as necessary to confirm the suitability of the parts. Specifically, Flowserve Limitorque failed to perform hardness testing on three different stock orders of commercially-dedicated hex head cap screws and keys. In addition, Flowserve Limitorque failed to perform visual inspection to verify elastic stop nuts were manufactured by specific suppliers.

In its response dated April 17, 2018, Flowserve Limitorque stated that all inspectors would be re-trained on all applicable inspection plans used for receipt inspection for fasteners. All fasteners used in safety-related applications would be inspected to the applicable inspection plans and all inspection records would be reviewed and approved by the QA Supervisor.

The NRC inspection team reviewed the documentation that provided the objective evidence for the completion of the corrective actions. Flowserve Limitorque's ADN No. 2018-99900100/2018-201-E-3 describes the response to Nonconformance 99900100/2018-201-03. The NRC inspection team verified that in inspection records dated back to 2018, hardness testing and visual inspection were part of the receipt inspection requirement for fasteners and elastic stop nuts, respectively. The NRC inspection team also verified that Flowserve Limitorque inspectors were trained to the latest applicable inspection plans.

The NRC inspection team determined that Flowserve Limitorque's corrective actions were adequately implemented to address Nonconformance 99900100/2018-201-03. Based on its review, the NRC inspection team closed Nonconformance 99900100/2018-201-03. No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque 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 Limitorque is implementing its policies and procedures associated with the control of nonconforming materials, parts, or components program. No findings of significance were identified.

The NRC inspection team issued Nonconformance 99900100/2022-201-03 in association with Flowserve Limitorque's failure to implement the regulatory requirements of Criterion XVI of Appendix B to 10 CFR Part 50. Nonconformance 99900100/2022-201-03 cites Flowserve Limitorque for failing to promptly correct conditions adverse to quality as documented in ADN No. 99900100/2018-201-E-1 and in Flowserve Limitorque's official response to the NRC. Specifically, Flowserve Limitorque did not include motor torque to be measured and verified to conform to the associated speed-torque curve in Flowserve Limitorque procedure No. LYB-QAP-10.4, and did not specify

the measured motor torque or provide a comparison to the associated speed-torque curve in RMT Data Sheets for Peerless DC motors. Flowserve Limitorque initiated CAR No. 202210-63407 to address this issue.

4. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its commercial-grade dedication (CGD) program to verify their compliance with the regulatory requirements of Criterion III and Criterion VII, of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed a sample of CGD documents and commercial-grade surveys of several commercial vendors on Flowserve Limitorque's AVL. The sample of CGD documents and commercial-grade surveys reviewed was for the commercial-grade dedication of the following items or services: bar stock, castings, DC motors, nuclear grease, fasteners, calibration services, and heat treating services. The documents reviewed included: (1) commercial-grade dedication plans; (2) POs; (3) technical evaluations; (4) checklists; (5) inspection reports; and (6) testing certificates.

The NRC inspection team evaluated the criteria for the identification of item functions, credible failure mechanisms and modes, selection of critical characteristics and acceptance criteria, identification of verification methods, and justification of the sampling methodologies, as applicable, to verify effective implementation of Flowserve Limitorque's CGD process. In addition, the NRC inspection team verified that commercial-grade surveys contained the objective evidence necessary to demonstrate the commercial vendors adequately controls the critical characteristics during the fabrication process or service activities. The NRC inspection team confirmed that Flowserve Limitorque's CGD process provides reasonable assurance that the items and services being dedicated would perform their intended safety function.

The NRC inspection team also discussed the CGD program with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team reviewed Flowserve Limitorque's measures established for the use of accreditation in lieu of performing commercial-grade surveys for the procurement of calibration services as part of the CGD process. Flowserve Limitorque implements this process as described in Nuclear Energy Institute (NEI) document No. 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial-Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1, dated September 2020. The NRC staff determined this guidance to be acceptable in a safety evaluation (SE) dated November 23, 2020 (ADAMS Accession No. ML20322A019).

During the review of a sample of receipt inspection records for calibration services performed by an accredited laboratory to the requirements of International Standard Organization (ISO)/International Electrotechnical Commission (IEC) 17025, "General Requirements for the Competence of Testing and Calibration Laboratories," the NRC

inspection team noted that Flowserve Limitorque incorrectly listed the conditions from the SE as the critical characteristics required to be verified as part of the CGD process. The critical characteristics for calibration services are already verified as part of the laboratories' accreditation process under ISO/EC 17025-2017 and the conditions from the SE should not be identified as critical characteristics. These conditions are verified as part of the receipt inspection process to ensure that the PO requirements have been met. The NRC inspection team determined this issue to be minor because it is a documentation issue and had no impact on the CGD of the calibration services. Flowserve Limitorque initiated CAR No. 02210-63223 to address this issue.

The NRC inspection team noted that receipt inspection for calibration services as part of the CGD process was not being adequately performed. For example, while the laboratory's accreditation scope showed that the calibration laboratories were accredited to the 2017 edition of ISO/IEC 17025, some of the certificates of calibration reviewed stated that the calibration was done in accordance with the laboratories' 2005 edition of their ISO/IEC 17025 program. The 2005 edition of ISO/IEC 17025 is no longer valid as it was superseded with the 2017 edition. Further, for a sample of the certificates of calibration or laboratory documentation reviewed, the NRC inspection team noted that none of the documents certified that the PO requirements were met. One of the conditions from the SE states that at receipt inspection, it is validated that: (1) the laboratory's documentation certifies that the calibration was performed in accordance with the laboratory's 2017 edition of ISO/IEC 17025, and (2) that the PO requirements were met. However, the receipt inspection checklist did not identify that these conditions were not met. The NRC inspection team determined this issue to be minor because the laboratories were accredited to the 2017 edition of ISO/IEC 17025. Flowserve Limitorque initiated CAR No. 02210-63223 to address this issue.

In addition, the NRC inspection team noted that another condition from the SE was not included in some of the sample of POs reviewed. Specifically, the condition states that a documented review of the laboratory's accreditation is performed and includes a verification that the laboratory's accreditation was achieved based on an on-site accreditation assessment by the selected accrediting body within the past 48 months. The laboratory's accreditation cannot be based on two consecutive remote accreditation assessments. The NRC inspection team determined this issue to be minor because the laboratories were accredited to the 2017 edition of ISO/IEC 17025 and there have not been any issues identified with the calibration services provided. Flowserve Limitorque initiated CAR No. 02210-63223 to address this issue. No findings of significance were identified.

During the review of a sample of CGD documents for bar stock and castings, the NRC inspection team noted that Flowserve Limitorque identified heat number and material composition as critical characteristics. The acceptance method for the verification of the heat number was visual inspection, and for the material verification, Flowserve Limitorque would choose a sample and send it to a qualified laboratory in Flowserve Limitorque's AVL for testing. The NRC inspection team identified that Flowserve Limitorque did not have documented objective evidence to show that the commercial supplier had established adequate traceability controls (e.g., heat traceability and lot and batch control) and that these controls were effectively implemented. In addition, the NRC inspection team identified that Flowserve Limitorque did not develop and document a technical basis for the selection of the sampling plans' sample size. The NRC inspection team determined this issue to be minor because Flowserve Limitorque performs testing

on the material and conducts operational tests of the final components. Flowserve Limitorque initiated CAR No. 202210-63404 to address this issue.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque is implementing its CGD program in accordance with the regulatory requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50. With the exception of the minor issues identified above, the NRC inspection team also determined that Flowserve Limitorque is implementing its policies and procedures associated with the CGD program.

5. Control of Special Processes

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its control of special processes program to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50, and with the requirements of the American Society for Nondestructive Testing (ASNT) SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing." Flowserve Limitorque's special processes activities are limited to wet fluorescent magnetic particle testing (MT) and coating (painting). There were no safety-related non-destructive examination (NDE) or coating activities performed during the week of the inspection. As such, the NRC inspection team reviewed a sample of completed MT and coating certifications. The NRC inspection team confirmed that the NDE reports and coating certifications contained the required information in accordance with Flowserve Limitorque's NDE and coating procedures.

For a sample of training and qualification records for NDE and coating personnel, the NRC inspection team confirmed they were qualified in accordance with the requirements of ASNT SNT-TC-1A and Flowserve Limitorque's procedures, as applicable.

The NRC inspection team also discussed the control of special processes with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

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

6. Test Control

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of its 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 Limitorque's test procedures and test results related to electric actuator production tests.

The NRC inspection team also observed the torque test of an SMB-0 actuator on a Flowserve Limitorque torque stand. While the SMB-0 actuator was not safety-related, the process used by Flowserve Limitorque for testing SMB-0 actuators is the same for safety-related and non safety-related. The NRC inspection team confirmed the torque values specified on the test report were consistent with the torque data traces by checking a sample of direct torque measurements. The NRC inspection team verified the current calibration of the test instrumentation equipment and the torque stand as well as the qualification of the test engineer and test technician.

In addition, the NRC inspection team confirmed the tests were performed using properly calibrated M&TE and verified that Flowserve Limitorque's test procedures adequately included the applicable technical, quality, and regulatory requirements. The NRC inspection team also confirmed that the following testing elements were satisfied, verified, and recorded, as appropriate: (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) any deviations documented and evaluated.

The NRC inspection team discussed the test control program with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque 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 Limitorque 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 Limitorque's policies and implementing procedures that govern the implementation of its 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.

For a sample of M&TE, the NRC inspection team determined that the M&TE had the appropriate calibration stickers and current calibration dates, including the calibration due date. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. 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, and the due date for recalibration. Furthermore, the NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards. The NRC inspection team confirmed that when M&TE equipment is found to be out of calibration, Flowserve Limitorque proceeds to identify items that have been accepted using this equipment since the last valid calibration date and performs an extent of condition review.

The NRC staff observed the calibration of a number and variety of small and medium gages. The calibration technician ensured that suitable environment conditions were present before conducting the calibration activities. All the calibration standards used were appropriately controlled such that the current calibration status could be determined, all standards and equipment were identified to be within calibration, and only minor adjustments were needed for items undergoing calibration checks.

The NRC inspection team also discussed the M&TE program with Flowserve Limitorque’s management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

During a walkthrough of the manufacturing floor, the NRC inspection team noted that a multimeter in the electrical work area was past two months the calibration due date and had not been sent for calibration or segregated to prohibit its use. The NRC inspection team noted that existing procedures did not contain guidance to trace where the multimeter had been used. Flowserve Limitorque indicated that final inspections conducted would ensure proper measurements for the assembled electrical components and only one individual performs those inspections. Flowserve Limitorque provided the calibration records for the final inspection tool, and the NRC inspection team confirmed that it was currently in calibration. The NRC inspection team determined this issue to be minor because the multimeter was not currently in use at the time, and there was only one example of an M&TE being out of calibration on the manufacturing floor. Flowserve Limitorque initiated CAR No. 202210-63408 to address this issue.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque is implementing its M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. With the exception of the minor issue identified above, the NRC inspection team also determined that Flowserve Limitorque is implementing its policies and procedures associated with the M&TE program.

8. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed Flowserve Limitorque's policies and implementing procedures that govern the implementation of 10 CFR Part 21 program 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 Limitorque's POs for compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents." The NRC inspection team also verified that Flowserve Limitorque's nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program.

Furthermore, for a sample of 10 CFR Part 21 evaluations performed by Flowserve Limitorque, the NRC inspection team verified that Flowserve Limitorque had effectively implemented the requirements for evaluating deviations and failures to comply. The NRC inspection team verified that notifications were performed in accordance with the requirements of 10 CFR 21.21 and Flowserve Limitorque's procedure, as applicable.

The NRC inspection team also discussed the 10 CFR Part 21 program with Flowserve Limitorque's management and technical staff. The attachment to this inspection report lists the documents reviewed and personnel interviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that Flowserve Limitorque 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 Limitorque is implementing its policies and procedures associated with the 10 CFR Part 21 program. No findings of significance were identified.

9. Entrance and Exit Meetings

On October 17, 2022, the NRC inspection team discussed the scope of the inspection with Mr. Tyler Thompson, Plant Manager, and other members of Flowserve Limitorque's management and technical staff. On October 21, 2022, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Thompson and other members of Flowserve Limitorque's management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

ATTACHMENT

1. ENTRANCE/EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Tyler Thompson	Plant Manager, Director	Flowserve Limitorque	X*	X	
Kenneth Woodall	Plant Manager, Operations	Flowserve Limitorque	X*		
Christopher Shaffer	Quality Assurance Manager	Flowserve Limitorque	X	X	X
Zachary Cox	Engineering Manager	Flowserve Limitorque	X*		
Eric Henkel	Communications Operations Manager	Flowserve Limitorque	X*		
AJ Trill	Research & Development Manager	Flowserve Limitorque	X*	X*	
Steve Campbell	Planning Manager	Flowserve Limitorque		X	
Amy Wingfield*	Order Management Supervisor	Flowserve Limitorque	X		
Kyle Ramsey	Chief Mechanical Engineer	Flowserve Limitorque	X		X
Kyle Sawyer	Quality Engineer	Flowserve Limitorque	X		X
Kevin Kersey	Gage Calibration Technician	Flowserve Limitorque			X
David Robertson	Lead Test Engineer	Flowserve Limitorque			X
Sam Hicks	Test Technician	Flowserve Limitorque			X
Yamir Diaz-Castillo	Inspection Team Leader	Nuclear Regulatory Commission (NRC)	X	X	
Yiu Law	Inspector	NRC	X*	X*	
Eva Brown	Inspector	NRC	X	X	
Thomas Scarbrough	Inspector	NRC	X	X	

Name	Title	Affiliation	Entrance	Exit	Interviewed
Vince Voltaggio	Inspector	NRC	X	X	
Kerri Kavanagh	Branch Chief	NRC		X*	

*Participated Remotely

2. INSPECTION PROCEDURES USED

Inspection Procedure (IP) 36100, “Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance,” dated January 27, 2017

IP 43002, “Routine Inspections of Nuclear Vendors,” dated April 5, 2022

IP 43004, “Inspection of Commercial-Grade Dedication Programs,” dated April 5, 2022

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
99900100/2018- 201-01	CLOSED	Notice of Nonconformance (NON)	Criterion III & VII
99900100/2018- 201-02	CLOSED	NON	Criterion XVIII
99900100/2018- 201-03	CLOSED	NON	Criterion X
99900100/2022-201-01	OPENED	NON	Criterion III
99900100/2022-201-02	OPENED	NON	Criterion IV
99900100/2022-201-03	OPENED	NON	Criterion XVI

4. DOCUMENTS REVIEWED

Policies and Procedures

- LYB-CGD-0001, “Commercial Grade Dedication - Steel Bar Stock,” Revision 0, dated March 26, 2019
- LYB-CGD-0002, “Commercial Grade Dedication - Steel, Grey and Ductile Iron Castings and Forgings and Ductile Iron Bar Stock,” Revision 0, dated March 26, 2019
- LYB-ECC-0001, “Safety Related Actuator Critical Components Evaluation and Listing,” Revision 7, dated October 3, 2019
- LYB-EDP-005.001, “Procedure for Engineering Design Documents,” Revision 3, dated July 31, 2019
- LYB-EIP-042, “Worm Assembly,” Revision 10, dated September 24, 2019

- LYB-EIP-045, “Worm Shaft Gear Assembly (Hard Clutch),” Revision 5, dated February 2, 2022
- LYB-EIP-046, “Worm Shaft Gear Assembly (Soft Clutch),” Revision 5, dated February 2, 2022
- LYB-EIP-054, “Clutch Tripper Replacement SMB-1, 2, 3, 4,” Revision 2, dated September 26, 2019
- LYB-EIP-055, “Clutch Tripper Assembly SMB/SB-1, 2, 3, 4,” Revision 3, dated September 26, 2019
- LYB-EIP-058, “Keyway Inspection,” Revision 3, dated July 13, 2019
- LYB-EIP-059, “Inside Diameter (Mtr Pinions & W.S. Gears),” Revision 2, dated July 13, 2019
- LYB-EIP-422, “SMB-5 Flexible Clutch Assembly Procedure,” Revision 0, dated July 8, 2019
- LYB-EIP-444, “Center of Gravity Calculator,” Revision 1, dated December 5, 2019
- LYB-IP-10.23, “Bart stock, Tubing - Requiring Certification,” Revision 0, dated November 9, 2019
- LYB-IP-10.77, “Socket Head Set Crews,” Revision 0, dated November 20, 2019
- LYB-IP-10.106, “Grease - MOV Long Life Grade 0 and Mobil 28,” Revision 8, dated October 19, 2022
- LYB-IP-10.111, “Peerless-Winsmith Critical Component Material Testing,” Revision 16, dated August 8, 2022
- LYB-MES-0009, “Fastener Hardware Part# Prefix H,” Revision 1, dated July 1, 2022
- LYB-MES-BM1, “4340 STL Hot Rolled or Cold Finished,” Revision 0, dated June 1, 2020
- LYB-MES-BC2, “4140/4142 STL Bar,” Revision 0, dated November 3, 2020
- LYB-L 3457, “Dedication Plan for CGI Calibration,” Revision 4, dated March 3, 2022
- LYB-QA-0001, “Quality Manual,” Revision 8, dated March 24, 2020
- LYB-QAI-10.1, “Acceptance Criteria for Electric Actuator Production Test,” Revision 10, dated December 3, 2019
- LYB-QAP-0001, “Management Review,” Revision 1, dated March 24, 2021
- LYB-QAP-0006, “Purchasing Procedure,” Revision 4, dated June 2, 2020

- LYB-QAP-4.1, “Design and Development Procedure,” Revision 15, dated August 20, 2019
- LYB-QAP-4.2, “Applications Engineering Procedure for Product/Option Approval and Release,” Revision 2, dated September 27, 2019
- LYB-QAP-4.3, “Design Revision Procedure for Existing Products,” Revision 2, dated September 6, 2019
- LYB-QAP-5.1, “Procedure for and Issuance of Internal Engineering Documents Processing Engineering Change Orders,” Revision 9, dated February 22, 2021
- LYB-QAP-5.3, “Automated Test Software Control,” Revision 3, dated September 3, 2019
- LYB-QAP-10.1, “Test Laboratory Procedures,” Revision 12, dated November 1, 2019
- LYB-QAP-10.2, “Safety Related Nuclear Service Procedure,” Revision 8, dated August 12, 2019
- LYB-QAP-10.3, “Assembly Inspection Procedure,” Revision 12, dated August 12, 2019
- LYB-QAP-10.5, “Safety Issues Tracking and Notification Procedure,” Revision 0, dated September 26, 2019
- LYB-QAP-10.40, “Procedure for Certificates of Compliance,” Revision 8, dated April 23, 2020
- LYB-QAP-13.2, “Evaluation and Reporting of Potential Deviations,” Revision 19, dated August 16, 2019
- LYB-QAP-13.3, “Discrepant Material Report Procedure (DMR),” Revision 25, dated June 9, 2022
- LYB-QAP-14.1, “Corrective and Preventive Action Procedure,” Revision 18, dated September 19, 2022
- LYB-QAP-16.1, “Handling and Storing Quality Records,” Revision 25, dated April 17, 2018
- LYB-QAP-19.1, “Actuator Performance Data Verification Procedure,” Revision 2, dated August 12, 2019
- LYB-QAP-20.0, “Verification of Calibration Status,” Revision 0, dated October 20, 2022
- LYB-QCI-10.4, “Instructions for Using Hardness Testers and Reporting Measurement Results,” Revision 0, dated August 1, 2019
- LYB-QCP-10.5, “Inspection of Safety Related Nuclear Service Units and Parts Orders,” Revision 2, dated May 19, 2021

- LYB-QCP-11.1, “Calibration System,” Revision 6, dated November 19, 2022

10 CFR Part 21 Records

- Letter to the NRC, LIMDOC-2021-001, “Interim Report of the Evaluation of a Deviation Pursuant to 10 CFR 21.21(a)(2),” dated February 4, 2021
- Letter to the NRC, LIMDOC-2021-001, “Final Report of the Evaluation of a Deviation Pursuant to 10 CFR 21.21(a)(2),” dated April 20, 2021
- Letter to the NRC, “Interim Report – Formal Evaluation of Deviations Reported”, dated September 10, 2021
- Letter to the NRC, LIMDOC-2021-008, “10 CFR Part 21 Notification for a Flowserve - Limitorque Supplied DC Motor,” dated October 4, 2021
- Letter to the NRC, “Closure of Formal Evaluation - DC Cook O-Ring,” dated October 11, 2021
- Letter to the NRC, “Solenoid Coil Failure of Model 38878-8 Solenoid Valve at Catawba Nuclear Station for use on FWIV Actuator,” dated July 1, 2022
- Limitorque File No. 93 for DC motors, dated March 9, 2020
- Limitorque File No. 94 for actuator, dated November 30, 2020
- Part 21 File No. 95 Cam Pin Evaluation, “Summary of Evaluation from OPG Darlington”
- Part 21 File No. 95 Cam Pin Evaluation, “Summary of Evaluation of Cause and Scope”
- Part 21 File No. 95 Cam Pin Evaluation, “Evaluation of Impact to Safety Related Function”

Design and Commercial-Grade Dedication Records

- Dedication Plan for CGI Calibration of a Mitutoyo gage block set, asset No. QC-1486, dated June 8, 2022
- Dedication Plan for CGI Calibration of a torque wrench, asset No. QC-8282, dated April 29, 2022
- Dedication Plan for CGI Calibration of a temperature/humidity recorder, asset No. QC-0009, dated May 3, 2022
- Dedication Plan for CGI Calibration of a torque wrench, asset No. QC-8689, dated April 29, 2022
- Dedication Plan for CGI Calibration of a Fluke multi-product calibrator, asset No. QC-106, dated November 2, 2020

- Dedication Plan for CGI Calibration of a coordinate-measuring machine, asset No. QC-1600, dated March 3, 2022

- Dedication Plan for CGI Calibration of a Mitutoyo Rockwell hardness tester, asset No. QC-3003, dated August 4, 2022

- Dedication Plan for CGI Calibration of a temperature recorder, asset No. QC-3120, dated May 11, 2022

- Drawing No. 60-245-0115-3, "Spline Adapter," Revision L, dated January 22, 2981

Engineering Documents

- EDD-153, "Justification for Substitution of Ductile Iron for Gray Iron," dated November 12, 2013

- EDD-154, "Limitorque DC Motor EQ Program Test Failure Resolution," dated October 21, 2014

- EDD-158, "SMB-5 Flexible Clutch Assembly Procedure," undated

- EDD-175, "Stress Calculations for SMB-000 Torque Switch," dated August 8, 2014

- EDD-180, "SMB-000 'C Style' Torque Switch Design Data," dated July 20, 2016

- EDD-181, "Documented Changes from Revision 6 to Revision 7 of Critical Components List (ECC-0001)," dated August 19, 2014

- EDD-191, "Material Change from 1144 and 1141 Steel Bar to 4140 Steel Bar," dated May 6, 2019

- EDD-213, "Critical Component Failure Modes & Critical Characteristics Determination," dated December 20, 2019

- Flowserve Limitorque K-12028, "Peerless-Winsmith, Inc./Limitorque-Flowserve Critical Characteristic Selection Justification Table for All Nuclear Motor Applications," undated

Calibration, Non-Destructive Examination, Inspection, and Test Records

- Certificate of Calibration No. 2022008179 for a Mitutoyo gage block set, asset No. QC-1486, dated June 8, 2022

- Certificate of Calibration No. 2022004017 for a torque wrench, asset No. QC-8282, dated April 29, 2022

- Certificate of Calibration No. 2022004018 for a temperature/humidity recorder, asset No. QC-0009, dated May 3, 2022

- Certificate of Calibration No. 2022004017 for a torque wrench, asset No. QC-8689, dated April 29, 2022

- Certificate of Calibration No. EVL667160 for a Fluke multi-product calibrator, asset No. QC-106, dated November 2, 2020

- Certificate of Calibration No. 117738 for a coordinate-measuring machine, asset No. QC-1600, dated April 5, 2022

- Certificate of Calibration No. SS5858 for a Mitutoyo Rockwell hardness tester, asset No. QC-3003, dated August 4, 2022

- Certificate of Calibration No. 05.11.22.QC 3120, asset No. QC-3120, dated May 11, 2022

- Certificate of Calibration No. QC-126, Torque Testing Power Box PWR-041, dated January 10, 2022

- Certificate of Calibration No. QC-127, Torque Test Stand TS-041, dated January 10, 2022

- Certificate of Compliance No. 218726, Ohio Electric DC Motor, dated January 10, 2019

- Flowserve Coating Certification for order No. 184941.001, Primer: Carbozinc No. 11SG, dated October 26, 2020

- Flowserve Coating Certification for order No. 191555.001, Primer: Carbozinc No. 11SG, dated September 30, 2022

- Flowserve Coating Certification for order No. 191998.001, Primer: Carbozinc No. 11SG, dated September 21, 2022

- Flowserve Coating Certification for order No. 192682.001, Primer: Carbozinc 11SG, dated August 17, 2022

- Flowserve Report No. B0373, “Limitorque Environmental Qualification Report for SMB-000 ‘C Style’ Torque Switch,” dated August 22, 2014

- Flowserve Inspection Sheet for Nuclear Parts Order (Metallics) for order No. 195906.1, for a spline adapter, Part No. 60-245-0115-3, Heat No. MM21100170, dated October 19, 2022

- Flowserve SMB Test Report for purchase order (PO) No. 3136555, SMB-0 Unit, dated September 8, 2022

- Flowserve SMB Test Report for PO 174-21-CW-C0-1, SMB-0 Unit , dated October 20, 2022

- Inspection Data Record for Item No. 283, Part Description: Housing, PO No. 242978, Part No. P61-002-0389-4D, dated August 25, 2022

- Inspection Data Record for Item No. 293, Part Description: AISI 4140 CF HR AL4 5TL, PO No. 214811, Bar, Part No. BC2-06.25, dated December 6, 2021

- Inspection Data Record for Item No. 320, Part Description: AISI 4340 HR CF Steel Bar, PO No. 246804, Part No. BM1-03.75, dated September 15, 2022

- Inspection Data Record for Item No. 349, Part Description: AISI 4140/4142 CF HR ALY STL Bar, PO No. 247024, Part No. BC2-02.75, dated October 5, 2022

- Inspection Data Record for Item No. 363, Part Description: AISI 4340 HR CF STL Bar, PO No. 242628, Part No. BM1 - 04.75, dated January 1, 2022

- Inspection Data Record for Item No. 002, Part Description: Spline Adapter, Part No. 60-245-0115-3, Heat No. MM21100170

- Inspection Data Record for Part No. JG1-3/16x12, dated March 8, 2018

- Inspection Data Record for Part No. HC8-5/8-11X72, Part Description: Socket Head Cap Screw, dated February 9, 2018

- Inspection Data Record for Part No. HC8-5/16-18X52, Part Description: Socket Head Cap Screw, dated February 8, 2018

- Inspection Data Record for Part No. HCA-1/2-13X24, Part Description: Socket Head Cap Screw, dated February 15, 2018

- Inspection Data Record for Part No. HB8-5/16-18X24, Part Description: Hex Head Cap Screw, dated February 16, 2018

- Inspection Data Record for Part No. HC8-1/2-13X24, Part Description: Socket Head Cap Screw, dated February 16, 2018

- Inspection Data Record for Part No. CK1-41NTE-182, Part Description: Elastic Stop Nut, dated April 26, 2019

- Inspection Data Record for Part No. CK1-41NE-164, Part Description: Elastic Stop Nut, dated August 17, 2022

- Receipt Inspection Record for a sample of socket head cap screws, Part No. HC8-S/8-11x40, dated August 1, 2022

- Report of Non-Destructive Examination for a worm, drawing No. 60-400-0012, Revision W, order No. 191088.001, dated June 15, 2022

- Report of Non-Destructive Examination for a worm, drawing No. 60-400-0016-1, Revision Y, order No. 188048.002, dated June 17, 2022

- Report of Non-Destructive Examination for a worm, drawing No. 60-400-0016-2, Revision Y, order No. 189581.002, dated September 13, 2022

- Report of Non-Destructive Examination for a worm, drawing No. 60-400-0054-2, Revision Z, order No. 190228.002, dated April 20, 2022

- Test Certificate No. T 118144, Item: Chemistry and Tensile of Item 293, P/N BC2-06.25, EMJ, Heat MM21100170, PO 241811, Bar Stock, Specification: ASTM A29-20, 4140/4142, ASTM A434-18, Class BC 4-1/2" to 7", dated October 21, 2021

- Test Certificate No. T 200295, Item: Chemistry of Item 363, P/N BM1-04.75, EMJ, Heat 22098556, PO 242628, Bar Stock, Specification: ASTM A322-13(18) and ASTM A304-20, Type 4340, dated January 10, 2022

- Test Certificate No. T 208548, Item: FT-IR Analysis of Item 155, P/N Lube-Nuclear-EPO, Batch WH2A30G062, PO 243668, Canoil Canada, Specification: MOV Long Life, Grade O, Baseline Spectrum, dated May 9, 2022

- Test Certificate No. T 214787, Item: FT-IR of Motor Kit, Item No. 260, Model No. 176-18-0126, PO 244416, Peerless-Winsmith Kit No. B-15429, Ohio Electric, Specification, Assorted Materials, dated August 22, 2022

- Test Certificate No. T 215242, Item: Tensile Test of Item 283, P/N P61-002-0389-4D, PO 242978-2, Heat 8/2/2022 H-G F-1, Penn-Mar, Keel Block, 4 Sn 1-4, Specification: ASTM A536-84(19)e1, 65-45-12, dated August 15, 2022

- Test Certificate No. T 216136, Item: FT-IR Analysis of Item 301, Grease, Batch 70402606K, P/N Lube-Mobil 28, Supplier Candler Oil, Specification: Mobil 28 Grease Baseline Spectrum, dated September 21, 2022

- Test Certificate No. T 218429, Item: Chemistry & Tensile of Item 349, P/N BC2-02.75, EMJ, Heat 272773, PO 247024, Bar Stock, Specification: ASTM A29-20, 4140/4142, ASTM A434-18, Class BC 2-1/2" to 4", dated October 3, 2022

- Test Certificate No. T 216968, Item: Chemistry of Item 320, P/N BM1-03.75, EMJ, Heat X0465, PO 246804, Bar Stock, Specification: ASTM A322-13(18) and ASTM A304-20, Type 340, dated September 12, 2022

<u>Purchase Orders, Audit Reports, and Commercial-Grade Surveys</u>

- PO No. 242628 for bar stock, Part No. BM1-04.75, dated November 11, 2021

- PO No. 246804 for bar stock, Part No. BM1-03.75, dated August 8, 2022

- PO No. 242978 for a SMB-2/L 120-190 housing, item No. P61-002-0389-4D, dated December 3, 2021

- PO No. 245773 for fasteners, dated June 6, 2022

- PO No. 020167 for calibration services of three torque wrenches and one temperature and humidity recorder, dated April 4, 2022

- PO No. 020176 for calibration services of a Mitutoyo gage block set, dated May 26, 2022

- PO No. 022407 for calibration services of a Fluke multi-product calibrator, dated October 13, 2022

- PO No. 247850 for heat treating services, dated October 17, 2022
- PO No. 243019 for nuclear grease, dated December 8, 2021
- PO No. 247426 for a 1900 RPM motor, dated September 19, 2022
- PO No. 241811 for bar stock, dated September 17, 2021
- PO No. 238400 for FD1 Housing LSER-420-SMC/SMB-3, dated February 17, 2021
- Commercial-Grade Survey Report No. 2022-02-E, dated July 6, 2022
- Commercial-Grade Survey Report No. 2021-04-E, dated December 7, 2021
- Commercial-Grade Survey Report No. 2022-03-E, dated August 16, 2022
- Commercial-Grade Survey Report No. 26877, dated August 11, 2022
- Commercial-Grade Survey Report No. 2019-02-E, dated August 27, 2019

Nonconformance Reports

- 47081, 47163, 47190, 47215, 47237, 48775, 48851, 48781, 48771, 48817, 48850, 48791, 9000

Corrective Action Reports

- 202004-0540, 202103-25036, 202105-28754, 202107-32054, 202203-46545, 202203-46546, 202205-52078, 202206-52907, 202207-55710, 202209-61818
- Audit Deficiency Notification (ADN) No. 2018-99900100/2018-201-E-1, dated March 8, 2018
- ADN No. 2018-99900100/2018-201-E-2, dated March 8, 2018
- ADN No. 2018-99900100/2018-201-E-3, dated March 8, 2018

Corrective Action Reports Opened During the NRC Inspection

- 202210-63223, 202210-63406, 202210-63407, 202210-63404, 202210-63408, and 202210-63451

Training and Qualification Records

- Daniel Mason, Magnetic Particle Non-Destructive Examination (NDE) Level II Examiner
- A. Neil Fariss, Jr., Magnetic Particle NDE Level II Examiner
- Joseph E. Monroe, Electromagnetic, Liquid Penetrant, Magnetic Particle, and Ultrasonic NDE Level III Examiner

- Jason Groeper, Painter, as documented in the Coating Application Evaluation Form, ASTM D4228-05, “Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces”

- Sam Hicks, Test Technician

- Clifton Bradley and Cory Steele, Quality Control Inspectors

- Gary Fischer, Frances Faulkenberg, and Edward Lawrence, Lead Auditors

- Flowserve Training Session Record, “IP 10.10 Rev 6, Belleville Spring,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.14 Rev 8, Socket Head Cap Screws,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.15 Rev 5, Keys,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.16 Rev 3, Elastic Stop Nut,” dated March 4, 2018

- Flowserve Training Session Record, “IP 10.17 Rev 3, Flexloc Nuts,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.19 Rev 8, Hex Head Cap Screws Grade 5,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.20 Rev 7, Grade 5 Hex Nuts, ¼ Inch and Larger,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.22 Rev 4, Retaining Rings,” dated March 21, 2018

- Flowserve Training Session Record, “IP 10.95 Rev 3, Dowel Pin,” dated March 21, 2018

- Flowserve Training Session Record, “EIP 468 Rev 0,” dated March 21, 2018

- Flowserve Training Session Record, “QAP 16.1 Revision 25 - Scanning Receipt Inspection Records into Electronic File Storage,” dated April 17, 2018

Miscellaneous

- Flowserve Limitorque Management Review August 24, 2021, Meeting Minutes, dated September 12, 2022

- Flowserve Limitorque Internal Letter for ADN 2018-99900100/2018-201-E-2, dated April 11, 2018

- Flowserve Limitorque Internal Letter for ADN 2018-99900100/2018-201-E-2, dated May 16, 2018