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

July 2, 2018

Mr. John DeBonis
Quality Assurance Manager
Target Rock, a division of
Curtiss-Wright Flow Control Company
1966E Broadhollow Road
East Farmingdale, NY 11735

SUBJECT: TARGET ROCK'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99900060/2018-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. DeBonis:

From May 14–18, 2018, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Target Rock (TR) facility in East Farmingdale, NY. The enclosed report presents the results of the inspection. The purpose of the limited-scope technical inspection was to assess TR's compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

This technically-focused inspection specifically evaluated TR's implementation of quality activities associated with the design control activities for the NuScale emergency core cooling system (ECCS) valves being performed by TR. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) program.

During this inspection, the NRC inspection team found that implementation of your QA program failed to meet certain NRC requirements contractually imposed on you by your customers or NRC licensees. Specifically, the NRC inspection team determined that TR was not implementing aspects of its design control and test programs consistent with regulatory requirements. The specific finding and references to the pertinent requirements are identified in the enclosures to this letter. In the response to the enclosed notice of nonconformance (NON), TR should document the results of the extent of condition and determine if there are any effects on other safety-related components.

Please provide a written explanation or statement 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, a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from

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

Sincerely,

***/RA/* Jermaine Heath for**

Terry W. Jackson, Chief
Quality Assurance Vendor Inspection Branch-1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99900060

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99900060/2018-201 and Attachment

SUBJECT: TARGET ROCK'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99900060/2018-201 AND NOTICE OF NONCONFORMANCE

Dated: July 2, 2018

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OFC	NRO/DCIP	NRO/DCIP	
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DATE	07/02/2018	07/02/2018	

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NOTICE OF NONCONFORMANCE

Target Rock Division
Curtiss-Wright Flow Control Company
1966E Broadhollow Road
East Farmingdale, NY 11735-1768

Docket Number 99900060
Inspection Report No. 99900060/2018-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted on May14-18, 2018, of activities performed at Target Rock (TR), a business unit of Curtiss-Wright Flow Control Company, certain activities were not conducted in accordance with NRC requirements that were contractually imposed upon TR by your customers or by NRC licensees:

A. Criterion III, "Design Control," of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis, as specified in the license application, for those structures, systems, and components (SSCs) to which this appendix applies are correctly translated into specifications, drawings, procedures and instructions." Criterion III also states, in part, "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.

   NuScale contract Task Order (TO) No. 11, Statement of Work SW-1114-9480, subsection 4.2, states in part, that, a certificate of conformance shall be provided for shipment/submittal of items or services delivered to NuScale and shall meet the following requirements: (1) identify the purchased material, equipment, or service and are traceable to the NuScale procurement document assigned to the work and required deliverables; (2) identify the specific procurement requirements met by the purchased material, equipment, or service (e.g., codes, standards, and other specifications); (3) identify any procurement requirements that have not been met, together with an explanation and means for resolving the nonconformance(s); (4) is signed or otherwise authenticated by a person who is responsible for this QA function and whose function and position are described in the supplier's NuScale approved QA program; (5) has been generated in accordance with the certification system established by and described in the Supplier's QA program; (6) certifies conformance with all requirements of the purchase order; (7) references the QA program and the title and revision/date of the QA manual utilized to fulfill the scope of the purchase order and; (8) is provided on the letterhead of the company to which the procurement document was issued.

   Contrary to the above, as of May 18, 2018, TR failed to translate the applicable design basis requirements as specified in NuScale's TO for the Emergency Core Cooling System (ECCS) valves into their specifications, drawings, procedures and instructions. In addition, TR failed to provide objective evidence to NuScale ensuring the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the SSCs were met.

Specifically, TR failed to translate certificate of conformance requirements from NuScale's TO No. 11, SW-1114-9480 into their ECCS valve proof-of-concept (POC) Test Procedure TRP 9484. In addition, TR failed to submit eight certificate of conformance requirements for the ECCS valve POC testing services to NuScale to provide objective evidence for the selection and review for suitability of application of processes that are essential to the safety-related functions of the ECCS valve for the NuScale POC Test design certification process.

This issue has been identified as Nonconformance 99900060/2018-201-01.

B. Criterion XI, "Test Control," of Appendix B, 10 CFR Part 50, states, in part, that "test procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions."

Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50, states, in part, that "measures shall be established to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled and calibrated….to maintain accuracy within necessary limits."

TR Assembly and Test Procedure No. 9484, "Emergency Core Cooling System Valves Proof of Concept Assembly and Test Procedure," Revision 0, dated November 13, 2015, subsection 3.1, "Valve and Fixture Preparation," states, in part, that "indicating pressure gauges shall be calibrated prior to each test or series of tests, indicating pressure gauges shall have a range of not more than 4 times, and not less than one-and-one half times, the test pressure, all other measuring instruments shall be within normal calibration intervals, and all calibrations shall be traceable to the National Institute of Standards and Technology (NIST) when applicable."

Contrary to the above, as of May 18, 2018, TR failed to establish measures to assure that measuring and test instrumentation used during test activities affecting quality were adequately controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits. Specifically, TR failed to:

1. Control the traceability and calibration of a linear variable differential transducer (LVDT) used during POC test activities to measure the main valve disc position indications. TR did not control the LVDT under its calibration program.
2. Control the traceability and document the pre-test calibration of individual pressure transducers used during POC test activities of the ECCS valve to measure the inlet and outlet pressure, chamber pressure and inadvertent actuation block (IAB) valve pressure. TR did not control pressure transducers under their calibration program.
3. Control the traceability and document calibration status of the micrometer used for pre-test dimensional inspection of: (1) the arming valve disc position, (2) the main valve disc lift measurement, and (3) the IAB valve parts. TR did not control the micrometer under their calibration program.

This issue has been identified as Nonconformance 99900060/2018-201-02.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Electrical Vendor Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid noncompliances; and (4) the date when your corrective action will be completed. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible from the NRC Web site at http://www.nrc.gov/readingrm/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 Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Dated this 2nd day of July 2018.

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

Docket No.:	99900060	
Report No.:	99900060/2018-201	
Vendor:	Target Rock Division Curtiss-Wright Flow Control Company 1966E Broadhollow Road East Farmingdale, NY 11735-1768	
Vendor Contact:	Mr. John DeBonis, Quality Assurance Manager Phone: (631) 396-4429 jdebonis@curtisswright.com	
Background:	Target Rock, a business unit of Curtiss-Wright Flow Control Company, is an American Society of Mechanical Engineers (ASME) certificate holder with its scope of supply including, but not limited to, commercial-grade dedication (CGD), design, fabrication, assembly and testing of valves for safety-related applications for the commercial nuclear operating fleet.	
Inspection Dates:	May 14-18, 2018	
Inspection Team Leader:	Aaron Armstrong,	NRO/DCIP/QVIB-1
Inspectors:	Raju Patel Thomas Scarbrough	NRO/DCIP/QVIB-2 NRO/DEI/MEB
Approved by:	Terry W. Jackson, Chief Quality Assurance Vendor Inspection Branch-1 Division of Construction Inspection and Operational Programs Office of New Reactors	

EXECUTIVE SUMMARY

Target Rock
99900060/2018-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to verify that Target Rock (TR) implemented an adequate quality assurance (QA) program that complied with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities.”

This technically-focused inspection concentrated on implementation of TR’s QA program activities associated with the design, fabrication, and testing of the Emergency Core Cooling System (ECCS) proof of concept valve to provide reasonable assurance of the feasibility of a first-of-a-kind-engineering (FOAKE) design to support NuScale’s design certification application submittal activities.

During the inspection, the NRC inspection team reviewed TR’s preliminary design report, calculations, drawings and other design activities associated with the ECCS proof of concept valve. Further, the NRC inspection team observed the ECCS valve assembly set-up and test facility and also reviewed the final test report and test plan/procedure that TR submitted to NuScale.

This inspection was conducted at TR’s manufacturing facility in East Farmingdale, NY.

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

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

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, “Routine Inspections of Nuclear Vendors,” dated April 25, 2011.

The last NRC inspection of TR occurred in 2017, and identified Nonconformance 99900060/2017-202-01.

With the exception of the nonconformances described below, the NRC inspection team concluded that TR is effectively implementing its QA program in support of the design, manufacturing, and proof-of-concept (POC) testing of the ECCS valve. The results of this inspection are summarized below.

Design Control

The NRC inspection team issued Nonconformance 99900060/2018-201-01 in association with TR’s failure to implement the regulatory requirements of Criterion III, “Design Control,” of Appendix B to 10CFR Part 50. Nonconformance 99900060/2018-201-01 cites TR for failing to translate all pertinent design requirements as specified in the NuScale contract for the ECCS valve into their procedures and instructions. Specifically, TR failed to translate the NuScale’s requirements in TO No. 11, SW-1114-9480 certificate of conformance requirements in their ECCS valve POC assembly and test procedure TRP 9484. Further, TR did not submit a certificate of conformance for the ECCS valve POC testing services delivered to NuScale.

Test Control

The NRC inspection team issued Nonconformance 99900060/2018-201-02 in association with TR's failure to implement the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10CFR Part 50. Nonconformance 99900060/2018-201-01 cites TR for failing to ensure measuring and test equipment used during in test activities affecting quality were properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits. Specifically, TR did not: (a) control the traceability, the calibration status and calibration record of a linear variable differential transducer (LVDT) used for measuring the ECCS main valve disc position indication, (b) control the traceability, the calibration status and the pretest calibration records of individual pressure transducers used for measuring the inlet and outlet pressure, chamber pressure and inadvertent actuation block (IAB) valve pressure, (c) control the traceability and calibration status of the micrometer used for pre-test dimensional inspection of the arming valve disc position, the main valve disc lift measurement and the IAB valve parts.

Corrective Action

The NRC inspection team determined that objective evidence was insufficient to verify appropriate corrective actions have been implemented to support closure of the Nonconformance 99900060/2017-202-01 to Criterion VII for TR's dedications activities on a previous inspection. Nonconformance 99900060/2017-202-01 remains open.

REPORT DETAILS

1. Design Control

   a. Inspection Scope

   The NRC inspection team reviewed Target Rock's (TR's) policies and implementing procedures that govern the design control program to verify their 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 Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

   The NRC is reviewing NuScale's application that was submitted in accordance with 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," for certification of its small modular reactor design. During this inspection, the NRC inspection team focused on the design control activities for the NuScale emergency core cooling system (ECCS) valves being performed by TR. For example, the NRC inspection team reviewed the NuScale ECCS valve design requirements, including the NuScale Final Safety Analysis Report (FSAR), Revision 1, Section 6.3, "Emergency Core Cooling System," and NuScale Design Specification EQ-B020-2140, "ASME [American Society of Mechanical Engineers] Design Specification for Emergency Core Cooling System Valves."

   The NRC inspection team discussed with TR management and technical staff the design control program being implemented for the ongoing design process of the NuScale ECCS valves. In addition, the NRC inspection team reviewed Curtiss-Wright Procedure QMP1004, "Design Control," that establishes a system to control and verify the design of TR products to ensure that the specified requirements are met. The NRC inspection team reviewed a Failure Modes and Effects Analysis (FMEA) prepared by TR as part of the design process for the NuScale ECCS valves. The NRC inspection team also reviewed the proof-of-concept (POC) testing report performed by TR as part of the initial design development for the NuScale ECCS valves. The NRC inspection team conducted a visual examination of the prototype main valve and inadvertent actuation block (IAB) valve of the ECCS valve assembly that underwent POC testing. In addition, the NRC inspection team reviewed preliminary ASME design reports being prepared by TR in support of the design development for the NuScale ECCS valves. At this time, TR is manufacturing Engineering Test Valves to complete the design demonstration of the NuScale ECCS valves. In preparation for post-design activities, the NRC inspection team reviewed the qualification plan for the valve assembly in accordance with ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment used in Nuclear Power Plants."

   As part of the inspection activities, the NRC inspection team reviewed valve design drawings, calculations, analyses, and reports prepared by TR as part of the design control process for the NuScale ECCS valves.

   b. Observations and Findings

   During its review, the NRC inspection team identified an issue with the potential for the main valve of the ECCS valves to partially open, and then either fully open or close,

depending on conditions, that will need to be resolved as part of the completion of the design of the NuScale ECCS valves. As discussed in the Test Control section of this inspection report, the NRC inspection team identified issues with the traceability and reliability of the instrumentation used during the POC testing. The NRC inspection team identified aspects of the ECCS valve performance and conditions that will need to be addressed for use of the POC test results to support demonstration of the NuScale ECCS valve design. During this inspection, the NRC inspection team did not consider the design activities to have been fully completed to demonstrate the capability of the NuScale ECCS valve to perform its safety functions. However, the NRC inspection team found that the requirements for the ECCS valves in the TR documentation were consistent with the provisions in the NuScale FSAR and NuScale Design Specification.

The NRC inspection team noted that NuScale's contract Task Order (TO) No. 11, Statement of Work (SOW) SW-1114-9480, subsection 4.2, states in part, that, a certificate of conformance shall be provided for shipment/submittal of items or services delivered to NuScale and shall meet the following requirements: (1) identifies the purchase material, equipment, or service and is traceable to the NuScale procurement document assigned to the work and required deliverables; (2) identifies the specific procurement requirements met by the purchased material, equipment, or service (e.g., codes, standards, and other specifications); (3) identifies any procurement requirements that have not been met, together with an explanation and means for resolving the nonconformance(s); (4) is signed or otherwise authenticated by a person who is responsible for this QA function and whose function and position are described in the supplier's NuScale approved QA program; (5) has been generated in accordance with the certification system established by and described in the supplier's QA program; (6) certifies conformance with all requirements of the purchase order; (7) references the QA program and the title and revision/date of the QA manual utilized to fulfill the scope of the purchase order; and (8) is provided on the letterhead of the company to which the procurement document was issued.

The NRC inspection team reviewed the Target Rock Producer (TRP) 9484, to verify the certificate of conformance requirements of subsection 4.2 of TO No. 11 SW-1114-9480 were adequately translated, and noted that TRP 9484 did not establish such requirements for preparation and submittal of a certificate of conformance requirements for NuScale's review and approval. The NRC inspection team requested a copy of the certificate of conformance for the ECCS POC testing services provided to NuScale. The NRC inspection team learned that TR had not translated the requirements of TO No. 11 SOW and did not submit required information of the certificate of conformance for the ECCS POC testing to NuScale for review and approval as specified in TO No. 11 SW-1114-9480. The NRC inspection team and TR management discussed the status of the ECCS valve POC testing services and determined that both TR and NuScale had considered the ECCS valve POC testing services as completed without submitting to NuScale the required information for review and approval.

The NRC inspection team identified this issue as Nonconformance 99900060/2018-201-01 for TR's failure to transfer all pertinent design requirements into applicable test procedures and failing to submit the required information to NuScale for review and approval as specified in the contract requirements. TR initiated corrective action report (CAR) No. 18-117 to address this issue.

c. Conclusion

The NRC inspection team issued Nonconformance 99900060/2018-201-01 in associated with TR's failure to implement the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Nonconformance 99900060/2018/201-01 cites TR for failing to transfer all pertinent design requirements into applicable procedures and instructions and submitting documented objective evidence as specified in the safety-related contract requirements. Specifically, TR failed to translate NuScale's TO No. 11, SW-1114-9480 certificate of conformance requirements in its ECCS valve POC assembly and test procedure TRP 9484, and submit a certificate of conformance for the ECCS valve POC testing services delivered to NuScale for review and approval as specified in TO No. 11 SW-1114-9480.

2. Test Control

a. Inspection Scope

The NRC inspection team reviewed the policies and procedures that govern the implementation of TR's control of testing activities to verify compliance with the regulatory requirements in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

TR has been contracted by NuScale to design, fabricate and conduct proof of concept test for NuScale's ECCS valves to provide reasonable assurance of the feasibility of a first-of-a-kind-engineering (FOAKE) design to support NuScale's design certification application submittal activities.

The NRC inspection team reviewed NuScale Task Order (TO) No. 11, Revision 0, dated February 10, 2015, for Statement of Work SW-1114-9480, "Emergency Core Cooling System Valve Proof of Concept SOW," Revision 0, dated December 17, 2014, issued to TR. TO No. 11 is a safety-related, quality class Q contractual agreement issued to TR to conduct POC testing of the Reactor Recirculation Valve (RRV) and Reactor Vent Valve (RVV) of the ECCS for the NuScale reactor in accordance with NuScale's design specification.

Further, the NRC inspection team reviewed and discussed with TR's management team TRP 9484, "Emergency Core Cooling System (ECCS) Valves Proof of Concept Assembly and Test Procedure," Revision 0, dated November, 2015, and reviewed TR test report TRP 9785, "Proof of Concept Test Report for ECCS System Valves," Revision 0, dated December 14, 2015, that documented the POC test results.

b. Observation and Findings

TR performed POC testing of nuclear safety-related ECCS valves to demonstrate the feasibility of a FOAKE design to support NuScale's design certification application. The testing was performed using two valves that make up the ECCS valves, Reactor Recirculation Valve (RRV) and the Reactor Vent Valve (RVV) which includes all the piping, plus the associated control and data acquisition system. The POC testing consist of 4 tests that include: (1) Minimum reset pressure test; (2) Main valve opening test; (3) Arming valve operational pressure test; and, (4) Main valve operational test. The tests are to be performed using fresh water and air and repeated 5 times. The TR assembly and test procedure specifies the measuring and test equipment (M&TE)

calibration requirements, test pressure tolerances and test fluid requirements to meet ASME NQA-1 Table 304.1 for fresh water. Further, the TRP 9484 states that a test technician conduct pre-test dimensional inspection of the arming valve disc seat in fully seated position and the main valve disc lift and, an Linear Vertical Differential Transducer (LVDT) to be installed as a position indicator in lieu of magnetic reed position switch to allow for detailed data acquisition of the valves main disc stroke as a function of time.

The NRC inspection team reviewed the test report TRP 9785 and associated test results on TRP 9484, that documents the pre-test dimensional measurement of: (1) the arming valve disc in fully seated position, (2) the main valve disc lift using micrometer, and, (3) the main valve disc open and close position indication marks using a LVDT and pressure results for each test for each medium used on the datasheet. During the inspection, the NRC inspection team identified that the traceability and the calibration status of the micrometer, LVDT and individual pressure transducers used as part of the POC testing activity were not documented on the test datasheets. The gage calibration boxes in the TRP were crossed out. The TRP only documented the serial number and the calibration due date of the standard dead weight tester and the ASTROMED data acquisition recorder.

Further, the NRC inspection team learned that TR had documented the wrong serial number of the dead weight tester. During discussions with TR management, the NRC inspection team learned that TR had no documented objective evidence of: (1) the control of the traceability of each individual pressure transducer used and their pre-test calibration records, (2) the control of the traceability and calibration history of the LVDT under their calibration program, and (3) the traceability and calibration status of the micrometer used for pre-test measurements. The NRC inspection team identified this issue as Nonconformance 99900060/2018-201-02, for TR's failure to establish controls to ensure that the M&TE used during the safety-related ECCS valve POC testing activities affecting quality were controlled, calibrated and adjusted at specified periods to maintain accuracy within necessary limits. TR initiated CAR No. 18-118 to address this issue.

c. Conclusion

The NRC inspection team issued Nonconformance 99900060/2018-201-02 in association with TR's failure to implement the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Nonconformance 99900060/2018-201-02 cites TR for failing to establish controls to ensure that the measuring and test instrumentation used during test activities affecting quality were adequately controlled, calibrated and adjusted at specified periods to maintain accuracy within necessary limits.

3. Corrective Action

a. Inspection Scope

The NRC inspection team reviewed TR's policies and implementing procedures that govern the implementation of the control of corrective actions to verify compliance with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

b. Observation and Findings

Corrective Action Associated with Nonconformance 99900060/2017-202-01

Following the March 2017 inspection of TR, the NRC issued Nonconformance 99900060/2017/202-01 for TR's failure to establish measures that included provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, or examination of products upon delivery. Specifically, TR failed to conduct commercial-grade surveys or use another verification method to verify the critical characteristics, that, when verified, provide reasonable assurance that items and services will perform their intended safety function.

In a follow-up response dated May 22, 2017, TR stated the cause of the Nonconformance was that the format and content of the commercial-grade (CG) survey records/ checklists (which were titled as "Audit Reports") did not provide the specific requirements for documenting the objective evidence reviewed. The checklist did not stress CG survey performance, but rather program audit performance. TR stated that as corrective steps, Engineering will review each critical characteristic attribute verification (CCAV) sheet Method 2 critical characteristic. All CCAV sheets will be reviewed by a second engineer to ensure all the item's critical characteristics are now verified on the CCAV sheet. All Method 2 CCAV sheets will be reviewed and revised by August 31, 2017. Further, TR stated that Quality Assurance will revise the CG survey plans to include checklists based on the revised Method 2 characteristics/verification identified on the CCAV sheets. The revised checklist shall emphasize the identification and documentation of the objective evidence reviewed and will emphasize survey performance. TR stated this action would be completed by September 15, 2017.

During this inspection, the NRC inspection team verified the corrective actions that TR took to address the Nonconformance documented in Inspection Report No. 99900060/2017-202, dated April 24, 2017. Based on review, the NRC inspection team concluded that TR corrective action taken to address NON 99900060/2017-202-01, did not have sufficient objective evidence to support closure of the NON 99900060/2017-201-01, hence, the NRC inspection team considers the NON still open.

c. Conclusions

The NRC inspection team determined that objective evidence is insufficient to verify appropriate corrective actions have been implemented to support closure of the Nonconformance 99900060/2017-202-01. Nonconformance 99900060/2017-202-01 remains open.

4. Entrance and Exit Meetings

On May 14, 2018, the NRC inspection team presented the inspection scope during an entrance meeting with Mr. Steve Pauly, TR Vice President – Energy Products, and other members of TR management and technical staff. On May 18, 2018, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Steve Pauly, TR Vice President – Energy Products, and other members of TR's management and technical staff.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

Name	Title	Affiliation	Entrance	Exit	Interviewed
Michael Cinque	General Manager	Target Rock	X	X	X
Steve Pauly	Vice President – Energy Products	Target Rock	X	X	
Jim Whide	Senior General Manager	Target Rock		X	
Alex Dimeo	Director, QA	Target Rock	X	X	X
Michael Grant	Director, Operations	Target Rock	X		
Nick Campanelli	Director of Engineering	Target Rock		X	
John DeBonis	QA Manager	Target Rock	X	X	X
Joseph Simonetti	Engineering Manager	Target Rock	X		X
Brian Maher	QC Manager	Target Rock	X	X	
Garrett Yablonski	Manufacturing Engineering Manager	Target Rock	X	X	
Robert Lowery	Design Engineer	Target Rock	X	X	X
William Velkoff	Design Engineering Manager	Target Rock	X	X	X
Michelle Moore	Program Manager	Target Rock	X	X	
Jim Baccoli	Supply Chain Manager	Target Rock			X
Ed Bradshaw	Director of Program Management	Target Rock	X		X
Dolores Fantz	Contracts Administrator	Target Rock	X		X
Sujith Kurian	Quality Assurance Engineer	Target Rock	X	X	
James Arena	Purchasing Supervisor	Target Rock	X		
Zach Sanzo	Welding Manager	Target Rock	X		
Scott Schoeps	Assembly Manager	Target Rock	X		
Hugh O'Brien	Chief Engineer	Target Rock		X	X
Al Connelly	Calibration Technician	Target Rock			X
Louis E. Greaux	Contracts Manager	Target Rock	X		X

Name	Title	Affiliation	Entrance	Exit	Interviewed
Aaron Armstrong	Inspection Team Leader	NRC	X	X	
Thomas Scarbrough	Inspection Team Member	NRC	X	X	
Raju Patel	Inspection Team Member	NRC	X	X	
Kerri Kavanagh	NRO Branch Cheif	NRC		X*	

* On phone call

2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017

IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012

3. ITEMS OPENED, CLOSED, AND DISCUSSED:

Item Number	Status	Type	Description
99900060/2018-201-01	Open	NON	Criterion III
99900060/2018-201-02	Open	NON	Criterion XI
99900060/2017-202-01	Open	NON	Criterion VII

4. DOCUMENTS REVIEWED:

NuScale Documents

NuScale Final Safety Analysis Report, Tier 2, Section 6.3, "Emergency Core Cooling System," Revision 1

NuScale Design Specification EQ-B020-2140, "ASME Design Specification for Emergency Core Cooling System Valves," Revision 3, dated February 14, 2018

NuScale Task Order Agreement No. CO-1012-2074, Revision 0, for task order (TO) 1, "Category I Valve Concept Study and Preliminary Design," Revision 0, dated October 17, 2012, on TR Project No. 127527

NuScale contract for TO 4, "Emergency Core Cooling System Valve Design SOW," Revision 0, dated September 20, 2013, on TR Project No.14Z506

NuScale contract for TO 11, "ECCS Valve Proof of Concept Statement of Work," Revision 0, dated February 10, 2015, on TR Project No. 15Z501(11)

NuScale contract for TO 12, “ECCS Phase 2 Review Statement of Work,” Revision 0, dated October 2, 2015, on TR Project No. 15Z501(12)

NuScale contract for TO 13, “Primary Valve Seismic Update,” Revision 0, dated February 9, 2016, on TR Project No. 16Z540

NuScale contract for TO 16, “Emergency Core Cooling System Valve Detailed Design Statement of Work,” Revision 2, dated March 2, 2017, on TR Project No. 17Z503

NuScale contract for TO 20, “Fabrication of ECCS Engineering Test Valves,” Revision 0, dated March 26, 2018, on TR Project No. 18Z509 and 18E

NuScale Engineering Change Notice, ECN-A011-6107, “Modification of Upper RPV Drawing to Incorporate Bolted ECCS Main Valves,” Revision 2, dated February 12, 2018

Policy and Procedures

Quality Management Procedure (QMP) 1004, “Design Control,” Revision 1, August 14, 2017

QMP-1010, “Inspection and Testing,” Revision H, October 1, 2013

QMP 1013, “Control of Nonconforming Product,” Revision M, March 17, 2013

QMP 1014, “Corrective and Preventive Action,” Revision I, August 21, 2017

QMP-1018, “Training,” Revision C, December 10, 2009

QMP-1023, “Energy Products Nuclear Quality Assurance Manual, Edition 10,” Revision 1, October 27, 2016

TR procedure (TRP) 5464, “Calibration Procedure for Timing Marker – ASTRO-MED Dash & Chart Recorder,” Revision B, June 13, 2001

TRP 9484, “Emergency Core Cooling System Valves Proof of Concept Assembly and Test Procedure,” Revision 0, dated November 3, 2015

Target Rock Plans and Analyses

NuScale Engineering Report (ER)-B020-6113, “ECCS Valve Subcomponent Level FMEA,” Revision 0, dated January 26, 2018, forwarding Curtiss-Wright Target Rock Report No. 9969, “Subcomponent Level Failure Modes and Effects Analysis (FMEA) of the NuScale ECCS Valve System,” Revision A, dated January 25, 2018.

NuScale ER-B020-6117, “ECCS Valve Qualification Plan,” Revision 0, dated March 27, 2018, forwarding Curtiss-Wright Target Rock Report No. 9986, “Qualification Plan for NuScale Emergency Core Cooling System Valves,” dated March 22, 2018.

Target Rock Drawings

NuScale Engineering Drawing (ED)-B020-2617, “Reactor Vent Valve Drawing,” Revision 1, dated March 29, 2018, forwarding Target Rock Drawing No. ECCS-RVV-001, “Reactor Vent Valve (RVV) Assembly, Pilot Operated, Fail Open, On/Off, NPS 5 Class 2500, Flanged,” Revision 2, dated September 15, 2017.

NuScale ED-B020-2650, “Reactor Recirculation Valve Drawing,” Revision 1, dated March 29, 2018, forwarding Target Rock Drawing No. ECCS-RRV-001, “Reactor Recirculation Valve (RRV) Assembly, Pilot Operated, Fail Open, On/Off, NPS 2 Class 2500, Flanged,” Revision 2, dated September 15, 2017.

NuScale ED-B020-5679, “Inadvertent Actuation Block Drawing,” Revision 1, dated March 29, 2018, forwarding Target Rock Drawing No. ECCS-IAB-001, “IAB Valve Assembly,” Revision 2, dated September 15, 2017.

NuScale ED-B020-2651, “Trip and Reset Valves Drawing,” Revision 1, dated March 29, 2018, forwarding Target Rock Drawing No. ECCS-TRV-001, “Trip/Reset Valve (TRV) Assembly, On/Off, NPS 3 Schedule 160 BW Connection,” Revision 2, dated September 15, 2017.

NuScale ED-B020-5690, “Single Trip Valve Drawing,” Revision 1, dated March 29, 2018, forwarding Target Rock Drawing No. ECCS-TV-001, “Trip Valve (TV) Assembly, On/Off, NPS 3 Schedule 160 BW Connection,” Revision 2, dated September 15, 2017.

Target Rock Reports

Engineering Report (ER)-B0202-3817, “Proof of Concept Test Report for Emergency Core Cooling (ECC) System Valves,” Revision A, dated December 18, 2015, forwarding Curtiss-Wright Target Rock Report 9785, Revision 0, dated December 14, 2015.

ER-B020-6052, “ECCS RVV Diffuser Report,” Revision 0, dated March 5, 2018, forwarding Curtiss-Wright Target Rock Report No. 9967, “NuScale ECCS RVV Diffuser Report,” Revision A, dated February 15, 2018.

ER-B020-6289, “ECCS Valve Description,” Revision 0, dated March 27, 2018, forwarding Curtiss-Wright Target Rock Report No. 10013, “System Description and Summary Report for Detail Design of the Emergency Core Cooling (ECC) System Valves,” Revision A, dated March 9, 2018.

ER-B020-6230, “Preliminary ASME Design Report for RRV,” Revision 0, dated March 29, 2018, forwarding Curtiss-Wright Target Rock Report No. 9994, “ASME Design Report for Target Rock Valve Model ECCS-RRV-001 Code Class 1,” Revision 0, dated February 20, 2018.

ER-B020-6306, “Preliminary ASME Design Report for RVV,” Revision 0, dated March 29, 2018, forwarding Curtiss-Wright Target Rock Report No. 10021, “ASME Design Report for Target Rock Valve Model ECCS-RVV-001 Code Class 1,” Revision 0, dated March 9, 2018.

ER-B020-6307, “Preliminary ASME Design Report for Pilot Valves,” Revision 0, dated March 29, 2018, forwarding Curtiss-Wright Target Rock Report No. 10018, “ASME Design Report for Target Rock Valve Models ECCS-TRV-001 and ECCS-TV-001 Code Class 1,” Revision 0, dated February 26, 2018.

Target Rock Calculations

Calculation, “NuScale ECCS Inadvertent Actuation Block (IAB) Valve Force Balance Calculation for Valve Model ECCS-IAB-001,” Revision 0, dated January 9, 2018.

Calculation, “NuScale ECCS Reactor Recirculation Valve (RRV) Force Balance Calculation for Target Rock Valve Model ECCS-RRV-001,” Revision 0, dated January 9, 2018.

Calculation, “NuScale ECCS Reactor Vent Valve (RVV) Force Balance Calculation for Target Rock Valve Model ECCS-RVV-001,” Revision 0, dated January 9, 2018.

Calculation, “Temperature Coefficient of Expansion Calculations for ECCS-RRV-001,” dated July 14, 2017, ECCS-RVV-001, dated June 14, 2017, ECCS-IAB-001, dated July 6, 2017; ECCS-TRV-001 and ECCS-TV-001, dated September 15, 2017.

Calculation, “NuScale IAB Sizing Calculation,” dated June 20, 2017.

Calculation, “NuScale RRV Sizing Calculation,” dated March 31, 2017.

Calculation, “NuScale RVV Sizing Calculation,” dated March 31, 2017.

Calculation, “NuScale ECCS Main Valve Pressure-Temperature Rating and Hydrostatic Test Pressure Calculations,” Revision 0, dated May 9, 2017.

Calculation, “NuScale ECCS Actuators (Trip/Reset Valves) Pressure-Temperature Rating and Hydrostatic Test Pressure Calculations,” Revision 0, dated May 9, 2017.

Calculation, “NuScale ECCS Reactor Recirculation Valve (RRV) Bonnet Bolting Calculation for Target Rock Valve Model ECCS-RRV-001, Revision 0, dated October 31, 2017.

Nonconformance and Corrective Action Reports

TR Corrective Action Request (CAR) No. 18-117, 18-118, 18-119 and 18-1120

Calibration Certificates

Certificate of Calibration for TR 7053, “Conductivity Meter,” calibrated by MCS Calibration Inc., dated April 19, 2018

Certificate of Calibration for TR 7341, “ASTROMED Digital Recorder,” calibrated by MCS Calibration Inc., dated August 15, 2017

Certificate of Calibration for TR 6350, “dead weight tester,” model No. 451 calibrated by MCS Calibration Inc., dated April 1, 2015, at the time of ECCS valve POC test activity

Miscellaneous Documents

Certificate of Qualification for Christopher McAndrews –Test technician dated April 22, 2016 with eye exam dated April 2018

Certificate of Qualification for All Connolly, Calibration technician dated September 13, 2016, due September 13, 2019

TR internal water chemistry log from August 31, 2015 through November 30, 2015, documenting pH values of water quality used during ECCS valve POC test.

5. Corrective Actions Issued during Inspection

CAR No. 18-117, 18-118, 18-119 and 18-120

6. ACRONYMS USED:

ASME	American Society of Mechanical Engineers
CAR	Corrective Action Request
CQVIB	Quality Assurance Vendor Inspection Branch
CFR	*Code of Federal Regulations*
DCIP	Division of Construction Inspection and Operational Programs
ECCS	Emergency Core Cooling System
ECN	Engineering Change Notice
FOAKE	First of a Kind Engineering
IAB	Inadvertent Actuation Block
IP	Inspection Procedure
LVDT	linear variable differential transducer
NON	Notice of Nonconformance
NQA-1	Nuclear Quality Assurance - 1
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
POC	Proof of Concept
QA	Quality Assurance
QMP	Quality Management Procedure
RRV	Reactor Recirculation Valve
RVV	Reactor Vent Valve
SOW	Statement of Work
TO	Task Order
TOA	Task Order Agreement
TR	Target Rock
TRP	Target Rock Procedure
TRV	Trip/Reset Valve
TV	Trip Valve
US	United States (of America)