

RS-24-078

10 CFR 50.55a

August 20, 2024

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Alternative Request RV-08, Revision 1, Associated with Safety Relief Valve Testing Interval

- References:
1. Letter from P. R. Simpson (Constellation Energy Generation, LLC) to U.S. NRC, "Submittal of Relief Requests Associated with the Sixth Inservice Testing Interval," dated February 17, 2022
 2. Letter from N. L. Salgado (U.S. NRC) to D. P. Rhoades (Constellation Energy Generation, LLC), "Quad Cities Nuclear Power Station, Units 1 and 2 – Proposed Alternative to the Requirements of the ASME OM Code (EPID L-2022-LLR-0017)," dated November 9, 2022

In Reference 1, Constellation Energy Generation, LLC (CEG) submitted an alternative request to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with the sixth 10-year inservice testing (IST) interval at Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS). Specifically, CEG requested to implement alternative RV-08 for the testing interval of the QCNPS Target Rock safety relief valves on the basis that the proposed alternative provides an acceptable level of quality and safety. The proposed alternative extended the required test sampling interval for these valves from 24 months to 48 months from the date of the as-left set pressure test. The NRC authorized use of alternative request RV-08 for the sixth 10-year IST interval at QCNPS in Reference 2.

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (z)(1), CEG requests NRC approval of the attached Revision 1 to alternative request RV-08 for the QCNPS Target Rock safety relief valves. Revision 1 of RV-08 retains the 48 month test sampling interval that was previously authorized in Reference 2, but alters the start date of the 48 month interval such that it starts upon installation in the plant rather than on the date of the as-left set pressure test.

The revision is necessary to provide flexibility for performing as-left testing and to accommodate the time when a valve is in storage following the set pressure test until installation in the plant. This change aligns with the original ASME OM Code requirement to test the valves at least once every five years from the date of the as-left set pressure test and CEG's plan to replace the Target Rock safety relief valve on each unit every other refueling outage.

CEG requests approval of this request by February 20, 2025, to support the upcoming Unit 1 refueling outage, which is currently scheduled to start March 10, 2025.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Ken Nicely at (779) 231-6119.

Respectfully,

Mark Humphrey
Sr. Manager Licensing
Constellation Energy Generation, LLC

Attachment: Quad Cities Nuclear Power Station 10 CFR 50.55a Request RV-08, Revision 1

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector – QCNPS

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Proposed Alternative to the ASME OM Code to Revise Main Steam Relief/Safety Valve (MSRV) "Group of One" Testing Interval in Accordance with 10 CFR 50.55a(z)(1), "Alternative Provides Acceptable Level of Quality and Safety"

1. ASME Code Components Affected

Component Number	System	Code Class	Category
1-0203-003A	Main Steam	1	C
2-0203-003A	Main Steam	1	C

2. Applicable Code Edition and Addenda

American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), 2017 Edition with no Addenda.

3. Applicable Code Requirements

ASME OM Code, Division 1, Mandatory Appendix I, "Inservice Testing of Pressure Relief Devices in Water-Cooled Reactor Nuclear Power Plants," paragraph I-1320, "Test Frequencies, Class 1 Pressure Relief Valves," states:

- (a) *5-Yr Test Interval.* Class 1 pressure relief valves shall be tested at least once every 5 yr, starting with initial electric power generation. No maximum limit is specified for the number of valves to be tested within each interval; however, a minimum of 20% of the valves from each valve group shall be tested within any 24-month interval. This 20% shall consist of valves that have not been tested during the current 5-yr interval, if they exist. The test interval for any installed valve shall not exceed 5 yr. The 5-yr test interval shall begin from the date of the as-left set-pressure test for each valve.
- (b) *Replacement With Pretested Valves.* The Owner may satisfy testing requirements by installing pretested valves to replace valves that have been in service, provided that
 - (1) for replacement of a partial complement of valves, the valves removed from service shall be tested prior to resumption of electric power generation or
 - (2) for replacement of a full complement of valves, the valves removed from service shall be tested within 12 months of removal from the system

4. Reason for Request

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (z)(1), Constellation Energy Generation, LLC (CEG) proposes an alternative to the requirement of ASME OM Code Division 1, Mandatory Appendix I, subparagraph I-1320(a). Specifically, the

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proposed alternative changes the test sampling interval, which requires a minimum of 20% of the valves from each valve group to be tested, for the MSRVs listed above from 24 months to 48 months. The proposed alternative does not alter the requirement to test Class 1 pressure relief valves at least once every five years beginning from the date of the as-left set pressure test for each valve. In addition, the proposed alternative does not alter the requirement of subparagraph I-1320(b)(2) to test valves removed from service within 12 months of removal from the system. The basis of this request is that an MSRV set pressure performance assessment supports the conclusion that the proposed alternative would provide an acceptable level of quality and safety.

At Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2, there is a single Target Rock 3-Stage, Model 74-67F, safety relief valve installed on each unit's Main Steam lines inside the drywell. This valve is classified into an Inservice Testing (IST) program valve group that includes only this valve (i.e., a group of one on each unit). Per the requirements of ASME OM Code, Division 1, Mandatory Appendix I, subparagraph I-1320(a), this valve is assigned a five-year testing interval (i.e., beginning from the date of the as-left set pressure test) and is required to be tested every outage in order to comply with the additional requirements that a minimum of 20% of the valves in each group are tested every 24 months. QCNPS Units 1 and 2 are currently operating on 24-month refueling cycles. The QCNPS Units 1 and 2 Target Rock safety relief valves have continued to show reliable set pressure test performance as described in Section 5 below.

In Reference 1, the NRC authorized a proposed alternative for QCNPS that extended the required test sampling interval from 24 months to 48 months from the date of the as-left set pressure test. Revision 1 of proposed alternative RV-08 retains the 48 month test sampling interval that was previously authorized in Reference 1, but alters the start date of the 48 month interval such that it starts upon installation in the plant rather than on the date of the as-left set pressure test. The revision is necessary to provide flexibility for performing as-left testing and to accommodate the time when a valve is in storage following the set pressure test until installation in the plant. This change aligns with the original ASME OM Code requirement to test the valves at least once every five years from the date of the as-left set pressure test and CEG's plan to replace the Target Rock safety relief valve on each unit every other refueling outage. As discussed above, the proposed alternative does not alter the requirement to test the valves at least once every five years beginning from the date of the as-left set pressure test for each valve.

A performance assessment of the QCNPS Units 1 and 2 Target Rock safety relief valves concluded that there is reasonable assurance that each valve will retain the set pressure within the required drift tolerances after extending the test sampling interval from 24 months to 48 months. Extending the MSRV test sampling interval from 24 to 48 months will permit testing the Target Rock safety relief valves every other refueling outage with a corresponding reduction in occupational radiological dose incurred during the valve removal, testing, and re-installation maintenance activities.

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5. Proposed Alternative and Basis for Use

CEG proposes that the ASME OM Code, Division 1, Mandatory Appendix I, subparagraph I-1320(a) minimum test sampling interval for the group of one MSR/V be extended from 24 months to 48 months for each valve. The proposed alternative does not alter the requirement to test Class 1 pressure relief valves at least once every five years beginning from the date of the as-left set pressure test for each valve. In addition, the proposed alternative does not alter the requirement of subparagraph I-1320(b)(2) to test valves removed from service within 12 months of removal from the system.

A fleet-wide CEG Safety and Relief Valve (SRV) Best Practices Maintenance Program was implemented in 2010 with several enhancements incorporated between 2010 and 2014 that resulted in improved MSR/V setpoint drift performance. QCNPS, Units 1 and 2, is included as part of this fleet-wide program. Continued improvements to this program further increase the MSR/V reliability.

The SRV Best Practices Maintenance Program is comprised of methods and philosophies concerning maintenance, inspection and techniques which uses the equipment manufacturer's recommended maintenance practices and enhancements identified by CEG that have been broadly termed "Best Practices." The MSR/V best practices are developed from the application of the EPRI/NMAC Safety and Relief Valve Testing and Maintenance Guide (i.e., Reference 2) and from CEG (formerly Exelon) operational experience. The MSR/V best practices have been implemented through CEG's oversight of the valve vendor's test and rebuild processes. Major program elements include specific performance and inspection criteria and maintenance steps that exceed original equipment manufacturer (OEM) specifications and/or industry established guidelines. The main program elements include: (1) spring testing, (2) lapping techniques and tools, (3) set pressure adjustment methodology precision, (4) average delay time (ADT) trending, and (5) internal component condition variations. Collectively, use of these elements has supported a trend in improved setpoint retention of MSR/Vs in service at QCNPS.

An engineering program document has been established to provide governance over the CEG-approved vendor SRV maintenance procedures, to define the program elements, and to establish performance tracking and trending guidelines. This program document and the CEG-approved vendor procedures are updated to incorporate advances in technology and operating experience from the CEG fleet, the OEM, and the industry. Major elements of the program are further described below.

Spring Testing

Spring testing is performed periodically based on valve type. The SRV Best Practices Maintenance Program requires that the spring characteristics meet physical dimension requirements that are tighter than previous acceptance criteria based on CEG operating experience. This has minimized spring compression rate variations.

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Lapping Techniques and Tools

The lapping technique includes multiple lapping passes that develop tighter tolerances using a CEG-designed lapping tool based on internal fleet operating experience. The SRV Best Practices Maintenance Program requires this additional lapping to meet the tighter seat leakage tightness criteria. This technique has minimized variation of the seat-to-disk surfaces.

Set Pressure Adjustment Methodology Precision

The SRV set pressure adjustment process includes a spring adjustment factor methodology for the first set pressure adjustment. The SRV Best Practices Maintenance Program includes a calculated spring adjustment factor based on the SRV set pressure adjustment during the pre-certification testing and CEG operating experience. A more accurate set pressure adjustment is obtained with fewer lifts and will minimize introducing variations of the seat-to-disk surfaces.

Average Delay Time (ADT) Trending

For the Target Rock 3-Stage MSRVs, the ADT measures the time between the pilot valve opening and the main disk opening. The SRV Best Practices Maintenance Program has trended the ADTs for the Target Rock 3-Stage MSRVs for determining if additional maintenance should be performed. The program includes a tighter tolerance than the industry standard criteria for ADT. An SRV with an ADT value outside this criterion is further evaluated for additional maintenance prior to installation.

Internal Component Condition Variations

The SRV inspection and maintenance processes include additional inspections for internal components with criteria that are more restrictive than previous acceptance criteria based on internal fleet operating experience. Specifically, for the Target Rock 3-Stage MSRVs, tighter tolerances are applied to the pilot abutment and preload gaps which reduce the likelihood of vibration-induced seat leakage caused by pressure transients.

In addition, CEG's procedural guidance for the Best Practices Maintenance Program assigns the fleet safety relief valve (SRV) Program Engineer the following responsibilities:

- Develop, implement, and update the SRV Best Practices Maintenance Program;
- Maintain awareness of industry SRV issues;
- Identify and investigate opportunities for program improvements;
- Interface with the Electric Power Research Institute (EPRI), Safety Relief Valve Users Group (SRVUG), and Target Rock Users Group (TRUG).

Additionally, the procedure recommends attendance at the annual SRVUG and TRUG meetings as a means of staying current with industry experience. These practices ensure

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the latest industry experience is identified, evaluated, and captured, as appropriate, in the Best Practices Maintenance Program.

CEG has performed an assessment pertaining to the performance of the QCNPS, Units 1 and 2, Target Rock MSRVs. The MSRV setpoint drift performance of the QCNPS, Units 1 and 2, MSRVs has steadily improved due to this enhanced maintenance program. This assessment concluded that there is reasonable assurance that each MSRV will retain the set pressure within the required drift tolerances after extending the test sampling interval to a proposed 48-month interval.

This assessment reviewed as-left/as-found set pressure data going back to 1998 and identified: (1) whether the valves' set pressure drifted up or down, and (2) the absolute set pressure change between tests. Based on the time between the as-left and as-found set pressure test of each MSRV, the set pressure drift was then linearly extrapolated to determine whether the MSRV's set pressure would still be within the required $\pm 3.0\%$ tolerance following a 48-month period. An evaluation concluded that use of linear extrapolation provides the best mathematical approach.

Since 2014, 10 QCNPS, Units 1 and 2, valves were removed and as-found tested, and using the linear extrapolation method, all valves were projected to have lift setpoints within the $\pm 3.0\%$ set pressure tolerance. Table RV-08-1 summarizes historical set pressure test performance, in years of service, predicting when each MSRV would exceed the $\pm 3.0\%$ set pressure tolerance for MSRVs removed and tested since 2014.

Table RV-08-1:
MSRV Setpoint Performance Projection

Year As-Found Tested	Setpoint Performance Projection in Years
2014	4.4
2015	21.6
2016	18.2
2017	172.2
2018	25.9
2019	35.8
2020	10.2
2021	140.8
2022	27.3
2023	22.1

The improved valve performance can be attributed to implementation of the SRV Best Practices Maintenance Program which requires that all valves be disassembled and

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inspected prior to as-left testing and installation. CEG will continue to disassemble and inspect each subject MSRV following as-found set pressure testing to verify that parts are free of defects resulting from time-related degradation or service-induced wear. Each valve shall be disassembled and inspected prior to as-left testing and installation in accordance with the SRV Best Practices Maintenance Program.

Extending the test sampling interval from 24 months to 48 months (i.e., from the date of installation in the plant), while maintaining the requirement to test the valves at least once every five years beginning from the date of the as-left set pressure test for each valve, is viewed as acceptable based upon past performance and a mathematical evaluation which shows that the QCNPS Target Rock safety relief valves can maintain their setpoint within tolerance over a 48-month period. This proposed alternative to the test sampling requirements will also contribute to the principals of maintaining radiation dose As Low As Reasonably Achievable (ALARA).

Using recent dose measurements associated with QCNPS, Units 1 and 2, MSRV removal and replacement, the average radiological exposure incurred per valve has been 0.54 rem. Extending the MSRV test sampling interval from 24 to 48 months would allow extending the schedule of testing of the MSRV on each unit from every refueling outage to every other refueling outage, potentially providing a reduction of two MSRVs tested every ten years per unit. This amounts to a potential radiological exposure savings of approximately 2 rem for the station over a ten-year IST interval.

Since 2014, CEG has been collecting, trending, and analyzing SRV test, maintenance, inspection, and performance data across the fleet. Trending and analyzing data between the stations, which have the same SRV model, reduces the effective maximum elapsed time between the same model SRV tests (i.e., in this case Target Rock 3-Stage SRV Model 67F at Dresden Nuclear Power Station, Peach Bottom Atomic Power Station, and QCNPS). The SRV Best Practices Maintenance Program establishes the tracking and trending guidelines for maintaining this effort.

Based on the application of the SRV Best Practices Maintenance Program, the past performance of the MSRVs at QCNPS, and a mathematical evaluation of valve performance, there is reasonable assurance that each MSRV will remain within the setpoint tolerance over the extended 48-month test sampling interval.

If an as-found set pressure test result failure were to occur, the failure would be documented in CEG's Corrective Action Program and the requirements of I-1320(c) would be followed. This guidance states in part:

The Owner shall evaluate the cause and effect of valves that fail to comply with the set-pressure acceptance criteria...Based upon this evaluation, the Owner shall determine the need for testing in addition to the minimum tests...to address any generic concerns that could apply to valves in the same or other valve groups.

Actions determined by the evaluation would be taken to address the failure. Returning the valve to a 24-month test sampling interval may be optionally implemented based on the failure and evaluation, but is not required.

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In summary, the proposed alternative provides an acceptable level of valve operational readiness, provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1), and provides for reduced occupational radiological exposure.

6. Duration of Proposed Alternative

The proposed alternative will be utilized for the entire sixth 120-month IST Program interval, which began on August 18, 2023, and is scheduled to end on July 17, 2033.

7. Precedent

See Reference 1 below.

8. References

1. Letter from N. L. Salgado (U.S. NRC) to D. P. Rhoades (Constellation Energy Generation, LLC), "Quad Cities Nuclear Power Station, Units 1 and 2 – Proposed Alternative to the Requirements of the ASME OM Code (EPID L-2022-LLR-0017)," dated November 9, 2022
2. Electric Power Research Institute | Nuclear Maintenance Applications Center (EPRI/NMAC) Safety and Relief Valve Testing and Maintenance Guide, Revision of TR-105872, Technical Report 3002005362, August 2015