

January 10, 2019

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U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Docket No. 50-395
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SOUTH CAROLINA ELECTRIC & GAS COMPANY
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
RELIEF REQUEST RR-4-19, USE OF A PERFORMANCE BASED TESTING FREQUENCY
FOR CHECK VALVES AS AN ALTERNATIVE TO THE REQUIREMENTS OF THE
AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE FOR OPERATION AND
MAINTENANCE OF NUCLEAR POWER PLANTS

Reference 1: Virgil C. Summer Nuclear Station (VCSNS) Unit 1 Relief Request RR-4-14, Use of A Performance Based Testing Frequency for Pressure Isolation Valves As An Alternative To The Requirements Of The American Society Of Mechanical Engineers Code For Operation And Maintenance Of Nuclear Power Plants (ML18282A046).

Reference 2: Safety Evaluation by The Office of Nuclear Reactor Regulation for V.C. Summer Relief Request Regarding The Use Of A Performance Based Testing Frequency For Pressure Isolation Valves, dated December 17, 2018 (ML18345A060).

In accordance with the provisions of 10 CFR 50.55a(z)(1), South Carolina Electric & Gas Company (SCE&G), acting for itself and as an agent for South Carolina Public Service Authority (Santee Cooper) hereby submits the attached request for using an alternative to the inservice testing requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance (O&M) of Nuclear Power Plants. SCE&G has determined that the proposed alternative would provide an acceptable level of quality and safety.

SCE&G submitted a relief request for the use of a performance based testing frequency for pressure isolation valves (PIV) (Reference 1). The NRC approved this request and issued the safety evaluation (Reference 2). SCE&G is submitting this relief request to include two check valves which are tested in parallel with two of the PIVs that were changed to a performance based frequency. This will align the check valve testing with the PIV performance based testing frequency. Additionally, SCE&G is requesting relief from certain Check Valve Condition Monitoring requirements which would prevent the station from immediately extending the PIV and Check Valve testing frequency to every third outage.

A detailed description of the proposed alternative, including basis for relief, is enclosed with this letter. SCE&G requests NRC review and approval of this request by **October 5, 2019** to support planning for refueling outage (RF-25), which is scheduled to start in the Spring of 2020.

Should you have any questions, please call Michael S. Moore at (803) 345-4752.

Sincerely,

George A. Lippard
Site Vice President
V.C. Summer Nuclear Station

Commitments contained in this letter: None

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Concurrences:

See Correspondence Routing and Approval CHOP Sheet

Verification of Accuracy

TBD

Action Plan:

None

Changes to the UFSAR, USAR, QA Topical Report, ISFSI FSAR, DSAR or PSDAR:

None

Enclosure 1

**RELIEF REQUEST RR-4-19, USE OF A PERFORMANCE BASED TESTING
FREQUENCY FOR CHECK VALVES AS AN ALTERNATIVE TO THE
REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
CODE FOR OPERATION AND MAINTENANCE OF NUCLEAR POWER PLANTS**

1. ASME Code Component(s) Affected

Inservice Test (IST) Program Valve ID	IST Program Description*	Code Class	Code Category
XVC08703A-RH	RH Header A Bypass Check Valve (IRC)	2	A/C
XVC08703B-RH	RH Header B Bypass Check Valve (IRC)	2	A/C
XVC08948A-SI	SI Loop A Outlet Header Check Valve	1	A/C
XVC08948B-SI	SI Loop B Outlet Header Check Valve	1	A/C
XVC08948C-SI	SI Loop C Outlet Header Check Valve	1	A/C
XVC08956A-SI	SI Accum A Disch Header Check Valve	1	A/C
XVC08956B-SI	SI Accum B Disch Header Check Valve	1	A/C
XVC08956C-SI	SI Accum C Disch Header Check Valve	1	A/C
XVC08973A-SI	RCS Loop A Cold Leg Inlet Hdr Check Valve	1	A/C
XVC08973B-SI	RCS Loop B Cold Leg Inlet Hdr Check Valve	1	A/C
XVC08973C-SI	RCS Loop C Cold Leg Inlet Hdr Check Valve	1	A/C
XVC08974A-SI	SI Header A Check Valve (IRC)	2	A/C
XVC08974B-SI	SI Header B Check Valve (IRC)	2	A/C
XVC08988A-SI	RHR Supply Header Check Valve	1	A/C
XVC08988B-SI	RHR Supply Header Check Valve	1	A/C
XVC08990A-SI	Loop A Low Head Hot Leg Check Valve	1	A/C
XVC08990B-SI	Loop B Low Head Hot Leg Check Valve	1	A/C
XVC08990C-SI	Loop C Low Head Hot Leg Check Valve	1	A/C
XVC08992A-SI	Loop A High Head Hot Leg Check Valve	1	A/C
XVC08992B-SI	Loop B High Head Hot Leg Check Valve	1	A/C
XVC08992C-SI	Loop C High Head Hot Leg Check Valve	1	A/C
XVC08993A-SI	Loop A High Head Hot Leg Hdr Check Valve	1	A/C
XVC08993B-SI	Loop B High Head Hot Leg Hdr Check Valve	1	A/C
XVC08993C-SI	Loop C High Head Hot Leg Hdr Check Valve	1	A/C
XVC08995A-SI	Loop A High Head Cold Leg Check Valve	1	A/C
XVC08995B-SI	Loop B High Head Cold Leg Check Valve	1	A/C
XVC08995C-SI	Loop C High Head Cold Leg Check Valve	1	A/C
XVC08997A-SI	Loop A Low Head Cold Leg Check Valve	1	A/C
XVC08997B-SI	Loop B Low Head Cold Leg Check Valve	1	A/C
XVC08997C-SI	Loop C Low Head Cold Leg Check Valve	1	A/C
XVC08998A-SI	Loop A Low Head Cold Leg Check Valve	1	A/C
XVC08998B-SI	Loop B Low Head Cold Leg Check Valve	1	A/C
XVC08998C-SI	Loop C Low Head Cold Leg Check Valve	1	A/C
* Acronym Key: SI – Safety Injection, RH – Residual Heat Removal			
Table 1: ASME Code Component(s) Affected			

2. Applicable Code Edition and Addenda

American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) 2004 Edition through OMB-2006 Addenda.

3. Applicable Code Requirement

ASME OM Code Subsection ISTC-3630, *Leakage Rate for Other Than Containment Isolation Valves*, states, in part, that "Category A valves with a leakage requirement not based on an Owner's 10 CFR 50, Appendix J program, shall be tested to verify their seat leakages [are] within acceptable limits. Valve closure before seat leakage testing shall be by using the valve operator with no additional closing force applied."

ASME OM Code Subsection ISTC-3630(a), *Frequency*, states, "Tests shall be conducted at least once every 2 years."

Mandatory Appendix II, 4000(b), *Optimization of Condition-Monitoring Activities*, (1)(e), states, in part, "Identify the interval of each activity. Interval extensions shall be limited to one fuel cycle per extension."

4. Reason for Request

Pursuant to 10 CFR 50.55a, Codes and standards, paragraph (z)(1), an alternative to the requirement of ASME OM Code Subsection ISTC-3630(a) for check valves XVC08703A/B-RH and an alternative to Mandatory Appendix II, 4000(b)(1)(e) for all valves listed in Table 1 is being requested. The basis of the request is that the proposed alternative would provide an acceptable level of quality and safety.

Reason for Request for Alternative to ISTC-3630 for Check Valves XVC08703A/B-RH

ASME OM Code Subsection ISTC-3630 paragraph (a) requires that leakage rate testing for Category A valves with a leakage requirement not based on an owner's 10 CFR 50, Appendix J program, be performed at least once every two years.

SCE&G is requesting relief from ISTC-3630 for valves XVC08703A/B-RH.

SCE&G previously submitted a relief request for the use of a performance based testing frequency for several pressure isolation valves (PIV) (Reference 6). SCE&G proposed to perform PIV testing at intervals ranging from every refueling outage to every third refueling, not to exceed 60 months. The specific interval for each valve would be a function of its performance and would be established in a manner consistent with the Containment Isolation Valve (CIV) extended test eligibility process guidance under 10 CFR 50, Appendix J, Option B. SCE&G uses PIV Leakage Testing (STP-215.008) to verify the close function of the PIVs which are also check valves.

The NRC approved this request and issued the safety evaluation report (Reference 7). This relief request included valves XVG08701A/B-RH and XVG08702A/B-RH, which are the Residual Heat Removal (RHR) header isolation valves. These are 12 inch, motor operated, active gate valves located in the RHR inlet line from the Reactor Coolant (RC) hot legs. These normally closed valves installed in series form the pressure boundary between the reactor coolant and residual heat removal systems. SCE&G did not include valves XVC08703A/B-RH, RHR Header Bypass Check Valves, which are 3/4-inch check valves

located in bypass lines around the inner RHR System Inlet Isolation valves, XVG08702A/B-RH. The purpose of these check valves is to open to relieve any pressure buildup in the piping between the XVG08701A/B-RH and XVG08702A/B-RH and to close to prevent pressure/flow from bypassing XVG08702A/B-RH. XVC08703A/B-RH are not considered PIVs. XVC08703A/B-RH are tested in parallel with XVG08702A/B-RH using the same test procedure as the PIVs, STP-215.008, under the same plant conditions. If leakage through both valves is unacceptable, XVC08703A/B-RH can be isolated so that XVG08702A/B-RH can be tested by itself to determine the source of the leakage. XVC08703A/B-RH cannot be tested by itself.

This relief request is being submitted to align the testing of the two check valves with the performance based testing of the isolation valves. This will allow SCE&G to recognize the benefits of performance based testing of the PIVs which include:

- Eliminate unnecessary thermal cycles in the RCS cold leg safety injection piping.
- Dose reduction to conform with Nuclear Regulatory Commission (NRC) and industry As Low As Reasonably Achievable (ALARA) radiation dose principles.

A detailed explanation of these benefits is discussed in the previous submittal of reference 6.

Reason for Request for Alternative to Mandatory Appendix II, 4000(b) For All Valves Listed in Table 1.

SCE&G was previously granted relief from ISTC-3630 to allow performance based testing for all valves listed in Table 1, except for XVC08703A/B-RH. SCE&G is requesting the use of a performance based frequency for XVC08703A/B-RH as discussed previously in this relief request.

SCE&G is also requesting an alternative to Mandatory Appendix II, 4000(b) for all valves listed in Table 1 of this relief request. Mandatory Appendix II, 4000(b)(1)(e) requires that extensions of testing intervals be limited to one fuel cycle per extension. SCE&G was granted relief from the frequency requirements in ISTC-3630(a), but did not specifically ask for relief from the interval extension requirements found in Appendix II, 4000(b)(1)(e) for either the closure or leakage tests of the valves, which, in this case happen to be the same test. SCE&G is requesting to immediately extend all valves listed on Table 1 of this relief request to every third refueling outage. This will allow SCE&G to immediately recognize the benefits of the performance based testing which are discussed previously and in more detail in Reference 6.

5. Proposed Alternative and Basis for Use

Proposed Alternative and Basis for Use for alternative to ISTC-3630 for Check Valves XVC08703A/B-RH

SCE&G proposes to perform testing of valves XVC08703A/B-RH at intervals ranging from every refueling outage to every third refueling outage, not to exceed 60 months. The

specific interval for each valve would be a function of its performance and would be established in a manner consistent with the CIV extended test eligibility process guidance under 10 CFR 50, Appendix J, Option B. SCE&G uses PIV Leakage Testing (STP-215.008) to verify the close function of the PIVs which are also check valves. These valves have been historically tested at the required interval schedule, which is currently every refueling outage, or two years, as specified in ASME OM Code Subsection ISTC-3630 paragraph (a). Leakage rates less than the leakage limits found in TS and VCSNS procedure STP-215.008, "SI and RH System Valve Leakage Test", shall be considered acceptable.

SCE&G is proposing that valves which have demonstrated good performance for two consecutive cycles may have their test interval extended to every third refueling outage, not to exceed 60-months. Any leakage test failure would require the component to return to the initial interval of every RFO or two years until good performance is re-established. This direction/requirement will be added to the valve testing procedure, STP-215.008, SI and RH System Valve Leakage Test, will be a commitment in accordance with the station's Procedure/Commitment Accountability Program (P/CAP), SAP-0630, and will serve to initiate corrective action as warranted.

The two valves identified in this portion of this request are in water applications. Testing is performed with water pressurized to slightly below or at the function maximum pressure differential; however, where necessary the observed leakage is adjusted to the function maximum pressure differential value in accordance with ASME OM Code Subsection ISTC-3630, paragraph (b) *Differential Test Pressure*, item (4). Testing of the check valves is performed during plant startup following a refueling shutdown. The testing is performed by applying test pressure to the Reactor Coolant System (RCS) side of the disk by using the RCS as the pressure source or the Charging System via the Emergency Core Cooling System (ECCS) test header and the associated flow meters. Although the testing of the check valves includes a limit on allowable leakage rate, the main purpose of this limit is to prevent overpressure failure of the low-pressure portions of connecting systems. The allowable leakage limit provides a standard against which the check valve leakage can be compared to determine if the component is degraded or degrading. Excessive check valve leakage (i.e., greater than the allowable leakage limit) could lead to overpressure of the low-pressure piping or components, potentially resulting in a loss of coolant accident (LOCA) outside of containment.

Although the two subject valves of this portion of this relief request are not PIVs, much of the basis used to justify the performance based testing of PIVs in reference 6 is applicable to performance based testing of the check valves. A detailed discussion of the basis can be found in reference 6. A summary of the applicable basis is as follows:

- NEI 94-01 was cited as an approach similar to the requested alternative method and provides reasonable assurance of continued operational readiness.
- Separate functional testing of check valves will continue to be conducted per the ASME OM Code. For check valves, functional testing is accomplished in accordance with ASME OM Code Mandatory Appendix II, Check Valve Condition

Monitoring Program. Performance of the separate two-year leak rate testing does not contribute any additional assurance of functional capability but rather provides added assurance of valve integrity, thereby reducing the probability of gross valve failure and consequent intersystem LOCA.

- Relief valves in the low pressure (LP) piping may not provide inter-system LOCA (ISLOCA) mitigation for inadvertent PIV mis-positioning, but their relief capacity can accommodate conservative seat leakage rates.
- Alarms are provided that identify high pressure to low pressure leakage. Operators are highly trained to recognize symptoms of a present ISLOCA and to take appropriate actions.
- NUREG-0933, *Resolution of Generic Safety Issues*, Section 3, Issue 105, *Interfacing Systems LOCA at LWRs*, discussed the need for PIV leak rate testing based primarily on three pre-1985 historical failures of applicable valves industry-wide. These failures all involved human errors in either operations or maintenance. The performance of PIV leak rate testing provides assurance of acceptable seat leakage with the valve in a closed condition. Typical testing does not identify functional problems which may inhibit the valve's ability to reposition from open to closed.

Table 2 below presents historical test data that demonstrates acceptable check valve performance for XVC08703A/B-RH.

Table 2: Historical Leak Rate Test Performance for Residual Heat Removal Check Valves

IST Program Valve ID	Date of Test	Measured Value (gpm)	TS Allowable Leakage Limit (gpm)	Comments
XVC08703A-RH	5/29/2014	0.0	5	Combined Leak Rate (XVC08703A-RH and XVG08702A-RH)
	11/30/2015	0.11		
	5/31/2017	0.18		
	11/22/2018	-0.13*		
XVC08703B-RH	5/29/2014	0.93	5	Combined Leak Rate (XVC08703A-RH and XVG08702A-RH)
	11/30/2015	1.18		
	5/31/2017	0.62		
	11/22/2018	0.86		

* The baseline leakage was less than the leakage measured through XVC08703A-RH and XVG08702A-RH in parallel.

Based on valve performance history, there is continued assurance of valve operational readiness, as required by ASME OM-2004 Code, paragraph ISTC-3630 and Appendix II-4000(b)(1)(e). Therefore, this proposed alternative to extend the testing frequency will continue to provide assurance of the valves' operational readiness and provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(z)(1).

Proposed Alternative and Basis for Use for Alternative to Mandatory Appendix II, 4000(b) For All Valves Listed in Table 1.

Mandatory Appendix II, 4000(b), *Optimization of Condition-Monitoring Activities*, (1)(e), states, in part, "Identify the interval of each activity. Interval extensions shall be limited to one fuel cycle per extension."

Leak tests of all valves in Table 1 of this Relief Requested were last performed during the Fall 2018 outage (RF-24). SCE&G is proposing to immediately implement testing every third refueling outage and perform testing in RF-27.

The results of the leakage tests for all of the valves listed in Table 1, with the exception of XVC08703A/B-RH, are shown in the RR-4-14 submittal (Reference 6). The results of the leakage tests for XVC08703A/B-RH are shown in Table 2 above. All valves listed in Table 1 of this relief request have successfully passed their leak rate tests for the past four outages.

Appendix II requires check valve testing interval extensions to be limited to one refueling at a time, based on the assumption that there is no history that would support immediately

extending testing to a much longer interval. Extending the interval one refueling at a time also reduces the risk of not being able to detect failures that may be induced by the newly-increased time between tests, by allowing earlier detection of conditions which may lead to failure. VCS has provided test history over the last four refueling outages showing satisfactory performance for these check valves. These valves are a robust design, with well understood service conditions. Furthermore, flow is injected into the RCS through these valves each refueling outage during Charging Pump Comprehensive Inservice Testing, exercising the valves open. During normal operations, station instrumentation would show signs (high pressure) of any gross leakage, if one of these valves failed to close following testing. Based on test history, unlikelihood of failure, and ability to detect gross leakage, it is acceptable to immediately test these check valves every third outage.

6. Duration of Proposed Alternative

This request, upon approval, will be applied to the remainder of the station's fourth 10-year interval, which commenced January 1, 2014, and is currently scheduled to end on December 31, 2023.

7. Precedence

SCE&G submitted a relief request for the use of a performance based testing frequency for PIVs (Reference 6). The NRC approved this request and issued a Safety Evaluation Report (Reference 7). SCE&G inadvertently failed to include two check valves which are tested in parallel with two of the PIVs. This relief request is being submitted to align the check valve testing with the PIV testing.

8. References

1. 10 CFR 50.55a, *Codes and Standards*, paragraphs (b)(3)(iv) and (z)(1)
2. ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code), 2004 Edition through Omb-2006 Addenda
3. Letter from NRC (S. Bahadur) to NEI (B. Bradley), *Final Safety Evaluation of Nuclear Energy Institute (NEI) Report, 94-01, Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J" (TAC No. ME2164)*, dated June 8, 2012 (ML121030286)
4. NRC Information Bulletin 88-08, *Thermal Stresses in Piping Connected to Reactor Coolant Systems*, dated June 22, 1988
5. NUREG-0933, Resolution of Generic Safety Issues, (Main Report with Supplements 1-34); Section 3, New Generic Issues; Issue 105: Interfacing Systems LOCA at LWRs (Rev. 4); Fard, M. Reisi; U.S. NRC, Division of Risk Analysis; Published December 2011
6. Virgil C. Summer Nuclear Station (VCSNS) Unit 1 Relief Request RR-4-14, Use of A Performance Based Testing Frequency For Pressure Isolation Valves As An Alternative To The Requirements Of The American Society Of Mechanical Engineers Code For Operation And Maintenance Of Nuclear Power Plants (ML18282A046).

7. Safety Evaluation by The Office of Nuclear Reactor Regulation for V.C. Summer Relief Request Regarding The Use Of A Performance Based Testing Frequency For Pressure Isolation Valves, dated December 17, 2018 (ML18345A060).