August 27, 2001

Mr. Harold W. Keiser
Chief Nuclear Officer & President
PSEG Nuclear LLC - X04
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - SAFETY EVALUATION OF INSERVICE TESTING PROGRAM RELIEF REQUEST V-005 FOR EXCESS FLOW CHECK VALVES (TAC NO. MB1724)

Dear Mr. Keiser:

By letter dated April 11, 2001, PSEG Nuclear LLC submitted Relief Request V-005 for Hope Creek Generating Station (HCGS). Your letter proposed an alternative to certain requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the Code) pertaining to inservice testing of excess flow check valves (EFCVs). Your submittal also included an associated license amendment request to revise the HCGS Technical Specifications. The amendment request is being reviewed separately under TAC No. MB1723.

The Nuclear Regulatory Commission (NRC) staff has completed its review of the subject relief request as documented in the enclosed Safety Evaluation (SE). The NRC staff's SE concludes that the proposed alternative to the Code requirements described in Relief Request V-005 will provide an acceptable level of quality and safety for testing of EFCVs. Therefore, the alternative is authorized pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a(a)(3)(i)) for the remainder of the term of the current operating license.

Sincerely,

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure: Safety Evaluation

cc w/encl: See next page

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Hope Creek Generating Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST V-005

FOR EXCESS FLOW CHECK VALVE TESTING AT

HOPE CREEK GENERATING STATION

PSEG NUCLEAR LLC

DOCKET NO. 50-354

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves are performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to Sections (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. Guidance related to the development and implementation of IST programs is given in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," issued April 3, 1989, and its Supplement 1 issued April 4, 1995. Further guidance is given in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," and NUREG/CR-6396, "Examples, Clarifications, and Guidance on Preparing Requests for Relief from Pump and Valve Inservice Testing Requirements."

The 1989 Edition of the ASME Code is the applicable Code of record for the second 10-year interval IST program at the Hope Creek Generating Station (HCGS). Subsection IWV of the 1989 Edition, which gives the requirements for IST of valves, references Part 10 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-10) as the rules for IST of valves. OM-10 replaces specific requirements in previous editions of Section XI, Subsection IWV, of the ASME Code. Subsection IWP of the 1989 Edition, which gives the requirements for IST of pumps, references Part 6 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-6) as the rules for IST of pumps. OM-6 replaces specific requirements in previous editions of Section XI, Subsection IWP, of the ASME Code.

By letter dated April 11, 2001, PSEG Nuclear LLC (PSEG or the licensee) submitted Relief Request V-005 for the HCGS. The licensee's submittal proposed an alternative to certain requirements of Section XI of the Code pertaining to IST of excess flow check valves (EFCVs). The submittal also included an associated license amendment request to revise the HCGS Technical Specifications (TSs). The amendment request is being reviewed separately. The U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the alternative proposed in Relief Request V-005 is given below.

2.0 EVALUATION

2.1 Background

As discussed in the licensee's submittal and in Section 6.2.4.3.1.14 of the HCGS Updated Final Safety Analysis Report, EFCVs are provided in the instrument lines that penetrate the primary containment and form part of the reactor coolant pressure boundary. The EFCVs are designed to close automatically to limit the release of fluid in the event of an instrument line break. Each EFCV has its position indicated in the control room.

2.2 Relief Request V-005

The Code (OM-10, paragraph 4.3.2) requires that check valves be exercised quarterly during plant operation, or if valve exercising during plant operation is not practical, testing may be limited to full-stroke during refueling outages. Rather than testing the EFCVs quarterly or during refueling outages, the licensee currently tests all EFCVs at least once every 18 months per TS Surveillance Requirement (SR) 4.6.3.4 (reference NRC Safety Evaluation for HCGS Relief Request V04 dated December 21, 1999). The EFCV testing is performed immediately preceding a planned refueling outage. The Code (OM-10, paragraph 4.1) also requires verification of valve position indication at least once every 2 years.

The licensee's submittal requested relief from the exercise frequency requirements and position indication verification frequency requirements of the Code for EFCVs. The licensee's relief request proposed that, pursuant to 10 CFR 50.55a(a)(3)(i), the EFCVs be tested consistent with the proposed license amendment changes to TS SR 4.6.3.4. The proposed license amendment would change TS SR 4.6.3.4 to revise required testing of EFCVs from once per 18 months for all valves to a test of a representative sample each 18 months such that all valves are tested once in 10 years. The relief request pertains to the following EFCVs:

1ABXV-3666A	1BBXV-3732F	1BBXV-3803A
1ABXV-3666B	1BBXV-3732G	1BBXV-3803B
1ABXV-3666C	1BBXV-3732H	1BBXV-3803C
1ABXV-3666D	1BBXV-3732J	1BBXV-3803D
1ABXV-3667A	1BBXV-3732K	1BBXV-3804A
1ABXV-3667B	1BBXV-3732L	1BBXV-3804B
1ABXV-3667C	1BBXV-3732M	1BBXV-3804C
1ABXV-3667D	1BBXV-3732N	1BBXV-3804D
1ABXV-3668A	1BBXV-3732P	1BBXV-3820
1ABXV-3668B	1BBXV-3732R	1BBXV-3821
1ABXV-3668C	1BBXV-3732S	1BBXV-3826
1ABXV-3668D	1BBXV-3732T	1BBXV-3827

1ABXV-3669A	1BBXV-3732U	1BCXV-4411A
1ABXV-3669B	1BBXV-3732V	1BCXV-4411B
1ABXV-3669C	1BBXV-3732W	1BCXV-4411C
1ABXV-3669D	1BBXV-3734A	1BCXV-4411D
1BBXV-3621	1BBXV-3734B	1BCXV-4429A
1BBXV-3649	1BBXV-3734C	1BCXV-4429B
1BBXV-3725	1BBXV-3734D	1BCXV-4429C
1BBXV-3726A	1BBXV-3737A	1BCXV-4429D
1BBXV-3726B	1BBXV-3737B	1BEXV-F018A
1BBXV-3727A	1BBXV-3738A	1BEXV-F018B
1BBXV-3727B	1BBXV-3738B	1BGXV-3882
1BBXV-3728A	1BBXV-3783	1BGXV-3884A
1BBXV-3728B	1BBXV-3785	1BGXV-3884B
1BBXV-3729A	1BBXV-3787	1BGXV-3884C
1BBXV-3729B	1BBXV-3789	1BGXV-3884D
1BBXV-3730A	1BBXV-3801A	1FCXV-4150A
1BBXV-3730B	1BBXV-3801B	1FCXV-4150B
1BBXV-3731A	1BBXV-3801C	1FCXV-4150C
1BBXV-3731B	1BBXV-3801D	1FCXV-4150D
1BBXV-3732A	1BBXV-3802A	1FDXV-4800A
1BBXV-3732B	1BBXV-3802B	1FDXV-4800B
1BBXV-3732C	1BBXV-3802C	1FDXV-4800C
1BBXV-3732D	1BBXV-3802D	1FDXV-4800D
1BBXV-3732E		

2.3 Licensee's Basis for Relief Request

The licensee's submittal provided the following basis for the relief request:

> Excess flow check valves are installed on instrument lines penetrating containment in accordance with Regulatory Guide 1.11. The lines are sized and/or orificed such that offsite doses will be substantially below 10CFR100 limits in the event of a rupture. Therefore, individual leak rate testing of these valves is not required for conformance with 10CFR50 Appendix J requirements.
>
> Functional testing of valves to verify closure can be accomplished by the process of venting the instrument side of the valve while the process side is under pressure. Such testing is required by Technical Specification 4.6.3.4 at least once per 18 months. Systems design does not include test taps upstream of the Excess Flow Check Valves. For this reason, the EFCV's cannot be isolated and tested using a pressure source other than reactor pressure. Testing on a frequency greater than once per 18 months is not prudent for several reasons. The testing described above requires the removal of the associated instrument or instruments from service. Since these instruments are in use during plant operation, removal of any of these instruments from service may cause a spurious signal, which could result in a plant trip or an unnecessary challenge to safety systems. Additionally, process liquid will be contaminated to some degree, requiring special measures to collect flow from the vented instrument side and also will contribute to an increase in personnel radiation exposure.

Testing on quarterly basis is deemed impractical since the risk of performing the test quarterly outweighs the benefit achieved with a quarterly test and will also increase personnel exposure.

Testing on a Cold Shutdown frequency is also impractical considering the large number of valves to be tested and the condition that reactor pressure > 500 psig is needed for testing. OMa - Part 10 - Section 4.2.1.2(e) allows test deferrals to refueling outage if it is impractical to test quarterly or during cold shutdowns.

Industry experience, as documented in NEDO-32977-A, indicates that EFCV's have a very low failure rate. A review of the maintenance history for Hope Creek EFCV's has shown that they have been extremely reliable over the life of the plant, showing less than 1% failure rate associated with testing of these valves. Examples of causes for the failures included alarm problems, indication (limit switch adjustments), and bent instrument tubing. Failures resulted in the replacement of only one of the valves. This review of the surveillance test history shows no evidence of time based failure mechanisms or common mode failures associated with excess flow check valves. The Hope Creek test experience is consistent with the findings in the NEDO document. The NEDO document indicates similarity that many reported test failures at other plants were related to test methodologies and not actual EFCV failures. Thus, the EFCV's at Hope Creek, consistent with the industry, have exhibited a high degree of reliability, availability, and provide an acceptable level of quality and safety.

Therefore, PSEG Nuclear LLC requests relief pursuant to 10CFR50.55a(a)(3)(i) to test excess flow check valves at the frequency specified in the Hope Creek Technical Specifications Surveillance Requirements (SR) 4.6.3.4. As discussed in the Technical Specification Bases for this SR, this test provides assurance that each valve actuates to check flow on a simulated instrument line break.

2.4 Alternative Testing

The licensee submittal proposed the following alternate testing:

Functional testing with verification that flow is checked will be performed per Technical Specification 4.6.3.4.

The EFCV's have position indication in the control room. Check valve remote position indication is excluded from Regulatory Guide 1.97 as a required parameter for evaluating containment isolation. The remote position indication will be verified in the closed direction at the same frequency as the exercise test, which will be performed at the frequency prescribed in Technical Specification 4.6.3.4. After the close position test, the valves will be reset, and the remote open position indication will be verified. Inadvertent actuation of an EFCV during operation is highly unlikely due to the spring-poppet design. Hope Creek verifies that EFCV's indicate open in the control room at a frequency greater than once every 2 years.

2.5 Evaluation

The basis for the licensee's license amendment request and relief request is the high degree of reliability shown by the EFCVs and the low consequences of an EFCV failure. The supporting analysis for the licensee's conclusion is based on General Electric Nuclear Energy (GENE) Topical Report NEDO-32977-A, "Excess Flow Check Valve Testing Relaxation," dated June 2000. The topical report provided: (1) an estimate of steam release frequency into the reactor building due to a break in an instrument line concurrent with an EFCV failure to close, and (2) assessment of the radiological consequences of such a release. The topical report concluded that the EFCV test interval could be extended up to 10 years based on the topical report reliability and consequence analysis without significantly affecting plant risk. The topical report suggested a staggered test interval based on actual valve performance with each valve being tested at least once every 10 years. The staff accepted the generic applicability of the topical report by a safety evaluation report (SER) dated March 14, 2000, and agreed that the EFCV test interval could be extended to as much as 10 years. The staff also noted that licensees adopting the topical report must have a failure feedback mechanism and corrective action program to ensure that EFCV performance continues to be bounded by the topical report results. Additionally, each licensee is required to perform a plant-specific radiological dose assessment and EFCV failure rate and release frequency analysis to confirm that their facility is bounded by the generic analysis of the topical report.

The staff reviewed the licensee's proposal for its applicability to Topical Report NEDO-32977-A and conformance with approved staff guidance regarding radiological dose assessment, EFCV failure rate and release frequency, and the proposed failure feedback mechanism and corrective action program and has found the proposal adequate in these areas. The staff concludes that the radiological consequences of an EFCV failure are sufficiently low and acceptable, and that the alternative testing in conjunction with the corrective action program provides a high degree of valve reliability and operability. Additionally, an orifice or small piping is installed upstream of the EFCVs to limit reactor water leakage in the event of rupture. The orifice or small piping limits leakage to a level where the integrity and functional performance of secondary containment and associated safety systems are maintained. Therefore, the staff finds that the licensee's proposed test alternative provides an acceptable level of quality and safety.

3.0 CONCLUSION

Based on the above evaluation, the staff finds the proposed alternative test frequency, which would allow a representative sample of EFCVs to be tested every 18 months with all EFCVs being tested at least once every 10 years, to be acceptable. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), Relief Request V-005 is authorized for use based on the proposed alternative providing an acceptable level of quality and safety for the remainder of the term of the current operating license.

Principal Contributor: Y. S. Huang

Date: August 27, 2001