Public Service
Electric and Gas
Company

Corbin A. McNeill, Jr.
Vice President -
Nuclear

Public Service Electric and Gas Company P.O. Box 236, Hancocks Bridge, NJ 08038 609 339-4800

February 27, 1986

Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

Attention: Ms. Elinor Adensam, Director
Project Directorate 3
Division of BWR Licensing

Dear Ms. Adensam:

MAIN STEAM ISOLATION VALVE SEALING SYSTEM
HOPE CREEK GENERATING STATION
DOCKET NO. 50-354

On December 12, 1985 Public Service Electric and Gas Company (PSE&G) submitted six 10 CFR 50 Appendix J Exemption Requests to the Nuclear Regulatory Commission (NRC) (letter from C.A. McNeill to E. Adensam) in which Exemption Request 4 discussed Main Steam Isolation Valves (MSIVs). In support of this request, PSE&G met with members of the NRC staff on February 20, 1986 to discuss details regarding the design and operation of the MSIVs and the Main Steam Isolation Valve Sealing System (MSIVSS). This transmittal provides additional information requested at the meeting to supplement the details provided in the December 12, 1985 Appendix J letter.

As described in the Final Safety Analysis Report (FSAR) Section 6.7.2 and shown on Figures 6.2-28 (Sheet 1 of 28) and 6.7-1, the MSIVSS is designed to eliminate the release of fission products through the MSIVs that would bypass the filtration, recirculation, and ventilation system (FRVS) after a loss-of-coolant accident (LOCA) by pressurizing the sections of the main steam lines between the inboard and the outboard MSIVs, and between the outboard MSIVs and the main steam stop valves (MSSVs), to a pressure 5 psi above the reactor pressure vessel (RPV) pressure. Within 20 minutes after a LOCA, as evidenced by high drywell pressure and/or low reactor water level, the MSIVSS is manually initiated from the main control room after the operator verifies that the MSIVs and the MSSVs are shut and the main steam line pressure has dropped to 20 psig or less. This latter requirement prevents the lifting of the MSIV disk since it can be unseated by a back pressure differential of 25 psi. The MSIVSS utilizes sealing gas supplied by the primary containment instrument gas receivers located in the reactor building, and upon MSIVSS initiation, the motor-operated isolation valves can be opened allowing the gas from the receivers to enter the main steam lines.

A review of various other BWR facilities, specifically Hatch 2, Limerick 1 and 2, Susquehanna 1 and 2 and Hanford 2 indicates these plants utilize a vacuum seal type system which must process the fission products that are removed from the isolated main steam pipe sections thru a standby gas treatment system and then release the processed leakage to the atmosphere. The design of the Hope Creek Generating Station (HCGS) MSIV sealing system is a positive seal type system which forces sealing air to leak into the containment and therefore prevents radioactive fission products from leaking out of the containment. A comparison of these two types of sealing systems indicates the positive type is superior to the vacuum type because the positive seal does not allow any fission products to leak outside of the containment.

Since the HCGS MSIVSS has been designed to maintain a positive 5 psi differential pressure between the isolated portions of the main steam lines and the RPV, a Type C leak rate test at 5 psig was proposed rather than the 52.9 psig test pressure (1.10 Pa) required by 10CFR50 Appendix J, Paragraph III.C.2(b). The Exemption Request letter of December 12, 1985 identified this deviation with the justification that a test pressure of 52.9 psig would lift the disk on the inboard valve and result in a meaningless test. However, as indicated in Paragraph 3.6.1.2c of the Final Draft of the HCGS Technical Specifications dated February 14, 1986, the NRC staff requires the MSIVs to be tested at a pressure of 20 psig and indicated (incorrectly) that this value is the seal system differential pressure. As a result of this disagreement between PSE&G and the NRC regarding the MSIV test pressure, a meeting was held on February 20, 1986 such that PSE&G could present the rationale (summarized below) behind using 5 psig as the local leak rate test (LLRT) pressure for the MSIVs.

When testing the MSIVs, a force is maintained on the poppet by the air cylinder (see Attachment 1). Pressurizing the inboard MSIVs at 5 psig in the reverse direction results in approximately a 6 percent reduction in the air cylinder's sealing force. If an LLRT where conducted using 20 psig as the test pressure, the result would be an approximate 25 percent reduction in the air cylinder's sealing force (see Attachment 2). In short, the test pressure is acting to unseat the poppet, thereby increasing the likelihood that valve leakage in excess of 11.5 SCFH will occur. In an actual situation, a DBA LOCA, there will be pressure in the main steam lines aiding the MSIVs to seal closed. Conservatively estimating the main steam line pressure to be 500 psig (at the end of MSIV closure - see Figure 6.3-16), the actual sealing force will be at least seven times greater than the force generated by the air cylinder without any upstream steam pressure in the main steam lines. In EPRI Report NP 2454, Comparison of Generic BWR-MSIV Configurations dated June 1982, it was demonstrated that the leak rate decreased with high poppet loading (i.e., pressure). It is based upon this rationale that PSE&G proposed local leak rate testing the inboard MSIVs at 5 psig.

A requirement to test the MSIVs at 20 psig, with the acceptance criteria limited to 46 SCFH for all four main steam lines, would require extensive MSIV reconditioning, now and throughout the life of the plant. This rework would not only impact the current fuel load schedule, but possibly extend the length of future outages and increase ALARA doses. Based upon the detailed arguments presented above, PSE&G strongly believes an MSIV test pressure of 5 psig is more than sufficient to demonstrate valve leakage; while, the currently imposed value of 20 psig creates an unnecessarily restrictive test pressure which neither reflects operational conditions nor functions to obtain any additional information.

In conclusion, PSE&G requests the NRC to approve 10CFR50 Appendix J Exemption Request 4 based upon the December 12, 1985 submittal, as well as the supplemental information presented herein, and accordingly incorporate the revised Final Draft copy of the HCGS Technical Specifications (see Enclosure 1). Should you have any questions on the subject filing, please do not hesitate to call us.

Sincerely,

Corbin A. McNeill, Jr.
Vice President - Nuclear

Attachment
Enclosure

C D.H. Wagner
USNRC Licensing Project Manager

R.W. Borchardt
USNRC Senior Resident Inspector

ATTACHMENT 1

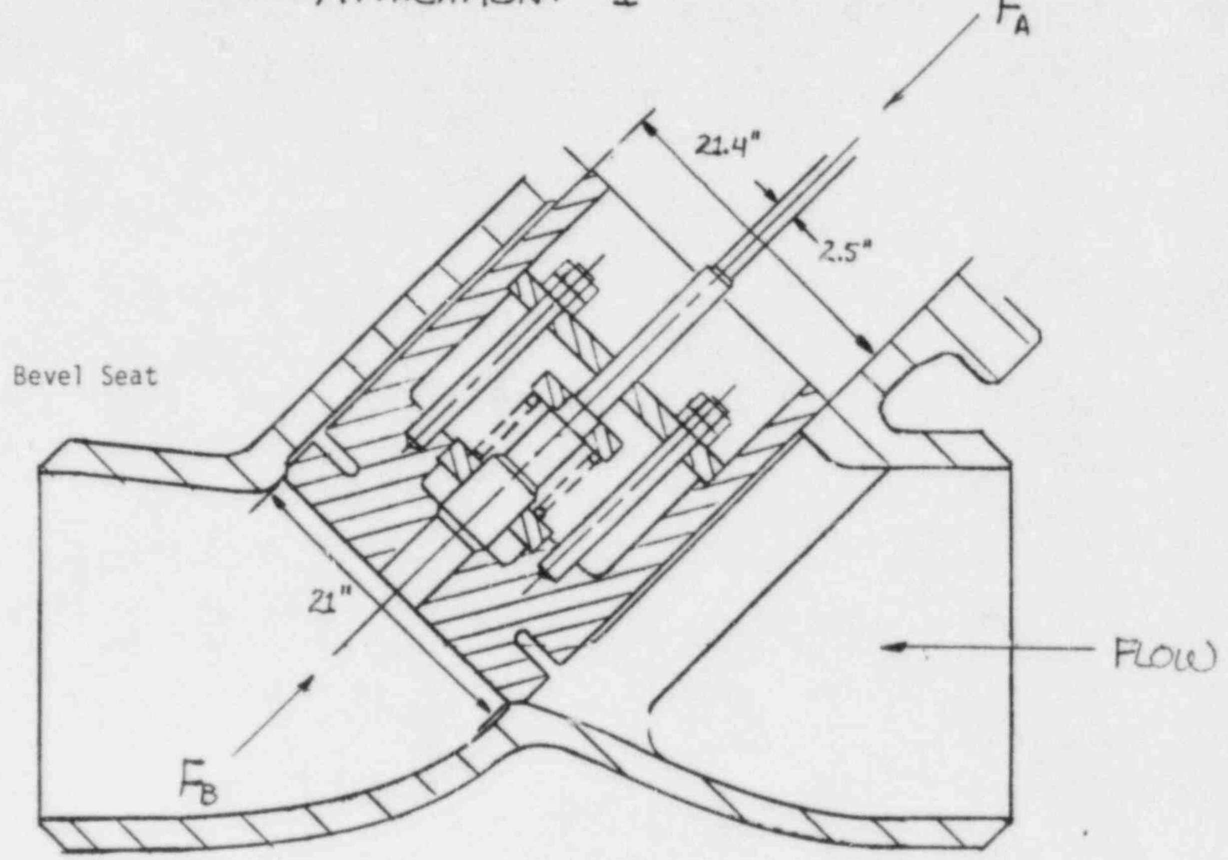

Figure 4-1. Bevel Seat Design

(Source: Atwood & Morrill Co., Inc.)

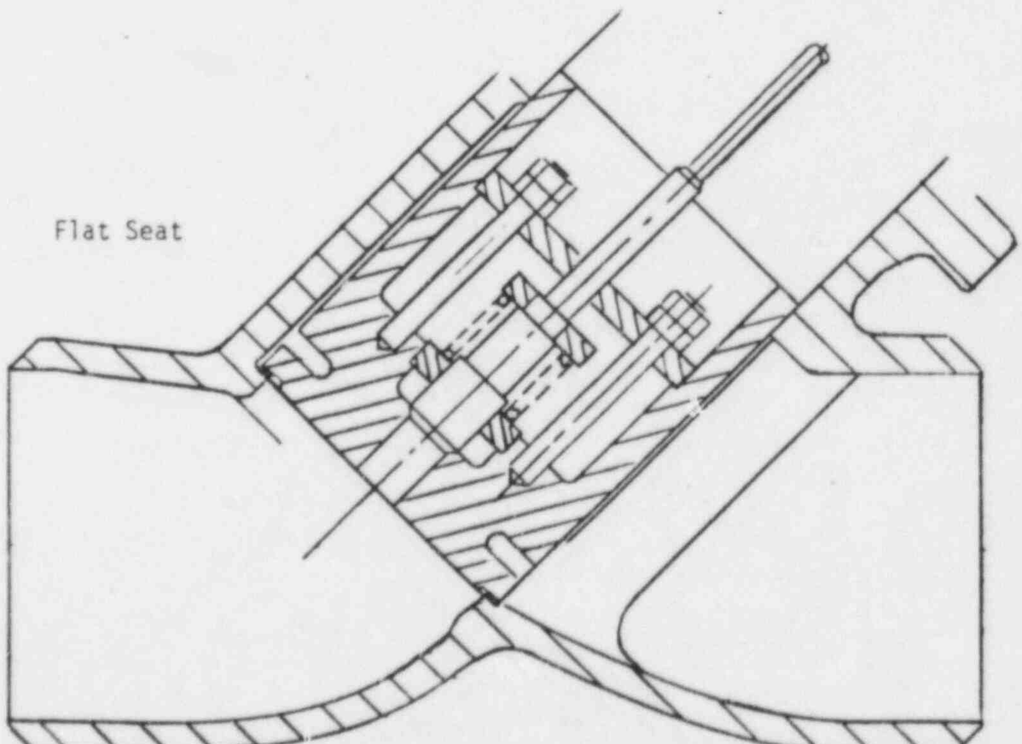

Figure 4-2. Flat Seat Design

(Source: Atwood & Morrill Co., Inc.)

ATTACHMENT 2

$F_A = P_A \times A_A$ Where: $A_A = \pi R_A^2$
R_A = 10 IN (inside radius of air cylinder, not shown in Attachment 2)
P_A = 90 LB/IN^2 (instrument gas system pressure)

Therefore: $F_A = (90\ LB/IN^2)(\pi(10\ IN)^2)$
= 28,274 LB

CASE 1 - 5 PSIG TEST PRESSURE

$F_{B1} = P_{B1} \times A_B$ Where: $A_B = \pi R_B^2$
R_B = 10.5 IN (underside radius of poppet)
P_{B1} = 5 LB/IN^2 (test pressure)

Therefore: $F_{B1} = (5\ LB/IN^2)(\pi(10.5\ IN)^2)$
= 1732 LB
Sealing Force Reduction = $(F_{B1}/F_A) \times 100\%$
= (1732 LB/28,274 LB) x 100%
$\approx$ 6%

CASE 2 - 20 PSIG TEST PRESSURE

$F_{B2} = P_{B2} \times A_B$ Where: P_{B2} = 20 LB/IN^2 (test pressure)

Therefore: $F_{B2} = (20\ LB/IN^2)(\pi(10.5\ IN)^2)$
= 6927 LB
Sealing Force Reduction = $(F_{B2}/F_A) \times 100\%$
= (6927 LB/28,274 LB) x 100%
$\approx$ 24.5%

CASE 3 - DBA LOCA, RECIRCULATION LINE BREAK

$F_{A,TOTAL} = F_{A,LOCA} + F_A$ Where: $F_{A,LOCA} = P_{A,LOCA} \times (A_P - A_S)$
$P_{A,LOCA}$ = 500 LB/IN^2 (approx. pressure on MSIV at closure)
A_P = 360 IN^2 (area on topside of poppet)
A_S = 4.91 IN^2 (area of poppet shaft)

Therefore: $F_{A,TOTAL} = (500\ LB/IN^2)(360\ IN^2 - 4.91\ IN^2) + 28,274\ LB$
= 205,819 LB
Sealing Force Increase = $F_{A,TOTAL}/F_A$
= 205,819 LB/28,274 LB
$\approx$ 7.3

ENCLOSURE 1

FINAL DRAFT

PRIMARY CONTAINMENT LEAKAGE

LIMITING CONDITION FOR OPERATION

3.6.1.2 Primary containment leakage rates shall be limited to:

a. An overall integrated leakage rate of less than or equal to L_a, 0.5 percent by weight of the containment air per 24 hours at P_a, 48.1 psig.

b. A combined leakage rate of less than or equal to 0.60 L_a for all penetrations and all valves listed in Table 3.6.3-1, except for main steam line isolation valves*, valves which form the boundary for the long-term seal of the feedwater lines, and other valves which are hydrostatically tested per Table 3.6.3-1, subject to Type B and C tests when pressurized to P_a, 48.1 psig.

5 c. *Less than or equal to 46.0 scfh combined through all four main steam lines when tested at 20 psig (seal system ΔP).

d. A combined leakage rate of less than or equal to 10 gpm for all containment isolation valves which form the boundary for the long-term seal of the feedwater lines in Table 3.6.3-1, when tested at 1.10 Pa, 52.9 psig.

e. A combined leakage rate of less than or equal to 10 gpm for all other containment isolation valves in hydrostatically tested lines in Table 3.6.3-1 which penetrate the primary containment, when tested at Pa, 48.1 psig Δp.

APPLICABILITY: When PRIMARY CONTAINMENT INTEGRITY is required per Specification 3.6.1.1.

ACTION:

With:

a. The measured overall integrated primary containment leakage rate exceeding 0.75 L_a or

b. The measured combined leakage rate for all penetrations and all valves listed in Table 3.6.3-1, except for main steam line isolation valves*, valves which form the boundary for the long-term seal of the feedwater lines, and other valves which are hydrostatically tested per Table 3.6.3-1, subject to Type B and C tests exceeding 0.60 L_a, or

c. The measured leakage rate exceeding 46.0 scfh combined through all four main steam lines, or

d. The measured combined leakage rate for all containment isolation valves which form the boundary for the long-term seal of the feedwater lines in Table 3.6.3-1 exceeding 10 gpm, or

e. The measured combined leakage rate for all other containment isolation valves in hydrostatically tested lines in Table 3.6.3-1 which penetrate the primary containment exceeding 10 gpm,

restore:

a. The overall integrated leakage rate(s) to less than or equal to 0.75 L_a, and

*Exemption to Appendix "J" of 10 CFR 50.