November 14, 2000

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

SUBJECT: HOPE CREEK GENERATING STATION, AMENDMENT REQUEST RE: INCREASE OF ALLOWABLE MAIN STEAM ISOLATION VALVE (MSIV) LEAK RATE AND DELETION OF MSIV SEALING SYSTEM (TAC NO. MA9978)

Dear Mr. Keiser:

By letter dated December 28, 1998, as supplemented October 15, 1999, and March 3, 2000, Public Service Electric & Gas Company (PSE&G) applied for an amendment to the Hope Creek Generating Station (HCGS) Operating License No. NPF-57. On August 21, 2000, the license for HCGS, to the extent held by PSE&G, was transferred to PSEG Nuclear Limited Liability Company (PSEG Nuclear). By letter dated September 6, 2000, PSEG Nuclear stated that they have assumed responsibility for the active items on the Hope Creek docket previously submitted by PSE&G as of the date of the transfer including the subject amendment request.

The proposed change would have modified the facility technical specifications to increase the allowable leak rate of the main steam isolation valves (MSIV) and to delete the MSIV Sealing System. After careful review, the Nuclear Regulatory Commission (NRC) staff concluded that it could not complete its review because of an unresolved Control Room Habitability Envelope (CRHE) issue. By letter dated August 29, 2000, you withdrew the amendment request.

The status of the staff's review is provided in the enclosed draft Safety Evaluation (SE). The staff is providing this draft SE to document the completed portions of the review, and to document the issues that require resolution. In any future submittal, any changes to those portions of your original request for which the staff has completed its review will be subject to additional staff review and approval. We request that you clearly identify any such changes in subsequent submittals. The Agency-wide Document Access Management System accession number for this document is ML003736445. Upon resolution of the issues associated with the CRHE, you may resubmit your amendment request referencing the enclosed draft SE. The

staff will then complete its review of your request for any unresolved issues and for any changes that you may have made.

If you have any questions regarding this matter, I may be reached at 301-415-3199.

Sincerely,

/RA/

John Harrison, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure: Draft Safety Evaluation

cc w/encls: See next page

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DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO FACILITY OPERATING LICENSE NO. NPF-57

PSEG NUCLEAR, LLC

ATLANTIC CITY ELECTRIC COMPANY

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated December 28, 1998, as supplemented October 15, 1999, and March 3, 2000, the Public Service Electric & Gas Company (PSE&G) requested changes to the Hope Creek Generating Station (HCGS) Technical Specifications (TSs). On August 21, 2000, the license for HCGS, to the extent held by PSE&G, was transferred to PSEG Nuclear Limited Liability Company (PSEG Nuclear or the licensee). By letter dated September 6, 2000, PSEG Nuclear stated that they have assumed responsibility for the active items on the Hope Creek docket previously submitted by PSE&G as of the date of the transfer including the subject amendment request. The proposed amendment would revise the TSs to permit an increase in the allowable leak rate for the main steam isolation valves (MSIVs) and to delete the MSIV Sealing System (MSIVSS). The main steam drain lines and the main condenser would be utilized as an alternate MSIV leakage treatment method. The letters dated October 15, 1999, and March 3, 2000, provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

Specifically, the licensee requested that:

(1) The allowable leak rate specified in TS 3.6.1.2 be changed from 46.0 total standard cubic feet per hour (scfh) to 200 scfh per main steamline, as well as a 400 scfh leak rate combined for all four steamlines. TS 3.6.1.2 would also be revised to require that with the measured leakage rate exceeding 400 scfh combined through all four main steamlines or 200 scfh for any one main steamline, the leakage rate will be restored to less than or equal to 11.5 scfh on affected MSIVs.

(2) TS 3/4.6.1.4 and its associated Bases be revised to permit the deletion of the MSIVSS from the TSs and replace them with requirements and Bases for the “MSIV Leakage Treatment Pathway.” The licensee proposes these changes as an alternative to Regulatory Guide (RG) 1.96, “Design of Main Steam Isolation Valve Leakage Control

Enclosure

Systems for Boiling Water Reactor Plants," by utilizing the main steamlines and main condenser as an alternate method for MSIV leakage treatment.

(3) TS Tables 3.3.2-1 and 3.6.3-1 be revised to permit the deletion of the MSIVSS valves and associated main steamline drain valves.

(4) The TS Index be administratively revised to reflect the above changes.

2.0 BACKGROUND

Each of the four main steamlines (MSLs) contain two quick-closing MSIVs, one located inside and one located outside of the primary containment. These valves function to isolate the reactor system in the event of a break in a steamline outside the primary containment, a design basis loss-of-coolant accident (LOCA), or other events requiring containment isolation. Although the MSIVs are designed to provide a leak-tight barrier, it is recognized that some leakage through the valves will occur. Operating experience at various boiling water reactor (BWR) plants has indicated that degradation has occasionally occurred in the leak-tightness of MSIVs, and the specified low leakage limits are difficult to maintain.

Due to recurring problems with excessive leakage of MSIVs, the Nuclear Regulatory Commission (NRC) staff issued RG 1.96 which recommends the installation of a supplemental leakage control system (LCS) to ensure that the isolation function of the MSIVs complies with the specified leakage limits. To meet this RG, the licensee installed a safety-related MSIVSS that is designed to eliminate the release of fission products through the closed MSIVs that would otherwise bypass the Filtration, Recirculation, and Ventilation System (FRVS) after a LOCA. This is accomplished by pressurizing the sections of the MSLs between the inboard and outboard MSIVs, and between the outboard MSIVs and the main steam stop valves, to a pressure above that of the reactor pressure vessel. Sealing gas is supplied from two independent primary containment instrument gas receivers. Leakage past the MSIVs is directed back into primary containment where it can be processed as a filtered release and reduce the potential contribution to offsite and control room doses.

The deletion of the MSIVSS was proposed by the licensee partly in response to Generic Issue C-8. Generic Issue C-8 deals with staff concerns about public risk because of the incidence of MSIV leakage test failures and the limitations of the LCS for mitigating the consequences of leakage from these valves. If MSIV leakage is greatly in excess of the TS allowable value, the LCS would be unavailable because of design limitations. The Generic Issue was initiated in 1983 to assess (1) the causes of MSIV leakage failures, (2) the effectiveness of the LCS and alternative leakage paths, and (3) the need for additional regulatory action to reduce public risk. The resolution of Generic Issue C-8 (see NUREG-1372, Regulatory Analysis for the Resolution of Generic Issue C-8, "Main Steam Isolation Valve Leakage and LCS Failure" dated June 1990) concluded that no backfit requirements to reduce public risk were warranted and that no action should be taken. However, one of the alternative resolutions of Generic Issue C-8 showed that several non-seismic Category I paths resulted in lower offsite doses than the LCS and could handle larger MSIV leakage rates.

In a parallel effort, the BWR Owners Group (BWROG) formed the MSIV Leakage Committee in 1982 to identify and resolve the causes of high MSIV leakage rates. The BWROG then formed

a follow-on MSIV Leakage Closure Committee to address alternate actions to resolve ongoing but less severe MSIV leakage problems and to address the limited capability of the LCS. The results of these committee activities were submitted to the NRC in several General Electric (GE) proprietary reports, the latest of which is NEDC-31858P, Revision 2, dated September 1993, titled, "BWROG Report for Increasing Main Steam Isolation Valve Leakage Rate Limits and Elimination of Leakage Control Systems" (herein referred to as the BWROG report). This report concludes that the proposed increase of the MSIV leakage limit (up to a maximum of 200 scfh) will reduce radiation exposures to maintenance personnel, reduce outage durations, and extend the effective service life of the MSIVs. The report also concludes that the proposed elimination of the LCS will similarly reduce exposures to maintenance personnel, reduce outage durations, and that the LCS can be replaced with an alternate method for MSIV leakage treatment using the MSLs and the main condenser. In the application dated December 28, 1998, the licensee referenced the BWROG report as part of the basis for the proposed amendment.

The proposed alternative MSIV leakage treatment method recommended in the BWROG report, and as proposed by the licensee, takes advantage of the large volume in the main steamlines and main condenser to provide hold-up and plate-out of fission products that may leak through closed MSIVs. This method uses the main steam drain lines to direct leakage to the main condenser. In this approach, the main steam piping, the bypass/drain piping, and the main condenser are used to mitigate the consequences of an accident that could result in potential offsite exposures comparable to Title 10 of the Code of Federal Regulations (10 CFR) Part 100 limits.

The NRC staff's review of BWROG report NEDC-31858P, Revision 2, is contained in a safety evaluation (SE) dated March 3, 1999. The primary issue of concern is the ability of the piping and components in the alternative leakage treatment (ALT) pathway to remain structurally intact and to act as a hold-up volume for fission products during and following a safe shutdown earthquake (SSE). The staff concluded that licensees referencing the report, subject to the limitations described in the SE, should be able to justify plant-specific amendments and should be allowed to increase the MSIV leakage rate up to a maximum of 200 scfh and, if applicable, eliminate the LCS. The limitations as described in the SE are as follows:

(1) Individual licensees should provide a detailed description of the ALT drain path and the basis for its functional reliability, commensurate with its intended safety-related function. The licensee should also describe their maintenance and testing program for the active components (such as valves) in the ALT path.

(2) Individual licensees should provide plant-specific information for piping design parameters (e.g., uniqueness of piping configurations, pipe span between supports, and diameter-to-thickness ratios for each pipe size), to demonstrate that they are enveloped by those associated with the earthquake experience database.

(3) Individual licensees should demonstrate that the plant condenser design falls within the bounds of design characteristics found in the earthquake experience database. This should include a review of as-built design documents and/or a walkdown to verify that the condenser has adequate anchorage.

(4) Individual licensees should perform a plant-specific seismic evaluation for representative supports and anchorages associated with affected piping and the condenser.

(5) Individual licensees should confirm that the condenser will not fail due to seismic II/I type of interaction (e.g., structural failure of the turbine building and its internals).

(6) Individual licensees of plants whose Final Safety Analysis Report (FSAR) or Updated FSAR (UFSAR) reference Appendix A to 10 CFR Part 100 should perform a bounding seismic analysis for the ALT path piping. Those licensees committed to Part 100 should discuss the basis for selecting a particular portion of the bypass/drain line for the bounding analysis.

(7) The methodology and criteria used for the analytical evaluations should be those which are in compliance with the design basis methodology and criteria, or those which are acceptable to the staff.

(8) The facility ground motion estimates shown in Figures 1 through 13 of the SE have been reviewed and accepted by the staff for inclusion in BWROG's earthquake experience database. These 13 facility ground motion estimates may be used to verify the seismic adequacy of equipment in the alternative MSIV leakage pathway for plants referencing the BWROG's Topical Report, NEDC-31858P, Revision 2.

(9) At the present time, there is no standard endorsed by NRC that provides guidance for determining what constitutes an acceptable number of earthquake recordings and their magnitudes and for determining the required number of piping and equipment items, that should be referenced in the earthquake experience database when utilizing the BWROG methodology. Therefore, individual licensees are responsible for ensuring the sufficiency of the data to be submitted for staff review and determination.

The NRC staff's review of the licensee's submittal dated December 28, 1998, revealed that additional information would be required from the licensee. The NRC issued a request for additional information (RAI) on July 1, 1999. The licensee provided its response in a letter dated October 15, 1999. The staff's review of the licensee's response prompted the issuance of a second RAI to the licensee on January 6, 2000. The licensee provided its response to the second RAI in a letter dated March 3, 2000. However, because of Control Room Habitability Envelope (CRHE) concerns described more fully in Section 3.1.4 below, the review of the changes affecting control room operator dose cannot be completed at this time.

3.0 EVALUATION

The NRC staff's evaluation consists of a radiological assessment, a seismic adequacy evaluation, a functional evaluation, intermediate conclusions, and an overall conclusion, as follows:

3.1 Radiological Assessment

To demonstrate the adequacy of the HCGS engineered safety features (ESF) to mitigate the radiological consequences of design basis accidents (DBAs) with a maximum MSIV total leak

rate of 400 scfh from four main steamlines and without relying upon the MSIVSS, the licensee reevaluated the offsite and control room radiological consequences from a postulated LOCA. The licensee submitted the results of its offsite and control room doses in its amendment request.

In its submittals, the licensee concluded that the existing ESF systems at HCGS with the increased MSIV leak rate of 400 scfh and without relying upon the MSIVSS would provide reasonable assurance that the radiological consequences of a postulated LOCA at the exclusion area boundary (EAB) and in the low population zone (LPZ) would be within the dose reference values given in 10 CFR Part 100 and that the radiological consequence to the control room operator would meet the dose criteria specified in General Design Criterion (GDC) 19 of Appendix A to 10 CFR Part 50.

To review the licensee's radiological consequence assessments, the staff performed a confirmatory radiological consequence calculation for the following three potential fission product release pathways after the postulated LOCA:

(1) containment leakage;

(2) post-LOCA leakage from ESF systems outside containment; and

(3) MSIV leakage.

3.1.1 Containment Leakage Pathway

In its calculation of the radiological consequences of the postulated LOCA, the staff used the source term assumptions given in RG 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of Coolant Accident for Boiling-Water Reactors" (Revision 2). In the HCGS UFSAR, the primary containment was assumed to leak to the reactor building at a constant rate of 0.5 percent of the containment volume per day for the duration of the accident. Because the reactor building is not maintained at a 0.25-inch water gauge negative pressure during the first 175 seconds of the accident, all containment leakage is assumed to be released unfiltered to the environment. After this initial 175-second period, the primary containment leakage was assumed to be processed by the FRVS prior to release to the environment.

The FRVS consists of two ESF subsystems: the FRVS recirculation subsystem (FRVS-RS) and FRVS ventilation subsystem (FRVS-VS). Both subsystems are located inside the reactor building and are seismic Category 1 design. The FRVS-RS is designed to filter and clean contaminated air in the reactor building after a DBA or abnormal occurrence that could result in high airborne radiation levels in the reactor building. The FRVS-VS is designed to exhaust sufficient air from the reactor building to maintain a negative pressure in the reactor building and to remove airborne radioactive materials before discharging the air to the environment. The FRVS-VS takes suction only from the discharge duct of the FRVS-RS.

In HCGS License Amendment No. 30 (August 1989), the staff determined the overall iodine removal efficiency to be 99 percent for the FRVS charcoal adsorbers. This was based on the test acceptance criteria in the HCGS TS for the charcoal adsorbent from the two beds in series

(FRVS-RS and FRVS-VS). They are 7.5 percent and 1 percent, respectively, which correspond to a combined iodine penetration for the two beds in series of less than 0.075 percent. This evaluation also used a 99 percent iodine removal efficiency for the FRVS. The staff's calculated offsite doses resulting from this pathway are given in Table 1 and the parameters and assumptions used in the staff's calculation are given in Table 2.

3.1.2 Post-LOCA Leakage Pathway from ESF Systems Outside Containment

Any leakage water from ESF components located outside the primary containment releases fission products during the recirculating phase of long-term core cooling after a postulated LOCA. In the HCGS UFSAR, the licensee estimated this leakage to be less than 10 gallons per hour (gph) and used 10 gph for the entire duration of the accident (30 days). The staff assumed 50 percent of the core iodine inventory is mixed in the primary containment sump water being circulated through the containment external piping systems and assumed 10 percent of the iodine in the liquid leakage becomes airborne. Because the HCGS reactor building is provided with an ESF-grade filtration system to filter the reactor enclosure building exhaust, the staff has not calculated the contribution to the LOCA doses from a passive failure in an ESF component. The staff's calculated offsite doses resulting from this pathway are given in Table 1 and the parameters and assumptions used in the staff's calculation are given in Table 2.

3.1.3 MSIV Leakage Pathway

The staff assumed that the fission product leakage allowed by the TS in the main steamlines is released directly into the environment. The staff gave credit for fission product deposition and holdup in the main steamlines, main steam drain lines, and main condenser provided that the licensee seismically analyzed them to qualify as holdup volumes for fission products after the postulated LOCA. Sections III(c) and VI of Appendix A to 10 CFR Part 100 require that structures, systems, and components necessary to ensure the capability of mitigating the radiological consequences of an accident that could result in exposures comparable to the dose guidelines of Part 100 be designed to remain functional during and after a safe-shutdown earthquake.

The staff assumed a double guillotine pipe rupture in one of the four MSLs upstream of the inboard MSIV. A total of 400 scfh (the maximum allowable leakage limit) is assumed to occur: (1) 200 scfh through the broken steamline, (2) 100 scfh through a second intact steamline, and (3) the remaining 100 scfh through a third intact steamline. The staff's calculated offsite doses resulting from this pathway are given Table 1 and the parameters and assumptions used in the staff's calculation are given in Table 2.

3.1.4 Control Room Habitability

After a DBA, the HCGS control room emergency filtration system (CREFS) supplies non-radioactive outside air to pressurize the control room. The CREFS is designed to maintain the control room at 1/8-inch water gauge positive pressure relative to adjacent areas. The pressurization is accomplished by introducing 1,000 cfm of outside air, which is mixed with 3,000 cfm of control room return air before entering the control room emergency filtration unit.

The CREFS is an ESF system and is redundant. Each subsystem has a design flow capacity of 4,000 cfm. The licensee proposed a conservative recirculating flow rate of 4,000 cfm. Each subsystem consists of, among other things, a high-efficiency particulate air (HEPA) filter, charcoal adsorbers, and a post HEPA filter. The licensee proposed a charcoal filter removal efficiency of 99 percent for iodine in elemental and organic forms.

In evaluating airborne radioactivity concentrations in building wakes, the staff assumed a ground-level release of airborne fission products from the turbine building as a diffusion source and the control room air intake as a single-point receptor. The staff estimated the control room building wake atmospheric dispersion parameters (χ/Q values) in accordance with the guidelines in the standard review plan (SRP). The parameters used in the staff's radiological consequence assessment are given in Table 2.

During the review, the staff requested additional information about the unfiltered control room air infiltration rate assumed in the licensee's control room operator dose calculation, and asked if the licensee had performed any unfiltered control room air in-leakage testing. This request was the result of the staff's experience with several other utilities that were unable to validate their unfiltered inleakage assumptions. Approximately 20 percent of operating plants used tracer gas testing to measure the amount of unfiltered control room air infiltration and in each case the measured infiltration exceeded the assumptions used in their control room operator dose calculations. Therefore, the requested information was required in order to provide reasonable assurance that the doses to the control room operators would be in accordance with control room habitability requirements.

The licensee responded in a letter dated October 15, 1999, that the unfiltered control room air infiltration rate assumed in the control room operator dose calculation was 10 cfm, which reflects in-leakage only through the control room doors (egress and ingress). The licensee further stated that it had not performed any control room unfiltered air in-leakage tests to verify this assumption.

3.1.5 Radiological Assessment Conclusion

The staff has found that the off-site radiological consequences of the proposed change, depicted in Table 1, are within the values referenced in 10 CFR Part 100. However, the staff has identified a concern with assumed control room inleakage assumptions that have not been validated by plant-specific testing. Therefore, the staff could not complete its review of the HCGS control room habitability because of this unresolved concern.

TABLE 1

Radiological Consequences
(rem)

Pathways	EAB[1]		LPZ[2]	
	Thyroid	WB[3]	Thyroid	WB
MSIV Leak	70	2.5	11	0.5
Containment Leak	29	<1	22	<1
ECCS Leak	18	<1	14	<1
TOTAL	117	2.5	47	0.5
Dose Criteria[4]	300	25	300	25

[1] Exclusion area boundary
[2] Low population zone
[3] Whole body
[4] 10 CFR Part 100

	Thyroid	Whole Body
Control Room Operator Doses:	See Note	See Note
Control Room GDC-19 Criteria:	30	5.0

Note: Values to be determined subsequent to CRHE issue resolution

Table 2

Assumptions Used to Evaluate Radiological Consequences

Parameter	Value
Reactor Power MWt	3458
Fraction of core inventory released, fractions	
Noble gases	1.0
Iodine	0.25
Iodine chemical forms, fractions	
Organic	0.04
Elemental	0.91
Particulate	0.05
Primary containment leakage, percent/day	0.5
Primary containment free volume, ft^3	3.01E+5
Suppression pool water volume, ft^3	9.11E+5
ECCS leak rate, gph	10
Iodine partition factor for ECCS leakage	0.01
FRVS flow rate, cfm	9.0E+3
FRVS filter efficiencies, percent	
Organic	99
Elemental	99
Particulate	99
Total MSIV leak rate, scfh	400
Atmospheric dispersion values, sec/m^3	
0-02 hour EAB	1.7E-4
0-08 hour LPZ	8.3E-6
8-24 hour LPZ	5.4E-6
1-04 day LPZ	2.1E-6
4-30 day LPZ	5.5E-7
Control Room Atmospheric dispersion values, sec/m^3	
0-08 hour	5.3E-4
8-24 hour	3.1E-4
1-04 day	1.2E-4
4-30 day	3.5E-5

3.2 Seismic Adequacy Evaluation

3.2.1 Reliability of Boundary Valves

The proposed HCGS ALT system utilizes the MSLs and main steam drain lines to direct MSIV leakage to the main condenser. The ALT path takes advantage of the large volume of the MSLs and condenser to hold-up and plate-out fission products in the MSIV leakage effluent. To mitigate a DBA, this path must be available under DBA conditions with loss of offsite power.

The ALT path is from the outboard side of the MSIVs through four drain lines which join a drain header to the main condenser. To establish the ALT path, Valve 1ABHV-F072, which is a non-1E motor-operated valve (MOV) and normally closed, is required to open. The valve is presently bypassed by a 1/8" orifice when AOV 1ABHV-F069 is opened. The licensee stated in their submittal dated October 15, 1999, that this valve will be modified to fail open upon a loss of instrument air or electric power. This bypass flow path will, therefore, establish the ALT path whenever a single failure of 1ABHV-F072 to open occurs. In order to accommodate the postulated ALT flow rates, the licensee's submittal dated October 15, 1999, stated that the orifice size in the 1ABHV-F069 valve line will be increased to 0.8". The licensee also indicated that it will implement a modification to supply the MOV 1ABHV-F072 with Class-1E power.

Valves 1ABHV-F070A, B, C, and D are normally closed, but are continuously bypassed during operation by a 1/8" orifice. The licensee's submittal dated October 15, 1999, stated that the flow capacity of these bypass lines will be increased by the addition of a 0.6" orifice that will allow the ALT path to be established without opening the 1ABHV-F070A, B, C, and D valves.

Valve 1ABHV-F071 is a normally open MOV with Class-1E power. This valve has no bypass and must be open for establishing the ALT path. For this valve to cause an ALT path failure it would have to be mispositioned to "closed" and the valve or the 1E power source would have to fail.

The boundary valves that need to close are 1ABHV-3631A, B, C, and D; 1ABHV-F020, 1ABHV-F019, 1ABHV-F016, 1FDHV-F029, 1FCHV-F026; and 1FDHV-4922. The piping to these boundary valves was evaluated in a seismic evaluation report by EQE International, Inc. The EQE report, dated November 12, 1998, is included as Attachment 4 to the licensee's submittal dated December 28, 1998, (herein referred to as the EQE report). Failure of (or, leakage from) one or more of the main steam stop valves (1ABHV-3631A, B, C, and D) will still result in a passive leakage path to the main condenser through the main steam lead drains through 1ABFO-1051, which has a 0.3" orifice. This "Backup ALT" will likely be available in a post-seismic event since the major piping is seismically designed and the small bore piping is reasonably rugged. Failure of either: 1) 1FDHV-F029 (the HPCI drain pot steam condensate drain to the condenser); 2) 1FCHV-F026 (the RCIC drain pot steam condensate drain to the condenser); or 3) 1FDHV-4922 (the HPCI gland seal condenser vacuum pump discharge) would result in leakage back into the secondary containment. If the lines are broken or open past the boundary valve, the discharge would be treated by the FRVS. Valves 1ABHV-F019 and 1ABHV-F016 are lined up in series, and provide safety-related primary containment isolation. Failure of the valve 1ABHV-F020 would result in the above mentioned "Backup ALT" treating any leakage past that boundary valve. However, since this valve is procedurally required and

ensured to be in the closed position, its failure to close is not postulated and is excluded from the inservice testing (IST) Program.

The licensee stated that the valves required to establish the ALT path or to form the isolation boundary of the ALT path will have added requirements to assure their operability and ability to function. Many of these valves are already safety-related or are in the IST program. The remaining valves (that are required to operate) will be added to the IST program. The proposed ALT path is composed of safety-related and non-safety-related piping. For the safety-related piping, the licensee will continue to implement required inspections for that class of piping. The non-safety-related piping is part of the Flow Accelerated Corrosion (FAC) program, and as such, it is periodically inspected and has been partially replaced with FAC resistant chrome-moly (A335 Grade P22) piping.

Based on the above, the staff found the licensee’s actions to ensure the reliability of the MSIV ALT path to be acceptable. To ensure that the proper required actions are taken by plant operators, the licensee stated in its December 28, 1998, submittal that they will modify plant emergency response procedures to incorporate the required changes to ensure that the ALT pathway is lined up in place of the original MSIVSS.

3.2.2 Seismic Verification Walkdowns

The ALT path consists of the main steam piping (beyond the outboard MSIVs), the steam drain lines, the condenser, and interconnected piping. Portions of this piping were not seismically analyzed as this analysis was not required in the original licensing basis of HCGS.

In order to confirm the functional capability of the ALT path, the licensee performed seismic verification walkdowns of the ALT system at HCGS. The plant walkdown verification procedure reviewed various design attributes of the as-installed scope of equipment, piping and tubing to ensure that the installations are representative of database design practice and that components are free of known seismic vulnerabilities. The procedure was based on earthquake experience and the identified conditions that have resulted in failure of piping and tubing systems and components. Specifically, the walkdowns were performed to: (1) verify that the HCGS plant features have attributes for piping and pipe support similar to those in the earthquake experience database that has demonstrated good seismic performance; (2) verify general conformance of pipe support spans to the requirements of ANSI B31.1; and (3) examine the ALT path from the outboard MSIVs to the condenser to identify potential seismic vulnerabilities considering those structural details and causal factors that resulted in component damages at database plants.

The walkdowns focused on piping systems which were not seismically analyzed; however, those systems which are seismically analyzed were also examined via walkdown to identify any anomalies that may have gone undetected during the original construction. The potential vulnerabilities which were identified as "outliers" include categories such as support failure, falling of non-seismically designed plant features (II/I), proximity and impact, and differential seismic anchor motion on piping systems. Table 4-1 of the EQE report presents a complete list of the outliers identified during the walkdowns. As indicated in the table, all outliers have been resolved.

3.2.3 Validation of Earthquake Experience Database

To justify the seismic capacity of the main steam piping and condenser as the MSIV ALT system, the licensee relied on comparing the components that make up the ALT system to an earthquake experience database developed for BWROG by EQE, Inc.. The objective of the comparison was to show that facilities with structures, components, and equipment similar to those at HCGS have undergone strong earthquake ground motion greater than that of the HCGS design-basis earthquake (DBE) and remained undamaged and functional. To demonstrate the seismic adequacy of the ALT system for HCGS, the licensee used the following earthquake-facility pairs:

NO.	EARTHQUAKE	FACILITY
1	1971 San Fernando, CA	Burbank Power Plant, CA
2	1971 San Fernando, CA	Valley Steam Plant, CA
3	1979 Imperial Valley, CA	El Centro Steam Plant, CA
4	1987 Whittier Narrows, CA	Commerce Refuge to Energy Plant, CA
5	1989 Loma Prieta, CA	Moss Landing Power Plant, CA
6	1992 Landers, CA	Coolwater Power Plant, CA
7	1992 Petrolia, CA	PALCO Cogeneration Plant, CA

Of these seven earthquake-facility pairs, only the Coolwater Power Plant ground motion, as represented by a response spectrum, was made onsite. The other six ground motions are ground motion estimates based on actual nearby recordings. For facilities without onsite seismic recording instruments, estimating the ground motion requires knowledge of: (1) the earthquake magnitude; (2) the distances from the facility and recording site to the fault rupture area; (3) the distance from the facility to the recording site; and (4) the geologic structure between the earthquake focus and the recording site as well as the geologic structure directly beneath the facility and recording site. An evaluation by the NRC staff of each of these facility ground motion estimates is contained in the SE of the BWROG report dated March 3, 1999.

With the exception of the Moss Landing Power Plant response spectrum, the licensee used response spectra that have been previously reviewed and accepted by the staff. In its RAI dated July 1, 1999, the staff pointed out that the Moss Landing Power Plant response spectrum used by the licensee was not the accepted estimate developed by Pacific Gas & Electric (PG&E). In its submittal dated October 15, 1999, the licensee provided the accepted response spectrum. In addition, in its original submittal the licensee used the condenser at the earthquake experience site of Ormond Beach, CA, for comparison with the HCGS condenser. However, the licensee did not provide a comparison between the Ormond Beach response spectrum and the HCGS SSE spectrum. In its submittal dated October 15, 1999, the licensee stated that the Ormond Beach spectrum was not used for comparison with the HCGS condenser for anchorage adequacy. In summary, the licensee has used facility ground motion estimates to demonstrate

the seismic adequacy of the ALT system for HCGS that have been previously reviewed and accepted by the NRC staff.

3.2.4 Comparison of HCGS and Experience Data

Table 4.3 of the EQE report provides a database for main steam and process piping at Valley Steam Plant, Units 1 and 2, and El Centro Steam Plant. Data provided included pipe diameter, schedule, wall thickness and pipe diameter-to-thickness (D/t) ratio. Table 4-4 of the EQE report provides a data comparison between the HCGS ALT system piping and the piping of the above-selected database facilities. Although the HCGS ALT piping data appear to be generally enveloped by the presented experience database, in terms of pipe thickness and diameter-to-thickness ratio, the staff questioned, in Item No. 3 of its RAI dated January 6, 2000, the validity of the Valley Steam Plant Units 1 & 2 as a database site for the HCGS plant, because its response spectrum does not totally envelop the HCGS response spectrum.

The staff noted that the Valley Steam spectrum is exceeded by the HCGS spectrum in the frequency range 6 to 21 Hz. The staff also noted that the Moss Landing spectrum is exceeded by the HCGS spectrum in the frequency range 4.2 to 13 Hz. In the RAI, the staff also requested that the licensee provide a justification for not including piping larger than 4 inches in diameter in the above-mentioned Table 4-3 and Table 4-4.

In its response dated March 3, 2000, the licensee stated that the piping that is relied upon to establish an ALT pathway includes both seismically analyzed and non-seismically designed systems. All piping greater than 4 inches in diameter was seismically designed and is part of the safety-related piping in the main steam system. Portions of the main steam drain system piping that have not been seismically analyzed are less than or equal to 4 inches in diameter. The licensee has reviewed these piping systems to demonstrate that they fall within the bounds of design characteristics found in selected conventional power plant steam piping. In regard to the concern that the HCGS spectrum exceeds the Steam Valley and Moss Landing spectra in certain frequency ranges, the licensee stated that the frequencies of interest for these non-seismically designed piping systems are predominantly in the low frequency portion of the spectra, and that the earthquake response spectra for Moss Landing and Valley Steam power plants bound the HCGS design SSE spectra in these low frequency ranges.

The staff has reviewed the natural frequencies and modal participation factors up to 33 Hz for a representative seismic analysis of the ALT pathway piping, as provided in the licensee's submittal dated March 3, 2000. The staff found that the natural frequencies and modal participation factors for the first two significant modes are 0.71 Hz and 2.085, and 1.31 Hz and 3.059, respectively. The modal participation factors for higher modes become much less significant. On this basis, the staff found the piping data represented by Valley Steam Plant Units 1 & 2 and El Centro Steam Plant, as provided in Table 4-3 of the EQE report, to be an acceptable database for the HCGS ALT system drain line.

As indicated in the submittal dated December 28, 1998, the licensee has compared the structural characteristics of the HCGS main condenser to those of similar database condensers which have experienced significant earthquake ground motions as addressed in the BWROG report. In Table 3-1 of the EQE report, the design attributes of the condenser are compared with

the two sites in the earthquake experience database, namely, Moss Landing Units 6 & 7, and Ormond Beach Units 1 & 2.

In the RAI dated January 6, 2000, the staff questioned the approach taken by the licensee in qualifying the HCGS condenser by the earthquake experience database. The staff noted that in Figures 3-1 through 3-3 of the EQE report, the comparisons were made, for the physical configuration and dimension, between the HCGS condenser and condensers at Ormond Beach and Moss Landing. However, as shown in Figures 3-5 and 3-6 of the report, database sites at El Centro and Moss Landing were used to demonstrate the adequacy of the HCGS condenser anchorage. The staff requested that the licensee explain why different pairs of database sites were used for different aspects of condenser comparison. The staff also questioned the validity of the Ormond Beach's condenser data, since, as previously stated in Section 3.2.3 of this SE, the licensee elected not to provide the Ormond Beach spectrum for comparison with the HCGS spectrum. In the end, it seemed that the only database site which is valid for demonstrating the seismic adequacy of the HCGS condenser is Moss Landing. The staff considered the data insufficient and, therefore, not acceptable.

The staff expressed its concern in the RAI dated January 6, 2000, about the lack of sufficient earthquake experience data provided by EQE, Inc., for the condenser. In its SE of the BWROG report dated March 3, 1999, the staff stated that at the present time, there is no standard, endorsed by NRC, that provides guidance for determining what constitutes an acceptable number of earthquake recordings that should be provided by licensees that utilize the BWROG methodology. Therefore, individual licensees are responsible for ensuring the sufficiency of the earthquake experience data to be submitted for staff review. On that basis, the staff also stated in the RAI that if the licensee is unable to provide a sufficient earthquake database for the condenser, it will be required to perform analytical evaluations for the condenser, against all the pertinent operating and design loadings, in accordance with the plant's design-basis methodology and criteria.

In its response to the staff's RAI, the licensee stated in the letter dated March 3, 2000, that seismic analyses of the HCGS condenser had been performed to demonstrate that the HCGS condenser would retain its structural integrity following a seismic event such that its function as a post-LOCA iodine plate-out structure is ensured. The staff review of the licensee's analysis of the condenser is discussed in the following section, along with the evaluation of the ALT pathway piping and pipe supports.

3.2.5 Evaluation of ALT Pathway

As indicated in the licensee's submittal dated October 15, 1999, portions of the MSIV ALT pathway piping systems and related components at HCGS are classified as seismic Class I systems, and are located in the reactor building (RB). These systems were seismically analyzed and designed to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section III requirements for Class 1, 2, and 3 components. The remaining portion of main steam drain and associated piping, less than or equal to 4 inches in diameter, were analyzed for dead weight and thermal loads using computer and spacing criteria, without consideration of seismic loads. These non safety-related pipes are generally composed of welded steel piping and standard support components, and are similar to piping found in the earthquake experience database. The system is predominantly supported for dead weight

utilizing rod hangers. These rod hangers are constructed from standard support catalog parts, typically consisting of clamps, threaded rods, weldless eye nuts, turnbuckles, and welding legs, and are attached to either concrete or structure steel. The objective of the assessment of the non-seismic main steam drain piping is to demonstrate that piping position retention will be maintained during a seismic event and hence provide assurance that the pipe supports will behave in a ductile manner and that all lines are free of known seismic hazards. Upon completing its assessment of the main steam drain piping, the licensee was able to ensure that these HCGS piping systems will perform in a manner similar to piping and supports that have been observed to demonstrate good seismic performance.

The licensee performed walkdown reviews of the design attributes of the ALT pathway piping configurations, including routing, pipe size and support configurations. All pipe support anchorage designs and loadings were reviewed. The only outlier identified was a large, unsupported in-line component (Strainer ST-D003 in the reactor core isolation cooling (RCIC) room). The licensee has already resolved the outlier by modification. All other attributes indicate that the system is designed for good seismic performance. In addition, the licensee performed a bounding seismic analysis to verify the seismic adequacy of the anchorages for each representative type of pipe support within the ALT pathway piping that is not classified as seismic Class I systems. Based on its review of the licensee's analytic approach and plant modifications, the staff finds the licensee’s evaluation approach of pipe supports to be acceptable.

As indicated previously in Section 3.2.4 of this SE, the staff found the piping data represented by Valley Steam Plant Units 1 & 2 and El Centro Steam Plant, in Table 4-3 of the EQE report to be acceptable database for the HCGS ALT system drain line. On this basis, the staff, therefore, finds the ALT pathway piping and supports to be seismically adequate.

The HCGS condenser anchorage consists of six sliding plate supports at the periphery and one fixed plate support in the center. The center anchor support plate is anchored to the concrete foundation by 4 2-1/2" diameter bolts, and these bolts resist lateral loads in both north-south and east-west directions. Each of the six sliding plates is anchored to the concrete foundation by 4 2" diameter bolts. The embedment of each bolt into the concrete foundation is 3'-0". The sliding plates have oversized or slotted holes allowing thermal growth in specified directions.

As indicated by the licensee in the submittal dated March 3, 2000, seismic analyses of the condenser anchorages had been performed, and documented in EQE Report 200235-R-01 and EQE Calculation 200235-C-1. The seismic demand at the condenser anchorage elevation was developed based on a RG 1.60 design spectrum with a peak ground acceleration (PGA) of 0.2g, the SSE level for HCGS. The condenser seismic demand is taken as 5% of critical damping spectra broadened by ± 15% in accordance with plant design criteria. The licensee evaluated the condenser anchorage capacity using a methodology consistent with that described in the Seismic Qualification Utility Group (SQUG) document titled "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 2A, dated March 1993. The seismic and operating loads were combined to determine shear and tension demands on condenser anchorages. The ratio of the combined load demand to capacity is less than 1.0. The licensee’s calculation concludes that the condenser anchorage has adequate capacity to resist the seismic and operating loads. Based on its review of the licensee's analytic approach

and the resulting conclusion, the staff finds the licensee's evaluation approach of the condenser anchorage to be acceptable.

The licensee also indicated in the submittal dated March 3, 2000, that calculations (10855-M4-129-6) were performed for the condenser structural members as part of the original plant design. The design calculations include evaluation of combined axial and bending loads due to dead weight and seismic operating basis earthquake (OBE). These design loadings result in less than approximately 10% of allowable stress. Based on these design calculations, the licensee estimated the stresses for the HCGS SSE to be less than about 20% of design allowables, and thus had adequate capacity to resist the seismic and operating loads. Based on its review of the information provided by the licensee and the resulting estimated stress levels, the staff finds the licensee's evaluation approach of the condenser structural members to be acceptable.

3.2.6 Bounding Seismic Analysis

In its SE of the BWROG report dated March 3, 1999, the staff specifically requested that individual licensees of plants whose FSARs or UFSARs reference Appendix A to 10 CFR Part 100 perform a bounding seismic analysis for the ALT path system piping. Item No. 7 of the staff's RAI dated July 1, 1999, reiterates such a staff request. The licensee responded in the submittal dated October 15, 1999, that a bounding seismic analysis of the ALT pathway piping was performed using a general-purpose finite element piping analysis program, considering pertinent loadings and criteria. The licensee's document, Calculation No. 200965-C-001, provides details of such representative and bounding seismic analysis, including the basis for the selection of the system configuration analyzed.

The portion of piping selected for the bounding seismic analysis is the main run of the ALT drain pathway, which spans from various seismic anchor locations in the RB to the condenser located in the turbine building (TB). The licensee stated that this piping portion is typical and represents a significant portion of the total non-seismic Class I piping within the MSIV seismic verification boundary. Fixed anchors were modeled for anchor supports at piping class break locations (seismic Class I to non-seismic Class I boundary) and at the terminal equipment (condenser). Pipe supports were modeled as one- or two-way restraints, with applicable gaps and/or sliding characteristics, based on walkdown observations and/or support drawing reviews. Variable spring supports were modeled with applicable cold load setting and spring stiffness.

The pipe material used is carbon steel, SA-106 Grade B, with 1" to 2" calcium silicate insulation. Pipe sizes include 2", 3" and 4" diameter pipes of schedules 160, 80 and 120, respectively. The licensee calculated and applied the appropriate stress intensification factors at the location of the pipe fittings.

The highest attachment point for the pipe supports in the piping models is at elevation 137' of the TB. As such, the 5% of critical damping floor response spectra of the Auxiliary and TBs at that elevation are enveloped and conservatively used as the seismic demand input for dynamic analyses.

The licensee used the general purpose finite element piping program AutoPIPE to perform both static and dynamic analyses of the piping model. Load cases considered are gravity, pressure, thermal, differential building settlement, and seismic loads. The licensee used dynamic

analyses to perform the modal superposition response spectrum analysis method with modes up to 33 Hz, and with missing mass corrections. Both directional and modal responses were combined using the Square-Root-of-the-Sum-of-Squares method.

The results from the analyses of the non-seismic Class I portions of the HCGS MSIV ALT pathway piping indicate that the combined pipe stresses for the various loading combinations, including SSE, considered in accordance with the ANSI B31.1 code, are within the appropriate stress allowables, with adequate margins. The licensee also evaluated pipe supports, including steel support members, anchor plates, welds, and anchor bolts, and found that the demand on the supports, including SSE loading, is within the appropriate allowable capacities. Based on its review of the information provided by the licensee and the resulting available margin, the staff finds the licensee's evaluation approach of the ALT system piping to be acceptable. In addition, the results provide further confirmation of the seismic adequacy of the ALT system piping that was established on the basis of the earthquake experience database.

3.2.7 Seismic Dynamic Analysis of Turbine Building

The performance of the TB during a seismic event is of interest to the issue of MSIV leakage only to the extent that the building structure and its internal components should survive and not degrade the capabilities of the selected main steam and condenser pathways.

The HCGS TB is classified as non-seismic structure, and was designed in accordance with the criteria provided by the Uniform Building Code. The licensee used codes and criteria similar to those used for seismic Category I structures for the structural design of the entire TB. In addition, the licensee dynamically analyzed the TB to verify that it does not collapse on, or interact with, adjacent seismic Category I structures for abnormal and extreme environmental conditions, including an SSE.

Based on the above discussion, the staff concludes that the TB will withstand an SSE and other abnormal and extreme environmental conditions and is adequate for this license amendment request.

3.2.8 Seismic Adequacy Evaluation Conclusion

Based on the above evaluation, the staff concludes that upon completion of the plant modifications identified in Section 3.2.1, for valves 1ABHV-F069 and 1ABHV-F070A, B, C and D, as well as providing MOV 1ABHV-F072 with Class 1E power, there is reasonable assurance that the HCGS MSLs, main steam drain lines, condenser, and associated interconnected piping and supports will be seismically adequate for the proposed MSIV ALT system. The staff’s conclusion is based on: (1) the staff’s independent analysis of the earthquake experience database confirmed that the DBE demand at HCGS is below the seismic ground motion that was experienced at the facilities in the earthquake experience database; (2) representative pipe support anchorages were reviewed and found to be seismically adequate; (3) the HCGS condenser shell and its anchorages have been analytically evaluated and found to be seismically adequate; (4) the majority of the main steam system piping was seismically analyzed as part of the initial design of the plant; (5) the non-seismically analyzed ALT piping is represented by piping in the earthquake experience database that demonstrated good seismic performance; (6) the bounding seismic analysis performed for the non-seismic portion of main steam drain lines

further confirms adequate safety margins for piping stresses and support loads; and (7) the TB has adequate capability to withstand the DBE loads. The staff, therefore, concludes that the licensee's proposed ALT system meets the intent of Appendix A of 10 CFR Part 100 and is acceptable.

It should be noted that the staff's acceptance of the experience-base methodology as presented by BWROG and PSE&G is restricted to its application for ensuring the pressure boundary integrity and functionality of the MSIV alternate leakage treatment system. The staff's acceptance of the methodology for this application is not an endorsement for the use of the experience-base methodology for other applications at HCGS.

3.3 Functional Evaluation

The licensee has evaluated the ability of the MSIV alternate leakage treatment pathway to function under the conditions specified in NEDC-31858P, Revision 2. The evaluation described in the following paragraphs is from a functional system perspective, and does not include a seismic evaluation.

As specified in Section 6.2.6 of the Hope Creek Safety Evaluation Report (NUREG-1048), the MSIV Sealing System is manually initiated approximately 20 minutes after the onset of a LOCA. As described below, use of the MSIV alternate leakage treatment pathway will also require the use of operator actions to control valve position following a LOCA. The licensee has concluded that the operator actions necessary to functionally align the system can be accomplished within the time currently required for initiation of the current MSIV Sealing System. To ensure that the required actions are taken by the plant operators, the licensee stated in its December 28, 1998, submittal that they will modify plant emergency response procedures to incorporate the required post-LOCA changes to ensure that the MSIV alternate leakage treatment pathway is lined up in lieu of the MSIV Sealing System.

There are several valves in the proposed MSIV alternate leakage treatment pathway that must open to allow MSIV leakage to drain to the main condenser. Starting from the main steam lines, first there are four valves in parallel (1ABHV-F070A, B, C, and D), each with an orificed line that bypasses it. Next is valve 1ABHV-F071. Finally, there are two valves in parallel, 1ABHV-F072 and 1ABHV-F069 (this last valve also has an orifice in series with it).

NEDC-31858P, Revision 2, states that all drain pathway valves required to be open in post-LOCA conditions will be supplied with Class-1E power. Valve 1ABHV-F072 (a non-1E MOV that is normally closed) needs to be in the open position to establish the alternate leakage treatment pathway. Therefore, the licensee stated in its December 28, 1998, submittal that they will implement a modification to supply this MOV with Class-1E power.

Valves 1ABHV-F070A, B, C, and D are non-1E MOVs that are normally closed. These valves are not, however, required to be open to establish the alternate leakage treatment pathway. In lieu of opening these MOVs, the licensee's design will credit the permanently installed orifice lines to establish the required leakage treatment pathway. Since these orifice elements are currently sized at 1/8th inch, a modification will be made to increase their size to 0.6 inch. Installation of the 0.6 inch orifice in each of the four lines will provide a total flow area of 1.1 square inches, which is sufficient for the proposed leakage treatment pathway. Therefore, no

electrical modifications are necessary for the 1ABHV-F070A, B, C, and D valves. However, these valves could also be opened to establish the alternate leakage treatment pathway. If these valves are not or cannot be opened (e.g., due to non-safety-related power being unavailable), the leakage from the outer MSIVs will pressurize the space between the outer MSIVs and the Main Steam Stop Valves until equilibrium flow is established through the 0.6 inch orifice elements. Normally, the flow through these orifice elements will be isolated (via the 1ABHV-F069 and 1ABHV-F072 valves) during startup in accordance with plant operating procedures.

Valve 1ABHV-F069 is a fail-closed air-operated valve. This valve will provide a backup in the case of a failure of 1ABHV-F072 to open. Since the proposed leakage treatment pathway will require flow through either 1ABHV-F069 or 1ABHV-F072, valve 1ABHV-F069 will be modified from a fail-closed valve to a fail-open valve. In addition, the current 1/8th inch flow orifice in the 1ABHV-F069 line will be replaced with a 0.8 inch diameter orifice. Consequently, if valve 1ABHV-F072 failed to open as required, the bypass drain path around valve 1ABHV-F072 would be available to convey MSIV leakage to the condenser. Therefore, the radiological dose assessment for this backup pathway is essentially equivalent to the dose assessment for the primary pathway.

Valve 1ABHV-F071 is a normally open MOV with Class-1E power. This valve has no bypass and must be open in order to establish the alternate leakage treatment pathway. The valve will fail "as-is" on a loss of power. For this valve to cause a leakage treatment pathway failure, it would have to be mispositioned to “closed” and the valve or the 1E power source would have to fail. It is very unlikely that it would be in the closed position if the main steam line drains were required for treatment of MSIV leakage. If this valve were closed during normal operation, the alternate leakage treatment pathway would be considered inoperable and proposed TS 3.6.1.4 would require corrective action or an eventual shutdown. Although the valve is not locked open and does not have the power removed from the motor operator, the staff considers it to be sufficiently reliable to perform its function, given the low probability of its failure and the resultant low potential impact on overall risk.

In addition to the primary alternate leakage treatment pathway, there is an uncredited “backup” alternate leakage treatment pathway. Failure of one or more of the Main Steam Stop Valves (1ABHV-3631A, B, C, & D) will still result in a passive leakage path to the main condenser through the main steam lead drains through 1ABFO-1051, which has a 0.3" orifice. Any leakage past the Class-1E powered Main Steam Stop Valves or leakage into the steam line before the Turbine Stop Valves would be leakage to the condenser through this path.

Further, the licensee stated in its October 15, 1999, submittal that they would inservice test the MSIV alternate leakage treatment pathway valves and the associated boundary valves as appropriate to ensure that the MSIV alternate leakage treatment pathway can be established. Also, these components are within the scope of the Maintenance Rule, 10 CFR 50.65.

Based on the above, the staff finds that the proposed design provides a reliable alternate leakage treatment method, and, therefore, is acceptable.

Regarding the Technical Specifications, proposed TS 3.6.1.4 will ensure that the MSIV alternate leakage treatment pathway remains capable of performing its post-accident functions, or appropriate actions are taken to place the plant in a safe condition.

Further, the licensee has proposed new requirements in TS 3.6.1.2 related to restoration of acceptable leak rates if any of the proposed limits are exceeded. The new requirements state that, if the MSIV leakage rate exceeds 400 scfh combined through all four main steam lines, or 200 scfh for any one main steam line, the leakage rate shall be restored to less than or equal to 11.5 scfh (the current criterion for leakage) on affected MSIVs. The staff concludes that these new requirements will restore the leakage rates to values that are consistent with the revised radiological analysis and are, therefore, acceptable.

4.0 CONCLUSION

With regard to the radiological assessment of offsite doses in Sections 3.1.1, 3.1.2, and 3.1.3, the seismic adequacy evaluation in Section 3.2, and the functional evaluation in Section 3.3, the Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public would not be endangered by operation in the proposed manner; (2) such activities would be conducted in compliance with the Commission's regulations; and (3) the issuance of the amendment would not be inimical to the common defense and security or to the health and safety of the public.

However, the radiological assessment of control room operator doses depends on determining the amount of unfiltered air infiltrating the control room, and there is an unresolved issue associated with this determination. Therefore, the Commission has concluded, based on the considerations discussed above, that the review of this amendment request cannot be completed until the CRHE issue associated with this change are resolved.

5.0 REFERENCES

(1) Letter, E. C. Simpson (PSE&G) to Document Control Desk (NRC), “Request for Change to Technical Specifications, Increase of Allowable MSIV Leakage Rate and Deletion of MSIV Sealing System, dated December 28, 1998. Accession No. 99010600117

(2) General Electric Nuclear Energy, “BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems,” NEDC-31858P, Revision 2, dated September 1993. Accession No. 9310140046

(3) Letter, F. M. Akstulewicz (NRC) to T. A. Green (BWROG), “Safety Evaluation of GE Topical Report, NEDC-31858P, Revision 2, dated March 3, 1999. Accession No. 9903110303

(4) Letter, R. B. Ennis (NRC) to H. W. Keiser (PSE&G), “Request for Additional Information,” dated July 1, 1999. Accession No. 9907070283

(5) Letter, M. B. Bezilla (PSE&G) to Document Control Desk (NRC), “RAI Response for Increase of Allowable MSIV Leakage Rate and Deletion of MSIV Sealing System Technical Specification Changes,” dated October 15, 1999. Accession No. ML003716516

(6) Letter, R. B. Ennis (NRC) to H. W. Keiser (PSE&G), “Request for Additional Information,” dated January 6, 2000. Accession No. ML003671900

(7) Letter, D. F. Garchow (PSE&G) to Document Control Desk (NRC), “RAI Response for Increase of Allowable MSIV Leakage Rate and Deletion of MSIV Sealing System Technical Specification Changes,” dated March 3, 2000. Accession No. ML003691651

(8) AutoPIPE Version 4.70.06, Rebis Industrial Working Group Software, Walnut Creek, CA.

6.0 <u>LIST OF ACRONYMNS AND INITIALISMS USED</u>

ALT	Alternate Leakage Treatment
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
CFR	Code of Federal Regulations
CREFS	Control Room Emergency Filtration System
DBA	Design Basis Accident
DBE	Design Basis Earthquake
EAB	Exclusion Area Boundary
ESF	Engineered Safety Features
FAC	Flow Accelerated Corrosion
FRVS	Filtration, Recirculation, and Ventilation System
FRVS-RS	FRVS Recirculation System
FRVS-VS	FRVS Ventilation System
FSAR	Final Safety Analysis Report
GDC	General Design Criteria
GE	General Electric
GIP	Generic Implementation Procedure
gph	Gallons Per Hour
HCGS	Hope Creek Generating Station
HEPA	High-Efficiency Particulate Air
IST	Inservice Testing
LCS	Leakage Control System
LOCA	Loss-Of-Coolant Accident
LPZ	Low Population Zone

MOV	Motor-Operated Valve
MSIV	Main Steam Isolation Valve
MSIVSS	Main Steam Isolation Valve Sealing System
MSL	Main Steam Line
NRC	Nuclear Regulatory Commission
OBE	Operating Basis Earthquake
PG&E	Pacific Gas and Electric
PGA	Peak Ground Acceleration
PSE&G	Public Service Electric and Gas Company
RAI	Request for Additional Information
RB	Reactor Building
RCIC	Reactor Core Isolation Cooling
RG	Regulatory Guide
scfh	Standard Cubic Feet per Hour
SE	Safety Evaluation
SRP	Standard Review Plan
SSE	Safe Shutdown Earthquake
TB	Turbine Building
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report

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