Public Service
Electric and Gas
Company

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Vice President and Chief Nuclear Officer

August 12, 1988

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United States Nuclear Regulatory Commission
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Gentlemen:

RESPONSE TO GENERIC LETTER 88-01
TRANSMITTAL OF AFFIDAVIT
HOPE CREEK GENERATING STATION
DOCKET NO. 50-354

Public Service Electric and Gas Company's response to Generic Letter 88-01 for the Hope Creek Generating Station dated July 29, 1988 did not include an affidavit. The required affidavit is included in the attached resubmittal of the July 29, 1988 response.

Should you have any additional questions or comments, please do not hesitate to contact us.

Sincerely,

Steven E Miltenberger

Affidavit
Attachments (3)

A001
1/1

C Mr. G. W. Rivenbark
USNRC Licensing Project Manager

Mr. G. W. Meyer
USNRC Senior Resident Inspector

Mr. W. T. Russell, Administrator
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380 Scotch Road
Trenton, NJ 08628

Pef: Response to Generic Letter 88-01

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

Steven E. Miltenberger, being duly sworn according to law deposes and says:

I am Vice President and Chief Nuclear Officer of Public Service Electric and Gas Company, and as such, I find the matters set forth in our letter dated August 12, 1988 , concerning Docket No. 50-354 for Hope Creek Generating Station, are true to the best of my knowledge, information and belief.

Steven E Miltenberger

Subscribed and Sworn to before me
this 12th day of August, 1988

Eileen M. Ochs

Notary Public of New Jersey

EILEEN M. OCHS
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires July 16, 1992

My Commission expires on ______

ATTACHMENT 1

Public Service Electric and Gas Company
Response to Generic Letter 88-01

In accordance with the information contained in Generic Letter 88-01 dated January 25, 1988, Public Service Electric and Gas Company (PSE&G) hereby provides Hope Creek Generating Station (HCGS) responses to the five identified items: (1) Intergranular Stress Corrosion Cracking (IGSCC) Mitigation, (2) Inservice Inspection (ISI) Program, (3) Technical Specifications, (4) Leak Detection, and (5) Reporting Requirements. In addition, Attachment 2 contains the PSE&G position on various topics contained in NUREG-0313, Revision 2 which supplements the information provided in this attachment.

1. IGSCC Mitigation

During the design, fabrication and construction of HCGS, PSE&G followed the NRC staff guidance contained in NUREG-0313, Revision 1. As such, the reactor coolant system austenitic stainless steel piping was built to eliminate susceptibility to IGSCC and significant sensitization to stress corrosion cracking was precluded. Details regarding pipe composition, weldment materials and processes, and post-welding techniques are further detailed in Attachment 2, Items 1, 2 and 3. At the time of the construction of HCGS, some nickel based alloys were utilized in several piping systems (a listing is provided in Attachment 3) and were subsequently reviewed by the NRC staff in Section 5.2.3 of NUREG-1048, the NRC Safety Evaluation Report (SER) for HCGS, dated October 1984. With the issuance of this generic letter however, the NRC staff has revised positions on nickel based alloys and concludes that only Inconel 82 is considered resistant to IGSCC. Therefore, with the exception of the materials identified in Attachment 3, PSE&G either made use of corrosion resistant grades of stainless steel or treated less resistant grades with corrosion resistant cladding (CRC) or solution heat treatment (SHT).

Some examples of the design details utilized to minimize the possibility of IGSCC include the following:

- The reactor pressure vessel (RPV) nozzle safe-ends and extensions were replaced with corrosion resistant materials and the thermal sleeves were redesigned to eliminate crevices.
- CRC was applied to field weld connections of Type 304 stainless steel piping in the recirculation system and all shop welds were furnace solution heat treated before installation.

- To minimize the number of stagnant lines, the recirculation system bypass line and control rod drive return line were eliminated.
- The stainless steel piping in the core spray (CS) and residual heat removal (RHR) systems (the low-pressure coolant injection line and RPV head spray line) was replaced with impact tested carbon steel piping from the RPV to the outboard containment isolation valve.
- The RHR shutdown cooling suction and return lines have Type 304L stainless steel transition pieces between the recirculation line connections and the impact-tested carbon steel pipe that extends to the outboard containment isolation valve.

Furthermore, fabrication techniques and installation procedures minimized the possibility of IGSCC and included the following details:

- Welding heat input was restricted to 110,000 Joules per inch maximum, and interpass temperature to 350 ^{o}F.
- High heat welding processes, such as block welding and electroslag welding, were not permitted.
- All weld filler metal and castings were required by specification to have a minimum of 5% ferrite.
- Whenever any wrought austenitic stainless steel was heated to temperatures over 800 ^{o}F, by means other than welding or thermal cutting, the material was again solution heat treated.
- Exposure to contaminants capable of causing stress corrosion cracking of stainless steel components was avoided by carefully controlling all cleaning and processing materials that contact the stainless steel during manufacture and construction.
- Special care was exercised to ensure removal of surface contaminants prior to any heating operations.
- Water quality for cleaning, rinsing, flushing and testing was controlled and monitored.
- Suitable packaging and protection were provided for components to maintain cleanliness during shipping and storage.

Since issuance of the Operating License for HCGS in April 1986, PSE&G has not identified any reactor coolant pressure boundary (RCPB) piping failures or degradation due to IGSCC.

Therefore, PSE&G is confident that measures taken to minimize the possibility of IGSCC were commensurate with the latest acceptable industry practices and the NRC staff guidance at the time of construction. As discussed in Attachment 2, ongoing efforts to maintain piping integrity, including the classification of those nickel based alloys listed in Attachment 3 under IGSCC Category G (NUREG-0313, Revision 2, Section 5.3.1.7), assure the RCPB is resistant to or will be monitored for IGSCC. Presently, PSE&G does not plan to replace piping or components within the HCGS RCPB; however, if IGSCC is discovered during subsequent inservice inspections, PSE&G will utilize the latest industry accepted techniques commensurate with NRC staff recommendations given in Generic Letter 88-01 and NUREG-0313, Revision 2 to accomplish the repairs and/or replacements.

2. ISI Program

As discussed in Attachment 2, Item 11, the RCPB piping at HCGS meets the IGSCC Category A definition described in Section 5.3.1.1 of NUREG-0313, Revision 2, with the exception of those nickel based alloys listed in Attachment 3 which meet the IGSCC Category G definition described in Section 5.3.1.7. Therefore, during the second refueling outage for the third fuel cycle, scheduled to begin in September 1989, PSE&G will augment the ISI program which inspects austenitic stainless steel piping for evidence of IGSCC. The schedule for inspection will follow the comparable provisions of Section XI of the ASME Boiler and Pressure Vessel Code, 1983 Edition through the Summer of 1983 Addenda, and include additional inspections which assure that 25% of the welds susceptible to IGSCC will be examined every 10 years and all the nickel based alloys listed in Attachment 3 will be examined. The selection of the specific welds for inspection will be made by or under the direction of PSE&G personnel and include a meaningful and representative sample of the welds under consideration.

The inspection methods and personnel are detailed in Item 10 of Attachment 2. The sample expansion discussion is contained in Item 12 of Attachment 2.

3. Technical Specifications

PSE&G concurs with the NRC Staff that the ongoing Technical Specification inprovement process should remove and relocate certain portions of the current Technical Specifications, including those portions related to the ISI Program. Regardless of the outcome or timing of this improvement process, the information contained in this transmittal will be incorporated into the Inservice Inspection Program Long Term Plan (ISI LTP) when the next revision is issued.

Therefore, PSE&G does not plan to submit a License Change Request (LCR) for amendment of Technical Specification 4.0.5 to incorporate a similar commitment as exampled in Attachment B to Generic Letter 88-01. This decision is the result of several conditions which in summary include: (1) if an LCR was submitted and approved by the NRC staff, the information would eventually be relocated to the ISI LTP as a result of the Technical Specification improvement effort and therefore inclusion in the Technical Specifications for the near term is unnecessary and unproductive, (2) the ISI LTP will be revised regardless of the outcome of the Technical Specification improvement effort and thus the commitments contained in this transmittal will already be incorporated into the appropriate relocation document, and (3) the fact that this transmittal contains commitments which satisfy the intent of the various staff positions identified in the generic letter and NUREG-0313, Revision 2 is sufficient to assure compliance.

4. Leak Detection

Discussions in Attachment 2, Item 13 provide information on the HCGS conformance with Regulatory Guide 1.45 and identify the current leakage detection requirements contained in the HCGS Technical Specifications. Based on the information provided in the response to Item 13, PSE&G is confident that the current Technical Specification adequately address the operability requirements in the event of any reactor coolant system operational leakage.

5. Reporting Requirements

Discussions contained in Attachment 2, Item 14 provide a PSE&G commitment regarding NRC notification in the event of discovery of a flaw which does not meet the criteria for continued operation without an evaluation as specified in ASME Section XI code.

ATTACHMENT 2

Public Service Electric and Gas Company
Position on Intergranular Stress Corrosion Cracking
In Boiling Water Reactor Austenitic Stainless Steel Piping

The following PSE&G positions are provided on various topics involving Intergranular Stress Corrosion Cracking (IGSCC) in boiling water reactor (BWR) austenitic stainless steel piping as contained in Attachment A to Generic Letter 88-01. Where appropriate, references to NUREG-0313, Revision 2 (enclosed with the generic letter) are included in order to support the PSE&G position or address specific NRC staff statements on IGSCC.

1. Scope

Updated Final Safety Analysis Report (UFSAR) Section 5.2.3 discusses reactor coolant pressure boundary (RCPB) material and Table 5.2-7 identifies the RCPB components by form, material and specification.

2. Materials

In summary, UFSAR Section 5.2.3.4.1.1 discusses the fabrication and processing details employed at Hope Creek Generating Station (HCGS) to avoid significant sensitization and stress corrosion cracking of austenitic stainless steel. Additional information regarding compatibility of the RCPB materials with reactor coolant is provided in Section 5.2.3.2.3. To summarize, HCGS has utilized the following materials in the construction of HCGS which are considered resistant to IGSCC:

- stainless steel grades 304L and 316L,
- stainless steel grades 304 and 316 which have been given a solution heat treatment (SHT) after shop welding,
- carbon and low alloy steels with conservative corrosion allowances on exposed surfaces,
- corrosion resistant cladding (CRC) and 5% ferrite weld filler metal and castings on field weld connections and heat affected zones,

Through these measures, and the necessary design and purchase specifications and installation and welding techniques, Public Service Electric and Gas Company (PSE&G) is confident that the RCPB austenitic stainless steel piping is resistant to sensitization and IGSCC. However, in 20 areas, nickel based alloy materials were used which, until the issuance of this generic letter and Revision 2 to

NUREG-0313, have been considered resistant to IGSCC. This conclusion was also reached in the NRC Staff's Safety Evaluation Report (SER), NUREG-1048 dated October 1984, Section 5.2.3. Attachment 3 contains a listing of the nickel based alloys used in the HCGS RCPB, identified by location and type of material. Further discussions regarding these types of materials and their classification pursuant to Generic Letter 88-01 are contained in Items 11 and 13 below.

3. Processes

PSE&G employed the solution heat treatment (SHT) process to eliminate severe sensitization of stainless steel piping after shop welding. UFSAR Sections 1.8.1.44, 5.2.3.2.3 and 5.2.3.4.1.1 further describes this process as utilized at HCGS including the associated compliance with Regulatory Guide 1.44. As identified in NUREG-0313, Revision 2, Section 2.2, solution heat treatments must be performed in accordance with effective procedures and specifications. UFSAR Sections 5.2.3.4.2.1 and 5.2.4.3 summarize the implementation of this requirement. Therefore, PSE&G can conclude that for those piping systems which did not completely meet Staff Position (1) on Materials (except the nickel based alloys), the appropriate process was employed to assure that the respective piping was resistant to IGSCC.

4. Water Chemistry

Amendment 8 to the HCGS Facility Operating License NPF-57 dated August 17, 1987 modified the Technical Specifications to permit PSE&G to conduct a hydrogen water chemistry test. This test was developed to study the effects of hydrogen injection as another method to inhibit the initiation and growth of IGSCC by reducing oxygen levels in the recirculation system piping. The initial tests have proven successful and questions regarding long-term usage are under investigation, including the potential for a permanent hydrogen water chemistry program. Therefore, additional testing and evaluation are still in progress, results of which and any plans for permanent system installation will follow industry development and as appropriate discussed with the NRC staff. Until finalization of this issue, PSE&G will not at this time alter the Inspection Schedules discussed in Generic Letter 88-01 and addressed in Item 11 below.

5. Weld Overlay Reinforcement
6. Partial Replacement
7. Stress Improvement SI of Cracked Weldments
8. Clamping Devices
9. <u>Crack Evaluation and Repair Criteria</u>

PSE&G has operated HCGS since April 1986 and to date has not encountered any weld or piping cracks indicative of IGSCC. Hence, PSE&G has not needed to evaluate and/or repair such cracks. Additionally, the repair procedures and staff recommendations for weld overlays, partial replacement, stress improvements and/or clamping devices have not been necessary. In the future, PSE&G will utilize the latest industry technology commensurate with the NRC recommendations given in Generic Letter 88-01 and NUREG-0313, Revision 2 to accomplish any repairs and/or replacements should the need arise.

10. <u>Inspection Methods and Personnel</u>

Inspections performed to satisfy commitments made as a result of Generic Letter 88-01 and NUREG-0313, Revision 2 will conform to ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition through the Summer 1983 Addenda. This commitment already exists within the HCGS Inservice Inspection Program Long Term Plan (ISI LTP) in accordance with 10 CFR 50.55a(g).

Previous inspections of weldments included in the scope of Generic Letter 88-01 have been performed in accordance with the NDE Coordination Plan implemented at the EPRI NDE Center in Charlotte, North Carolina. All future inspections will be conducted in accordance with that program or another formal program approved by the NRC.

11. <u>Inspection Schedules</u>

With the exception of the nickel based alloy materials identified in Attachment 3, the HCGS RCPB materials meet the IGSCC Category A definition described in Section 5.3.1.1 of NUREG-0313, Revision 2. Specifically, the austenitic stainless steel piping and weldments at HCGS have: (i) no known cracks, (ii) a low probability of incurring IGSCC problems, (iii) are either fabricated of IGSCC resistant material or have been solution heat treated after welding, and (iv) corrosion resistant cladding has been applied where necessary. Inspections of Category A materials will be scheduled to meet the requirements of Section XI of the ASME Boiler and Pressure Vessel Code, 1983 Edition through the Summer of 1983 Addenda, Table IWB 2500-1, as previously committed to in the ISI LTP.

With regard to the nickel based alloy materials, the IGSCC Category G definition described in Section 5.3.1.7 of NUREG-0313, Revision 2 applies since no previous inspections have been performed. PSE&G shall examine all the areas identified in Attachment 3 during the next refueling outage, the second refueling outage scheduled for September 1989. Should no evidence of IGSCC be found during that inspection, then these material locations will be reclassified under IGSCC Category D, and inspected every two refueling outages, pursuant to Sections 5.3.1.4 and 5.3.2.4 of NUREG-0313, Revision 2, respectively.

The augmented inspection encompassed by these two commitments will be incorporated into the HCGS ISI LTP with the next revision. Therefore, PSE&G is confident that HCGS meets the requirements specified in Generic Letter 88-01 to preclude the potential for future IGSCC development in the RCPB austenitic stainless steel piping at HCGS. This assurance satisfies the purpose of ISI of piping in that structural integrity and reliability of piping is maintained (in accordance with 10 CFR 50.55a(g)(6)(ii)) and that there continues to be an extremely low probability of abnormal leakage (in accordance with 10 CFR 50, Appendix A, Criterion 14.)

12. Sample Expansion

As discussed in Items 5, 6, 7, 8, and 9 above, PSE&G has not encountered any cracked welds in the RCPB piping which could be considered indicative of IGSCC. However, should one or more IGSCC Categories A, B, or C welds exhibiting IGSCC be found by a sample inspection during the 10 year ISI interval, an additional sample of the welds in that category will be inspected, approximately equal in number and service history to the original sample. This additional sample will be similar in distribution (according to pipe size, system and location) to the original sample, unless it is determined that there is a technical reason to select a different distribution. If any welds in the expanded sample exhibit IGSCC, all welds in that category will be inspected.

As discussed in Item 11 above, the 20 areas identified in Attachment 3 which are currently classified under IGSCC Category G will all be inspected during the next refueling outage.

13. Leak Detection

The NRC Staff Position on Leak Detection requested information on conformance with Position C of Regulatory Guide 1.45. PSE&G has committed to follow Regulatory Guide 1.45, Revision 0 dated May 1973 for RCPB leakage as clarified in UFSAR Sections 1.8.1.45 and 5.2.5. In summary, the following clarifications or exceptions to the 9 items under Position C are as follows:

C1. Discussions regarding identified leakage sources, collection and monitoring are contained in UFSAR Sections 5.2.5.1.1, 5.2.5.2.1 and 5.2.5.4.2.

C2. Discussions regarding unidentified leakage sources, collection and monitoring are contained in Sections 5.2.5.1.1, 5.2.5.2.1, and 5.2.5.5. The accuracy of the noble gas monitoring system is 10 gpm, rather than 1 gpm as discussed in Sections 1.8.1.45 and 5.2.5.5.2.

C3. In lieu of providing 3 detection systems including an airborne particulate radioactivity monitor, HCGS utilizes 5 separate and diverse leak detection methods as described in Sections 1.8.1.45 and 5.2.5.2.1.

C4. Provisions are available to monitor the systems connected to the RCPB and alarm intersystem leakage by using radioactivity and differential flow monitors as discussed in Sections 5.2.5.1.4 and 5.2.5.2.2.

C5. Except as identified in Position C2 above, the sensitivity and response time for 4 of the 5 leak detection systems is adequate to detect an unidentified leakage rate, or its equivalent, of one gpm in less than one hour. See Sections 1.8.1.45 and 5.2.5.5.2 and further details below for additional information.

C6. In lieu of a Seismic Category I airborne particulate monitoring system, the drywell floor and equipment drain sump level monitors, and pressure and temperature monitors are Seismic Category I and will remain functional following an SSE. The other detection systems are capable of performing their functions following seismic events that do not require plant shutdown. See Sections 1.8.1.45, 5.2.5.2.1 and 5.2.5.11 for additional information.

C7. Sections 1.8.1.45 and 5.2.5.2.1 contain information regarding control room indicators and alarms and justification for not providing conversion procedures for the drywell air cooler condensate flow monitor and noble gas monitor systems.

C8. The provisions for testing and calibration of these detection systems are specified in Technical Specifications 3/4.3.1 and 3/4.3.2 and discussed in UFSAR Sections 1.8.1.45 and 5.2.5.9.

C9. Technical Specification 3/4.3.1 requires the five leak detection systems to be operable and Technical Specification 3/4.3.2 specifies leakage limits of 5 gpm for unidentified leakage and 25 gpm for identified leakage.

The NRC Staff has previously reviewed and approved these positions in Section 5.2.5 of the Safety Evaluation Report (SER - NUREG-1048). With regard to the additional staff positions identified in Generic Letter 88-01, PSE&G provides the following responses:

1. Technical Specification 3.4.3.2, Action (b) stipulates that if reactor coolant system unidentified leakage is greater than 5 gpm, within 4 hours the leakage rate must be reduced to within 5 gpm or within the next 12 hours the plant must be in Hot Shutdown and within the following 24 hours the plant must be in Cold Shutdown.

   HCGS utilizes a Class 1E microprocessor based system to calculate the unidentified leakage collected in the drywell floor drain sump. As an input to this system, the sump level is measured via a differential pressure transmitter which provides a signal to an analog to digital converter, which converts this signal to a bit equivalent. Because the sump configuration and transmitter span is provided to the processor, it calculates gallons per bit values. The radiation processor in the Class 1E Radiation Monitoring System (RMS) uses the information to calculate a flow rate on the basis of bit changes and the time elapsed since the previous bit change. This information is continually displayed at the RMS panel or via data link to the operator's console. Upon sensing a 5 gpm leak rate or an increase in leakage of 1 gpm per hour, within 1 minute, the processor initiates an alarm.

   Regulatory Guide 1.45 does not specify leakage rate limits nor actions which should result if such limits are exceeded, deferring instead to the Technical Specifications. Technical Specification 3/4.3.2 specifies maximum leakage rate limits and corrective actions required when these limits are exceeded. Currently there is no requirement for corrective action nor plant shutdown if unidentified leakage increases by over 2 gpm per 24 hours. Rather, the corrective action only addresses unidentified leakage in excess of 5 gpm or any identified RCPB leakage. However, the drywell floor drain sump monitoring system does alarm when unidentified leakage increases by more than 1 gpm per hour. This alarm function is an extension of Regulatory Guide 1.45 Position C.2 and C.5. Therefore, PSE&G believes that adequate alarm indications exist and the current Technical Specification requirements and corrective actions assure prompt detection of and response to RCPB leakage.

   Thus, PSE&G meets the intent of the NRC positions in this Generic Letter and in Section 6. . of NUREG-0313, Revision 2.

2. As discussed in UFSAR Sections 5.2.5.4.3 and 5.2.5.5.1, identified leakage from pumps, valve stem packings and the reactor vessel head seal are discharged to the equipment drain sump and monitored during plant operation. Unidentified leakage is that portion of the total leakage not identified above and collected in the floor drain sump. Unidentified leakage includes any allowance for leakage that does not compromise barrier integrity and is not identifiable. The 5 gpm Technical Specification maximum criteria for unidentified leakage is established to allow time for corrective action before the process barrier could be significantly compromised since this rate is only a small fraction of the calculated flow from a critical crack in a primary system pipe.

3. Technical Specification 3/4.4.3 identifies the operability and corrective action requirements for the five leakage detection systems described in UFSAR Sections 1.8.1.45 and 5.2.5.2.1. If only four of these five systems are operable, continued operation is permitted for up to 30 days provided grab samples of the containment atmosphere are obtained; however, the drywell floor and equipment drain sump monitoring system must be operable. If either of these two sump monitoring systems are inoperable (or less than three other systems are inoperable or inoperability continues for more than 30 days) plant shutdown is required within 12 hours. Since HCGS has Category G welds, this Technical Specification requirement satisfies the identified staff position.

14. Reporting Requirements

PSE&G will notify the NRC of flaw evaluations and/or repairs for cracks that do not meet Section IWB-3500 criteria for continued operation or any change found in the condition of welds previously known to have IGSCC. In addition, timely recommendations made by the NRC for sample expansion based upon this notification will be considered.

ATTACHMENT 3

Hope Creek Generating Station
Reactor Coolant Pressure Boundary
Nickel Based Alloys

Location	Material Used
Recirculation Suction Nozzles N1A and N1B (Nozzle to Safe-End Welds)	ENiCrFe-3 Weld Butter ERNiCr-3/ENiCrFe-3 Filler
Recirculation Discharge Nozzles N2A, N2B, N2C, N2D, N2E, N2F, N2G, N2H, N2J and N2K (Nozzle to Safe-End Welds)	ENiCrFe-3 Weld Butter ERNiCr-3/ENiCrFe-3 Filler
Core Spray Nozzles N5A and N5B (Nozzle to Safe-End Welds and Safe-End)	ENiCrFe-3 Weld Butter ERNiCr-3/ENiCrFe-3 Filler SB-166 Safe-End
Core Spray Nozzles N5A and N5B (Safe-End to Safe-End Extension Welds and Safe-End)	ENiCrFe-3 Weld Butter SB-166 Safe-End
Head Spray Nozzle N6A (Nozzle to Flange Weld)	ENiCrFe-3 Weld Butter ERNiCr-3/ENiCrFe-3 Filler
Jet Pump Instrumentation Nozzles N8A and N8B (Nozzle to Safe-End Welds)	ENiCrFe-3 Weld Butter ERNiCr-3/ENiCrFe-3 Filler
Control Rod Drive Return Line Nozzle N9 (Nozzle to Cap Weld and Cap)	ENiCrFe-3 Weld Butter SB-166 Cap