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Robert L. Mittl General Manager
Nuclear Assurance and Regulation

October 30, 1985

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

Attention: Mr. Walter Butler, Chief
Licensing Branch 2
Division of Licensing

Gentlemen:

INDEPENDENT DESIGN VERIFICATION PROGRAM -
ADDITIONAL INFORMATION
HOPE CREEK GENERATING STATION
DOCKET NO. 50-354

In the course of the NRC audit of the Hope Creek IDVP at Sargent and Lundy's office in Chicago during the week of September 30, 1985, certain additional information was requested from PSE&G Company. This is a response to that request.

In the IDVP final report, open items were identified as a result of the observation report responses given to S&L by Bechtel and PSE&G. As previously discussed with you, it is our intent to have PSE&G personnel verify that each of these open items is closed in accordance with the commitments made to S&L.

Specifically, you requested further assurance regarding the basemat confirmatory analysis, completion of the hazards analysis program, and completion of the setpoint calculation program. As mentioned above, PSE&G personnel will verify completion of the three aforementioned issues, and provide to you a completion report to that effect. We would also like to confirm that at your request, an advance copy of the basemat confirmatory analysis report was delivered to your consultant, Dr. G.A. Harstead, on October 12, 1985.

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The second issue you requested clarification of regards the discussion of trends in Section II of the IDVP final report. The trends noted by S&L include the areas of Engineering Calculations, Procedures, FSAR Control, Drawings and Specifications. In the final report, S&L summarized their discussion of trends as follows:

"In summary, the most significant trend that the IDVP team was able to identify involved the need for preparation of additional calculations or revisions to calculations in order to complete the analysis or substantiate the use of undocumented engineering judgement. In each case where additional calculations were performed or calculations were revised, the calculations demonstrated that the design was sufficiently conservative to accommodate the technical issues involved or validated the engineering judgement used.

Other identifiable trends involved the need for additional procedures and other design process controls to prevent and correct discrepancies in drawings, specifications, and other documents. The discrepancies identified in these areas were relatively small in number compared to the large number of documents actually reviewed, and the resolution of these discrepancies did not require any design or hardware changes.

None of the trends appeared to have any generic significance for the design areas reviewed by the IDVP team. BPC and PSE&G have also made commitments in connection with identified programs for ongoing design activities to provide additional calculations and documentation and to develop and implement additional or enhanced design controls. These programs provide adequate assurance that there will be no generic implications regarding BPC's design process or the design of other HCGS systems and structures arising out of the trends identified in the IDVP."

It should be noted that the trend cause categories, as noted in Exhibit II-3, identify several causes which appear to be in fact a singular "trend".

In many cases, several ORs and a correspondingly large number of "deficiencies", were written for the same basic observation, thereby resulting in an artificially high total frequency count in Exhibit II-3. For example, S&L generated over 21 "deficiencies" from their review of specifications M-067 and M-068 alone, due to the fact that current revisions

of these specifications were unavailable for their review as of the cutoff date of the audit. Similarly, their review of the hazards program alone resulted in over 44 "deficiencies". Both these examples are further detailed in Attachment 1, and by themselves account for:

13 of the 67 Undocumented Engineering Judgement
11 of the 63 Design Input Discrepancies
11 of the 61 Inadequate Review of Documents
10 of the 55 Design Documents Technically Inadequate
13 of the 31 Inadequate Internal Design Procedures

During the course of the IDVP Audit, Bechtel transmitted approximately 6400 documents to S&L for their review. Additional documents, primarily in the Equipment Qualification area were provided directly from PSE&G to S&L. In consideration of the large amount of information typically contained in each document the number of actually observed "deficiencies" is a very low fraction of the transmitted data, particularly if common cause multiple counting as described above is eliminated. Furthermore, it should be emphasized that in no case did any of the observations result in a physical change to the plant.

Although S&L concluded that none of the trends have any generic significance, PSE&G and Bechtel intend to address the identified trends regarding Hope Creek as follows:

1. On the subject of engineering calculations, specifically regarding undocumented engineering judgement and the need for preparation of additional calculations, it continues to be our intent to include sufficient documentation in calculations such that a qualified independent verifier can understand and verify the accuracy and completeness of the calculation.

   It should be recognized that over the past twelve years of this progect, the standards against which calculation adequacy is judged have changed. Therefore, some of the early design performed on this project may appear to have less calculational support than would be appropriate if that design work were initiated today. This is particularly relevant in the Civil/Structural discipline which sees heavy design and calculation work in the early project stages. This early design work represents the purest state-of-the-art Bechtel design work with the least amount of interaction with outside equip-

ment suppliers or designers, and a resultant high number of design calculations. These factors significantly contributed to the increased level of scrutiny of the Civil/Structural area during the IDVP, and a higher number of concerns raised by Sargent & Lundy in this area.

S&L's review of over 600 project calculations generated ORs resulting in 89 calculations being developed or revised. Although BPC maintains that the use of engineering judgement was proper and appropriate in these cases, Sargent & Lundy required that extensive evidence be provided to substantiate the design judgements, hence the need for supporting design calculations. In Bechtel's opinion, few of the 89 calculations were legitimately required for clarification. After reviewing the 89 cases of revised and new calculations, the conclusion stated on Page II-20 of the S&L report is, "In no case was a design or hardware change required to resolve an issue raised in an observation report. This constitutes evidence of the adequacy of the design of the Hope Creek Generating Station."

In each calculation where S&L identified a specific inconsistency, such as an incorrect reference, Bechtel will correct those inconsistencies.

Bechtel and PSE&G intend to address the subject of calculation adequacy through two mechanisms. First, the existing as-built programs require that a large percentage of the project calculations be reviewed and updated to reflect the as-built configuration of the plant. The procedures which govern these as-built programs have been clarified to incorporate concerns raised by S&L. This will help ensure that all calculations falling under the various as-built programs are technically adequate. Second, as part of the calculation turnover process from Bechtel to PSE&G, PSE&G reviewers will correct any other inconsistencies which are identified. This process includes a formal turnover of calculations, by engineering discipline, to PSE&G engineering. Prior to turnover, a review of the calculation is done by PSE&G engineering, and any identified discrepancies or inconsistencies are corrected. At the time of turnover, an additional review is made by PSE&G to assure references are included, completeness, and legibility.

2. Regarding procedures, S&L expressed a concern about the lack of procedures or procedural detail. Exhibit II-3 indicates a total of 31 Observation Reports associated with procedural concerns. Almost all the observations were associated with four ongoing programs: Hazards, Piping As-Built Reconciliation, Support Reassessment, and Civil Load Verification. Attachment 1, Page 2, demonstrates that the Hazards Program alone accounts for 13 of the 31 procedural observations. Although the determination of when sufficient procedures exist is a subjective issue, PSE&G and Bechtel are commited to providing additional guidelines as specified in the final report. This includes enhancement of the as-built program documents to include additional guidance and documentation, and enhancement of the hazards program, particularly the final portions of that program, to include additional documentation and guidance. Attachment 2 provides examples of on project guidance documents either developed or revised to address concerns raised in the IDVP.

   Formal Bechtel Engineering Department Procedures (EDPs) are issued by the Engineering Department to control those activities essential to assure compliance with regulatory design requirements. Implementation of these procedures is accomplished on project by the use of design guidelines issued by the project (as described above) or by the Chief Discipline Engineer.

   Bechtel has committed that certain Engineering Department Procedures which govern activities associated with those Observation Reports classified by S&L as having a common cause will be reviewed by the Engineering Department. The purpose of the review will be to identify and, if appropriate, to modify elements of those procedures, to minimize future occurrence of the indicated trends. This review will encompass the following procedures:

	Cause (From Exhibit II-3)	Procedure
1.	Undocumented Engineering Judgement	EDP 4.37, Engineering Calculations
2.	Design Input Discrepancies	EDP 4.1, Design Criteria

	Cause (From Exhibit II-3)	Procedure
2.	Continued	EDP 4.49, Design Specification EDP 4.22, Preparation and Control of SAR EDP 4.23, SAR Change Control EDP 4.37, Engineering Calculations EDP 4.46, Project Drawings EDP 4.50, Nuclear Piping System Design Specifications
3.	Lack of Design Calculations	EDP 4.37, Engineering Calculations
4.	Inadequate Review of Documents	EDP 4.1, Design Criteria EDP 4.27, Design Verification
5.	Design Documents Technically Inadequate	EDP 4.27, Design Verification EDP 4.46, Project Drawings EDP 4.22, Preparation and Control of SAR EDP 4.49, Design Sepcifications EDP 4.50, Nuclear Piping System Design Specifications
6.	Incorrect FSAR	EDP 4.22, Preparation and Control of SAR EDP 4.23, SAR Change Control

3. Discrepancies between the FSAR and other design documents were identified in 24 Observation Reports. It is recognized that although the FSAR is a living document, it should reflect the plant design. However, at any point in time, particularly during contruction, discrepancies may be found because of the evolving design process. We believe the Hope Creek FSAR is more accurate than is typical

of any plant at this stage of completeness. It is important to note that none of the discrepancies resulted in a design change, and as stated by S&L "... consisted primarily of editorial changes or clarifications." Nevertheless, we are reviewing our FSAR change control process to determine if improvements can be made. Further, it has always been our intent to have the FSAR current at the time of fuel load. Based on the number and nature of the observations in this area, we do not agree that this should be considered a trend.

4. Drawing inconsistencies were also noted as a trend. As noted by S&L, "Considering the large number of drawings reviewed during the IDVP, the inconsistencies found do not appear to be significant." We agree with that conclusion, and in addition to correcting the specific findings, we will continue to assure that the procedures governing drawing control are followed. Again, we do not agree this should be considered a trend.

5. Specifications were listed as the last identifiable trend, specifically regarding undocumented engineering judgements, inadequate detail or review, design input discrepancies, and inconsistencies. S&L states that, "As a result of the resolution achieved for each observation report in this area, the team concluded that the discrepancies and inconsistencies found in specifications have had no effect on the design adequacy of HCGS." PSE&G does agree that where specifications are to be used as a design document, they will be updated and kept current. This will be particularly true where new design is required.

The last area for which you requested clarification regards the ongoing programs which we have in place to confirm plant design. These programs include load verification for structures, as-built reconciliation programs for piping and pipe supports, reassessment programs for raceway and HVAC supports, setpoint caculation, seismic II/I, equipment anchorage verification, equipment qualification, and hazards assessment for HELB and MELB. As previously discussed, each of these programs was instituted by Bechtel and PSE&G earlier in the design process to assure design adequacy of Hope Creek, and each was in place prior to the IDVP. Certain enhancements were agreed to with S&L during the course of the IDVP, primarily

in the area of documentation and guidance. Evidence of this was available to you during your audit at Bechtel's offices. A more detailed discussion of these programs is included in Attachments 3 through 10.

Based on PSE&G's and Bechtel's experience, we believe that the observations identified by S&L during the IDVP would have been addressed as each of these programs was completed. We are confident that, with the enhancements agreed to with S&L, the documentation of the completion of these programs will be comprehensive and will facilitate later reviews.

We believe this provides the information you requested and also addresses the comments submitted by MHB Technical Associates to the Public Advocate of New Jersey. If anything further is required, please advise.

Very truly yours,

Attachments:
1. Examples of Trend Development
2. Examples of On Project Guidance Documents Issued or Revised to Address IDVP Concerns
3. Structures Load Verification Program
4. ABR
5. As-Built Reassessment Program for Cable Tray, Conduit and HVAC Supports
6. Setpoint Calculation Program
7. Seismic II/I
8. Equipment Anchorage Verification Program
9. Environmental Qualification Program
10. Pipe Break Hazards Review

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EXAMPLES OF TREND DEVELOPMENT

A. SPECIFICATIONS M-067 and M-068

OR No.	Affected Specification	Inadequate Review of Documents	Design Docs. Technically Inadequate	Design Input
5	M-067	x	x	
11	M-067	x	x	
12	M-067		x	
13	M-068	x	x	x
25	M-068			x
26	M-068	x	x	
27	M-068	x	x	
28	M-068	x	x	
29	M-068	x	x	x
35	M-067	x	x	
38	M-067			x

EXAMPLES OF TREND DEVELOPMENT (Cont'd)

B. HAZARDS REVIEW PROGRAM

OR No.	Undocumented Engineering Judgement	Design Input	Inadequate Review of Documents	Design Docs. Technically Inadequate	Lack of Design Calcs.	Inadequate Design Procedures
55	x	x				x
56	x	x				x
57	x	x				x
58	x	x				x
72	x				x	x
85	x	x				x
86	x	x				x
124			x	x		
134			x			
132	x	x			x	x
147*	x				x	x
164	x	x				x
166*	x	x	x			x
167	x	x				x
175	x	x				x

*Seismic II/I related ORs

EXAMPLES OF ON PROJECT GUIDANCE DOCUMENTS

ISSUED OR REVISED TO ADDRESS IDVP CONCERNS

Program	Document	Issued/Revised
Piping ABR	Stress Group Procedure for As-Built Reconciliation [Appx. U]	Revised 8/26/85
Instrument Setpoints	Guideline for Finalizing Committed Instrument Setpoint Calculations	Issued 9/20/85
Hazards	Project Guide For Final Hazard Assessment Program	Issued 9/30/85
	Design Criteria D7.3	Revised 9/30/85
Load Verification	Load Verification Procedure, Calculation 621-29	Revised 8/13/85
As-Built Re-assessment for Cable Tray, Conduit and HVAC Supports	Calculation 677-1005	Issued 7/23/85
Seismic II/I	Specification G-052	Revised 9/16/85

STRUCTURES LOAD VERIFICATION PROGRAM

The Load Verification Program for structures was established prior to the IDVP. The procedure for performing load verification of structures is documented by a calculation issued in 1984. In addition, the Hope Creek General Civil Structural Design Criteria issued in 1975 requires an assessment of structural members after pipe hanger locations and loads are fully known.

The purpose of the Load Verification Program is to verify the adequacy of the as-built structures since the initial design was based on estimated loads. Completion of the Load Verification Program is constrained by the need to obtain the as-built configuration of the structures and piping systems. After installation of bulk commodities, major equipment and pipe supports, the as-built loads are established. Walkdowns are performed to review the attachments of various miscellaneous structural components. Load verification calculations are then performed to verify the adequacy of critical structural elements.

As a result of the observations identified by S&L, the Load Verification Program was enhanced primarily with regard to documentation, guidance and verification of engineering judgements. We are confident that the observations would have been addressed by the Load Verification Program had this program been completed prior to the IDVP. As noted by S&L, ".... design was sufficient to accommodate all identified cases of undocumented judgement and support the conclusions concerning technical adequacy."

ABR

The As-Built Reconciliation is a program required by ASME Section III, Subsection, NA, Paragraph NA3355 and NRC Bulletin 79-14, to reconcile differences between the "as-designed" and the "as-constructed" configuration of safety related piping and supports. Specification 10855-P-450(Q) originally issued in October 1984 outlines the requirements and procedures of the as-built program.

The as-built packages were prioritized based on stress levels which might have a high probability of hardware modifications. This approach was taken in order to perform any required fixes early in the ABR cycle.

Upon completion of field review, the as-built packages are sent to SFAO for review and drawing update to include any required change authorizing documents. The calculation review process includes component and pipe routing verification against the as designed computer model. Additionally, the pipe support design is reviewed for any construction modifications identified by the as-built walkdown.

As a result of the IDVP, certain areas to the ABR program were enhanced, such as documenting training sessions, rechecking of all computer models, and design information involved in the ABR program independent of as-built variations, etc. Since there has been no change to the original criteria and scope, and no program changes other than enhancements as noted above, the ABR program as originally defined would have picked up any design discrepancies during the reconciliation process.

AS-BUILT REASSESSMENT PROGRAM FOR

CABLE TRAY, CONDUIT AND HVAC SUPPORTS

The purpose of the As-Built Reassessment program for raceway and HVAC supports is to confirm the structural adequacy of as-built Seismic Category I cable tray, conduit and HVAC supports, HVAC ducts, and auxiliary steel beams. This objective is accomplished by (i) reviewing the existing design documents based on design critical cases, (ii) conducting field walkdown where necessary to obtain as-built data and (iii) evaluating the adequacy of as-installed details.

This reassessment program was started in June, 1984. As a result of the IDVP, minor enhancements were made to this program to document some engineering judgements. Since no changes in criteria or other programmatic changes other than documentations were made, we are confident that the concerns identified by S&Ls observations would have been covered by the completion of the reassessment program.

Attachment 6

SETPOINT CALCULATION PROGRAM

The Hope Creek setpoint calculation program was initiated in September of 1984 by Bechtel. At this time, "committed" calculations for all Balance of Plant 1E instruments were started. Calculations were issued as "committed" since the final seismic and environmental qualifications reports were not available for the devices for which the calculations were performed. When committed calculations are made "final", the complete "committed" calculation is essentially redone utilizing final data and including omitted data, references, equations and justifications which caused the original calculation to be "committed". Adherence to Bechtel procedure EDP 4.37 will assure that all committed calculations have been finalized and include a statement of which factors were considered and which were not and the basis for each exclusion.

PSE&G is currently generating separate, final setpoint calculations following the GE setpoint methodology which is under review by the NRC. The PSE&G setpoint effort as covered in PSE&G Site Engineering Instructions (SEI) 3.4, uses data from the Bechtel work but supercedes the setpoint calculations done by Bechtel.

The setpoint program includes calculations for those setpoints established by Bechtel, General Eelectric and other vendors. These calculations are being used to verify the setpoints established in the issued setpoint documents which are being used during startup of the Hope Creek plant. The scope of this program includes "full" calculations for 10-20% of the NON-Q setpoints. The remaining NON-Q setpoints are verified by use of a "mini" calculation which is limited to verification of instrument accuracy, setpoint, calibration tolerance, recalibration tolerance, reset point, and scaling calculations.

SEISMIC II/I

The purpose of this program is to identify those portions of structures, systems and components whose continued function is not required, but whose failure could reduce the functioning of any safety related plant feature to an unacceptable safety level. These portions are then assessed to confirm that they will not fail during an SSE.

The program addresses all II/I commodities and is the project's basis for fully satisfying licensing commitments. Items not previously designed for II/I considerations are fully evaluated by walkdowns and supporting calculations are prepared as necessary.

Specification 10855-G-052(Qs), originally issued in June, 1984, details the inspection, documentation and evaluation criteria used by the walkdown teams.

During the design process, and prior to the actual walkdown, area drawings and the model were thoroughly reviewed to identify potential Seismic II/I interactions for engineering designed items. Review was based on existing Design Criteria D7.2, 7.3, and 7.9. All identified interactions were then accounted for in the plant design. To include construction designed items along with the engineering designed items, walkdowns are being performed and all interactions documented and evaluated as required in all safety related structures. A final walkdown will be performed just prior to room turnover to ensure that additional commodities, if installed after the first walkdown, are properly evaluated and documented.

The original walkdown program was implemented in June 1984. The only changes made as a result of the IDVP have been certain program enhancements in regard to the documentation of the use of engineering judgement and the requirements for approval signatures on the record sheets. Previously, the program met the requirements of Reg. Guide 1.29.

PSE&G, as well as BPC, are certain that the results of the II/I program would have been no different had there been no IDVP findings.

EQUIPMENT ANCHORAGE VERIFICATION PROGRAM

The Equipment Anchorage Verification Program was established prior to the IDVP. The evaluation procedure for performing equipment anchorage verification is documented by calculations issued in 1984.

The purpose of the Equipment Anchorage Verification Program is to verify the as-built structural adequacy of the Seismic Category I equipment based on the as-built configuration and final loading conditions.

At the time of the IDVP, all final as-built information was not yet available for the SACS heat exchanger and the foundation verification effort was consequently not complete. We are confident that the observations identified by S&L would have been considered by the Equipment Anchorage Verification Program had this program been complete. The verification of the HPCI pump however, had been completed and was found to be adequate by S&L. As noted by S&L. "In the review of the HPCI pump and SACS heat exchanger foundations, the team found that there was a comprehensive design procedure for equipment foundations which outlined the design requirements."

ENVIRONMENTAL QUALIFICATION PROGRAM

The Hope Creek EQ program was established to conform to the requirements of IEEE-323-1974 and to asure that the necessary equipment is qualified to perform its required function in its installed environment, as documented in the FSAR. The initial phase of the program was under the guidance of Bechtel Power Company and the final EQ package review was by PSE&G Engineering Department. During this program, PSE&G, GE, and BPC personnel jointly worked to ensure that all pertinent qualification information was received and reviewed by PSE&G for compliance with IEEE-323-1974 and 10 CFR 50.49.

The PSE&G review procedures were documented and implemented by the cognizant engineering personnel. This procedure required the use of detailed checklists and established the format of the document packages to be assembled for USNRC review and for historical proof of the equipment qualification effort. The nature of this work was such that review records were essentially working files which would not completely be in final form until receipt of an operating license.

As the program progressed, it was the intent of PSE&G to periodically refine the quality of the documented records as time allowed. An internal PSE&G Quality Assurance Department audit of the EQ program documents was requested by the EQ supervisor to assess the overall quality of the EQ program at that time from the standpoint of providing auditable material. The QAD audit revealed no serious program deficiencies but it identified certain improvements in the EQ records which would better facilitate an audit. Steps were taken at that time to begin a general upgrade of document quality. Subsequently, the IDVP program identified similar areas needing improvement because the ongoing EQ program was not complete at the time of the IDVP.

During the week of July 15, 1985, approximately 90% of the Hope Creek record packages were available for review by the USNRC. The NRC audit of our program documents revealed that they were generally complete, easy to follow, and reflected an outstanding program. Items of the type identifed in the IDVP and in our QAD audit had been satisfactorily addressed and it is concluded that the EQ program meets the commitments in the FSAR.

PIPE BREAK HAZARDS REVIEW

The pipe break hazards review addresses the effects of postulated High and Moderate Energy Line Breaks (HELB and MELB). The HELB review evaluates the consequences of potential pipe whip, jet impingement, flooding and compartment pressurization. The MELB review evaluates the consequences of flooding and water spray.

The Hope Creek design has addressed HELB and MELB considerations through three mechanisms. Design criteria documents were issued during the design and construction phase specifying separation requirements, defining hazards, and providing for hazard reviews. Examples of these criteria documents are D7.3, "Procedure for Documentation and Criteria of Plant Separation", issued for comment on March 4, 1982 and use on March 20, 1983, and D7.9, "Field Routed Procedure", issued for comment on July 28, 1981 and use on March 6, 1983. Separation reviews were held during 1982 and 1983 utilizing the project model and drawings to locate problem areas early in the construction phase. The results of these separation reviews are documented on separation review data sheets, as required by D7.3 Appendix E. Final verification of the design has always rested on a final hazard walkdown, to be performed when construction on systems and areas in the plant are completed. Project Specification G-19.1, "Procedure for Jobsite Review of Hazards Effects", issued for use on February 28, 1985, provides guidance for performing these walkdowns and requires they be performed approximately two weeks prior to room turnover from BPC to PSE&G. This requirement assures that the review is properly based on as-built conditions.

The scope of the existing hazards review program was not appreciably changed as a result of the IDVP. Increased emphasis has been placed on written guidance documents and clear documentation of review decisions and results.