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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

Public Service Electric and Gas Company, et al.	)	
	)	Docket No. 50-354-OL
(Hope Creek Generating Station)	)	

JOINT MOTION TO DISMISS PROCEEDING

Pursuant to published notice by the U.S. Nuclear Regulatory Commission, the Public Advocate of the State of New Jersey ("Public Advocate") filed a petition for leave to intervene and request for a hearing on the application of Public Service Electric and Gas Company, et al. ("Applicants") for an operating license for the Hope Creek Generating Station and was admitted as a party to the captioned proceeding by the Atomic Safety and Licensing Board ("Licensing Board"). The Public Advocate and Public Service have entered into a settlement agreement, a copy of which is attached hereto for the information of the Licensing Board. As part of that agreement, the Public Advocate has agreed to withdraw as a party to this proceeding. Accordingly, by their undersigned respective attorneys, pursuant to the provisions of the settlement agreement and in accordance with the provisions of 10 C.F.R. Part 2:

1. The Public Advocate hereby requests the Licensing Board for leave to withdraw as a party to this proceeding

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and for dismissal of its admitted contentions.

2. The Public Advocate and Applicants hereby move the Licensing Board to enter an order in the form attached approving the withdrawal of the Public Advocate as a party to this proceeding and dismissal of its contentions.

The NRC Staff, the only other party to the proceeding, has stated that it has no objection to these motions.

Respectfully submitted,

Richard E. Shapiro
for the Public Advocate

Richard Lanpher
for the Applicants

February 19, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges
Marshall E. Miller, Chairman
Dr. Peter A. Morris
Dr. David R. Schink

In the Matter of	)	
	)	Docket No. 50-354-OL
PUBLIC SERVICE ELECTRIC AND GAS COMPANY, et al.	)	
	)	
	)	February , 1985
(Hope Creek Generating Station)	)	

ORDER TERMINATING PROCEEDING

On February , 1985, the Public Advocate of the State of New Jersey ("Public Advocate") and Public Service Electric and Gas Company, et al. ("Applicants") submitted a pleading entitled "Joint Motion to Dismiss Proceeding". Therein these parties requested the following relief based upon a settlement agreement which had been executed between the Public Advocate and Public Service:

1. The Public Advocate requested leave to withdraw as a party to this proceeding and dismissal of its admitted contentions.

2. The Public Advocate and Applicants moved for the entry of an order approving the withdrawal of the Public Advocate as a party to this proceeding and dismissal of its contentions.

The movants stated that the NRC Staff, the only other party to the proceeding, had no objection to their motion.

Upon consideration of the Joint Motion and the entire record in this matter and pursuant to the authority contained in 10 C.F.R. Part 2, the motions of the parties are granted, and this proceeding is terminated.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

_____
Marshall E. Miller, Chairman
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland
this _____ day of February, 1985.

JOINT AGREEMENT AND SETTLEMENT

Whereas the parties to this Agreement -- Public Service Electric and Gas Company (PSE&G) and the Public Advocate of the State of New Jersey (Public Advocate) -- agree that the interests of safety and health are preeminent in the operation of the Hope Creek Generating Station (Hope Creek); and

Whereas the parties to this Agreement agree that all appropriate actions should be taken to safeguard the public interest in health and safety, whether or not required by law or regulation; and

Whereas the parties to this Agreement share a mutual interest in the fair and expeditious resolution of the Contentions presently before the Atomic Safety and Licensing Board (Board) in the proceeding (Proceeding) relating to the issuance of an operating license for Hope Creek; and

Whereas the voluntary resolution of these Contentions will further the assurance of the public in the safe and reliable operation of Hope Creek through the early identification of potential concerns and the willingness of the parties to address these concerns in a prompt and responsible manner:

NOW, THEREFORE, it is agreed by the parties hereto:

1. On June 29, 1983, the application by PSE&G and Atlantic City Electric Company for an operating license for Hope Creek was docketed by the Nuclear Regulatory Commission (NRC) as Docket No. 50-354 OL.

2. On September 9, 1983, the Public Advocate petitioned for leave to intervene in the Proceeding before the Board and requested a hearing. This petition was granted on October 5, 1983.

3. Following a special prehearing conference held on November 22, 1983, the Board issued a Special Prehearing Conference Order on December 21, 1983, which admitted four contentions proposed by the Public Advocate, relating to (1) intergranular stress corrosion cracking (IGSCC); (2) management competence; (3) environmental qualification of safety-related electrical and mechanical equipment; and (4) salt deposition from the Hope Creek cooling tower. The contention relating to salt deposition was subsequently withdrawn by the Public Advocate.

4. The remaining admitted contentions in the Proceeding are as follows:

Contention I - Pipe Cracks

The recirculation piping installed at Hope Creek utilized American Iron and Steel Institute Type SS-304, which is highly susceptible to IGSCC, intergranular stress corrosion cracking. The Applicants have failed to demonstrate that they can prevent and mitigate IGSCC in accordance with 10 CFR Part 50, Appendix A, Criterion 3,

Quality of Reactor Coolant Pressure Boundary:

1. All critical recirculation piping has been identified and tested for susceptibility to IGSCC, and where susceptibility is found, the piping is replaced with corrosion-resistant piping. Among this critical piping are other Type 304 pipes including connections to the decay heat removal system; or

2. Where replacement is found not to be feasible, then all possible preventive measures have been taken prior to start-up; including, but not necessarily limited to, the use of solution heat treatment ("SHT") in shop welds, field application of corrosion-resistant cladding ("CRC") and the use of the Inductive Heating Stress Improvement ("IHSI") process; and

3. After start-up PSE&G can and will implement a continuing system for the identification and replacement of recirculation piping susceptible to IGSCC. To be acceptable, such system must provide for regular and verifiable inspection techniques which do not rely upon manual ultrasonic testing ("UT").

Contention II - Management Competence

Prior to operation, PSE&G must demonstrate that it has fully resolved the management implications of the Salem events of February 22 and 25, 1983, which resulted in the NRC civil penalty, and that it has taken all steps necessary to achieve and maintain the technical qualifications required for the safe operation of Hope Creek as a result of these incidents.

Contention III - Environmental Qualification

The Applicants have not demonstrated that safety-related electrical and mechanical equipment, components and subcomponents will be environmentally qualified at the start of operation and throughout the life of operation, so as to assure compliance with G.D.C. 1, 2 and 4 of 10 CFR Part 50, Appendix A. (General Design Criteria).

5. With respect to Contention I, the actions which have been undertaken or commitments made by PSE&G include the implementation of IGSCC remedies applied in accordance with NUREG-0313 and NUREG-0313 rev. 1, replacement of susceptible materials in certain systems with carbon steel or type 304L grade stainless steel, removal of other susceptible and non-essential lines, solution heat treatment of shop welds, application of corrosion-resistant cladding in the shop in preparation for field welds, commitments to improve UT and training programs and implementation of a water chemistry control program. The specific undertakings and commitments are more fully set forth in the responses to the Public Advocate's discovery requests and the Hope Creek Safety Evaluation Report (SER).

6. With respect to Contention II, PSE&G has undertaken actions and initiated programs as described in the document entitled "An Overview of PSE&G Technical Qualifications and Management Capability in Support of the Operation of Hope Creek Generating Station," dated July 1984.

7. With respect to Contention III, PSE&G has undertaken actions and initiated programs as described in the document entitled "Environmental Qualification Summary Report," dated August 1984, which is to be amended in 1985.

8. Independent audits covering, among other things, the design, construction and quality assurance related to Hope Creek have been performed by the NRC, Theodore Barry & Associates (TB&A), and others. Specifically, Bechtel Power Corporation (Bechtel), the architect/engineer for Hope Creek, has been audited by the NRC with respect to Hope Creek in audits conducted on April 19 - 23, 1982, on July 12 - 15, 1982, on November 29 - December 2, 1982, on March 14 - 18, 1983, on January 16 - 19, 1984, and on May 14 -17, 1984. All non-conformances with respect to such audits have been resolved satisfactorily. Further, on September 19 - 30, 1983, the NRC performed a construction team inspection (CTI) at Hope Creek. The CTI summary states, in part:

> "It is concluded that the licensee's construction, quality assurance and on site design control programs are effective in assuring conformance to regulatory requirements and PSE&G commitments. Construction Management, the Bechtel offsite fabrication shop, and Bechtel Supplier Quality Representatives to the job site are considered to be significant strengths of the project."

The CTI inspection also identified areas for corrective action, and on January 15, 1985, the NRC issued its systematic assessment of licensee performance (SALP) report for the period of August 1, 1983 through October 31, 1984. The SALP report contains the following in its summary overall facility evaluation:

> "The applicant's performance was satisfactory. Initiatives to improve site communications were effective and improvements in craft and supervisor training were apparent. There were no major construction problems and corrective actions were generally prompt and effective. The CTI identified both strengths and weaknesses in the project's activities and the applicant aggressively pursued resolution of the weaknesses.
>
> "Construction management by both the applicant and Bechtel provided effective control of the work. Corrective action was generally complete, thorough, and adequate to prevent recurrence of problems. In some cases management was insufficiently active in identification of generic problems although the improved NCR trending and field engineering accountability program have improved this condition.

"The construction of the project remained on schedule and close to budget due in large part to good communications within and between the applicant and Bechtel. Bechtel also transferred many people with experience from recently completed nuclear projects to Hope Creek to build a solid experience base. Performance throughout this SALP period generally improved with the addition of more experienced personnel to the Bechtel site organization."

NRC Region I issued its Evaluation of Construction Quality for Hope Creek as of November 1984 which was presented to the Advisory Committee on Reactor Safeguards Subcommittee in November 1984. Region I's overview and conclusions with respect to the project are as follows:

"Region I Overview

"Region I inspections indicate the applicant to be: (1) responsive to facility construction needs and to be providing aggressive management attention to NRC concerns, (2) improving QA/QC programs and increasing QA/QC manpower, and (3) recognizing the necessity of continuous management attention to assure quality performance. Adequate management review is evident, with both site and corporate management aggressively involved with decision-making; this has been noted both in Region I inspections and in other independent assessments.

"Region I has developed a high degree of confidence in the Hope Creek nondestructive examination (NDE) program, as a result of the independent verification of the applicant's examination, using the NRC Region I Mobile Laboratory (NDE Van).

"SALP reports have generally indicated a strong involvement by PSE&G management in their overview of construction. Management has initiated many new and innovative programs to improve communications and jobsite morale. Examples of such initiatives undertaken by the applicant, during the last SALP period assessed, have included:

-- A transition plan to coordinate orderly transfer of the Hope Creek project from the construction phase to operations.

-- A documentation and record turnover (DART) team, established to identify all records and schedule their turnover, format, and location (storage).

-- The PRIDE Program, to upgrade work force morale and improve communications, including a suggestion program, newsletter, and surveys of attitude and morale.

-- Bechtel QA review of all past 10 CFR Part 21 reports, for applicability to Hope Creek, using printout from the Public Document Room.

-- The Response Coordination Team (RCT) to coordinate closure of NRC Bulletins, Circulars, and Information Notices. The RCT has also undertaken to investigate and resolve NRC Generic Letters, GE SIL's and TIL's, and INPO identified items.

-- Applicant QA verification that corrective actions taken to correct past violations are still in effect.

-- An independent program to receive and evaluate safety concerns of any site employee (past or present). The program, initiated at Fermi by Detroit Edison and now being marketed as Safeteam, is intended to surface and resolve safety concerns at an early date.

-- field engineering responsibility for inspection of completed safety-related items, prior to turnover to QC for inspection, resulting in low QC reject rates.

As a result, the applicant's strong commitment to QA has been reflected by a quality project.

"in November 1984, a Senior Resident Inspector with 5 years of resident inspector experience at an operating nuclear plant (Peach Bottom) was permanently assigned to Hope Creek, and will help to cover the NRC's preoperational inspection program (initiated in October 84). The Hope Creek inspection program will also continue to have a resident inspector following the completion of construction and attendant activities.

"These two actions will help to insure that testing activities are properly performed, and that test results indicate that FSAR commitments are met, and that preparations for operation are sufficiently comprehensive.

"Conclusion

"Overall, Region I finds the construction program quality at Hope Creek to be acceptable. This does not mean that there have not and will not be problems to be solved. However, this review adds confidence that PSE&G, Bechtel, and the various subcontractors are committed to, and capable of, building a quality nuclear plant. In addition, the preoperational and startup testing programs are designed with a strong in-line QA/QC involvement. This is intended to insure that the pressures of achieving a January 1986 fuel load date will not adversely affect the project's quality."

9. The parties are committed to execute in good faith the programs and plans for action and agreements contained in this Agreement.

10. As a result of the agreements reached by the parties reflected in this Agreement, including the attachments, which are incorporated by reference herein, there are no remaining matters in controversy between the parties, and the Proceeding should be dismissed.

11. PSE&G has chosen to comply with NUREG 0313 and NUREG 0313 rev.1 by taking certain preventative or mitigating IGSCC actions which are recognized as acceptable by the NRC. As a result, PSE&G did not undertake certain other state of the art fixes currently recognized under the NUREG as appropriate alternate actions. Paragraphs 12 and 13 are designed to provide a mechanism whereby PSE&G provides assurance that its choice of countermeasures other than the replacement of pipes is appropriate for Hope Creek.

12. With respect to Contention I - Pipe Cracks, if the Proceeding is dismissed, PSE&G agrees that if within the first six years after the initial criticality of Hope Creek, it is determined that additional reasonable and prudent capital costs are or will be incurred to prevent and/or mitigate intergranular stress corrosion pipe cracking in the recirculation system as a result of the replacement of stainless steel 304 with stainless steel 316 NG, solution heat treatment of shop welds, application of corrosion resistant cladding or inductive heat stress improvement to meet the requirements of NUREG-0313 and NUREG-0313 rev. 1, it will seek to include in its rate base for the purpose of calculating revenue requirements no more than 100% of the reasonable and prudent capital costs which would have been incurred if such modifications had been made prior to the initial criticality of the unit, plus 75% of the difference between such amount and the actual reasonable and prudent capital cost of such modifications.

PSE&G also agrees that in the event costs so incurred are charged to maintenance expense, it will include in its determination of revenue requirements no more than 100% of the reasonable and prudent amount which would have been incurred if such modifications had been made prior to the initial criticality of the unit, plus 75% of the difference between such amount and the actual reasonable and prudent amount charged to maintenance expense.

13. With respect to Issue I - Pipe Cracks, if the Proceeding is dismissed, PSE&G agrees that if principally as the result of the preventative and mitigative alternatives set forth in paragraph 12, it incurs reasonable and prudent additional replacement energy costs as a result of a forced outage of more than three months or an extension of a scheduled outage for more than three months, it will seek to recover such reasonable and prudent incremental replacement energy costs incurred after the initial three month period or three month extension, as appropriate, over a period no shorter than three years.

14. (a) Also with respect to Contention I - Pipe Cracks, if the Proceeding is dismissed, PSE&G agrees to utilize at Hope Creek for the purpose of identifying IGSCC in the recirculation system improved piping inspection techniques, procedures and devices as they become available and have been qualified for nuclear service, provided those techniques, procedures or devices have been found effective for use in BWR's such as Hope Creek by the Electric Power Research Institute (EPRI) or approved by the NRC for newly-licensed or operating BWR's and after a determination that such techniques, procedures or devices are appropriate for Hope Creek considering the public interest. PSE&G will provide a report documenting any such determination to the Public Advocate and, if appropriate, to the Nuclear Safety Advisory Board for Hope Creek (NSAB) on a timely basis and include all elements of its analysis in arriving at that determination.

(b) Further, with regard to IGSCC in the recirculation system, PSE&G agrees to monitor and keep abreast of developments in leak detection techniques, procedures and devices. New leak detection techniques, procedures and devices which have been found effective for use in BWR's such as Hope Creek by EPRI or are required by the NRC for use in newly-licensed BWR plants will be evaluated by PSE&G for use at Hope Creek. If, after this evaluation of the site specific applicability at Hope Creek, PSE&G determines that the use of the new leak detection technique, procedure or device is not in the public interest, it will provide the evaluation to the Public Advocate and, if appropriate, to the NSAB on a timely basis and include all elements of its analysis in arriving at that determination.

(c) If new leak detection and/or piping inspection techniques, procedures or devices are found appropriate and cause additional reasonable and prudent capital, operation or maintenance costs, or replacement energy costs, the Public Advocate will not object to the inclusion in rates of those reasonable and prudent costs. It is also agreed that the Public Advocate will exclude all such costs, including the site specific evaluation cost, in any calculations involving the "Cost Containment Agreement" dated August 10, 1982, including all amendments.

15. (a) Also with respect to Contention I - Pipe Cracks, if the Proceeding is dismissed, PSE&G agrees that if the NRC requires utilization of hydrogen water chemistry by newly-licensed BWR's subsequent to the issuance of a license to operate Hope Creek, PSE&G shall conduct a Hope Creek specific evaluation to determine whether hydrogen water chemistry would be an appropriate IGSCC-countermeasure at Hope Creek. Following its completion, this evaluation shall be reviewed by the NSAB, if appropriate, and governmental entities and shall be provided to the Public Advocate on a timely basis.

(b) If, after this site specific evaluation PSE&G decides to use hydrogen water chemistry as an IGSCC countermeasure, then the reasonable and prudent cost of such a countermeasure will be recognized by the Advocate as an exclusion from the Cost Containment Agreement dated August 10, 1982 including all amendments. It is also agreed that the reasonable and prudent cost of the site specific analysis regardless of whether hydrogen water chemistry is utilized is an exclusion from the Cost Containment Agreement if said analysis occurs during the effective period of the Cost Containment Agreement. In addition, if said addition of hydrogen water chemistry measures requires the incurrence of additional reasonable and prudent capital, operation and maintenance and/or replacement power costs, the Public Advocate will not object to the inclusion in rates of those costs or the cost of the site specific analysis.

(c) If, after the site specific evaluation, PSE&G determines not to utilize hydrogen water chemistry as an IGSCC countermeasure, it shall include in its evaluation all elements of its analysis as to why implementation of such a countermeasure would not be in the public interest.

16. With respect to Contention III - Environmental Qualification, if the Proceeding is dismissed, PSE&G agrees that if within the first six years after the initial criticality of Hope Creek, it determines to shut down Hope Creek for a period of forced outage of more than one month or to extend a scheduled outage for more than one month principally in order to replace safety-related electrical and mechanical equipment, components and subcomponents to meet NRC requirements for environmental qualification, the rate provisions set forth in paragraphs 12 and 13 shall apply to the appropriate reasonable and prudent capital, maintenance and/or replacement energy costs associated with such replacement.

17. The provisions of paragraphs 11 through 16 shall not apply to costs incurred as a result of regulatory requirements not in effect at the date hereof, to costs other than for IGSCC incurred as a result of normal wear and tear, to any such costs aggregating less than $3,000,000 or to any cost overruns which are otherwise covered as to rate treatment by the Cost Containment Agreement dated August 10, 1982, including all amendments. In the event any additional costs which are covered by paragraphs 11 through 16 are incurred, PSE&G shall forthwith provide the Public Advocate with appropriate and sufficient information, if relevant, to reasonably establish: (1) the reasonable and prudent costs, if applicable, which would have been incurred if the modifications had been made prior to the initial criticality of the unit; (2) the reasonable and prudent costs, if applicable, of any equipment being replaced; (3) the reasonable and prudent costs, if any, of the modification; and (4) the incremental reasonable and prudent costs, if any, of appropriate replacement energy.

18. (a) With respect to Contentions II and III, PSE&G will undertake an independent design verification program and as-built construction review (IDVP) with respect to Hope Creek. The IDVP criteria and requirements, the systems and components to be reviewed and the workscope document for the IDVP have been prepared by Multiple Dynamics Corporation, which has no previous contract relationship with PSE&G or Bechtel, and which completed the workscope document for the IDVP as an independent consultant. The workscope document for the IDVP is attached hereto as Exhibit A and made a part hereof.

(b) The independent auditors selected to perform the IDVP are Sargent & Lundy. After evaluation of the Sargent & Lundy proposal for the IDVP, a copy of which proposal is attached hereto as Exhibit B, PSE&G agrees with the Public Advocate to have Sargent & Lundy expand the IDVP to include the Options offered by Sargent &

Lundy, with Multiple Dynamics Corporation to determine Option 2 - Selection of Other Systems for Verification. Sargent & Lundy will be directed to emphasize new or unusual features at Hope Creek in performing the IDVP, where appropriate. The parties agree that Sargent & Lundy will also conduct walkdowns of not less than six days, which shall include a review of the application of the PSE&G - Bechtel as-built verification program within the scope of the IDVP. Further, Sargent & Lundy will randomly select six additional environmental qualification packages, within the scope of the IDVP, which shall be evaluated for compliance with design commitments, NRC licensing requirements, the Final Safety Analysis Report, and the document entitled "Environmental Qualification Summary Report" dated August 19, 1984. Sargent & Lundy will also review the pre-operational test procedures applicable to the systems within the scope of the IDVP.

(c) Sargent & Lundy shall provide a copy of its final report to the Public Advocate. A schedule for completing any modifications to Hope Creek that are recommended by Sargent & Lundy will be submitted by PSE&G to the NRC and the Public Advocate for modifications that PSE&G proposes not completing prior to fuel load and low power testing. The basis for proceeding without such modifications will be provided by PSE&G to the NRC for approval. PSE&G will complete all items prior to fuel load and low power testing except for such matters as the NRC agrees need not be completed prior to such time.

(d) It is agreed that the cost of the IDVP and the costs associated with the independent consulting services being provided by Multiple Dynamics Corporation and Sargent & Lundy are exclusions from the Cost Containment Agreement, including all amendments. In addition, the Public Advocate will not object to the inclusion of any resulting additional reasonable and prudent capital, operation and maintenance and/or

replacement power costs.

19. With respect to Contention II - Management Competence, if the proceeding is dismissed, PSE&G agrees to have an independent consultant, Theodore Barry & Associates, audit the Hope Creek project in the areas of Project Management, Construction Management and Quality Assurance which shall include the QA Program as it relates to system turnovers, the Company's SAFE Team Program and a comparison of PSE&G's operational QA/QC program to applicable NRC Regulatory Guides and associated standards specifically related to QA/QC activities. TB&A shall be permitted to select the services of additional independent technical consultants as needed to assist in this effort. It is presently anticipated that this review will take three to four months and involve approximately 2,000 man-hours by TB&A and any such additional consultants. PSE&G agrees to institute remedial measures identified by the audit and to submit a schedule for this to the Public Advocate. TB&A will provide a copy of the final audit report to the Public Advocate. It is agreed by the parties that the cost of this audit is an exclusion in any calculation in the Cost Containment Agreement dated August 10, 1982, including all amendments. If as a result of the audit, additional reasonable and prudent capital, operation or maintenance costs, or replacement energy costs are incurred, the Public Advocate will not object to the inclusion of those costs. The parties understand that the NRC will conduct an operational readiness review prior to fuel load which will address operational QA/QC. Where the NRC schedules, in advance, an exit interview associated with this operational readiness review as it relates to operational QA/QC, PSE&G will provide the Public Advocate with notice of any such exit interview and will consent to the Public Advocate's opportunity to attend any such interview.

20. With respect to Contention II - Management Competence, if the proceeding is dismissed, PSE&G agrees to provide the Public Advocate with all reports filed with the Nuclear Regulatory Commission, the New Jersey Board of Public Utilities or the New Jersey Department of Energy regarding forced outages which last more than 30 days and extensions of scheduled outages which last for more than 30 days at Hope Creek. PSE&G will also provide the Public Advocate with all correspondence between the Nuclear Regulatory Commission and PSE&G regarding any civil penalties leveled by the NRC for safety violations at Hope Creek. Within 60 days of the payment of any such penalty, PSE&G will also provide written notice to the Public Advocate of the causes of the occurrence which occasioned the civil penalty, as well as all management actions taken to preclude the reoccurrence of such an occurrence. PSE&G agrees that subsequent to any forced outage lasting more than 60 days or any scheduled outage extension of more than 60 days at Hope Creek, a report will be prepared and forwarded to the Vice President - Nuclear. This report will identify the causes of the outage or extension, management action taken to minimize the outage duration and, where appropriate, all remedial action so as to mitigate the potential for reoccurrence. Included within the report will be a time schedule for implementation of remedial measures and a schedule for progress reports.

21. With respect to Contentions II and III, if the Proceeding is dismissed PSE&G agrees to the inclusion on the Hope Creek Nuclear Safety Advisory Board (NSAB), or its functional equivalent, of a qualified member nominated by the Pubic Advocate. The following procedures will govern such membership:

A. Appointment

The Public Advocate shall submit to PSE&G a list of five such nominees after consultation with the President of the

New Jersey Board of Public Utilities, the New Jersey Commissioner of Energy and the New Jersey Commissioner of Environmental Protection, together with sufficient biographical information to permit evaluation of the nominees. The nominees must meet the standard qualifications established by PSE&G for membership, and, if such qualifications are met, PSE&G shall select the State designate from such list. Upon the death or resignation of the State member, or for reasons mutually agreed upon by PSE&G and the Public Advocate, another representative shall be selected in accordance with these provisions.

B. Duties, Responsibilities and Authority

The State member will be a member in full standing of the NSAB. He or she will have all of the duties, responsibilities and authority of any other member.

C. Access to and Disclosure of Information

(i) The State member will have the same access to information as other members and will be bound by the same non-disclosure and confidentiality agreements as such other members.

(ii) Notwithstanding the provisions of paragraph C(i) above, the State member may consult with experts on any matter pending before the NSAB and with the public officials enumerated above concerning any procedural problems relating to rights under this agreement. Prior to such consultation, the experts or any others to be involved in the

consultation shall sign nondisclosure agreements acceptable to PSE&G concerning confidential or proprietary information.

(iii) The State member shall not appear for either of the parties as a witness in any proceeding before the BPU, DEP, DOE or NRC or otherwise assist either party in any such proceeding. Nothing in this Agreement shall preclude the State member from appraising the NRC of safety matters which should be called to the attention of the NRC under applicable statutes and regulations.

D. Compensation

The State's member shall be compensated by PSE&G for the reasonable costs related to his or her membership on the NSAB, except that no costs, including consultants' fees, incurred as a result of any consultations referred to in paragraph C(ii) shall be borne by PSE&G.

22. The Public Advocate shall immediately withdraw all its Contentions from the Proceeding by joining with PSE&G in filing with the Board a Joint Motion to Dismiss in the form of Exhibit C hereto. The parties shall cooperate fully and do all things necessary in order to obtain the dismissal of the Proceeding as soon as possible. This Agreement shall become null and void and of no effect if the Proceeding is not dismissed. If the Proceeding is dismissed, the Public Advocate shall not seek to reintervene so long as PSE&G is complying with this Agreement and shall consult with PSE&G prior to any attempt to reintervene. The parties shall use their best efforts to resolve between themselves any matters so raised by the Public Advocate. If, however, the Public Advocate shall at any time seek to reintervene in the Proceeding for any

reason, or to represent any party that seeks to intervene in the Proceeding, whether before or after any such discussions with PSE&G, PSE&G shall have the right in its sole discretion to void this Agreement and/or to oppose such intervention on all available grounds.

23. The parties recognize that this Agreement has been reached because of their common goal of assuring a safe plant, a willingness to take extra steps to reach that goal, and a spirit of compromise and trust which has allowed them to resolve their present differences with sufficient assurance that future disputes relative to the meaning and requirements of this Agreement should not occur. In furtherance of this commonality of interests, the parties agree that, if, despite their present expectations, a dispute should arise regarding the meaning or requirements of this Agreement, they will make strenuous efforts to resolve the dispute amongst themselves. The parties also recognize that, in addition to direct negotiation, for many disputes there are other less expensive, more effective methods of resolution than the traditional law suit. Alternate Dispute Resolution procedures, such as mediation and fact finding, can often spare the high cost and wear and tear of litigation. The parties agree to explore resolution of any dispute hereunder through Alternate Dispute Resolution techniques through the Center for Public Resources or another similar organization which is mutually agreed upon before pursuing full-scale litigation if direct negotiations cannot resolve the matter.

24. The terms of this Agreement, including but not limited to PSE&G's agreement to perform any audit or evaluation are without effect on and without prejudice to the parties' rights or obligations in any other proceeding or before any body and have no res judicata or collateral estoppel effect therein, except as may be specifically provided for in separate rate sections 12 through 19 of this Agreement. In

BPU proceedings the Public Advocate is not precluded from contesting or questioning the findings of any audit or evaluation, or the prudency of causes, costs or scope of any remedial action resulting from findings of the audits contained herein.

25. The provisions of this Agreement shall expire no later than the expiration of the rate provisions set forth in paragraph 12, except that the provisions of paragraphs 14, 15, and 21 through 26 shall expire ten years after the date of this Agreement.

26. The parties understand and agree that certain information relating to the licensing of Hope Creek covered by this Agreement may be confidential. If the Proceeding is dismissed, PSE&G agrees to notify the Public Advocate with respect to any confidential filings with the NRC which would be covered by this Agreement and will provide copies of such confidential filings to the Public Advocate under a protective agreement. Nothing contained in this Agreement, however, shall require PSE&G to divulge any information to the Public Advocate if such would violate NRC requirements or result in the unauthorized disclosure of proprietary information.

27. Nothing contained in this Joint Agreement and Settlement shall be deemed to bind the NRC Staff to take, or to refrain from taking, any action impliedly or expressly authorized by statute, regulations or in furtherance of its regulatory

responsibilities, or to relieve PSE&G from its obligations under the Commission's Order Modifying License dated May 6, 1983.

Public Service Electric and Gas Company

By _____
R. Edwin Selover,
Vice President and General Counsel

Department of the Public Advocate
of the State of New Jersey

By _____
Joseph H. Rodriguez, Public Advocate

Dated: February 15, 1985

EXHIBIT A

PUBLIC SERVICE ELECTRIC & GAS CO.

HOPE CREEK GENERATING STATION

INDEPENDENT DESIGN VERIFICATION PROGRAM

WORK SCOPE DOCUMENT

PSEG-12-2559
REVISION 0

PREPARED BY

MULTIPLE DYNAMICS CORPORATION
29200 SOUTHFIELD, SUITE 103
SOUTHFIELD, MICHIGAN 48076
(313) 557-7766

NOVEMBER 1984

SUBJECT: HOPE CREEK GENERATING STATION INDEPENDENT DESIGN VERIFICATION PROGRAM - WORK SCOPE DOCUMENT	DATE ISSUED November 1984	DOC. NO. PSEG-12-2559
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ABSTRACT

This Work Scope Document defines the Independent Design Verification Program (IDVP) for the Hope Creek Generating Station, being constructed by Public Service Electric and Gas Company (PSE&G) near Salem, New Jersey. PSE&G is performing the IDVP at its own initiative to provide additional, independent assurance of the Hope Creek functional design and design control adequacy, prior to plant fuel load. A contractor independent from previous Hope Creek engineering and design activities will be selected to perform the IDVP, which will consist of a detailed design review of selected elements of the Hope Creek safety systems.

To provide further independence in this effort, PSE&G contracted Multiple Dynamics Corporation (MDC) to determine IDVP criteria and requirements, select the systems and components to be reviewed, and prepare the Work Scope Document. MDC has had no previous contract relationship with PSE&G or Bechtel Power Corporation, and has completed this Work Scope Document as an independent consultant.

Multiple Dynamics Corporation — Date 11/7/84

by Frank E. Gregor
President

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I. INTRODUCTION

This document is a work scope description of an Independent Design Verification Program (IDVP) for the Hope Creek Generating Station, being constructed by Public Service Electric and Gas Company near Salem, New Jersey. This Work Scope Document will be used by IDVP bidders in preparing proposals for performance of the IDVP scope, and as a reference document by the selected IDVP contractor, Public Service Electric and Gas Co. (PSE&G), Bechtel Power Corporation, General Electric Co., and other parties as necessary, during the performance of the IDVP.

This document provides a definition of Public Service Electric and Gas objectives and requirements in performing the Hope Creek IDVP. Separate sections define the IDVP contractor's requirements, the PSE&G/Bechtel/GE interface with the IDVP contractor, and the technical work scope of the program. Appropriate instructions to IDVP bidders in preparing proposals are also included.

Public Service Electric and Gas is performing the IDVP at its own initiative, to provide additional, independent assurance of Hope Creek design adequacy and thoroughness. This program is also intended to provide assurance of the design interface and control practices among PSE&G, Bechtel, and other contractors. These objectives will be achieved by a limited verification of selected systems' design concepts, detailed engineering

and analysis, and implementation into plant construction. These systems include elements of the High Pressure Coolant Injection (HPCI) System, the Automatic Depressurization System (ADS), and selected auxiliary systems which support the safe operation of HPCI and ADS.

The selection criteria, the choice of systems to be reviewed, and the preparation of this Work Scope Document, were performed by an independent consultant to Public Service Electric and Gas, to meet criteria appropriate to current independent design verification programs underway at other near-term-operating-license nuclear plants.

Fuel load for the Hope Creek Generating Station is planned for January, 1986. In support of this date, the Independent Design Verification Program is generally scheduled as follows:

- Request for Proposals Issued by PSE&G - November 15, 1984
- Bids Due to PSE&G - December 15, 1984
- IDVP Contractor Commences Work - January 14, 1985
- IDVP Contractor Issues Final Report - June 14, 1985

The IDVP contractor shall be required to complete the detailed work scope contained herein on a <u>firm, lump-sum basis</u>. The IDVP contractor shall submit a detailed proposal considering the corporate qualifications,

project management, communications protocol, and interface requirements described in this document.

The detailed nature of this Work Scope Document, and the IDVP contractor's detailed proposal, are designed to avoid undesired extras and contingencies from developing in this contract. These considerations will require the IDVP contractor to perform his work in a prudent, cost-effective and schedule-conscious manner, while maintaining the requisite independence to meet the IDVP objectives. The balancing of these considerations will be ensured by close communications between PSE&G and the IDVP contractor on matters of technical scope, budget, and schedule.

Mr. William F. Bauer, Principal Engineer, Public Service Electric and Gas Company, will serve as the Contract Administrator for the Hope Creek IDVP. Additional technical interfaces with PSE&G Newark and Site Engineering, with Bechtel Power Corporation at San Francisco and the Hope Creek site, and with General Electric at San Jose, California and the Hope Creek site, are defined in Section III of this Work Scope Document.

II. IDVP CONTRACTOR REQUIREMENTS

This section of the Work Scope Document contains general requirements related to performance of the Independent Design Verification Program by the selected contractor. These requirements are established to ensure effective,

independent design verification per the technical work scope definition of Section IV, while maintaining reasonable contract administration and adherence to PSE&G's schedule. These requirements are to be addressed in the IDVP bidder's proposal via positive statements of compliance, with exceptions or clarifications clearly noted for PSE&G review.

Tne requirements and expectations stated in this section represent the minimum acceptable requirements of PSE&G, and IDVP bidders shall clearly state where additional work beyond these requirements is included in the bidder's lump sum proposal.

a. Contractor's Objective

The contractor's objective is to provide additional, independent assurance to Public Service Electric and Gas, that conceptual engineering, detailed design implementation, and design control practices have been adequately performed for the Hope Creek Generating Station, given a limited scope of review of selected systems and components. This objective also includes additional assurance that the design interfaces among PSE&G, Bechtel, and General Electric have been properly administered and controlled to effect adequate design for the Hope Creek Generating Station.

The contractor will make his determination by reviewing engineering and design data, and related

engineering procedures and practices, and where necessary performing independent calculations and analyses. The contractor will also consider in this determination the input of interviews and meetings held with design personnel and management of the affected organizations, and the results of on-site physical inspections of constructed components.

The basis for determination of design adequacy shall be the design criteria and limitations defined in the Hope Creek Final Safety Analysis Report, including all Federal regulations, industry codes, and licensing commitments encompassed therein. The basis for determination of design control and interface adequacy shall be the PSE&G and Bechtel procedure manuals referenced in this Work Scope Document.

b. Contractor's Corporate Qualifications and Project Team

1. The IDVP contractor as a corporate entity shall be clearly independent from previous Hope Creek engineering and design activities associated with systems, components, and design aspects identified in the technical work scope of Section IV. This independence shall include any contractual relationships with PSE&G, Bechtel Power Corporation, or General Electric related to the Hope Creek Generating Station design and engineering activities discussed in this Work Scope Document.

2. The "key" employees of the IDVP contractor, as defined in Item 4 below, shall also be clearly independent from previous Hope Creek engineering and design activities associated with systems, components, and design aspects identified in the technical work scope of Section IV. This shall include current employment with the IDVP contractor, and previous employers where such previous employment provided a direct engineering involvement with these Hope Creek engineering and design activities in the last five years.

3. The IDVP contractor shall have successfully performed an IDVP of a similar nature on another nuclear plant, to provide evidence of the requisite experience and familiarity with the scope of work. Alternatively, the IDVP contractor must be a large, multi-disciplined architect-engineering firm with experience in complete, integrated design of a nuclear power plant.

4. The IDVP contractor shall assemble a review team with the following requirements:

   . A Program Manager will be designated who will coordinate and monitor all work of the contractor. The Program Manager will be the

primary technical and commercial interface contact with PSE&G, Bechtel, and other affected organizations per the communications protocol of Paragraph II(d) below. The resume of the proposed Program Manager shall be reviewed and approved by PSE&G prior to award of this contract. The IDVP contractor will not remove the Program Manager from his responsibilities under this work scope for the duration of this contract, unless ~~such removal contractor unless~~ such removal is caused by events beyond the contractor's control. Should such removal occur, PSE&G shall review and approve the resume of the proposed replacement prior to his assignment as Program Manager.

. "Key" employees of the IDVP contractor will be identified, covering all appropriate disciplines to be reviewed, per the technical Work Scope of Section IV. These key employees will be responsible for technical matters in their areas under the direction of the Program Manager. The resumes of key employees shall be reviewed and approved by PSE&G prior to the award of this contract. The IDVP contractor will strive to maintain these key employees on this work scope through the duration of the contract. PSE&G shall review and approve the

resumes of replacement key employees prior to their assignment to this contract.

. Resumes of the Program Manager and key employees assigned to this contract will be reviewed to determine:

- Individual's experience in nuclear power plant systems, regulatory requirements, methods of design verification and control, and task management skills.

- Individual's independence from previous Hope Creek engineering and design activities related to the scope of work.

. The IDVP contractor will assemble a "Senior Review Committee", composed of senior engineering and/or management personnel not directly involved with the day-to-day IDVP program, who will be responsible for reviewing and dispositioning observations and potential findings as discussed in Item II(d) below. The resumes of the proposed committee members will be included in the proposal.

. The IDVP contractor will assemble a total project team consisting of only full-time, bona fide employees of the contractor. No part-time employees, subcontractors, or

outside consultants will be utilized without prior, written approval of PSE&G. The contractor will strive to hold this team together for the duration of this contract. The contractor will provide in his proposal an organization chart showing the overall project team.

. The IDVP contractor will commit to start the work immediately upon contract award, provide personnel to ensure steady and timely progress, and complete the final report by June 14, 1985.

5. The IDVP contractor shall include in his proposal the following project team information, to allow PSE&G evaluation of the complete team in terms of manpower and expected commitment versus the lump sum price.

. Total manhours proposed
. Manhours per job classification
. Rate per job classification
. Support personnel included in overhead
. Support personnel to be invoiced, and corresponding rates
. Other charges to be included in lump sum cost

c. Contractor's Interface Requirements

The IDVP contractor will interface with PSE&G's Contract Administrator, with engineering and design personnel at PSE&G's Newark headquarters and Site Engineering Division at Hope Creek, with Bechtel Power Corporation at the San Francisco and Hope Creek site Resident Engineering offices, with Bechtel Construction Corporation Field Engineering at the Hope Creek site, and with General Electric at their San Jose headquarters and Hope Creek site offices. The IDVP contractor may also have a limited interface with Bailey Controls for the instrumentation and controls segment of the review. The affected organizations' interface structures are detailed in Section III of this Work Scope Document.

The IDVP contractor shall submit a program plan in his proposal, stating assumptions on how these interfaces will be accomplished on a lump sum cost basis. Specifically, PSE&G has the following expectations regarding the approach to be taken in performing the IDVP scope:

1. The bulk of engineering and design data review and analysis will be performed in the IDVP contractor's home office. All data consolidation, observation and potential finding dispositioning, and report preparation will be performed in the IDVP contractor's home office.

2. There will be a one-day IDVP "kickoff" meeting in Bechtel's San Francisco office at project commencement, to review with all affected parties the intent, scope, and administration of the IDVP. Bechtel will provide an overview of Hope Creek design and construction status, and identify areas where incomplete design and construction may have a bearing on the IDVP contractor's observations (e.g., system walkdowns and as-built reconciliations currently in progress by Bechtel).

3. The IDVP contractor will need to make a minimum number of visits to Bechtel's San Francisco and Hope Creek offices, to PSE&G's Newark and Hope Creek offices, and to General Electric's San Jose and Hope Creek offices, for technical data collection, data review, interviews, meetings, and follow-up actions. The contractor will state in his bid his assumptions on the expected number, duration, manpower requirements and nature of these visits, based on the technical work scope of Section IV.

4. The IDVP contractor will state his assumptions regarding visits to the Hope Creek site for plant familiarization tours, system walkdowns, and construction measurements, which may involve direct plant access, in a manner similar to Item 3 above.

5. The IDVP contractor will state his assumptions on meetings among PSE&G, Bechtel, and the contractor concerning the reporting of observations and potential findings, and their dispositioning, in a manner similar to Item 3 above.

6. There will be a final one-day meeting at PSE&G's Newark headquarters to review with PSE&G management the final results of the IDVP.

d. Contractor's Methods of Communication (Communications Protocol)

The IDVP contractor shall establish and maintain a communications protocol among himself, PSE&G, Bechtel, and other affected organizations to ensure the following objectives:

- The independence of the IDVP contractor's investigations, analyses, and determinations is not compromised.

- The IDVP contractor creates and retains a documented and auditable trail of communications to provide assured evidence of the independent verification.

- The generation of observations and potential findings, and their disposition, represent

correct interpretation of data provided, or allow identification of data not provided which is relevant to the observation or finding.

To meet these objectives, the IDVP contractor shall abide by the following communications and record keeping procedures:

1. Written correspondence on contract commercial matters, budget, schedule, and other issues not related to the technical work scope shall be addressed to the PSE&G Contract Administrator, with no copies to other parties.

2. Written correspondence for data requests shall include a tabulation of data requested, and be addressed to the PSE&G Contract Administrator (cc: Bechtel Task Leader) for data requested from PSE&G, to the Bechtel Task Leader (cc: PSE&G Contract Administrator) for data requested from Bechtel, and to the designated General Electric Project Manager (cc: PSE&G Contract Administrator and Bechtel Task Leader) for data requested from General Electric.

3. Meetings between the IDVP contractor and PSE&G, Bechtel or GE shall be scheduled at least one week in advance, and shall be preceded by a written meeting notice with agenda and names of contractor personnel attending. Meeting minutes

shall be taken and prepared by the IDVP contractor, with copies provided to the PSE&G Contract Administrator, the Bechtel Task Leader and the GE Project Manager (if affected).

4. Telecons may occur between the IDVP contractor and PSE&G, Bechtel and/or General Electric for the purposes of data gathering. The substance of these telecons shall be recorded in telecon notes by the IDVP contractor, and copies provided similar to meeting minutes.

5. Oral conversations may occur between the IDVP contractor and PSE&G, Bechtel and/or General Electric outside the setting of a formal meeting or telecon. Such conversations shall be recorded in written notes by the IDVP contractor, if substantive information is exchanged, and transmitted in a manner similar to meeting minutes.

6. After analysis of data and review of Hope Creek plant design and construction, the IDVP contractor may develop "observations" or "potential findings" related to perceived inadequacies in design or design control. Observations will not require a formal written response for the final report. Potential findings must have a PSE&G/Bechtel response to

allow the IDVP contractor to determine the validity of the finding.

Potential findings and observations shall be communicated in the following manner:

. The IDVP contractor may seek additional data via telecons, written data requests, or meetings, to internally resolve or confirm the observation or potential finding prior to release.

. The IDVP contractor shall forward a written statement of the observation or potential finding to the PSE&G Contract Administrator and the Bechtel Task Leader concurrently. The Bechtel Task Leader will forward to General Electric and/or other affected organizations those potential findings requiring review and response by them.

. Affected organizations' responses, other than those generated by PSE&G, will be forwarded to the Bechtel Task Leader, for subsequent forwarding to the PSE&G Contract Administrator. Bechtel's internal responses will also be forwarded to the PSE&G Contract Administrator, who will forward all responses to the IDVP Contractor. These responses will include any

corrective actions to be implemented by PSE&G, Bechtel, or General Electric.

. The IDVP contractor shall review the responses, and shall notify the PSE&G Contract Administrator and the Bechtel Task Leader via telecon of its agreement or disagreement with the response provided. PSE&G and/or Bechtel may choose to amend the response provided or let the response stand.

. The IDVP contractor shall utilize its internal "Senior Review Committee" to review all observations and potential findings, and disposition them on an individual basis to be "valid" or "invalid". All valid and invalid observations and findings, and the corresponding PSE&G/Bechtel responses where applicable, shall be incorporated into the draft and final reports discussed in Item II(f) below.

7. Copies of all written correspondence, meeting minutes, telecons, observations and potential findings transmittals, and findings responses, including drafts, between the IDVP contractor and PSE&G, Bechtel, and GE shall be kept on file by both the IDVP contractor and the interfacing organizations, until directed by PSE&G.

e. Contractor's Utilization of Data

1. The IDVP contractor will be provided access to all design data, drawings, and related design/engineering procedures, required for the IDVP effort. This access will be coordinated by the interface contacts listed in Section III of this Work Scope Document.

   The IDVP contractor must be able to accept design data and drawings in the following forms: hardcopy, microfiche (correspondence, data), aperture cards (drawings), and telecopier (correspondence, data). Data may be provided in any or all of these forms.

   The IDVP contractor shall develop a log of all data received for this contract, and shall maintain a controlled document storage and retrieval system for this contract separate from his other contract files. The IDVP contractor shall be required to return all data after contract completion as directed by PSE&G. The contractor shall also destroy or return any working copies made from original data, as directed by PSE&G.

2. Public Service Electric and Gas recognizes that in performing work on the Independent Design Verification Program, the IDVP contractor may be required to obtain, review, and analyze

proprietary design codes, information, or methods from Bechtel, General Electric, or other engineering or equipment firms. Therefore, the IDVP contractor shall agree to hold such information in strictest confidence, not to make use of such information other than for performing the Independent Design Verification Program work, to release it only to contractor employees requiring such information, and not to release or disclose it to any other party.

PSE&G reserves the right to require that the IDVP contractor sign written agreements implementing this provision, upon the written request of other firms involved in this verification program, provided such written agreements are acceptable to PSE&G.

f. Contractor's Work Output Requirements

The IDVP contractor shall provide the following documents as work output over the course of this contract:

1. A Program Plan, to be part of the proposal, which details project organization, resumes, overall approach to the task, positive statements indicative of compliance with the requirements in this Work Scope Document, and exceptions/clarifications to this Work Scope Document clearly highlighted. The Program Plan

shall provide evidence of a systematic approach (checklists, observation records, potential finding report, etc.) to be utilized by the IDVP contractor.

2. A bi-weekly contract status report to the PSE&G Contract Administrator, detailing contract financial status, overall work progress, problems and proposed solutions, and open issues between PSE&G and the IDVP contractor. This report shall be only for contract monitoring purposes, and shall contain no discussion of technical findings, discrepancies, etc., which are reserved for the Technical Report.

3. A network schedule with sufficient details and milestones identified to provide PSE&G assurance of timely and adequate progress. The IDVP contractor shall update this network chart and transmit it to the PSE&G Contract Administrator on a biweekly basis.

4. Copies of all meeting minutes, telecons, and correspondence recorded by the IDVP contractor under the scope of this contract, and meeting notices/agendas for requested meetings.

5. Individual, written documentation of observations and potential findings, issued

promptly as generated, for review and response by PSE&G, Bechtel, and affected organizations.

6. A Technical Report, draft and final versions, issued to the PSE&G Contract Administrator, which includes as a minimum:

   . An executive summary covering scope of work, project organization, methodology, results, and overall conclusions.

   . A detailed discussion of the program scope, objectives, selection of systems and components reviewed, and design disciplines and aspects examined.

   . A summary of the contractor's team, personnel assignments, management methods, Senior Review Committee.

   . A discussion of the independent design verification document collection, methods used, data review criteria and procedures, analyses completed, plant walkdowns.

   . A discussion of the contractor's review of the design control and interface process.

   . Compilation of the review results by discipline and design aspect.

. Conclusions and recommendations, including significant findings, significant design conservatisms, recommendations, and overall conclusions on Hope Creek functional design and design control adequacy, as measured against the IDVP contractor's objective.

. Appendices which provide detailed definitions, nomenclature, documents reviewed, review criteria, observation review records, checklists, potential finding reports and related responses, disposition of observations and potential findings as valid or invalid.

. A statement of the IDVP contractor's independence in performing this scope of work, including a testament of corporate and personnel lack of vested interest in the outcome of the IDVP, and the assurance of no previous corporate or key employee involvement in the engineering or design activities of Hope Creek systems and components pertinent to this IDVP.

g. Miscellaneous Contractor Requirements

1. Security Provisions and Work Rules

The IDVP contractor shall be required to abide by Public Service Electric and Gas security provisions and job site work rules at the Newark offices and the Hope Creek site. The IDVP

contractor shall also be required to abide by security regulations in effect at Bechtel and General Electric offices during visits to these facilities.

Document Control Center procedures for the obtaining and controlling of design data and drawings at Bechtel's San Francisco offices and Hope Creek job site offices shall be followed by the IDVP contractor.

2. Performance of Work per Procedures

The IDVP contractor shall perform his work per his established internal procedures manual. The contractor shall also abide by the reporting requirements of 10CFR21.

Should the IDVP contractor determine that a finding is reportable under 10CFR21, the contractor shall immediately report its finding verbally to Mr. Arthur E. Giardino, Manager, Quality Assurance, PSE&G, followed up by a written confirmation.

3. Contractor's Cost Reporting, Scope Changes, and Invoicing

The IDVP contractor shall bid and perform the Hope Creek Independent Design Verification Program on a lump-sum, fixed price basis. In

his proposal, the IDVP contractor shall clearly state:

. All assumptions regarding travel time and living expenses, including the amount of engineering manpower required at Bechtel, PSE&G, and General Electric offices, and time required for Hope Creek site investigations and walkdowns.

. All clarifications or assumptions made in interpreting the technical work scope of Section IV.

. All assumptions on the availability of data, turnaround times by Bechtel and PSE&G personnel, and review cycle times for potential findings and the draft Technical Report.

PSE&G will utilize these statements both as a reference basis for potential IDVP scope changes, and to assess the IDVP bidder's understanding of the scope and previous experience with this type of project.

In his proposal, the IDVP contractor shall discuss an invoicing plan based on the program schedule. Public Service Electric and Gas requires invoice payments on a lump sum contract

to be tied to defined and measurable milestones of progress by the IDVP contractor.

Public Service Electric and Gas recognizes that the IDVP contract may require scope changes to the lump-sum cost, based upon unanticipated developments in the technical scope of work or upon the request of PSE&G. Should the IDVP contractor believe that a change in the scope of work has been proposed, the contractor shall transmit a written scope change request to the PSE&G Contract Administrator within ten (10) days of such determination, detailing the nature of the change, proposed lump-sum adjustment, schedule impact, and basis for change against the contractor's original proposal statements. The contractor shall not commence work on the additional scope until written authorization from the PSE&G Contract Administrator is received.

III. PSE&G/BECHTEL/GENERAL ELECTRIC INTERFACE ORGANIZATION

The IDVP contractor shall develop and maintain working relationships with the following interface organizations, and shall become familiar with the stated procedural methods for Hope Creek design and design control:

a. Public Service Electric and Gas Company

For the Newark headquarters office, the IDVP contractor will coordinate activities through the PSE&G Contract Administrator, William F. Bauer. Additional contacts within specific disciplines of PSE&G's Hope Creek Project Organization and the Engineering and Construction (E&C) Department, will be identified to the contractor at the project "kickoff" meeting.

The IDVP contractor will utilize the Hope Creek Generating Station Project Manual, including all procedures pertinent to the IDVP contained therein, as a source document for PSE&G activities. The specific engineering and design procedures of each E&C Department discipline supporting the Hope Creek Project will also be referenced as they apply to review and approval of Hope Creek documents prepared by Bechtel Power Corporation.

For the PSE&G Hope Creek Site Engineering Division, a single contact will be identified to the IDVP contractor at the kickoff meeting. This contact will coordinate contractor activities involving all PSE&G site personnel.

The IDVP contractor will utilize the Hope Creek Site Engineering Division Instructions Manual as the source document for site engineering activities pertinent to the IDVP scope.

b. Bechtel Power Corporation

Bechtel Power Corporation, with main offices in San Francisco and support offices at the Hope Creek job site, is the architect/engineer and constructor for the Hope Creek Generating Station. As such, it is expected that a major portion of the IDVP contractor's work will be focused on Bechtel design and engineering activities.

Bechtel Power Corporation will coordinate all IDVP activities involving its work through a single contact, designated as the Bechtel Task Leader. The Bechtel Task Leader will have available discipline contacts and other resources, which will be identified at the kickoff meeting.

The IDVP contractor will utilize the Bechtel Hope Creek Project Engineering Procedures Manual as a source document for Engineering Department Procedures, Project Instructions, and Manager of Engineering Directives pertinent to the IDVP project.

The IDVP contractor will utilize the Bechtel Document Control Center as the source for obtaining data and drawings. A single contact will be designated at the project kickoff meeting, who will coordinate all data requests of the contractor.

The IDVP contractor will be provided an orientation to the Bechtel documentation system, including the use of the following Bechtel documents:

- Communication Control Register
- Design Document Register
- Supplier Document Register
- Indices for valves, components, instruments, equipment, dampers and piping lines
- Piping and Instrumentation Diagrams (P&ID), and Design Installation and Test Specifications (DITS)
- EE580 program containing cable, conduit, tray, and termination information

The use of these and other documents in retrieving design information at both the San Francisco and Hope Creek Bechtel offices will be explained to facilitate IDVP contractor identification of the needed data.

The Bechtel Task Leader will identify to the IDVP contractor the Bechtel site contacts for review activities and system walkdowns at the Hope Creek plant. These contacts may be in either Bechtel's Resident Engineering group (supporting the home office engineering effort) or in Bechtel's Field Engineering group (supporting the construction effort).

c. General Electric Company

The IDVP contractor will have a limited interface with the General Electric Company at their San Jose, California and Hope Creek site offices. This interface will be restricted to the transfer of design data and concepts which occurred between General Electric and Bechtel/PSE&G regarding the technical scope discussed in Section IV.

A General Electric contact will be identified at the kickoff meeting, and arrangements to meet with General Electric personnel for IDVP purposes will be established via the PSE&G Contract Administrator. Data requests and design control information for General Electric will be defined by the IDVP contractor after his initial engineering review effort at Bechtel.

d. Miscellaneous Interfaces

The IDVP contractor may have a limited interface with Bailey Controls for the instrumentation and controls segment of the review. This interface will be coordinated through the Bechtel Task Leader. No other interfaces are anticipated for the IDVP.

e. Services, Materials, Data Provided by PSE&G, Bechtel, GE

To support the IDVP contractor's work scope, the contractor will be provided the following services, materials, and data at contract initiation:

. Sufficient private office space, furniture and telephones for contractor personnel during their visits to PSE&G, Bechtel or GE facilities. This will not necessarily be dedicated offices, and the contractor should not assume that the contractor's materials, supplies, or belongings may be left during periods of contractor absence.

. Current organization charts for affected areas of PSE&G and Bechtel.

. Current versions of the PSE&G Hope Creek Project Manual, the PSE&G Site Engineering Division Instructions Manual, PSE&G E&C Department discipline procedures pertinent to Hope Creek, and the Bechtel Hope Creek Project Engineering Procedures Manual.

. Current revisions of specific design data for the affected systems, as may be determined by the contractor prior to the kickoff meeting.

. Current set of the Hope Creek Final Safety Analysis Report.

. Specific data normally prepared by sources outside the organizations to be reviewed, which served as input to certain design and engineering activities associated with the technical scope of work in Section IV. Review and independent verification

of this data is not part of this contractual scope, and the data is to be accepted by the IDVP contractor as valid input. This data is specifically identified in Section IV, and is provided directly to the IDVP contractor to avoid unnecessary and costly regeneration.

IV. TECHNICAL SCOPE OF WORK PERFORMANCE

a. Background and Selection Criteria

Public Service Electric and Gas requested an independent consultant to develop selection criteria and choose appropriate systems, components, and aspects to be included in the Hope Creek Independent Design Verification Program. This section of the Work Scope Document details these criteria, the selected areas of Hope Creek design to be reviewed, and other technical considerations for the IDVP contractor to assess the design and design control adequacy.

The basis for determining design adequacy, as stated in the Contractor's Objective of Section II(a), is the Hope Creek Final Safety Analysis Report. This includes all design criteria, design and licensing commitments, Federal regulations, industry codes and standards, and other aspects which are embodied in the FSAR related to the specific systems and components to be reviewed. The FSAR will serve as the IDVP contractor's source document for making

determinations on observations or potential findings concerning design adequacy.

The basis for determining design control adequacy and proper design interfaces will be the Hope Creek Project Manual procedures, Site Engineering Division instructions, PSE&G E&C Department discipline procedures, and the Bechtel Hope Creek Project Engineering Procedures Manual.

It is important to note that the primary function of this IDVP is an assurance of functional design adequacy and proper implementation of design control practices and interfaces. This will be accomplished by focusing on the application and continuity of design criteria and practices from system concepts and base Federal regulations through actual implementation via construction. This review is <u>not</u> intended to be a detailed quality assurance audit of safety-related systems similar to those performed on several occasions in the past.

The systems and components to be reviewed were selected on the following criteria:

. They must be safety-related and/or important to the safe shutdown of the plant.

. There should be an inability to verify the accident or emergency performance of equipment by

direct testing (on the assumption that direct testing serves as a design verification).

. There must be involvement of multiple architect/ engineer design interfaces

. There should be design changes which have occurred over the plant design period.

. There must be a cross-section of engineering and design disciplines.

. Parallel and series design interfaces will be considered.

. To the extent practical, there will be consideration of Hope Creek unique admitted contentions from the Atomic Safety and Licensing Board Prehearing Conference.

. The selected scope has not been previously reviewed or audited via other boiling water reactor IDVP's (on a generic basis) or through previous plant-unique design reviews and audits.

The selection process involved identifying engineering and design disciplines, specific segments of systems, and related design aspects to best accommodate these criteria. Elements of the High Pressure Coolant Injection (HPCI) System and

the Automatic Depressurization System (ADS), and selected auxiliary systems which support operation of these systems, were chosen as detailed below.

The emphasis on engineering discipline review and related design aspects is placed on the HPCI system. The elements of the HPCI system to be reviewed are portrayed on Figure 1 as highlighted segments of a simplified HPCI P&ID. The review of the ADS is limited to its function as part of the HPCI-ADS Emergency Core Cooling System "network" for high pressure relief in the safe shutdown process, and its diversity, separation and redundancy to HPCI. No separate figure is provided for the ADS.

Items (b) through (f) below address specific design disciplines and aspects to be reviewed. Item (g) discusses the design control process to be reviewed.

b. Electrical Design to be Reviewed

The electrical IDVP review will consist of two segments:

1. HPCI Steam Line Isolation Valves HV-F002, HV-F003

The contractor shall review the electrical motive and control power feeds to valves HV-F002 and HV-F003 in terms of the following:

. Diversity of power sources

- Redundancy and Class 1E channel separation
- Voltage requirements and regulation, including undervoltage protection
- Cable sizing, insulation, and code standards
- Conduit sizing (if any)
- Physical separation of cabling, conduit, and trays carrying power to these valves
- Fault protection sizing, selectivity, and coordination with overall Class 1E electrical system, for cables feeding these valves (for faults within valve, cabling, local control power cabinet, source motor control center, or 480 volt Class 1E unit substation bus).

The span of this review will cover the motive power feeds from the valves themselves out to and including the Class 1E 480 volt unit substation buses which directly power the valves, and the control power feeds from the valves to the control power cabinet buses.

2. HPCI-ADS Network Separation

The contractor shall review the electrical power separation between HPCI and ADS in the following aspects:

- Separation of Class 1E channels of control power to the ADS valves from those power channels feeding the HPCI system.

. Control power diversity and independency to the ADS valves as a system, for automatic and manual actuation.

The span of this review will cover from the essential control power cabinet buses to the ADS valves.

c. Instrumentation and Controls Design to be Reviewed

The instrumentation and controls IDVP segment shall consist of a detailed review of the flow orifice FO-N032 on the HPCI steam line, and all instrumentation and control functions which are generated from the flow orifice. This orifice generates steam flow signals which result in alarm and isolation/trip signals being supplied to shut down the HPCI turbine for abnormal conditions.

Mechanical designs of the orifice and instrument tubing are covered in paragraph (d) below.

The IDVP contractor shall review the following elements of the orifice FO-N032 and all connected instrumentation and controls:

. Sensing devices
. Signal conversion and processing devices
. Intermediate instrumentation cabinet devices
. Control room instruments, alarms, indication, setpoints

. Automatic trip functions, isolation logic, interlocks
. Capturing of information on sequence of events recorders, computer, hardcopy recorders
. Testability aspects for surveillance monitoring

The span of the review shall cover proper selection of devices, separation, redundancy, correct design and proper installation. The specification, design and correct application of AC and DC instrument power sources and components for the selected devices will also be reviewed. The review will trace all four instrument tubing lines from the orifice to the end devices.

This segment of the review may require some limited interface with Bailey Controls.

d. Mechanical/Structural Design to be Reviewed

The mechanical and structural IDVP review shall consist of two segments:

1. HPCI Steam Line

The IDVP contractor shall review the overall mechanical and structural design of the HPCI steam line from the main steam line tap to the HPCI turbine drain pot. This review will be performed considering the appropriate design and equipment specifications, and the compliance of the design to appropriate ASME code sections,

ANSI standards, and Federal regulations. The following specific aspects will be reviewed:

. Line sizing
. Thermal transients including line warmup
. Thermal movements
. Mechanical design of FO-N032 flow orifice
. Mechanical design of FO-N032 instrument tubing
. Penetration loads (including load path to structure)
. Penetration stresses
. Annulus pressurization loads interface
. HV-F002 valve loads and seismic qualification
. Main steam line design interface
. Pipe break locations
. Seismic loads interface

The IDVP contractor shall also assess the design adequacy of one each of the following components along the HPCI steam line, to be selected by the contractor:

. One snubber
. One hanger/support
. One pipe whip restraint

The assessment of design adequacy for these three selected components will consider sizing, proper placement, welds, and the effects of load transfer to the structure.

In the event the IDVP contractor generates a valid finding on the selected snubber, hanger/support, or pipe whip restraint, the contractor will select two (2) additional samples of the affected component type for further independent verification. The intent of this activity will be to define any generic design inadequacy related to these components.

The span of the review is the entire segment of the HPCI steam line from and including the main steam "tee" to and including the drain pot.

2. <u>HPCI Pump Suction Line from Condensate Storage Tank</u>

The IDVP contractor shall review selected mechanical and structural aspects of the buried HPCI pump suction line from the condensate storage tank to the HPCI pump, as follows:

- Line sizing
- Net Positive Suction Head margin
- Buried pipe analysis (seismic design, cathodic protection/corrosion control, sealants, etc.)
- Pipe break and flooding potential into Reactor Building

The span of the review is the entire HPCI pump suction line from the condensate storage tank to

the "tee" connection with the pump suction line from the torus.

e. Miscellaneous Design Aspects to be Reviewed

In addition to the specific electrical, instrumentation and controls, and mechanical/structural elements to be reviewed as discussed in paragraphs (b) through (d) above, the IDVP contractor shall review the following design aspects:

1. Environmental Qualification

The environmental qualification of the inboard HPCI steam line isolation valve HV-F002 motor shall be reviewed. The IDVP contractor shall not regenerate the drywell environmental responses of humidity, temperature, pressure, and radiation, but shall use provided data to determine its correct application to the qualification of the motor.

2. Pipe Break Analysis

The pipe break inside containment analysis shall be selectively reviewed to identify those pipe breaks which will impact HPCI or ADS operation. For these selected breaks, the contractor shall confirm that pipe whip, jet impingement, and related effects on the HPCI system do not concurrently disable the ADS function, and vice versa.

f. Identified Interfaces and Use of Existing Data

For the purposes of this Independent Design Verification Program, the IDVP contractor will be involved with design interfaces at General Electric, Bechtel Power Corporation, Bailey Controls and PSE&G. These interfaces will involve meetings, telecons, and correspondence as appropriate to accomplish the design verification. Such interfaces will be accomplished in such a manner as to maintain independence of the review.

The IDVP contractor shall accept without further verification the following existing input data:

- Site seismic g-level and related geological data prepared by Dames and Moore
- Building seismic response spectra prepared by EDS/Impell
- Instrumentation and controls standard specifications provided by Bailey Controls, Inc.
- Standard equipment product literature and test reports supplied by vendors to PSE&G or Bechtel
- Generic engineering or test data supplied by General Electric
- Drywell environmental responses supplied by Bechtel

The use of this supplied data does not waive the IDVP contractor's responsibility to verify its

correct application to the design of system components.

g. Design Control Process Review

In addition to ensuring the functional design adequacy by a review of selected systems and design aspects, the IDVP contractor shall review and assess the adequacy of the design control process. This shall consist of two aspects:

1. Flow of Design Information

For the selected systems and components in Items (b) through (e) above, the IDVP contractor shall review the flow of design information, specifically including these considerations:

. Were FSAR design criteria and commitments, and applicable Federal regulations, properly translated into Piping and Instrumentation Diagrams (P&ID), Design Installation and Test Specifications (DITS), design calculations, plant general specifications, equipment specifications, and Technical Specifications.

. Were P&ID's, DITS, design calculations, and specifications properly "expanded" into correct procurement documents, plant indices, detailed mechanical, electrical, controls and plant design drawings, and supporting data

such as stress reports, hanger sketches, and isometrics.

- Were data and drawings supplied by General Electric and other affected vendors properly interfaced and incorporated into the design.

- Did integration of design among disciplines occur to ensure proper transmission of data without conflicting designs developing.

- Has the design been correctly implemented in the plant construction per the contractor's physical examination. Do as-built configurations reflect the intended design, and are base configuration design documents in agreement with the as-built.

- Were approved design changes implemented in a manner that the system design intent was not violated, and were design changes initiated, processed, approved and implemented in the proper format to consider PSE&G, Bechtel, and GE technical input. Was configuration control maintained during design changes, particularly field-initiated changes.

- Have applicable NRC Inspection and Enforcement Bulletins, Notices, and Circulars, as selected

by the IDVP contractor, been appropriately considered and implemented.

2. Design Interfaces

For the selected systems and components, the IDVP contractor shall review the design interface among organizations to ensure that proper and complete transmission of design data occurred. This will include interfaces among PSE&B, Bechtel, and General Electric, and interfaces within units of the same corporation (particularly between Bechtel's San Francisco office and the engineering groups based at the Hope Creek site).

To determine the adequacy of the design control process, the IDVP contractor shall utilize the PSE&G and Bechtel engineering procedures discussed in Section III of this Work Scope Document, combined with physical inspections and personnel interviews.

The focus of this design control review is to ensure the proper communication, application, and continuity of design criteria and data, from FSAR base criteria and commitments to construction implementation, through review of design documents and physical inspections.

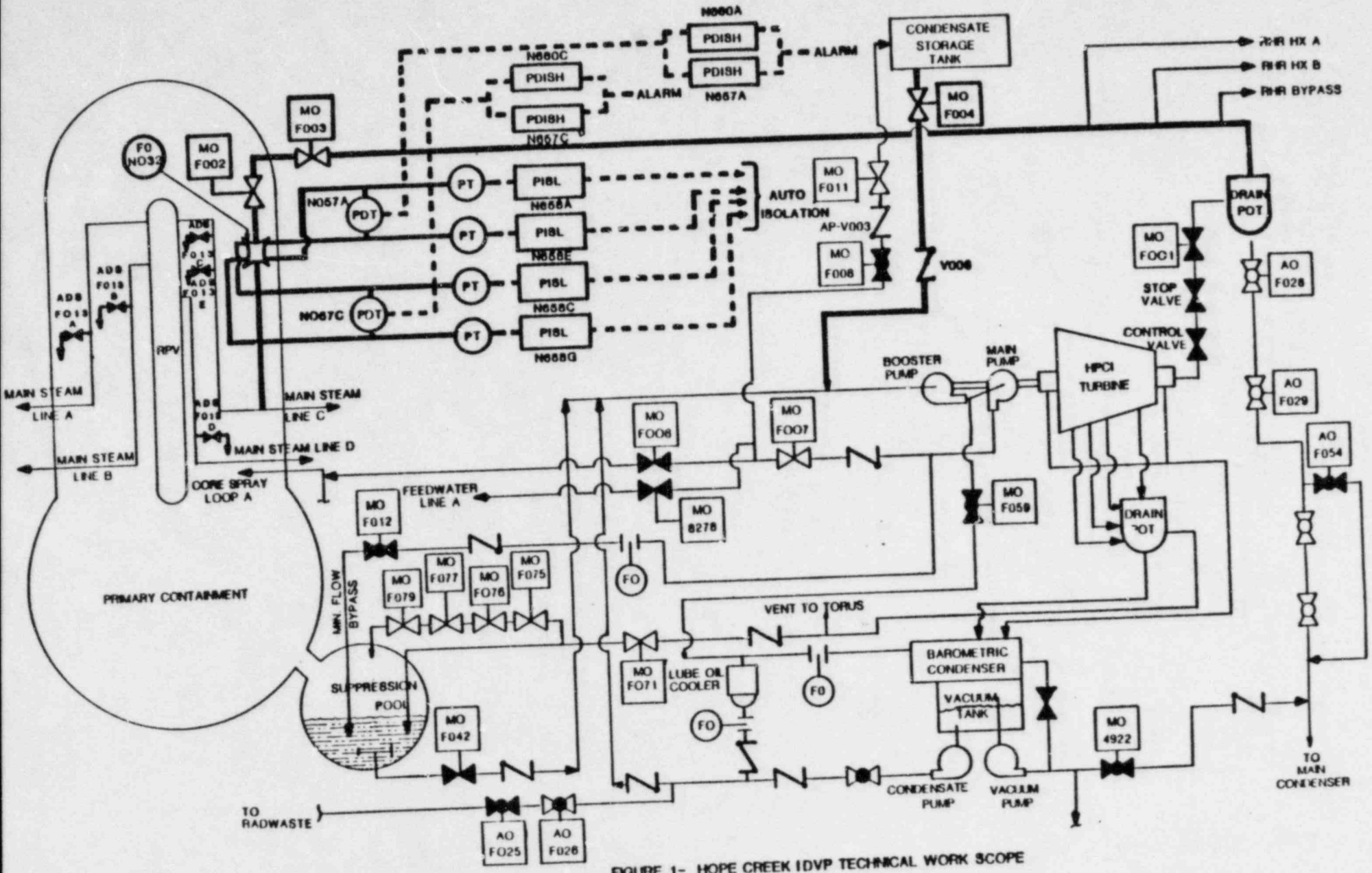


FIGURE 1- HOPE CREEK IDVP TECHNICAL WORK SCOPE

EXHIBIT B

Proposed Services for Independent Design Verification Program

Public Service Electric and Gas Company

Technical Information
Proposal 0189-27
December 1984

SARGENT & LUNDY

Sargent & Lundy is pleased to submit this proposal to Public Service Electric and Gas Company in response to your request for proposal, dated November 14, 1984, for services in connection with the Independent Design Verification Program for the Hope Creek Generating Station.

We have thoroughly reviewed your request for proposal and, based on our experience with similar assignments, we are confident that our proposal fully addresses the services outlined in your request and that we are best qualified to perform the tasks required.

This proposal offers Public Service Electric and Gas Company the following outstanding features:

- An organization that has designed 8 BWRs now in operation, currently has 2 more BWRs under design, and is servicing 4 operating BWRs designed by others
- A project team familiar with the current and past designs of the General Electric Company's BWRs
- A project team experienced in the design of High Pressure Coolant Injection and Automatic Depressurization systems for BWRs
- A carefully laid out plan incorporating the elements important to the success of a third party review
- Experience working with Bechtel Power Corporation on two major independent design reviews and a design compliance review
- Experience working with General Electric Company to develop the numerical information for predicting potential thermal hydraulic load conditions in BWR pressure suppression containments during a loss-of-coolant accident, safety/relief valve discharge, and related dynamic events
- Experience working with the Institute of Nuclear Power Operations to develop the Construction Project Evaluation Program and undergoing two construction project evaluations
- A contractor, as a corporate entity, who is clearly independent from previous Hope Creek Generating Station engineering and design activities

Our proposal includes the following options, with the advantages noted, for your consideration:

- Option 1 for verification of two additional snubbers, hanger/supports, or pipe whip restraints; offering you the advantage of resolving valid findings of the base program.
- Option 2 for selection of other systems for verification; offering you the advantage of ensuring unbiased results.

Approach

The review will be performed in accordance with the program plan by a dedicated project team experienced in all aspects of BWR safety systems design. This team will be directed by a Project Manager who has substantial experience in the nuclear field. The overall work will be performed under the direct surveillance of a partner of the firm, thus ensuring upper management attention.

We have divided our review and report preparation work into tasks for convenience and clarity of reporting. The fifteen tasks are discussed in detail in chapter III.

Schedule

The schedule indicates that work will be completed 22 weeks after award.

Experience

Sargent & Lundy currently is providing nuclear services to seven operating BWRs of our design and to four operating BWRs designed by other architect-engineers. We have designed eight BWRs that have received commercial operating licenses and we have another two under design now. We also have undergone a number of design reviews and other audits. Experience with reviews by others of our designs gives us a unique perspective on how an independent design review should be conducted.

Personnel

Our project team members have been selected to provide you with the most experienced engineers available. Their nuclear design experience, coupled with experience undergoing design reviews of this type, will help ensure that the verification program is completed to your satisfaction.

Option

The scope of this Independent Design Verification Program is rather limited in comparison with those recently performed on the Commonwealth Edison Company's Byron Unit 1 and the Illinois Power Company's Clinton Unit 1. Expanding the partial vertical and horizontal Independent Design Verification Program to include another mechanical

system that was designed by an architect-engineer with less influence from General Electric, would provide a more objective opportunity to examine the design process employed by the architect-engineer. The fact that the systems selected were designed by General Electric and many of the specifications and some of the hardware was provided by General Electric rather than Bechtel Power Corporation could compromise the applicablity and credibility of this review with respect to the balance-of-plant design. Sargent & Lundy recommends that the emergency closed cooling system be included in the review. This is a safety-related system designed by the A-E which includes sufficient equipment, piping, and instrumentation to provide a review of the design process employed by the A-E for that portion related to conceptual design, preparation of design criteria, function descriptions, and preparation of equipment specifications. A satisfactory review of the proposed additional mechanical system would yield increased assurance that the design of Hope Creek Generation Station is adequate.

We trust that this proposal provides you with sufficient information for your evaluation. We are prepared to begin work immediately to complete the study in accordance with your requested schedule. Thank you for considering Sargent & Lundy for this assignment.

This proposal for the Hope Creek Generating Station (Hope Creek) Independent Design Verification Program (IDVP) has been prepared in response to Public Service Electric and Gas Company's (PSE&G) request for proposal, dated November 14, 1984.

This document describes our proposed scope and approach to work; the schedule for carrying out the work and the project controls we will employ to manage the job; our proposed project team and Senior Review Committee, and the strengths they will bring to the project; and our qualifications and experience.

We have included, as an option, the assessment of the design adequacy for two additional samples of snubbers, hangers/supports, and pipe whip restraints on the High Pressure Coolant Injection System (HPCI) steam line. This design adequacy review will consider sizing, proper placement, welds, and the effective load transfer to the structure. This option would be exercised if the review generated a valid finding on the first design adequacy review.

We have also included, as an option, the selection of a mechanical system substantially independent of General Electric Company (GE) influence which would provide a better cross-section through which to examine the design process employed by the architect-engineer (A-E).

Beyond this introduction, our proposal is organized into five chapters.

In chapter II, Compliance with Program Requirements, we discuss how S&L proposes to meet the requirements outlined in section II of the Hope Creek Generation Station Independent Design Verification Program Work Scope Document (Work Scope Document).

In chapter III, Scope and Approach to Work, we discuss in detail how we would carry out the study. We also include a precedence diagram of the key events leading to issuance of the final report, a description of our quality assurance program, clarifications of the scope, and options for your consideration.

Chapter IV, Project Schedule and Controls, includes a discussion of the project schedule, the precedence network diagram, and our approach to monitoring progress on this project.

Chapter V, Organization, contains a description of our company organization, our project team approach, identification of key personnel, and the strengths our project team will bring to this study effort.

In chapter VI, Qualifications and Experience, we present our experience on similar recent projects.

A. Objective

Sargent & Lundy will provide assurance to PSE&G that the conceptual engineering, detailed design implementation, and design control practices for Hope Creek have been adequately performed on elements of the HPCI system, the Automatic Depressurization System (ADS), and auxiliary systems supporting their operation. Additional assurance will be given that the design control process and design interfaces among PSE&G, Bechtel Power Corporation (Bechtel), and GE have been properly administered and controlled to produce adequate designs of these systems.

B. Independence

Sargent & Lundy does not have, and never has had, any contractural relationship with PSE&G, Bechtel, or GE relative to Hope Creek. Furthermore, the key team members have not had any direct engineering involvement with the Hope Creek engineering and design activities in the last five years. Therefore, S&L is clearly independent from previous Hope Creek engineering and design activities.

C. Design Review Experience

Sargent & Lundy is one of the largest multi-disciplined, full-service architect-engineering firms in the country. We have been a leader in the design of electric generating plants since 1891.

Our leadership in the nuclear industry began in 1955. We have been involved with the complete integrated design of 24 nuclear power plants. A listing of the nuclear units we have designed is included in chapter VI (see Exhibit VI-3). Sargent & Lundy has been involved with eleven independent design verification or design review programs involving ten nuclear units during the past 5 years (see Exhibit VI-2).

D. Review Team

Sargent & Lundy will bring to this project a team that is experienced in the design and the design review of BWRs. The Project Manager will be S&L's primary technical and commercial interface with PSE&G and their other contractors. A detail discussion of S&L's organization for this project can be found in chapter V.

Sargent & Lundy will establish a Senior Review Committee which will be responsible for reviewing, and making recommendations regarding the disposition of, observations and potential findings identified by the project team. This Senior Review Committee will consist of Departmental Design Directors for the major engineering disciplines, the head of our Quality Assurance Division, and the Project Director as chairman.

E. Interfacing

All interfacing with personnel from PSE&G's headquarters and site, Bechtel, GE, and other contractors will be in accordance with the communication protocol. This protocol will be established by S&L and approved by PSE&G prior to the start of the review.

The S&L program plan for the IDVP is presented as a precedence diagram (Exhibit III-1) which graphically shows the flow of work activities. This diagram is supplemented by Exhibit III-2, Sequence of Design Review Activities, and Exhibit III-3, Processing of Observations. A discussion of each task in the plan is found in chapter III, Scope and Approach to Work. The communication protocol which will define the interfaces between S&L, PSE&G, and the other involved design entities will be established during Task 1.

Following the initial finalization and preparation tasks we anticipate holding a one day kickoff meeting (Task 3) in Bechtel's San Francisco office to review the objective, intent, scope, and administration of the IDVP. Following this meeting, two members of the project team will remain in Bechtel's offices to initiate familiarization and/or collection of the project files. We expect that commitments as to document delivery time to S&L will be made by all design participants. Sargent & Lundy does not expect that any additional travel to collect those documents will be required.

It is assumed that all required information will be supplied to S&L during Task 4. Telephone and written requests may be made during that period. The engineering and design review and analysis will be performed in S&L's Chicago offices. However, a meeting involving seven S&L team members for 1 week is anticipated to take place in San Francisco and San Jose to clarify, with personal interviews, the design documents supplied in Task 4. Additionally, a shorter meeting of four days is anticipated at the Hope Creek site for reviews, clarifications, and interviews.

The Hope Creek plant familiarization tours and systems walkdowns (Task 5) will be held during the early days of the review stage. During the review phase, reporting of observations and potential findings will occur. Exhibit III-3 shows the procedures for processing these items. Sargent & Lundy does not anticipate any travel for these activities, providing that responses to questions are received from the

designers in a timely manner. A final meeting in Newark between the management of PSE&G and the Senior Review Committee will be held to review the results of the IDVP (Task 13).

Sargent & Lundy will provide the communication and record keeping documents outlined in the Work Scope Document.

F. Use of Data

Sargent & Lundy will hold all proprietary design codes, information, and methods received from Bechtel, GE, and any other engineering or equipment firm in the strictest confidence. Sargent & Lundy will not make use of this information other than in performing the IDVP work and will release it only to S&L employees requiring such information.

G. Work Output

During the course of this contract, S&L will provide to PSE&G the following documents:

- A program plan
- Bi-weekly status reports
- A work schedule
- Notes of meetings, telecons, and correspondence
- Written documentation of observations and potential findings
- A draft and final technical report

H. Miscellaneous

Sargent & Lundy will abide by the miscellaneous contractor requirements outlined in section II.g of the Work Scope Document.

We have carefully reviewed the Work Scope Document contained in your RFP. We will conform to your scope of work with the clarifications noted in this chapter.

The work outlined in your RFP constitutes our base proposal. We are also prepared to perform the optional service of reviewing the design adequacy of two different HPCI steam line snubbers, hanger/supports, and pipe whip restraints if the review of one of the first components proves to have a valid finding. A further option we offer involves selection of another system for verification. These options are described in more detail at the end of this chapter.

Our approach to work is shown on the precedence diagram (Exhibit III-1).

The sequence of activities on tasks 6, 7, 8, 9, and 10 is shown in Exhibit III-2. We will process observations as shown in Exhibit III-3.

A. Tasks

1. Finalize Options, Report Outline, and Program Plan

Immediately following contract award, we will work with you to finalize the options to reflect any scope changes, including cost changes, which you may have developed since you issued the RFP on November 14, 1984. We have prepared this proposal based on the scope of work as defined in your RFP. However, we recognize that your requirements might change. We will send the finalized scope of work, report outline, and program to you within two weeks after award. If an option is chosen, S&L will submit a scope change to adjust the firm lump sum price.

2. Prepare Project Instructions

In order to properly control engineering assignments, S&L provides the client with a project manual which makes use of our nuclear services standard project instructions and procedures that we have used on numerous engineering assignments. The project manual includes the following:

- Project administrative instructions
- Project instructions
- Scope of work
- Organization chart
- Schedule
- Man-hour estimate

Project administrative instructions are prepared to cover interfaces between S&L and PSE&G, Bechtel, and General Electric that are not quality assurance related. Project instructions are project-specific quality assurance procedures. The remaining sections of the project manual include the scope of work, organization chart, schedule, and man-hour estimate. These sections are revised to incorporate additional assignments as they are authorized to S&L. The planned project administrative instructions and procedures are identified in Exhibit III-4.

We issue the project manual to the client for comments and revise the manual to incorporate these comments. Additional sections are added to the project manual as work is assigned. This manual ensures that all safety-related work meets the requirements of S&L's Quality Assurance Program as outlined in Topical Report SL-TR-1A.

The Project Manager is responsible for setting up the project manual following project award, and ensures that all project personnel are properly instructed in its use.

3. **Hold IDVP Kickoff Meeting**

Sargent & Lundy intends to send the Project Manager and five key personnel to the kickoff meeting.

4. **Assemble Design Requirements, Design Control and Interface Documents, and Design Documents**

The timely completion of this project requires that we obtain all relevant design requirements, design control and interfacing documents, and design documents on the designated systems and structures from PSE&G within 30 days after award. These documents will include, but not be limited to, those listed on Exhibits III-5, III-6, and III-7.

Our proposal assumes that this information will be made available to us. Receipt of approximately 75% of the documents within two weeks of project award, and the remainder within one month of project award is assumed. We will review these documents for completeness and determine the impact on the project should critical information be missing or incomplete.

Following the receipt of the design requirements, design control and interface information, and design documents, the detailed design review of elements of the HPCI, the ADS, and selected auxiliary systems which support the safe operation of the HPCI and ADS will begin. This review will employ the administrative procedures and checklists identified in Exhibit III-4 and will be performed in strict conformance to the instructions contained in the RFP. These reviews will follow the sequence shown in Exhibit III-2.

5. System Walkdown

The Project Manager and five key personnel will perform a system walkdown to familiarize themselves with the plant. They will use the procedures and checklists prepared as described in Exhibit III-4. This walkdown will help us confirm:

- That the as-built condition of the systems and components is as indicated in the design information supplied during Task 4
- The location of piping, components, and structures in the vicinity of postulated pipe breaks to assess the effects of jet impingement and pipe whip travel consequences
- Piping and pipe support as-built condition including field change records and dimensional configuration

It is requested that PSE&G provide working facilities at the site, the necessary personnel to escort the team within the plant, and any required training in plant safety and security. It is expected that this walkdown will take 3 days during the course of the design review process.

6. Electrical Design Review

The review will be performed in strict accordance with the instructions in section IV.b of the Work Scope Document. To more fully describe the proposed scope of our review we would like to briefly discuss each item in sections IV.b.1 and IV.b.2 of the Work Scope Document:

a. **HPCI Steam Line Isolation Valves HV-F002 and HV-F003:**

- **Diversity of power sources**

  We plan to use engineering documents (FSAR, GE requirements, electrical single-line drawings, schematic diagrams, and other documents) to establish the amount of power supply diversity required and confirm that the design meets these requirements. We anticipate reviewing the motive power and control power assignments from the 480V unit substations, through the source motor control centers, to the two HPCI valves. We are not planning to review motive power assignments to, or upstream of, the 480V unit substations or control power assignments upstream of the 480V unit substations and control power buses.

- **Redundancy and Class 1E channel separation**

  We plan, again, to use the engineering documents identified above plus physical layout and location drawings to establish the Class 1E channel designations of the valves, determine the redundancy and separation requirements, and confirm that the design meets these requirements. In addition, our system walkdown at the plant will include a verification that this aspect of the design was adequately implemented in the field.

We have assumed that the two HPCI valves picked for review are in redundant divisions so as to demonstrate the implementation of redundancy and Class 1E channel separation. The scope of our review will include the motive and control circuits and cables associated with the subject valves from the 480V unit substations and the first level of interlocks/sensors to the valves themselves. (In the category of "first level of interlock/sensors" we would include either interlocks/sensors that are dedicated to the functioning of the subject valves or, for interlocks/sensors that have multiple functions, that point at which the circuitry becomes

dedicated to the functioning of the subject valves.) We do not anticipate including anything upstream of the 480V unit substations nor are we including review of control power sources to the substations or control power cabinets.

- **Voltage requirements and regulation including undervoltage protection**

  We plan to use the engineering documents identified above in conjunction with the existing voltage drop/regulation calculations, equipment input voltage requirements, as-built cable lengths and sizes, and the undervoltage protection logic and settings to confirm that the connected power and control equipment will operate satisfactorily when required and will be appropriately protected during low voltage conditions. Our review will include the conditions of power being supplied from either the normal offsite sources or the emergency onsite systems. We assume that motive and control voltage regulations values at the 480V unit substation, control power cabinets, and first level interlock/sensors will be supplied to us as verified input to succeeding calculations and analyses.

- **Cable sizing, insulation, and code standards**

  We plan to use the engineering documents identified above, in addition to existing current carrying capacity calculations, to ensure that power and control cables have been applied within their ratings. We will consider such factors as voltage level, load, ambient temperature, cable concentrations in trays, conduits, ducts, and fire barriers. We also plan to review the cable insulation type to confirm compliance with FSAR and fire hazards analysis commitments. Finally, we intend to include a review of the current carrying capacity of appropriate containment electrical penetration conductors. A

complete review of qualification documents for cables, cable terminating and splicing materials, and containment electrical penetrations, however, is outside the scope of this proposal.

- **Conduit Sizing**

  We plan to use the existing conduit sizing criteria along with appropriate cable parameters and current carrying capacity assumptions to assess the reasonableness of the conduit installation with respect to conduit fill, bending radii, and the placement of junction boxes and pull points. The review of conduit supports, seismic consideration, cable support requirements, attachments to cable trays and equipment, and grounding is outside of our proposed scope of review.

- **Physical separation of cabling, conduit, and trays carrying power to these valves**

  We have assumed that the phrase "carrying power to these valves" indicates all cables, both motive power and control, immediately required for operation of these valves. In this regard, we intend to utilize the FSAR to determine the requirements for separation of safety division cables routed in cable trays, conduits, other raceways, and air. Once the requirements have been identified, we will determine if the design drawings have implemented these requirements and finally, confirm, as a part of our system walkdown, that the installation meets the design in this regard. As noted previously, the assumption has been made that the two HPCI valves picked for review are in redundant divisions so as to demonstrate physical separation between cabling. We intend to review

safety divisional separation only between external cables related to the subject valves. The effect of high/moderate energy line breaks on the HPCI and ADS electrical cables and panels will be reviewed. We are not planning to include review of wiring separation in panels, or any separation required as a result of safe shutdown, fire hazards, or flood analyses.

- **Fault protection sizing, selectivity and coordination with overall Class 1E electrical system.**

  We will use existing protective device sizing and setting criteria, overall Class 1E electrical system coordination curves, actual protective device sizings and settings, results of existing fault current calculations, containment electrical penetrations thermal change characteristics, and motor operated valve thermal damage characteristics to determine if the protective devices are properly sized, set, and coordinated to protect the connected equipment (such as motors, power centers, penetrations, and cable) and reduce nuisance tripping. Particular attention will be paid to the project's commitments to implementing Regulatory Guide 1.63, Electric Penetration Assemblies in Containment Structures for Water-Cooled Nuclear Power Plants, and Regulatory Guide 1.106, Thermal Overload Protection for Electric Motors on Motor-Operated Valves. Our scope of review will be limited to the protection provided to the power circuits downstream of the 480V Unit Substation.

b. **HPCI-ADS Network Separation:**

- **Separation of Class 1E channels of control power to the ADS valves from those power channels feeding the HPCI system.**

  For this review, we anticipate using the FSAR to determine the requirements for separation of HPCI and ADS cables. Once the requirements have been identified, we

will determine if the design drawings have implemented these requirements both electrically and physically and, finally, confirm, as part of our system walkdown, that the physical installation meets the design in this regard. We plan to include in our scope the components and primary power and control cabling for the HPCI equipment and the five ADS valves shown on Figure 1 of your Work Scope Document. We will, however, be reviewing electrical and physical Class 1E channel separation only between the identified HPCI and ADS items and not between the HPCI and ADS and other plant systems or components. Neither will our review include any review of separation upstream of the essential control power cabinet buses.

- **Control power diversity and independency to the ADS valves as a system, for automatic and manual actuation.**

  We interpret your requirements to mean a review of the diversity and independency of control power for automatic and manual actuation for the redundant channels within the ADS; no interface review with HPCI is involved. We will use the FSAR to determine diversity and independency requirements; schematic diagrams to confirm that control power source assignments are consistent with the diversity and independency requirements; physical cable routing and location drawings to assure that the design has correctly incorporated the diversity and independency requirements; and, finally, a review of the actual installation, as part of our system walkdown, to assure compliance with the design. Again, the scope of our review will not include anything upstream of the essential control power cabinet buses.

7. Instrumentation and Controls Design Review

The review will be performed on the flow orifice FO-N032 on the HPCI steam line and all instrumentation and control functions which are generated from the flow orifice in strict accordance with the instructions in Section IV.c of the Work Scope Document. To more fully describe the proposed scope of our review, we would like to breifly discuss each item in Sectin IV.c of the Work Scope Document:

a. **Sensing Devices:** We plan to use engineering documents (FSAR, GE system design specifications, instrument data sheets, instrument procurement specifications, physical drawings, electrical schematics, and other documents) to establish the proper selection of devices, separation, redundancy, correct design, and proper installation in accordance with applicable ANSI, IEEE, and ASME requirements. The review will trace all four instrument tubing lines from the orifice to the end devices. In addition, our walkdown at the plant will include a verification that these aspects of the design have been adequately implemented in the field. Our review will not encompass any hardware qualification aspects for seismic and environmental requirements.

b. **Signal Conversion and Processing Devices:** We plan to use engineering documents (FSAR, GE system design specifications, instrument data sheets, instrument procurement specifications, physical drawings, electrical schematics, and other documents) to establish the proper selection of devices, separation, redundancy, correct design, and proper installation in accordance with applicable IEEE requirments. The specification, design, and correct application of AC and DC instrument power sources and components will also be reviewed. In addition, our walkdown at the plant will include a verification that these aspects of the design have been adequately implemented in the field. Our review will not encompass any analysis of the internal circuit design of instrument power supplies to establish adequacy of that design to meet established voltage and current requirements. Our

review also will not encompass any hardware qualification aspects for seismic and environmental requirements.

c. **Intermediate Instrumentation Cabinet Devices:** We plan to use engineering documents (FSAR, GE system design specifications, instrument data sheets, instrument procurement specifications, physical drawings, electrical schematics, and other documents) to establish the proper selection of devices, separation, redundancy, correct design, and proper installation in accordance with applicable IEEE requirements. The specification, design, and correct application of AC and DC instrument power sources and components will also be reviewed. In addition, our walkdown at the plant will include a verification that these aspects of the design have been adequately implemented in the field. Our review will not encompass any hardware qualification aspec s for seismic and environmental requirements.

d. **Control Room Instruments, Alarms, Indications, and Setpoints:** We plan to use engineering documents (FSAR, GE system design specifications, instrument data sheets, instrument procurement specifications, physical drawings, electrical schematics, and other documents) to establish the proper selection of devices, separation, redundancy, correct design, and proper installation in accordance with applicable IEEE requirements. The correct establishment and proper documentation of setpoints will be reviewed. The specification, design, and correct application of AC and DC instrument power sources and components will also be reviewed. In addition, our walkdown at the plant will include a verification that these aspects of the design have been adequately implemented in the field. Our review will not encompass any analysis of the internal circuit design of instrument power supplies to establish adequacy of that design to meet established voltage and current requirements. Our review also will not encompass any hardware qualification aspects for seismic and environmental requirements.

e. **Automatic Trip Functions, Isolation Logic, and Interlocks:** We plan to use engineering documents (FSAR, GE system design specifications, electrical schematics, logic diagrams, and other documents) to establish that the required automatic trip functions, isolation logic, and interlocks have been provided and that proper separation, redundancy, and overall design are in accordance with applicable IEEE requirements.

f. **Capturing of Information on Sequence of Events Recorders, Computer, and Hard Copy Recorders:** We plan to use engineering documents (FSAR, GE system design specifications, design criteria, electrical schematics, and other documents) to establish the proper selection of parameter information and that separation, redundancy, and overall design are in accordance with applicable IEEE reuqirements. Our review will not encompass the capabilities of the computer or sequence of events recorder to capture the required information from a system timing or loading standpoint.

g. **Testability Aspects for Surveillance Monitoring:** We plan to use engineering documents (FSAR, design criteria, GE system design specifications, instrument data sheets, instrument procurement specifications, physical drawings, and other documents) to establish proper selection of devices, correct design, and proper installation to provide the required testability aspects for surveillance monitoring in accordance with applicable ANSI, IEEE, and ASME requirements. In addition, our walkdown at the plant will include a verificiation that these aspects of the design have been adequatley implemented in the field and that provisions for equipment access have been adequately addressed.

8. Mechanical/Structural Design Review

This review will be performed in accordance with section IV.d. of your work scope document. The mechanical and structural design of the HPCI steam line segment will be reviewed considering the appropriate design criteria, design input, design specifications, equipment specification, ASME code sections, ANSI standards, AISC standards, and federal regulations. We will consider the specific aspects listed in sections IV.d.1 and IV.d.2 of your work scope document as clarified below:

- Evaluation of the HPCI will be limited to the specific run pipe segments identified. Branch piping and instrumentation taps will be reviewed only to ensure that they have been properly addressed in the run pipe analysis.

- The sizing of lines, tubing, and orifices will be reviewed to determine if proper calculations and methods for sizing, mechanical design, and design margins were applied.

- Penetration stresses will be reviewed for two types of penetrations having different designs. The penetration stress reports to be reviewed are those covering the design of:
  - the mechanical penetration located between the inboard and outboard isolation valves, HV-F002 and HV-F003, on the HPCI steam line
  - one of the instrument line penetrations, of multiple line configuration, for the instrument lines connected to flow orifice FO-N032

  In reviewing the two penetration stress reports outlined above, the functional design adequacy of the somewhat common single line penetration, as well as the more elaborate multiple line configuration, can be ensured.

- The seismic qualification report for the inboard isolation valve HV-F002 will be reviewed considering the appropriate design specifications and the compliance of the design to appropriate ASME code sections, ANSI standards, and federal regulations as defined in the Hope Creek FSAR.

- Seismic qualification of the inboard isolation valve HV-F002 as it is referred to in the Work Scope Document will be interpreted as being the seismic qualification of the complete valve assembly. This includes the valve structure itself as well as the motor operator unit.

- The seismic qualification evaluation also will include a review of the ASME Certified Stress Report for the inboard isolation valve HV-F002.

- A detailed structural review of the analysis and design of one pipe hanger, one snubber, and one pipe whip restraint on the HPCI steam line will be performed. This review will include verification of the incorporation of interface loads in the supporting structures.

- The anchorage and inclusion of interface loads in the supporting structure for one penetration on the HPCI steam line and one instrument line will be verified.

- The HPCI pump cubical will be reviewed for flood protection provisions. This includes verification of load inclusion on doors, slabs, and walls.

- As an option, if valid findings result from the base verification program of the pipehanger, pipe snubber, and/or pipe whip restraints, we will select two additional pipe hangers, pipe snubbers, and/or pipe whip restraints on the HPCI steamline for inclusion in the program.

Our extensive BWR design experience indicates that the following items should receive particular attention as they relate to the HPCI system:

- Thermal Transients, Including Line Warmup
  - pipe geometry
  - fluid properties and flow rates
  - fluid pressure/temperature time history
  - effects of dissimilar metals
  - types of insulation
  - use of expansion joints

- Thermal Movements
  - consideration of header movements
  - evaluation for system operating modes
  - application of equipment thermal movements
  - restraint and support design for the calculated thermal movements
  - proper modeling and installation of expansion joints

- Mechanical Design of Flow Orifice (FO-N032)
  - proper sizing
  - location in piping run
  - proper use of orifice coefficient

- Mechanical Design of Instrument Tubing (FO-N032)
  - review of design methods and means of support
  - review of sizing criteria

- Penetration Stresses
  - annulus pressurization stresses
  - fatigue factors
  - faulted loading conditions
  - thermal transients

- Annulus Pressurization Load Interfaces
  - review of design input and method of application in the design of piping and support components

- HA-F002 Valve Loads and Seismic Qualification
  - review of valve modeling methods used to determine the valve interface loads and acceleration
  - allowables
  - non-seismic vibration considerations (chugging and SRV)

- Main Steam Line Design Interface
  - review of analytical boundary for evaluation at main steam branch connection
  - review of analytical documentation interface (i.e. GE, Bechtel)

- Pipe Break Locations
  - review of basis for selection of break locations
  - review of status of stress analysis versus final break locations

- Seismic Load Interface

- Component Support/Pipe Whip Restraint Assessment
  - review of adequate component sizing for defined loads and load combinations
  - review for adequacy of means of structural design, i.e. welds, anchor bolts, or other means of attachment to main structure
  - evaluation of placement considering analytical representation versus design versus as-built condition
  - evaluation of load transfer and associated design up to main steel attachment
  - pipe whip restraints analytical model and evaluation method
  - review of methodology to determine loading forcing functions applicable to design
  - model adequacy to ensure load transfer to demonstrate isolation valve protection and associated stress criteria

Our experience indicates that the following items should receive particular attention as they relate to the HPCI Pump Suction System:

- Line sizing
- Net positive suction head margin
- Cathodic protection/corrosion control
- Sealants

- Flooding potential

- Buried pipe analysis
  - soil-spring modeling techniques
  - seismic wave and soil modulus values
  - adequate consideration of backfill compaction, live and backfill loads, and building settlement

- Consideration of interface loads at interface at pump suction line

- Pipe break locations as may be required

9. **Environmental Qualification and Pipe Break Analysis Review**

   a. **Environmental Qualification.** The review will be performed in accordance with instructions in section IV.e of your Work Scope Document as clarified below:

      - We will review the inboard HPCI steam line isolation valve HV-F002 motor.

      - The environmental qualification review will be limited solely to the motor operator assembly and will address all of the safety-related components integral to the motor operator unit, including the electric motor drive unit, torque switches, limit switches, and terminal blocks.

      - The drywell environmental parameters as supplied by Bechtel or PSE&G will be accepted without further verification. The environmental parameters will, however, be checked for their correct application to the qualification of the motor. The environmental parameters which are required for the review include:
        - normal operating conditions
          - thermodynamic parameters of temperature, pressure, and humidity
          - integrated radiation dose for the lifetime of the motor operator

- abnormal conditions
  - temperature, pressure, and humidity associated with abnormal events as defined in the Hope Creek FSAR

- accident conditions
  - temperature profile
  - pressure profile
  - humidity profile
  - expected sprays, including demineralized water and duration
  - submergence requirement, including duration
  - integrated radiation dose for duration of accident
  - seismic requirements

- In addition to the environmental parameters outlined above, the following operating information is required for the valve motor environmental qualification review:
  - wear aging (i.e., How many cycles must the motor operate during it's life?)
  - power source limits (i.e., high-low)
  - containment test pressures, with number of expected cycles and length of cycles
  - non-seismic vibration levels (i.e., chugging and SRV)

  This data will be accepted without further verification other than verification of correct application to the design of the HV-F002 valve motor.

Our extensive BWR environmental qualification experience indicates that the following should receive particular attention:

- Identification of the installed motor operator assembly model, along with identification of the electric motor drive

unit model
- Identification of the motor operator units reduced voltage starting capabilities
- Identification of any maintenance and surveillance requirements which are critical to the qualification of the unit on a continuing basis
- Identification of any chemical spray requirements, including demineralized water

b. **Pipe Break Analysis:** This review will be performed in accordance with instructions in section IV.e of your Work Scope Document.

We will review potential pipe break locations and associated flooding in the reactor building for those breaks that would affect the HPCI and ADS. We also will evaluate the flood-affected safety-related equipment and structures. Emphasis will be put on review of criteria used for determination of pipe break locations, flood levels, propagation of flooding to adjacent areas, and the disposition of the safety-related equipment and structures.

The Pipe Break Analysis will be supplemented by consideration of the following:

- Methods to determine jet forces
- Resulting pipe deflection considering selection of structural elements including use of crushable materials
- Methods of evaluating jet forces on adjacent safety-related systems necessary to support the HPCI/ADS function

10. Design Control Process Review

The design control process review will be controlled by the requirements of the IDVP project manual and applicable project instructions. The review will be performed in accordance with section IV.g of your Work Scope Document regarding the flow of design information and external and internal organization design interfaces.

To assess the design control process, the PSE&G, Bechtel, and GE Quality Assurance Manuals will be reviewed along with the following Hope Creek site-specific design documents:

- Hope Creek Project Manual Procedures
- Site Engineering Division Instructions
- PSE&G E&C Department Discipline Procedures
- Bechtel Hope Creek Project Engineering Procedures Manual

These documents will form the basis for the review procedures to be included in the IDVP project manual and project instructions. The application of the requirements in 10CFR50, Appendix B and ANSI N45.2.11 will also be used to address the design control process adequacy; i.e., as established measures to assure that the applicable regulatory requirements and design criteria were correctly translated into specifications, drawings, procedures, and instructions.

Current organizational charts will be used to facilitate the review of the external and internal design interfaces. Physical inspections will be combined with personal interviews to assess the interface control of design information. Special emphasis will be placed on control of design changes including those initiated in the field.

It is anticipated that one trip to San Francisco and one trip to the Hope Creek site will be required by two S&L project team members involved in the design control process review to perform interviews with design personnel in order to more fully evaluate the design control process.

Should the review indicate that in a few instances design control procedures were not followed, the actual practices will be evaluated per ANSI N45.2.11, and processing as a potential observation will be initiated.

11. Review by Senior Review Committee

Sargent & Lundy will designate a Partner to chair the Senior Review Committee. He will be supported by key project personnel and the Mechanical, Electrical, and Structural Design Directors. This Senior Review Committee will review all observations and potential

findings and will determine the disposition of them as valid or invalid on an individual basis. All valid and invalid observations and findings and corresponding PSE&G, Bechtel and GE responses, where applicable, shall be incorporated into the draft and final reports.

For purposes of preparing this estimate, we have assumed that this committee will meet bi-weekly for a total of 40 hours during the course of this contract and will process 50 observations, 5 potential findings, and 50 dispositions.

12. Prepare Draft Report

Sargent & Lundy will prepare a detailed draft report following the outline presented in Exhibit III-8. This exhibit defines the contents including expected tables and figures. We believe it is very important that we reach a mutual understanding of the format and expected contents of the final report prior to initiation of the report. Following completion of the draft, the report will be sent to PSE&G for review and comments. We assume that PSE&G will return comments within two weeks.

13. Final Management Review at PSE&G

Sargent & Lundy will incorporate the PSE&G comments and call a meeting with PSE&G. It is expected that this meeting will last 3 days and that the Project Manager and four key personnel will be in attendance.

14. Prepare and Issue Final Report

Final comments on the draft will be resolved and the report issued. We have included a preliminary outline of the final report (Exhibit III-8).

15. Project Administration

The Project Manager will be responsible for the daily administration of this project and will be the major contact at S&L for PSE&G and its contractors. The Project Manager will be responsible for issuing all correspondence, meeting minutes, telecoms, and bi-weekly status reports.

B. Quality Assurance Program

We will perform this work in accordance with the S&L quality assurance (QA) program for nuclear power projects. This program includes management commitments and policies for safety-related design and procurement activities.

The quality assurance program has been accepted by the Nuclear Regulatory Commission as meeting the requirements of 10CFR50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The program also addresses Regulatory Guide 1.28 which endorses ANSI N45.2 and other applicable regulatory guides.

To fully implement these commitments, a project manual and instructions will be prepared which will form the basis for performing the IDVP. The project manual and instructions will provide for incorporating and implementing all requirements of the IDVP and assessment of the design adequacy, design control process, and interfaces.

Sargent & Lundy policy makes compliance with the requirements of the QA program and its implementing project manual and instructions mandatory for personnel performing the IDVP. The IDVP project manual will be approved by the Project Manager and the Head of the Quality Assurance Division.

C. Clarifications

In addition to the clarifications provided thus far in this section, S&L would like to make the following clarifications:

- The scope of work defined by the RFP did not include a review of the main building structure. Our IDVP will evaluate the adequacy of the mechanical components selected by PSE&G and the safe load path from the system support to the main building (structural) attachment. We will evaluate the attachment to the main building as well as the local effects. The overall building loads and load path to the building foundations are not included.
- The performance and schedule for completing the IDVP is dependent on the receipt of design data and other appropriate input from Bechtel and GE. We have assumed that approximately seventy-five

percent (75%) of the necessary input will be provided to S&L within two weeks of award and the remainder within one month of award.

- Timely response to questions, observations, and findings is required to meet the program schedule. We have assumed a response time of 10 working days.
- Our experience on four previous independent design reviews conducted by others on projects designed by S&L indicates that independent computer analysis for the IDVP on Hope Creek will not be required. If circumstances indicate that computer analysis will be required, S&L will discuss the need and basis for these with PSE&G for approval. Any computer analysis will be considered an additional cost to the firm price proposal.
- We assume that the responses by PSE&G, Bechtel, GE, or other contractors to our questions and observations will be complete and adequate. Based on our experience with independent design verifications, we have assumed in estimating our man-hours that approximately 50% of the questions will become observations and approximately 10% will become findings.
- Public Service Electric and Gas Company has preselected the HPCI and ADS systems as the basis of the scope of work in the RFP. Individually, the HPCI and ADS systems are relatively simple, with limited single failure criteria. In addition, the HPCI and ADS are extensively pre-engineered by GE. Therefore, it may be prudent to consider a mechanical system substantially independent of GE influence which would provide a better cross-section through which to examine the design process employed by the A-E. However, it is also important to examine GE/Bechtel interface requirements.

D. Options

Sargent & Lundy offers the following options:

- **Option 1 - Verification of two additional snubbers, hanger supports, or pipe whip restraints**

  In the event that the Senior Review Committee determines that a valid finding exists on either the snubber, hanger/support, or pipe whip restraint, S&L will select two additional samples of the affected

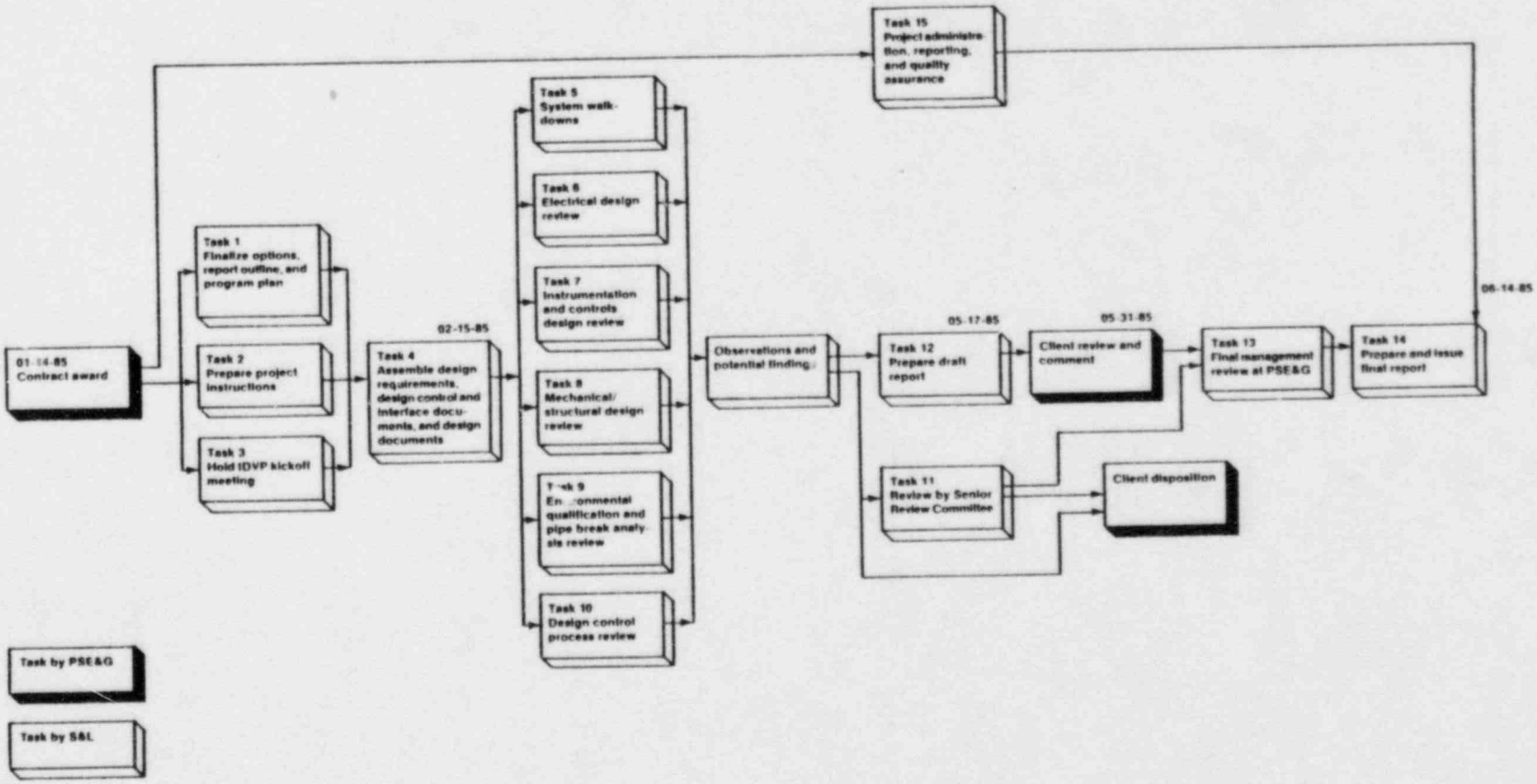
component type and provide an identical design review. This additional review will be considered an addition to the scope of work.

- **Option 2 - Selection of other systems for verification**

  Public Service Electric and Gas Company may wish to consider having S&L select another system in addition to the HPCI and ADS systems. We base this suggestion on the following considerations:

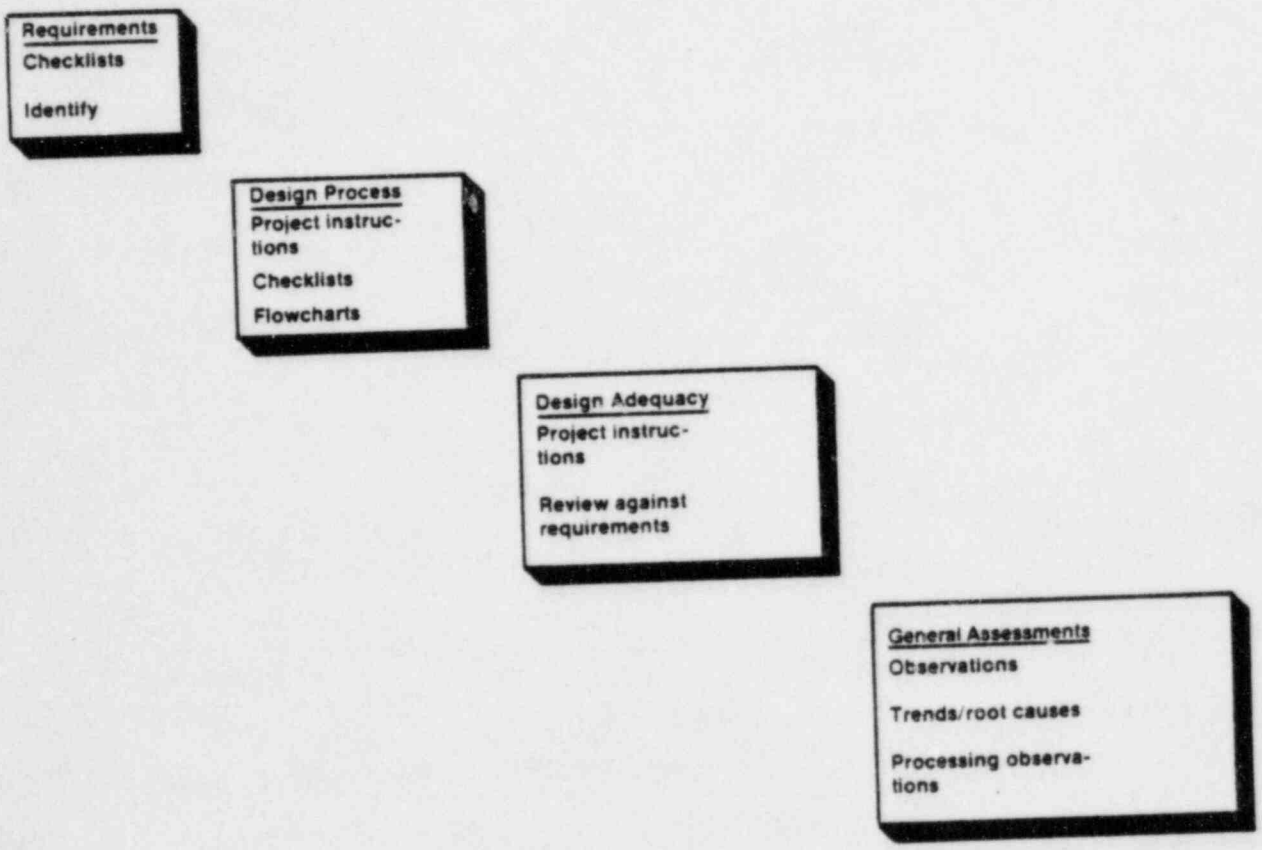
  - The availability of this RFP to the organizations providing the design and construction may prejudice the results of the HPCI and ADS systems verification. A random selection of another system would eliminate any possible bias in the finding.
  - The scope of this IDVP is rather limited in comparison with those recently performed on the Commonwealth Edison Company's Byron Unit 1 and the Illinois Power Company's Clinton Unit 1. Expanding the partial vertical and horizontal IDVP to include another mechanical system that was designedby an A-E, with less influence from GE, would provide a more objective opportunity to examine the design process employed by the A-E. The fact that the systems selected were designed by GE and many of the specifications and some of the hardware was provided by GE rather than Bechtel could compromise the applicability and credibility of this review with respect to the balance-of-plant design. A satisfactory review of the proposed additional mechanical system would yield increased assurance that the design of Hope Creek is adequate.

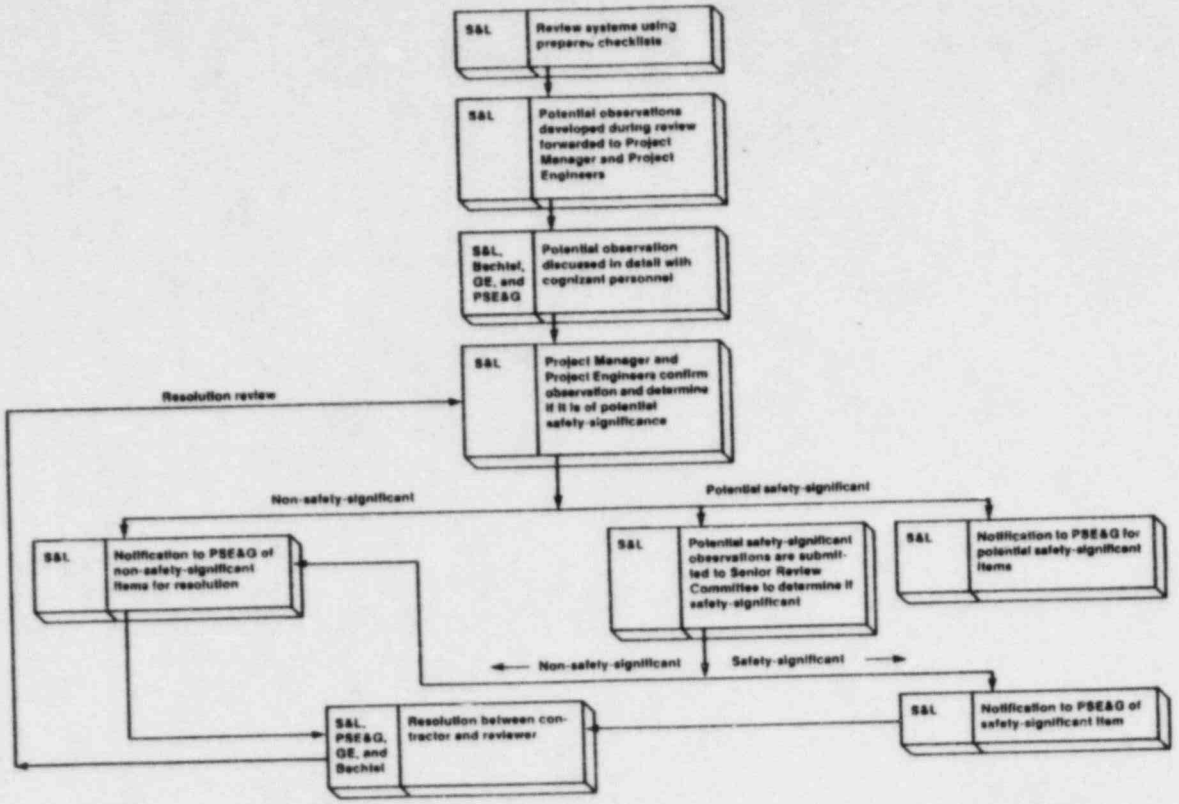
If PSE&G wishes to accept any or all of these options, S&L will provide a formal scope change to adjust the firm lump sum price.


01-14-85
Contract award
Task 1
Finalize options, report outline, and program plan
Task 2
Prepare project instructions
Task 3
Hold IDVP kickoff meeting
02-15-85
Task 4
Assemble design requirements, design control and interface documents, and design documents
Task 5
System walk-downs
Task 6
Electrical design review
Task 7
Instrumentation and controls design review
Task 8
Mechanical/ structural design review
Task 9
Environmental qualification and pipe break analysis review
Task 10
Design control process review
Observations and potential findings
Task 15
Project administration, reporting, and quality assurance
05-17-85
Task 12
Prepare draft report
05-31-85
Client review and comment
Task 11
Review by Senior Review Committee
Client disposition
Task 13
Final management review at PSE&G
Task 14
Prepare and issue final report
06-14-85
Task by PSE&G
Task by S&L

Sequence of Design Review Activities

Exhibit III-2




S&L
Review systems using prepared checklists
S&L
Potential observations developed during review forwarded to Project Manager and Project Engineers
S&L, Bechtel, GE, and PSE&G
Potential observation discussed in detail with cognizant personnel
S&L
Project Manager and Project Engineers confirm observation and determine if it is of potential safety significance
Resolution review
Non-safety-significant
Potential safety-significant
S&L
Notification to PSE&G of non-safety-significant items for resolution
S&L
Potential safety-significant observations are submitted to Senior Review Committee to determine if safety-significant
S&L
Notification to PSE&G for potential safety-significant items
Non-safety-significant
Safety-significant
S&L, PSE&G, GE, and Bechtel
Resolution between contractor and reviewer
S&L
Notification to PSE&G of safety-significant item

- Independent Design Verification Program Quality Assurance Project Plan
- Interface with Public Service Electric and Gas Company, Bechtel, General Electric, and Bailey Controls
- Intracompany correspondence
- Travel to offices and stations (security requirements)
- Project monitoring and progress reporting
- Processing changes in scope of work
- Conduct of field support personnel
- Documentation data procurement and control
- Independent review checklists

Licensing commitments contained in the Hope Creek Final Safety Analysis Report, including:

- Hope Creek SER
- ACRS commitments
- ASLB contentions
- Code of federal regulations
- Committed industry codes and standards
- Applicable IE bulletins, notices, and circulars
- Design and licensing commitments made to NRC-NRR and I&E Branches
- Fire protection report
- Heavy loads report (NUREG 0612)

- PSE&G, GE, and Bechtel Quality Assurance Manuals
- PSE&G - Hope Creek Generating Stations Project Manual
- PSE&G - Hope Creek Site Engineering Division Instructions Manual
- PSE&G - E&C Department Discipline Procedures
- Bechtel - Hope Creek Project Engineering Procedures Manual
- Current organization charts that represent design flow
- Appropriate engineering standards
- Interface design specifications (GE, Bechtel)

Design documents pertinent to the systems, structures or components being reviewed (HPCI, NB-ADS) including:

- System piping and instrumentation diagrams and control and instrumentation diagrams
- General arrangement drawings
- Applicable engineering standards
- System and component design criteria
- Technical specifications
- System functional descriptions
- Design drawing hierarachy
- Logic diagrams (with legend sheets)
- Loop diagrams
- Instrument index
- Instrument data sheets
- Instrument location drawings
- Function control diagrams
- Inoperable status panel input list
- Computer I/O list
- Annunciator input list
- Instrument procurement specifications
- Control board arrangement drawings
- Control board physical drawings
- Control board wiring drawings
- Intermediate instrumentation cabinet physical drawings
- Intermediate instrumentation cabinet wiring drawings
- Instrument impulse line routing drawings
- Electrical single-line drawings
- Electrical schematic diagrams
- Electrical key diagrams
- Electrical raceway and routing drawings
- Cable tabs
- Wiring drawings
- Master control diagrams or equivalent
- Calculations for cable derating
- Cable ampacity calculations
- Cable routing block diagrams
- Cable type code listing
- Equipment specifications and equipment data packages
- Equipment list
- Valve list
- Specification index
- ASME design specifications
- System piping drawings
- Piping composite drawings

- Piping isometric drawings
- Seismic II over I assessment report
- Flooding report
- Pipe whip restraint drawings
- GE system design specifications and data sheets
- GE instrument data sheets
- Environmental data
- Environmental qualification reports
- Approved design change documents
- Hanger sketches
- Hanger installation drawings
- Design calculations for the following documentation:
  - Pipe support and restraint calculations
  - Pipe support auxiliary steel calculations
  - Data prepared for input to the pipe program used in analysis
  - Special calculations used for flange qualification
  - Stress indices calculations used for non-standard fitting including integral attachments
  - Structural anchor calculations, if any
  - Calculations for fluid transient loads, if any
  - Pipe sizing for pressure and flow including corrosion allowances used in calculating pipe wall thickness

- Stress reports including the following aspects:
  - Functional capability assurance
  - Pipe break location identifications, based on stress criteria or lack thereof
  - Any ISI requirements
  - Thermal transient stress evaluation
  - Fatigue evaluation of gamma plugs
  - Class I fitting details and contours from field measurements
  - Stress indices for small taps

- Existing input data including:
  - Site seismic g-level and related geological data prepared by Dames and Moore
  - Building seismic response spectra prepared by EDS/Impell
  - Instrumentation and controls standard specifications provided by Bailey Controls, Inc.

- Standard equipment product literature and test reports supplied by vendors to PSE&G or Bechtel
- Generic engineering or test data supplied by General Electric Company
- Drywell environmental responses supplied by Bechtel

I. Executive Summary
   - A. Purpose
   - B. Scope
   - C. Project Organization
   - D. Methodology
   - E. Results
   - F. Overall Conclusions

II. Program Detail
   - A. Objectives and Scope
   - B. Systems and Components Reviewed
   - C. Method Utilization
   - D. Description of Expertise Involvement
   - E. Delineation of Aspects
     1. Licensing
     2. Design Adequacy
     3. Design Procedures
     4. Design Interface
     5. Control of Design Changes
     6. Design Reviews
     7. As-Built Verification

III. Results
   - A. Observations
   - B. Potential Findings
   - C. Dispositions

IV. Conclusions and Recommendations
   - A. Findings
   - B. Recommendations
   - C. Conclusions

V. Appendices
   - A. Project Team
   - B. Senior Review Committee
   - C. Management Methodology
   - D. Definitions
   - E. List of Documents Reviewed
   - F. Review Criteria
   - G. Review Records
   - H. Observation Reports
   - I. Dispositions
   - J. Independence Statement
   - K. IDVP Project Manual

A. Project Schedule

We have divided the scope of work on the project into the fifteen tasks presented on the precedence network (Exhibit III-1) described in detail in chapter III.

The precedence diagram illustrates the inter-relationship of each task to its predecessors and successors, and indicates whether tasks are to be performed by S&L or PSE&G.

The precedence diagram will be refined and reissued after project award to show the following additional information as appropriate:

- Assigned six character code for each task
- Estimated duration of each task in work days
- Schedules start and finish dates for each task
- Designation of specific lags between tasks

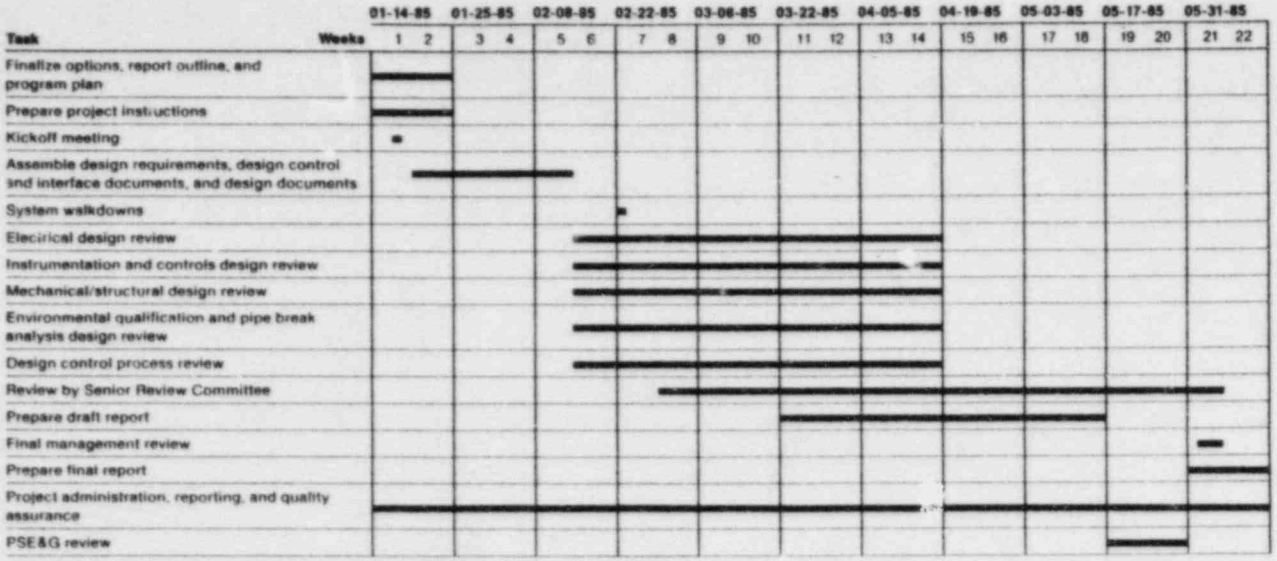
A time-scaled bar chart schedule for this project is shown as Exhibit IV-1. The exhibit demonstrates how we propose to sequence the work between the project start and finish dates.

B. Project Controls and Reporting

The revised precedence diagram will be used by the Project Manager to monitor and report on project progress. Revised start and finish dates for a rescheduled task will be shown on the precedence diagram. Also, actual start and finish dates will be added to the diagram as tasks are completed. Graphical notations will be used to show tasks which have started and those which have finished.

Project team man-hours will be budgeted to each task. The Project Manager will compare actual man-hours expended on a task to progress to determine project team performance. Corrective action will be implemented by the Project Manager to maintain schedule and progress control.

The format of the monthly engineering progress report will be custom tailored to PSE&G's needs. Progress will be reported to PSE&G by task. A project administrative instruction describing the report format will be prepared.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05-17-85
05-31-85
Task
Weeks
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
Finalize options, report outline, and program plan
Prepare project instructions
Kickoff meeting
Assemble design requirements, design control and interface documents, and design documents
System walkdowns
Electrical design review
Instrumentation and controls design review
Mechanical/structural design review
Environmental qualification and pipe break analysis design review
Design control process review
Review by Senior Review Committee
Prepare draft report
Final management review
Prepare final report
Project administration, reporting, and quality assurance
PSE&G review

The project team chosen for this project is shown in Exhibit V-1. Resumes for these individuals are included at the end of this technical information booklet. The project team is supported by engineers, designers, and other specialized personnel as required to perform the work associated with this project.

An executive-level review of the project team's results will be provided by the Senior Review Committee (Exhibit V-2). The Committee will be headed by the Project Director, Mr. P. L. Wattelet, and will include representatives from the mechanical, structural, and electrical engineering disciplines and from our Quality Assurance Division. The representatives from the mechanical, structural and electrical engineering disciplines will be the Design Directors from each of these departments. Quality Assurance will be represented by the Division Head. The Senior Review Committee will perform Task 11 with the primary function of assuring the validity of observations and findings.

The project team will also be supported by our Nuclear Services Section which will ensure that the team is kept up to date on the latest industry developments that are of consequence to this design review.

The strengths that our project team and Senior Review Committee will bring to the project are described below.

A. Project Team

- **Project Director - P. L. Wattelet**

  Mr. Wattelet, a partner of S&L, is the designated Project Director. He has over 17 years experience in the design and engineering of major nuclear-fueled electric generating stations. He has been the Project Director for numerous backfit and betterment projects at several nuclear units. He served as Mechanical Project Engineer, Project Manager, and Project Director for a two-unit 2250 MW PWR project. He has been supervisor of Safeguards Systems Analysis in our Nuclear Safeguards and Licensing Division, responsible for methods development and analysis of nuclear safeguards systems. He is a professionally registered engineer in Illinois, Indiana, Kansas, Michigan, and New York. Mr. Wattelet has also served as S&L's executive-level representative on the AE Advisory Committee of the Steam Generator Owner's Group.

- **Project Manager - R. J. Pruski**

  Mr. Pruski has been associated with the nuclear industry for over 16 years. He was most recently the Project Manager for an 839 MW nuclear unit project. His responsibilities included planning, coordination, and performance monitoring for S&L's work on the design, construction, testing, and licensing phases of the project. As a Project Manager and as a Mechanical Project Engineer, he has been responsible for various assignments on numerous projects in our Project Management Division. He served as a member on a task force addressing the S&L Quality Assurance Program. Mr. Pruski also serves as Task Force Chairman of S&L's Emergency Planning Program. As a Project Manager in our Nuclear Services Section, he is active in a variety of backfit, betterment, and evaluation projects. Mr. Pruski is a registered professional engineer in New Jersey, Illinois, and Ohio.

- **Assistant Project Manager - T. J. Daley**

  Mr. Daley has extensive experience in project management of major nuclear station projects. He was the Field Project Manager for 2 years for an 839 MW nuclear station design project. As Field Project Manager, Mr. Daley worked very closely with the client and the constructor in identifying and proposing resolutions to many of the problems that affected the project. Prior to this assignment, Mr. Daley worked as Mechanical Project Engineer on Commonwealth Edison Company's Carroll County Station. One of his responsibilities on this project was to coordinate the piping analysis and support design activities. Mr. Daley is professionally registered in California, New York, Illinois, and Ohio, with applications pending in Tennessee and Alabama.

- **Mechanical Project Engineer - D. P. White**

  Mr. White, the designated Mechanical Project Engineer, has 18 years of experience in the design, engineering, and analysis of nuclear power plants, including betterment work. He has provided input for PSAR, FSAR, and modification requirement responses for two major nuclear projects. His experience includes serving as a project engineer for S&L on the Commonwealth Edison Company's Zion Nuclear Station. Mr. White also has 15 years experience with another large A-E. This included working as a Project Engineer on a number of nuclear projects, as a Supervisor of the Mechanical Engineering Department, and most recently, as Manager of the Nuclear Section of the Mechanical Engineer Department. Mr. White is a professionally registered engineer in Illinois, Oregon, Pennsylvania, and Washington.

- **Structural Project Engineer - O. Zaben**

  Mr. Zaben has 15 years experience in the structural and architectural engineering and design of nuclear power plant structures. He has been involved, at various levels of responsibility, in the planning, design, licensing, and modification work associated with twelve nuclear plants. His responsibilities include reviewing and approving plant design criteria and authorizing construction drawings. He is a registered professional engineer in Illinois, Indiana, Kansas, New York, and Wisconsin. Mr. Zaben is a member of the S&L Structural Standards Review Committee.

- **Electrical Project Engineer - M. R. Schiavoni**

  Mr. Schiavoni has 13 years experience in the engineering and design of two BWR nuclear generating stations. At increasing levels of responsibility, he has been involved in all phases of the project including conceptual design and layout, equipment procurement and installation, and licensing. In his current position as Senior

Electrical Project Engineer, he has principal responsibility for all electrical aspects of the project, as well as the coordination of project efforts within the Electrical Department and its interfacing disciplines. Mr. Schiavoni is professionally registered in Illinois.

- **Quality Assurance Coordinator - H. G. L. McCullough**

  Mr. McCullough has 20 years experience in nuclear steam-electric station design including extensive experience in quality assurance for nuclear power plant projects. He is currently assigned as the Project Quality Assurance Coordinator for four plants being designed and under construction, monitoring effective implementation of S&L's QA program and performing periodic review of design control documents. He performs investigations of generic concerns in all areas of the project. His work involves interface with project engineers from all disciplines on safety-related matters in accordance with ANSI N45.2.11 and NRC Bulletins and Notices. Mr. McCullough participates in all NRC, INPO, and independent client audits of S&L's work on projects to which he is assigned. He is a registered professional engineer in Illinois.

- **Component Qualification Engineer - R. M. Tjernlund**

  Mr. Tjernlund is a Senior Project Engineer in the Component Qualification Division. He has 9 years experience in nuclear design, analysis, and testing. Most recently, he has been involved in developing services regarding Q-list, safety classification of spare parts, dedication of commercial grade components, and maintenance and surveillance. Prior to this he supervised a project team of fourteen engineers and three technical assistants responsible for demonstrating

the adequacy of a safety-related equipment used in a GE Mark II BWR. Activities included environmental and seismic qualification, fatigue analysis, finite element model analysis, dynamic testing, and impedence testing. Mr. Tjernlund is a registered professional engineer in the State of Illinois.

- **Engineering Mechanics Specialist - P. R. Olson**

  Mr. Olson has had over 11 years of experience in nuclear and fossil plant piping layout, design, and analysis. He has actively participated in the preparation, review, and documentation necessary for submittal of safety analysis reports. This experience includes a familiarization with standard review plan requirements for piping system related design activities, coordination of presentations to clients and the NRC on related topics, and participation in owners' group activities.

- **Control and Instrumentation Engineer - W. D. Crumpacker**

  Mr. Crumpacker has 8 years experience in nuclear power plant engineering at three major steam-electric stations. His work has included initial system design, equipment specification, wiring and installation design, and engineering for post-TMI modifications. He has also evaluated proposals and reviewed vendor drawings and prepared safety analysis reports for all major controls and instrumentation equipment.

- **Project Planning Engineer - J. Fortunski**

  Mr. Fortunski, the designated Project Planning Engineer, has broad experience in planning, scheduling, engineering, and design of major steam-electric generating stations, and has been responsible for scheduling and monitoring the progress of work on nuclear-fueled generating units. He has also been responsible for providing management with current and forecasted schedule variances and their effects on resources and cost and for keeping the project managers informed of the potential schedule or cost problems. Mr. Fortunski is a registered structural engineer in

the State of Illinois.

B. Senior Review Committee

- **Project Director - R. J. Mazza**

  Mr. Mazza, the Senior Review Committee Project Director, has extensive experience in the design and engineering of several major steam-electric generating stations, both nuclear and fossil, which represent more than 6,200 MW of generating capacity. He has been the Project Director for several nuclear power plant projects, including backfit work for Virginia Electric Power Company's North Anna and Surry stations and operating Zion, Dresden, and Quad Cities stations. Mr. Mazza also had complete responsibility for the La Salle station, a twin 1,122 MW BWR that recently began commercial operation of Unit 1. He was the lead Mechanical Project Engineer and lead Mechanical Engineer on two nuclear plants and one fossil plant. As an owner of the firm, Mr. Mazza is completely familiar with all of S&L's capabilities and commitments. Drawing upon his position and broad experience, he can enlist effective support from all of the firm's resources.

nuclear plants at Commonwealth Edison Company's

- **Mechanical Design Director - E. B. Branch**

  Mr. Branch has over 15 years of experience in the stress analysis of piping systems and mechanical equipment for power plants. He has extensive experience not only in the design process, but also with the design philosophy changes that have occurred in the nuclear industry through participation in ASME, PVRC, and NRC licensing activities. Mr. Branch has been active in the ASME Working Group on Piping Design, the Subgroup on Design, and the Section III Committee. He is also an active contributor in the PVRC Technical Committee on Piping Systems and is chairman of the Task Group on Industry Practices. He is currently involved in studies leading to more realistic design practices and methodologies. Mr. Branch is professionally registered in the State of Illinois.

- **Quality Assurance Division Head - H. C. Taylor**

  As the Quality Assurance Division Head, Mr. Taylor has developed and maintained QA procedures that are necessary for the implementation of S&L's QA program and has coordinated the preparation of detailed procedures by other engineering disciplines. He has been responsible for ensuring that an entire project team adheres to S&L's QA standards and procedures that have been established to meet U.S. government and industry requirements for nuclear power plants. He has been responsible for conducting training sessions in the use and implementation of S&L's QA program and procedures for all personnel involved in safety-related activities and has been responsible for internal and external audits of consulting organizations retained by S&L. He has established and maintained controls for identification, storage, and retrieval of safety-related documents. Prior to assuming these responsibilities, Mr. Taylor was the lead Electrical Engineer responsible for the design and engineering of electrical systems for fossil and nuclear power plants, including specifying equipment, reviewing specifications, and vendor design documents. He assisted in the preparation of the electrical portion of the PSAR for a 1000 MW nuclear generating station.

- **Structural Design Director - B. A. Erler**

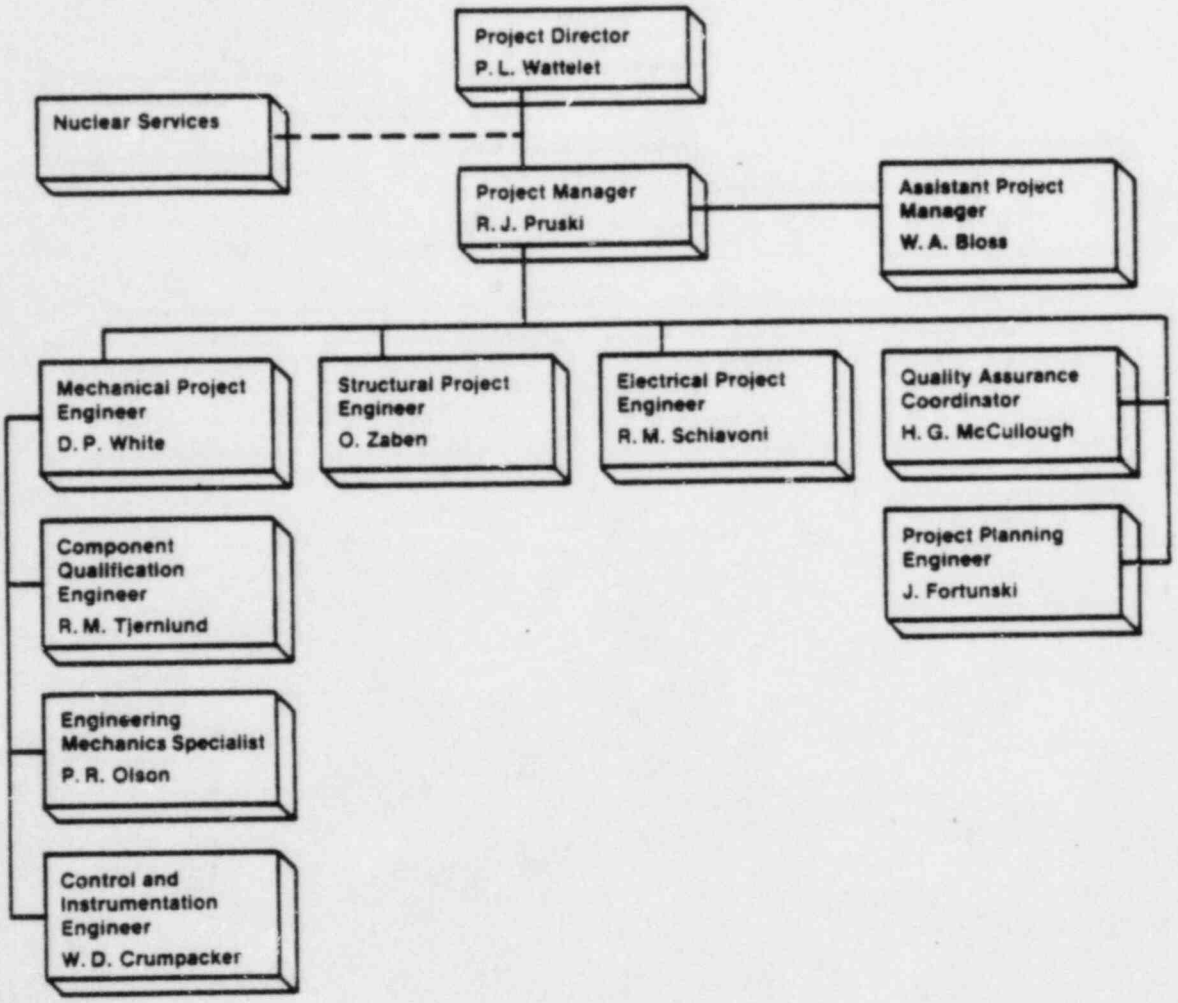
  Mr. Erler has more than 14 years experience in the design of nuclear power plants, involving work on eight nuclear stations. He has been responsible for the design and analysis of all the containment vessels in S&L's power plants since he assumed his current position. He has supervised the design of prestressed and reinforced concrete containments for many plants and has been responsible for seismic analysis of these structures. He has helped develop several national standards for the structural design of nuclear power plants. Through his work with professional committees, he has been involved in the development of criteria for nuclear containment design and design for extreme loads on nuclear plant structures. Mr. Erler is a professionally registered structural engineer in the State of Illinois.

- **Electrical Design Director - L. R. Stensland**

  Mr. Stensland has 30 years experience in electrical engineering of steam-electric generating stations. He has worked on numerous station design projects, as well as various backfit projects at both fossil- and nuclear-fueled plants. Before assuming his current position, he was the Senior Electrical Project Engineer for the Illinois Power Company's Clinton Station. His current job responsibilities include monitoring the flow of design information and the effectiveness of the Electrical Drafting Standards and the Drafting and Field Standards. He currently heads up S&L's task force program for conduit. When required, he reviews and comments on independent design review reports. He is S&L's specialist on transformers and a member of the I.E.E.E. Committee on Transformers. Mr. Stensland is a registered professional engineer in Arkansas, Illinois, Indiana, Kentucky, Louisiana, Michigan, New York, Ohio, Texas, and Wisconsin.

Proposed Project Team

Exhibit V-1

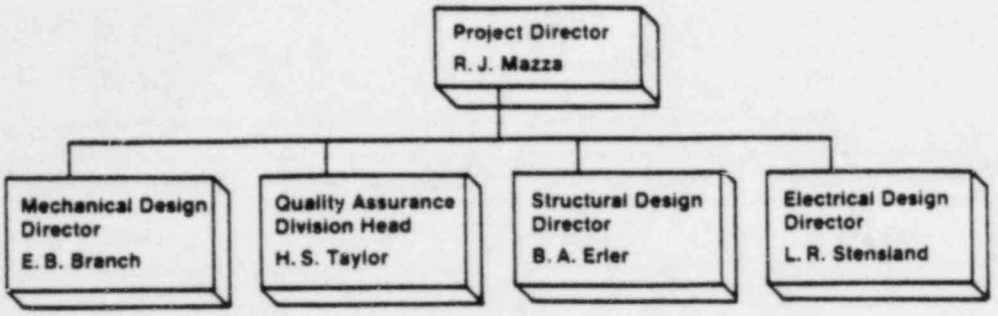


Support Divisions

Nuclear Safety and Licensing
Heating, Ventilating, and Air Conditioning
Mechanical Design and Drafting
Structural Design Engineering

Proposed Senior Review Committee

Exhibit V-2



A. Direct and Related

Sargent & Lundy has been providing nuclear backfit services for operating BWRs for over 20 years and for operating PWRs for over 10 years. Our nuclear services and backfit assignments cover a full range of TMI-related backfits, other NRC requirements, NRC bulletin-designated modifications, and plant betterment modifications. Exhibit VI-1 shows the operating BWRs we are currently servicing.

Exhibit VI-2 shows our experience complying with audits and design reviews similar to the proposed work. We have been involved in eleven such programs on ten nuclear units. Included among these is a self-initiated evaluation of the design control, construction control, scheduling, planning, quality assurance, and administrative procedures used in design and construction of the Texas Utilities Generating Company's Comanche Peak Station which S&L conducted. This experience gives us insight into how such design reviews should be conducted.

Sargent & Lundy also has provided loaned servants to the Institute of Nuclear Power Operations to assist in the development of procedures and practices used for the Construction Evaluation Project (CEP) in the mechanical and instrumentation and controls areas. In addition, an S&L mechanical engineer was a member of the CEP review team for one year.

B. Nuclear Design Experience

Sargent & Lundy provides comprehensive engineering, design, and construction management services for electric power generating and transmission facilities. Founded in 1891, we are today one of the nation's leading engineering partnerships. Over the years our clients have authorized us to design more than 700 units representing 90,000 MW of generating capacity. Since 1965, we have provided a wide range of these services to clients on more than 110 projects, including 17 large nuclear units.

Sargent & Lundy's overall nuclear design experience is summarized in Exhibit VI-3.

SARGENT & LUNDY

Operating BWRs Sargent & Lundy
Is Currently Servicing

Exhibit VI-1
0189-27
12/84

Unit	Model	Containment	MWT Licensed	CP Date	Commercial Operating Date
La Crosse	Unique	Unique	165	1963	1969
Dresden 2	BWR-2	Mark I	2527	1966	1971
Dresden 3	BWR-2	Mark I	2527	1966	1971
La Salle 1	BWR-5	Mark II	3323	1973	1982
La Salle 2	BWR-5	Mark II	3323	1973	1984
Quad Cities 1	BWR-3	Mark I	2511	1967	1972
Quad Cities 2	BWR-3	Mark I	2511	1967	1972
Brunswick 1	BWR-4	Mark I	2436	1970	1977
Brunswick 2	BWR-4	Mark I	2436	1970	1975
Susquehana 1	BWR-4	Mark II	3439	1973	1983
Susquehana 2	BWR-4	Mark II	3439	1973	1985

Client	Station/Unit	Description of Audit or Design Review
The Cincinnati Gas & Electric Company	Zimmer 1	Bechtel Power Corporation, as the construction manager and constructor, performed a detailed review of our design and the status of engineering.
Commonwealth Edison Company	Braidwood 1,2	The Institute of Nuclear Power Operations conducted an evaluation of our control of the design, including examinations of our organization and administration, design control, project support, training, quality control, and test control. The evaluation involved a detailed vertical path examination through the design combined with a horizontal examination at several points.
	Byron 1,2	Bechtel Power Corporation reviewed our design of the essential service water system, component cooling water system, and 125 volt dc distribution system for adherence to design requirements, technical adequacy, and adequacy of the design process. A Nuclear Regulatory Commission integrated design inspection team performed a detailed review of our design of the auxiliary feedwater and containment spray systems. The team evaluated the project organization, the technical aspects of mechanical, electrical, instrumentation, and structural design, and the adequacy of compliance with design requirements. The design process, including the adequacy of our design interface with the NSSS vendor, was also reviewed in detail. The Institute of Nuclear Power Operations conducted an evaluation of our control of the design, including examinations of our organization and administration, design control, project support, training, quality control, and test control. The evaluation involved a detailed vertical path examination through the design combined with a horizontal examination at several points.

Client	Station/Unit	Description of Audit or Design Review
		Teledyne Engineering Services conducted an independent design review of our design for the residual heat removal system in the low pressure coolant injection mode for loop C.
The Detroit Edison Company	Enrico Fermi 2	Cygna performed an Independent Design Verification Program of Sargent & Lundy's design. Included a horizontal review to confirm that an adequate design control process was established and implemented; and an in-depth, multi-disciplined technical review to confirm that the as-built configuration agreed with design specifications, criteria, and licensing commitments. This vertical review confirmed the accuracy and completeness of the design process including interfaces and design changes. Systems investigated included the RHR primary shutdown path components, RHRSW fluid path components, and the RHR cooling tower.
Illinois Power Company	Clinton 1	Bechtel Power Corporation reviewed our design of the high pressure core spray system and the Class 1E ac distribution system for adherence to design requirements, technical adequacy, and adequacy of the design process. The Institute of Nuclear Power Operations reviewed our control of design and construction processes associated with the residual heat removal system, the shutdown service water system, and the auxiliary power and dc systems.
Public Service Indiana	Marble Hill 1	Nova, an outside engineering consulting firm, peformed an engineering review to examine the engineering techniques Sargent & Lundy used in developing the Marble Hill design. The scope of Nova's review was directed to the instrumentation and controls area, it included documentation reviews, field examination and interviews with Sargent & Lundy engineering personnel.

Client	Station/Unit	Description of Audit or Design Review
Texas Utilities Generating Company	Comanche Peak 1, 2	Sargent & Lundy conducted an INPO-type, self-initiated evaluation of the construction project including an evaluation of the design control, construction control, scheduling, planning, quality assurance, and administration. The evaluation included examination of Texas Utilities Generating Company organization and administration, the design process, training, quality control, quality assurance, testing, planning, and scheduling and involved a detailed vertical path examination through the organization's design and construction functions, as well as horizontal examination at several points of the design process.

SARGENT & LUNDY

Nuclear Units Authorized for Design
by Sargent & Lundy

Exhibit VI-3
0189-27
12/84

Client	Station-Unit	Type of Reactor*	Rated Gross MW	Year of Operation
Commonwealth Edison Company	Dresden 2	BWR	850	1971
	Dresden 3	BWR	850	1971
	Quad-Cities 1	BWR	850	1972
	Quad-Cities 2	BWR	850	1972
	Zion 1	PWR	1085	1973
	Zion 2	PWR	1085	1974
	La Salle 1	BWR	1122	1982
	La Salle 2	BWR	1122	1984
	Byron 1	PWR	1175	1985
	Byron 2	PWR	1175	1986
	Braidwood 1	PWR	1175	1986
	Braidwood 2	PWR	1175	1987
	Carroll County 1	PWR	1175	2000
	Carroll County 2	PWR	1175	2001
The Cincinnati Gas and Electric Company	Zimmer	BWR	839	Converted**
Dairyland Power Cooperative	La Crosse	BWR	48	1969
Illinois Power Company	Clinton 1	BWR	985	1986
Public Service Company of Colorado	Fort St. Vrain 1	HTGR	330	1979
Public Service Indiana	Marble Hill 1	PWR	1175	Cancelled**
	Marble Hill 2	PWR	1175	Cancelled**
Southwest Atomic Energy Associates	SEFOR	LMFBR	7	1967
United Power Association	Elk River	BWR	20	1961
U.S. Atomic Energy Commission	Borax III	BWR	3	1955
	EBWR	BWR	5	1956

*BWR - boiling water reactor
HTGR - high temperature gas reactor
LMFBR - liquid metal fast breeder reactor
PWR - pressurized water reactor

**The designs were completed at the time the projects were coverted or cancelled.

210,010EX

A. Proposed Project Team

Title Partner and Project Director

Education Purdue University - Ph.D. Nuclear Engineering - 1966
Illinois Institute of Technology - B.S. Physics - 1962

Registrations Professional Engineer:
Illinois Indiana Kansas
Michigan New York

Admitted to Partnership - 1982
Appointed Associate - 1981

Responsibilities

As a project director, Dr. Wattelet is responsible for the implementation of the work and the technical integrity of the project during its execution. In the course of discharging these responsibilities, Dr. Wattelet directs project teams staffed by project managers, project engineers, and other technical personnel. Dr. Wattelet consults with the clients and project teams in planning and scheduling the project, and developing the appropriate cost control systems. He leads the development of and monitors project management documents such as engineering and construction schedules, man-hour estimates, project cost estimates, and scope of work. Dr. Wattelet regularly reports to the client regarding performance on the project and the status of engineering and construction. He works jointly with the client and project team on setting design parameters and operating philosophies which have significant engineering and economic implications. Dr. Wattelet directs the appropriate application of the Sargent & Lundy engineering policies and philosophies and maintains surveillance of the design to ensure their implementation throughout the project.

Experience

Dr. Wattelet has over 17 years of experience in the engineering and design of major nuclear steam-electr. generating stations, including the design of nuclear steam supply systems. At Sargent & Lundy he has been involved with balance-of-plant designs for large central generating station projects and also with backfit and betterment engineering services for several nuclear units.

Dr. Wattelet was a mechanical project engineer, project manager, and project director for a two-unit 2250-MW pressurized water reactor project. In these positions, he controlled Sargent & Lundy's project engineering man-hour expenditures by regularly monitoring expended man-hours versus projected man-hour estimates. He coordinated the

Experience, Continued

development of engineering documents such as design criteria, specifications, licensing documents, schematic and working drawings, bid evaluations, and design instructions. On major purchases, he worked with the client and vendors to select equipment best suited for specialized plant operating duty. Dr. Wattelet was also responsible for conformance of mechanical project work to applicable Sargent & Lundy standards and procedures. These included preliminary design studies to determine general plant layout, sizing, specification of equipment, analysis of economic factors, preparation of flow diagrams, and sizing and flexibility analysis of piping and support systems.

He has also been supervisor of Safeguards Systems Analysis in Sargent & Lundy's Nuclear Safeguards and Licensing Division responsible for methods development and analysis of nuclear safeguards systems.

Prior to joining Sargent & Lundy in 1972, Dr. Wattelet was a Senior Engineer for plant safety analysis in the Advanced Reactor Division of Westinghouse Electric Corporation. He developed methods for analyzing accidents in Liquid Metal Fast Breeder Reactors (LMFBR) and performed safety analyses on the Fast Flux Test Facility (FFTF). He organized and participated in regulatory proceedings for FFTF and interfaced with the AEC/RDT, who provided the funding for the LMFBR projects he worked on. Before this, Dr. Wattelet was an engineer at NASA where he participated in core design of the tungsten-water moderated rocket reactor.

Memberships

American Nuclear Society
Society of Sigma Xi
Western Society of Engineers

Publications

"Two Years After TMI" (coauthored), Midwest Engineer, publication of Western Society of Engineers, September 1981

"TMI-2 Plus Two" (coauthored), Sargent & Lundy General Engineering Conference, Chicago, Illinois, March 1981

"Multi-Cell Analysis of High-Energy Fluid Line Breaks," American Nuclear Society Winter Meeting, San Francisco, California, 1973

"FFTF Barriers to Fuel Failure Propagation," American Nuclear Society Summer Meeting, Boston, Massachusetts, 1971

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Marble Hill 1,2	Nuclear	1175 (each)	Suspended	Public Service Indiana	Project Director	1982 to present
					Project Manager	1978 to 1982
					Mechanical Project Engineer	1973 to 1978

Title Partner and Project Director

Education Purdue University - B.S.M.E. - 1956

Registrations Professional Engineer:
Illinois Virginia

Appointed Associate - 1971
Admitted to Partnership - 1977

Responsibilities

As a project director, Mr. Mazza is responsible for the implementation of the work and the technical integrity of the project during its execution. In the course of discharging these responsibilities, Mr. Mazza directs a project team staffed by a project manager, project engineers, and other technical personnel. Mr. Mazza consults with his client and project team in planning and scheduling the project and developing the appropriate cost control systems. He leads the development of and monitors project management activities such as preparing engineering and construction schedules, man-hour estimates, project cost estimates, and the scope of work. Mr. Mazza regularly reports to the client regarding performance on the project and the status of engineering and construction. He works jointly with the client and project team on setting design parameters and operating philosophies that have significant engineering and economic implications. Mr. Mazza directs the application of appropriate Sargent & Lundy engineering policies and philosophies and maintains surveillance of the design to ensure their implementation throughout the project.

Experience

Mr. Mazza has extensive experience in the design and engineering of major steam-electric generating stations. He has managed and worked on nine nuclear- and fossil-fueled station projects. His work has involved engineering problems covering a wide range of conditions relative to site selection, size and type of installation, operating requirements, fuel, space requirements, water supply, controls and instrumentation, heating, ventilating, and air conditioning (HVAC) equipment, and coal handling facilities. Mr. Mazza joined Sargent & Lundy in 1957.

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
La Salle 1,2	Nuclear	1122 (each)	1982/1984	Commonwealth Edison Company	Project Director	1977 to present
					Project Manager	1970 to 1977
Dresden 3	Nuclear	850	1971	Commonwealth Edison Company	Mechanical Project Engineer	1964 to 1971
Dresden 2	Nuclear	850	1971	Commonwealth Edison Company	Mechanical Project Engineer	1964 to 1970
Will County 4	Coal	532	1963	Commonwealth Edison Company	Mechanical Engineer	1959 to 1963
Gallagher 1-4	Coal	150 (each)	1958-1961	Public Service Indiana	Prepared Operating Data Book	1957 to 1958

Study

Client

Savannah River Operations Office

Project Description

Conceptual design of 1600-MW heavy water plant

Power Plant Backfit Projects

Station - Unit	Fuel	Rated Gross MW	Client	Assignment	Assignment Date(s)
Brunswick 1,2	Nuclear	790 (each)	Carolina Power & Light Company	Project Director	1983 to present
H. B. Robinson	Nuclear	665	Carolina Power & Light Company	Project Director	1983 to present
Susquehanna 1	Nuclear	1111	Pennsylvania Power & Light Company	Project Director	1983 to present
Zion 1,2	Nuclear	1085 (each)	Commonwealth Edison Company	Project Director	1981 to present
North Anna 1,2	Nuclear	1755 (total)	Virginia Electric and Power Company	Project Director	1981 to present
Surry 1,2	Nuclear	775 (each)	Virginia Electric and Power Company	Project Director	1981 to present
Dresden 2,3	Nuclear	850 (each)	Commonwealth Edison Company	Project Director	1979 to present
Quad Cities 1,2	Nuclear	850 (each)	Commonwealth Edison Company	Project Director	1979 to present

970,392
102684

Title Associate and Project Manager

Education University of Illinois - M.S. Nuclear Engineering - 1969
University of Illinois - B.S. Mechanical Engineering - 1968

Registrations Professional Engineer:
Illinois New Jersey Ohio

Appointed Associate - 1978

Responsibilities As project manager, Mr. Pruski is responsible for the planning, coordination, and performance monitoring of Sargent & Lundy's work on the project. He leads the project engineering staff in the preparation of schedules, the project cost estimate, and the project scope of work. Mr. Pruski controls Sargent & Lundy's project engineering man-hour expenditures by regularly monitoring expended man-hours versus projected man-hour estimates. He advises the client regarding the project's status in the monthly reports during review meetings and in his day-to-day communications with the client. He coordinates the development of documents such as design criteria, specifications, licensing documents, schematic and working drawings, bid evaluations, and design instructions. On major purchases, Mr. Pruski works with the client and vendors to select equipment best suited for specialized plant operating duty. By virtue of his position, he has the authority to call upon the resources of the firm to meet the demands of the project.

Experience Mr. Pruski has extensive experience in the design and engineering of nuclear-fueled steam-electric generating stations. He had served for 9 years in his present capacity as project manager on an 839-MW nuclear-fueled unit. Prior to his appointment to project manager, Mr. Pruski served for 5 years as mechanical project engineer, responsible for the coordination of all the efforts between the engineering and other support specialists within the mechanical disciplines. He directed and supervised the work of mechanical engineers assigned to the project. Mr. Pruski was also responsible for ensuring conformance of mechanical project work to applicable Sargent & Lundy standards and procedures. This included preliminary design studies to determine general plant layout and sizing, specifying equipment, analysis of economic factors, preparation of flow diagrams, and sizing of piping including analysis of flexibility and support systems. He maintained client contact and incorporated operating philosophies into

Experience, Continued

design parameters. He also interfaced with suppliers in selecting equipment, materials, and labor packages, evaluated proposals, and recommended purchases.

Prior to this, Mr. Pruski served as an engineering analyst in the Mechanical Analytical Division where he prepared numerous studies in the area of thermal-hydraulic analysis. Additionally, he performed engineering studies for power plant cooling systems.

In addition to his responsibilities on project work, Mr. Pruski has also served as a member on a task force addressing the Sargent & Lundy Quality Assurance Program. The task force reports directly to the Director of Engineering recommending changes to the Quality Assurance Program and suggesting improvements in engineering implementation. Additionally, Mr. Pruski serves as Task Force Chairman of Sargent & Lundy's Emergency Planning Program. The task force is responsible for developing company programs for emergency planning to support client requirements for actual emergencies and emergency drills. Mr. Pruski joined Sargent & Lundy in 1968.

Memberships

American Society of Mechanical Engineers (ASME)
AIF Cost Impact Subcommittee

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Zimmer 1	Nuclear	839	Suspended	The Cincinnati Gas & Electric Company	Project Manager	10-74 to 4-84
					Mechanical Project Engineer	9-69 to 10-74
Dresden 2,3	Nuclear	850 (each)	1971	Commonwealth Edison Company	Engineering Analyst	6-68 to 9-69

Title	Associate and Chief Support Design Engineer Mechanical Design and Drafting Division
Education	Loyola University - M.B.A. - 1977 University of Wisconsin - B.S.M.E. - 1969
Registration	Professional Engineer - Illinois
	Appointed Associate - 1981
Responsibilities	As chief support design engineer, Mr. Bloss is responsible for providing administration and direction to the Support Design Section/Mechanical Design and Drafting Division. He is responsible for coordinating the section's activities to sufficiently satisfy production and technical requirements. Through the section supervisors, he ensures the preparation of man-hour estimates and the proper distribution of manpower to efficiently meet project schedules. Mr. Bloss coordinates the section's activities with the work of the various interfacing project teams. By virtue of his position, he has the authority to call upon the resources of the firm to meet the demands of the project.
Experience	Mr. Bloss has extensive experience in the design and engineering of major steam-electric generating stations. He has worked as a mechanical engineer, mechanical project engineer, or project manager on six nuclear units and four fossil units with a capacity in excess of 7500 MW. He has also participated in studies, analyses, and reports encompassing preliminary engineering evaluations, system designs, piping analyses, pressure and temperature effects on structures, environmental problems, and radioactive waste removal. Mr. Bloss joined Sargent & Lundy in 1969.

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
All projects					Coordinates and supervises the Support Design Section of MDDD	1981 to present
La Salle 1	Nuclear	1122	1982	Commonwealth Edison Company	Coordinated the "For Record" release of piping system and support designs; responsible for work of MDDD component support personnel in the office and in the field	1980 to 1981
Fairview 1,2		550 (each)		Illinois Power Company	Directed preparation of Environmental Report, developed scope of work and project schedule with the client	1979 to 1980
Collins 4,5	Oil/Coal	504 (each)	1978/1979	Commonwealth Edison Company	Directed the design of mechanical systems for coal conversion; coordinated structural and electrical design with work being done by the Mechanical Department; developed scope of work and project schedule with the client	1979
Carroll County 1,2	Nuclear	1175 (each)	2000/2001	Commonwealth Edison Company	Directed the design of mechanical systems for nuclear plants, including preparation of design criteria, piping and instrumentation diagrams, and specifications; coordinated the Structural and Electrical Departments with the work being done in the Mechanical Department; coordinated the work of Mechanical Divisions to support the project schedule; developed the scope of work with the client; developed the project schedule with the client; and developed the internal project schedule with all departments	1977 to 1979

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Power Plant Design Projects, Continued

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Kaiseraugst	Nuclear	932	Deferred	Swiss Consortium	Coordinated the design effort of all disciplines for the design of GEX containment and internal systems, including structural design, piping design and analysis for seismic/transients and accident design such as LOCA and pipe rupture	1976 to 1977
Miscellaneous					During the Bailly N1 shutdown, participated in the following: a. Cardinal - minor bid evaluations b. La Salle - nitrogen piping and instrumentation diagram c. Byron/Braidwood - valve specification bid evaluation	1975 to 1976
Bailly N1	Nuclear	684	Cancelled	Northern Indiana Public Service Company	Assumed the position of Mechanical Project Engineer responsible for the coordination of the Nuclear Steam Supply System contract; the Engineering Mechanics Division (EMD); the Heating, Ventilating, and Air Conditioning Division (HVAC); the Electrical, Mechanical and Structural work in in the reactor building areas; piping design and analysis development; and pipe rupture	1973 to 1975
Fort St. Vrain 1	Nuclear	330	1979	Public Service Colorado	During the Bailly N1 shutdown, worked on the system piping and instrumentation diagram updates to as-built conditions; coordinated EMD work in seismic system transients and analysis of as-built piping systems; and coordinated pipe rupture	1972 to 1973

Power Plant Design Projects, Continued

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Bailly N1	Nuclear	684	Cancelled	Northern Indiana Public Service Company	Responsible for the beginning design stages of equipment drains, floor drains, fire protection, and rad-waste systems	1971 to 1972
Quad Cities 1,2	Nuclear	850 (each)	1972 (each)	Commonwealth Edison Company	Responsible for the design and specification of several systems and equipment which came late in the project; i.e., nitrogen inerting system; supervised the piping analysis for seismic and pipe rupture; and liaison with the field and the General Electric field personnel on miscellaneous items required to complete construction and pre-op testing	1969 to 1971

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Title Project Manager

Education University of Illinois - B.S.C.E. - 1958
Iowa State University - M.S./Nuclear Engineering - 1961

Registrations Professional Engineer:
Illinois Oregon Pennsylvania Washington

Responsibilities As project manager, Mr. White is responsible for the planning, coordination, and performance monitoring of Sargent & Lundy's work on the project. He leads the project engineering staff in the preparation of schedules, the project cost estimate, and the project scope of work. Mr. White controls Sargent & Lundy's project engineering man-hour expenditures by regularly monitoring expended man-hours versus projected man-hour estimates. He advises the client regarding the project's status in the monthly reports during review meetings and in his day-to-day communications with the client. He coordinates the development of documents such as design criteria, specifications, licensing documents, schematic and working drawings, bid evaluations, and design instructions. On major purchases, Mr. White works with the client and vendors to select equipment best suited for specified plant operating duty. By virtue of his position, he has the authority to call upon the resources of the firm to meet the demands of the project.

Experience Mr. White has a long and distinguished career record in the engineering and design of nuclear power stations. Before rejoining Sargent & Lundy this year, he served for 15 years as a nuclear engineer, at increasing levels of responsibility, for another large AE serving the power industry. His most recent position there was as Manager of Engineering, directing the technical performance of all engineering and drafting personnel assigned to the firm's West Coast office (approximately 100 engineers). Prior to this position, he was Manager of the Nuclear Section of the Mechanical Engineering Department. He was responsible for the administration of a large group of mechanical engineers and development and maintenance of design guides, guide specifications, and department procedures. He also provided liaison with clients, prepared estimates and proposals, and consulted and advised the Advanced Engineering Group on all aspects of mechanical design. His project engineering experience with that firm

Experience, Continued

included work on three nuclear station design projects. One of these projects included HTGR and LWR reactor technologies. Another of these stations was a two 1200-MW unit BWR design. His prior project engineering experience with Sargent & Lundy included work for two nuclear station design projects; a two 1100-MW unit PWR station and a 330-MW HTGR unit. Mr. White also directed S&L's efforts on feasibility studies for liquid metal fast breeder reactor power plants.

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Perry 1,2*	Nuclear	1200 (each)	1985/1988	The Cleveland Electric Illuminating Company	Senior Project Engineer	1972 to 1973
Takahamn 1*	Nuclear	826	1973	Kansai Electric Power Company, Japan	Project Engineer	1969 to 1972
Fort St. Vrain	Nuclear	330	1979	Public Service Colorado	Nuclear Project Engineer	1966
Zion 1,2	Nuclear	1100 (each)	-	Commonwealth Edison Company	Nuclear Project Engineer	1967 to 1969

*Projects performed with Gilbert/Commonwealth.

Title Associate and Senior Structural Project Engineer

Education Illinois Institute of Technology - M.S.C.E. - 1972
University of Illinois - B.S.C.E. - 1968

Registrations Professional Engineer:
Illinois Indiana Kansas New York Wisconsin

Structural Engineer - Illinois

Appointed Associate - 1982

Responsibilities As a senior structural project engineer, Mr. Zaben supervises the structural project engineers. Mr. Zaben is responsible for seeing that structural design conforms to applicable client, industry, and Sargent & Lundy standards and procedures. He participates in major decisions concerning the plant design and construction in concert with the client and other project-related disciplines. The major areas of his project involvement include siting, site development, all civil and structural work, and architectural treatment. He reviews and approves the basic plant design criteria and any unique structural engineering design concepts. He authorizes Sargent & Lundy drawings for construction by his signature and seal. Mr. Zaben reviews structural engineering and construction schedules and the project scope of work. Mr. Zaben coordinates the structural activities in the preparation of monthly project engineering and construction reports. Mr. Zaben coordinates preparation of specifications for equipment, materials, and labor packages. He evaluates proposals and makes purchase recommendations.

Experience Mr. Zaben has extensive experience in the civil, structural, and architectural engineering and design of fossil and nuclear power plants. As a structural project engineer, he has been in charge of six power plant projects and seven power plant modifications, studies, and sitework. Prior to that, he worked on seven coal, one coal and oil, and three nuclear stations at increasing levels of responsibility. He is a member of Sargent & Lundy's Reference Design Plant Committee and Structural Standards Review Committee.

Throughout his 15-year power plant career, Mr. Zaben has designed or supervised the design of power plant structures; site selection and site layout, including road and railroad layout; water intake and discharge structures; coal unloading facilities; disposal dike facilities for fly ash, bottom ash, and

Experience, Continued

flue gas desulfurization byproducts; and design of chimneys and chimney liners, coal silos, coal bunkers, and wastewater treatment structures.

As an assistant chief structural design engineer, he was involved in one nuclear unit and five fossil units. He reviewed project work with the supervisors for conformance with codes and criteria, and he assisted them in solving special problems. He monitored project progress and manpower requirements, developed design standards, and gave lectures on the structural design of power plants to new engineers.

As a supervising design engineer, Mr. Zaben coordinated the structural work on a nuclear project. He collected, reviewed, and disseminated information to his assigned engineers. He developed project design criteria and procedures and guided engineers in their design work. As a structural engineer, he was involved in the design of fossil and nuclear power plant structures.

Prior to joining Sargent & Lundy in 1970, Mr. Zaben worked as a designer of highway bridges and as a designer of power plants and precipitator support structures.

Membership

American Society of Civil Engineers

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Pleasant Prairie 2	Coal	570	1985	Wisconsin Electric Power Company	Senior Structural Project Engineer	1982 to present
Reference Plant	Coal	600-700	-	Sargent & Lundy	Senior Structural Project Engineer	1979 to present
Marble Hill 1,2	Nuclear	1175 (each)	Suspended	Public Service Indiana	Senior Structural Project Engineer	1979 to 1983
MTA Fossil Plant	Coal, Oil, & Refuse	697	1996 (held)	New York Power Authority	Senior Structural Project Engineer	1982 to 1983
Gibson 5	Coal	618	1982	Public Service Indiana	Senior Structural Project Engineer (includes coal unloading)	1982
Weston 3	Coal	321	1981	Wisconsin Public Service Corporation	Structural Project Engineer	1977 to 1982
Braidwood 1,2	Nuclear	1175 (each)	1986/1987	Commonwealth Edison Company	Senior Structural Project Engineer	1979 to 1981
Byron 1,2	Nuclear	1175 (each)	1985/1986	Commonwealth Edison Company	Senior Structural Project Engineer	1979 to 1981
Lawton Tire 1,2	Coal & Oil	NA	1979	The Goodyear Tire & Rubber Company	Structural Project Engineer (process steam)	1977 to 1979
Havana 6	Coal	439	1978	Illinois Power Company	Assistant Chief Structural Engineer	1975 to 1977
East Bend 2	Coal	648	1981	The Cincinnati Gas & Electric Company	Assistant Chief Structural Engineer	1975 to 1977
Coleto Creek 1	Coal	570	1980	Central Power and Light Company	Assistant Chief Structural Engineer	1974 to 1977
Zimmer 1	Nuclear	839	Suspended	The Cincinnati Gas & Electric Company	Assistant Chief Structural Engineer	1974 to 1977
Lansing 4	Coal	252	1977	Interstate Power Company	Assistant Chief Structural Engineer	1974 to 1976
Miami Fort 8	Coal	512	1978	The Cincinnati Gas & Electric Company	Assistant Chief Structural Engineer	1975
Clinton 1	Nuclear	985	1986	Illinois Power Company	Supervising Structural Engineer	1973 to 1974

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Power Plant Design Projects, Continued

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Ghent 1	Coal	511	1974	Kentucky Utilities Company	Structural Engineer	1970 to 1973
Bailly N1	Nuclear	684	Cancelled	Northern Indiana Public Service Company	Structural Engineer	1972

Power Plant Betterment Projects

Station - Unit	Fuel	Rated Gross MW	Client	Assignment	Assignment Date(s)
Cayuga 1,2	Coal	531 (each)	Public Service Indiana	Senior Structural Project Engineer (chimney steel liner examinations)	1982 to present
Fort St. Vrain 1	Nuclear	330	Public Service Company of Colorado	Senior Structural Project Engineer (miscellaneous modifications)	1979 to present
Grand Tower 3,4	Coal	60/100	Central Illinois Public Service Company	Senior Structural Project Engineer (modifications to levee and to crib house)	1984
Surry 1,2	Nuclear	775 (each)	Virginia Electric and Power Company	Senior Structural Project Engineer (miscellaneous modifications)	1983
North Anna 1,2	Nuclear	1755 (total)	Virginia Electric and Power Company	Senior Structural Project Engineer (miscellaneous modifications)	1983
Newton 1,2	Coal	567 (each)	Central Illinois Public Service Company	Senior Structural Project Engineer (chimney, liners, and coatings examination)	1983
Coffeen 1,2	Coal	938 (total)	Central Illinois Public Service Company	Senior Structural Project Engineer (examination of repair of silos)	1983

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Power Plant Betterment Projects, Continued

Station - Unit	Fuel	Rated Gross MW	Client	Assignment	Assignment Date(s)
Various	Fossil & Nuclear	-	Virginia Electric and Power Company	Senior Structural Project Engineer (conceptual studies for fossil and nuclear plants)	1983
Wabash River 1-6	Coal	886 (total)	Public Service Indiana	Senior Structural Project Engineer (ash pond extension)	1982 to 1983
				Senior Structural Project Engineer (ductwork and chimney)	1982 to 1983
Muskogee	Coal	572	Oklahoma Gas and Electric Company	Senior Structural Project Engineer (evaluation of precipitator support steel)	1982 to 1983
Sooner	Coal	N.A.	Oklahoma Gas and Electric Company	Senior Structural Project Engineer (evaluation of precipitator support steel)	1982 to 1983
Wolf Creek 1	Nuclear	1100	Kansas Gas and Electric Company	Senior Structural Project Engineer (site work)	1982
R. A. Gallagher 1-4	Coal	150 (each)	Public Service Indiana	Senior Structural Project Engineer (chimney repairs)	1982
Sequoyah 1,2	Nuclear	1128 (each)	Tennessee Valley Authority	Senior Structural Project Engineer (containment venting conceptual design)	1980
Zion 1,2	Nuclear	1085 (each)	Commonwealth Edison Company	Senior Structural Project Engineer (miscellaneous modifications)	1979 to 1980

Title Senior Electrical Project Engineer

Education University of Illinois - B.S.E.E. - 1971

Registration Professional Engineer - Illinois

Responsibilities

Mr. Schiavoni directs electrical engineers, analysts, and draftsmen in the development of the conceptual design, the design of individual system components, and the preparation of bid procurement specifications. Mr. Schiavoni supervises the project electrical engineering team that evaluates the proposals of manufacturers, makes purchase recommendations, and monitors the activities of manufacturers to ensure that manufacturers' drawings and finished components are received on schedule. He works with the client and with manufacturer and contractor representatives to ensure that the electrical design, engineering, and construction of the power plant incorporate the latest techniques. He coordinates the electrical engineering work with that of other Sargent & Lundy departments. Mr. Schiavoni reviews specifications and drawings to ensure that all electrical work is correctly done. After plant construction begins, he may make occasional visits to the site to check on progress of the electrical work and to ensure that it is done properly.

Experience

Mr. Schiavoni has been involved with the electrical engineering and design of two nuclear powered generating stations. His assignments have included electrical design work related to turbine-generator and main cycle systems as well as the main and auxiliary power systems. He has participated in specifying, evaluating, and integrating such items as the main and auxiliary power transformers, isolated and nonsegregated phase buses, medium and low voltage switchgear, large motors, and main control boards into the overall station design. Other responsibilities have included administration and coordination of the electrical installation contract with the client and contractor, and coordination of electrical portions of the safety analysis report. He currently has the principal responsibility for the engineering and design of all electrical aspects of a two-unit nuclear powered generating station.

Experience, Continued

From 1978 through 1982, Mr. Schiavoni served on the Sargent & Lundy Quality Assurance Coordinating Committee. This committee is responsible for reviewing, resolving, and coordinating departmental comments on the firm's quality assurance program and procedures. Committee members also serve as liaison between their respective engineering departments and the Quality Assurance Division.
Mr. Schiavoni joined Sargent & Lundy in 1971.

Nuclear Power Plant Design Projects

Station - Unit	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
La Salle 1,2	1122 (each)	1982/1984	Commonwealth Edison Company	Senior Electrical Project Engineer	10-81 to present
				Electrical Project Engineer	1-77 to 9-81
				Electrical Engineer	6-71 to 12-76
Enrico Fermi 2	1123	1984	The Detroit Edison Company	Electrical Engineer	6-71 to 6-72

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Title

Project Quality Assurance Coordinator
Quality Assurance Division

Education

U.S. Air Force Officer's Training - Graduate - 1962
University of Arizona, Tucson, Arizona - M.S. Program Nuclear Science and Engineering - 1962
Grinnell College, Grinnell, Iowa - B.S. Physics-Mathematics - 1961

Registrations

Professional Engineer - Illinois

ASQC - Certified Quality Engineer (test taken)

Responsibilities

As a Project Quality Assurance Coordinator, Mr. McCullough is responsible for assisting the nuclear or project team with the effective implementation of the quality assurance program. Mr. McCullough participates in all audits of Sargent & Lundy for the assigned nuclear projects. He consults with the project personnel to resolve possible nonconformances.

Experience

Mr. McCullough has extensive experience in the design, engineering, and related disciplines of nuclear steam-electric generating stations. Mr. McCullough is currently assigned as the Project Quality Assurance Coordinator on four nuclear units being designed and under construction. He monitors effective project implementation of Sargent & Lundy's Quality Assurance program and performs periodic reviews (overview) of design control documents, such as design criteria, change documents, calculations, and drawings. He performs investigations throughout the project when potential generic concerns are identified on other nuclear projects. These reviews and investigations may cover any engineering discipline, structural, mechanical, electrical, or nuclear. Mr. McCullough interfaces with nuclear project personnel on matters relating to quality assurance of safety-related items in accordance with the requirements of ANSI-N45.2.11 and the Nuclear Regulatory Commission's I.E. Bulletins and I.E. Notices. As the Project Quality Assurance Coordinator, he provides Quality Assurance requirements to technical consultant specifications and work procedures. His attendance at project interdepartmental meetings, as needed or requested, allows Mr. McCullough to identify potential Quality Assurance concerns or problems for evaluation and resolution. Mr. McCullough participates in all Nuclear Regulatory Commission (NRC), Institute of Nuclear Power Operations

Experience, Continued

(INPO), independent, and client audits of Sargent & Lundy on the assigned nuclear projects.

Previously, as a Safeguards Project Engineer, Mr. McCullough's experience and expertise had been utilized in the design of many nuclear power generating stations, six of which are in operation today. He had performed advanced analytical, evaluative, and support analyses for both boiling water reactor (BWR) and pressurized water reactor (PWR) nuclear plant designs. He helped develop and complete a fully automated nuclear fuel cycle and management computer program and the successful benchmarking against plant operational data. He prepared required calculations for safety analysis reports on design basis accidents and postulated high-energy line ruptures in either the primary or secondary containment. The computerized mathematical simulation models he utilized met the Nuclear Regulatory Commission acceptance criteria and had been satisfactorily benchmarked against other industry-wide calculational approaches. He completed the development efforts to improve the mathematical models for two-phase and two-component air, steam, water, and thermal-hydraulic calculations.

Prior to joining Sargent & Lundy in 1974, Mr. McCullough was a Senior Nuclear Specialist and a Senior Engineer for a specialized nuclear and development consulting firm. Having detailed nuclear system design experience, Mr. McCullough was responsible for the verification, expansion, and maintenance of the complete nuclear computer code library of over fifty programs. He helped develop new marketing avenues and advertising ideas for the nuclear programs. Customer service as a technical consultant, was also provided to individual users in the actual design and/or theoretical evaluation of reactor systems. He also provided consulting assistance to electric utilities and engineering firms who were having difficulties in performing their calculations. Mr. McCullough also worked with new reactor physics analytical and computer techniques for large and small reactors. A preliminary nuclear analysis was performed by Mr. McCullough for a multipurpose prototype plant. He was preparing a determination of conditions for a specific fuel lifetime estimate, using different codes for cross-section generation, transport, diffusion, and depletion calculations, when the project was cancelled.

Before this, Mr. McCullough was an engineering analyst for a major reactor vendor. He helped prepare the determination of the azimuthal xenon oscillations on the

Experience, Continued

stability of large reactor cores. This analysis required detailed two-dimensional physics calculations of beginning and different times during core life. The results of this analysis were essential for final core designs and final safety analysis reports for several nuclear plants now in operation. Before this, Mr. McCullough helped develop a digital simulation of an analog model to perform a thermal transient analysis of the core following a loss-of-coolant accident. Output from this program was used to calculate a pressure-temperature time history in the containment building. Results of these programs were used for various safety analysis reports, as well as final nuclear steam supply system (NSSS) design considerations.

Previous to this, Mr. McCullough was commissioned and served in the U.S. Air Force as a research engineering physicist. He performed and directed research in nuclear radiation effects, gas dynamics, and equation of state determinations. He also served as a project officer where he directed a theoretical program based on detailed experiments to predict radiation effect in solids. This work was essential for further system development. He also used large digital computer programs to aid in the solution of typical energy transport equations.

Memberships

American Society of Quality Control
American Nuclear Society (ANS), Chicago Section
- ANS-9, National Standards Subcommittee
- Chairman - ANS-9.7, Standards Working Group

Publications

"Glossary of Terms in Nuclear Science and Technology," ANS Publication (in printing), ANS-9 Subcommittee Member

"LWR In-Core Fuel Management Analysis" (coauthor)

"PWR Benchmark of Computer Code Power/s" (coauthor), SL-3743, 1979

"BIMSA - BWR Image Method Suppression Pool Analysis," Computer Code (09.5.142-1.0) (coauthor), May 1976, Proprietary

"Mark II Containment Dynamic Forcing Functions Information Report" (coauthor), jointly issued by General Electric Company and Sargent & Lundy, NEDO-21061, September 1975

Publications, Continued

"Computer Methods for Utility Reactor Physics Analysis," Reactor and Fuel Processing Technology (coauthor), Vol. 12, No. 2, Spring 1969

Nuclear Power Plant Design Projects

Station - Unit	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Byron 1,2 Braidwood 1,2	1175 (each)	1985/1986 1986/1987	Commonwealth Edison Company	Project Quality Assurance Coordinator	1-84 to present
				Project Management Mechanical Engineer	5-81 to 1-84
				Safeguards Project Engineer; Nuclear Analyst	8-76 to 5-81
				Engineering Analyst	2-74 to 8-76
Dresden 2,3	850 (each)	1971	Commonwealth Edison Company	Project Quality Assurance Coordinator	1-84 to present
				Nuclear Analyst	8-76 to 11-79
				Engineering Analyst	2-74 to 8-76
La Salle County 1,2	1122 (each)	1982/1984	Commonwealth Edison Company	Project Quality Assurance Coordinator	1-84 to present
				Nuclear Analyst	8-76 to 11-79
				Engineering Analyst	2-74 to 8-76
Quad Cities 1,2	850 (each)	1972	Commonwealth Edison Company	Project Quality Assurance Coordinator	1-84 to present
Clinton 1	985	1986	Illinois Power Company	Project Quality Assurance Coordinator	8-84 to present
				Nuclear Analyst	8-76 to 11-79
				Engineering Analyst	2-74 to 8-76
Zimmer 1	839	Suspended	The Cincinnati Gas & Electric Company	Project Quality Assurance Coordinator	1-84 to 2-84
				Nuclear Analyst	8-76 to 11-79
				Engineering Analyst	2-74 to 8-76
Bailly N-1	684	Cancelled	Northern Indiana Public Service Company	Safeguards Project Engineer; Nuclear Analyst	8-76 to 5-81
Zion 1,2	1085 (each)	1973/1974	Commonwealth Edison Company	Nuclear Analyst	8-76 to 11-79
Kaiseraugst	932	Deferred	General Electric Company/Swiss Consortium	Nuclear Analyst	8-76 to 11-79

Nuclear Power Plant Design Projects, Continued

Station - Unit	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Enrico Fermi 2	1123	1985	The Detroit Edison Company	Nuclear Analyst	8-76 to 11-79
Dresden 1	200	1960	Commonwealth Edison Company	Engineering Analyst	2-74 to 8-76

Power Plant Betterment Project

Station - Unit	Fuel	Rated Gross MW	Client	Assignment	Assignment Date(s)
Byron 1,2 Braidwood 1,2	Nuclear	1175 (each)	Commonwealth Edison Company	Project Management Mechanical Engineer (new effort pipe vibration testing)	1-83 to 1-84

Study

Type of Study/Station - Unit(s)	Client	Assignment	Assignment Date(s)
Nuclear Fuel Evacuation for Marble Hill Generating Station - Units 3 and 4	Public Service Indiana	Nuclear Analyst	7-78 to 8-78

Title	Project Engineer Component Qualification Division
Education	University of Illinois (Urbana) - B.S. Engineering Mechanics - 1975
Registration	Professional Engineer - Illinois
Responsibilities	Mr. Tjernlund is responsible for demonstrating the adequacy of all of the safety-related equipment used in nuclear power generating stations to perform their safety-related functions in the event of a seismic occurrence or accident. He supervises a project team staff in the Component Qualification Division in the preparation and review of equipment and design procurement specifications, performance of bid evaluations, calculation of loads required for design of equipment foundations and building floor slabs, preparation and review of equipment dynamic qualification reports, preparation and review of ASME certified design reports, preparation and review of NRC licensing documents, and in the design and analysis of mechanical piping penetration assemblies.
Experience	Mr. Tjernlund has nine years of nuclear experience in the design and analysis of mechanical piping penetration assemblies and seven years of nuclear experience in qualifying equipment for postulated seismic and accident events. He has experience in Fortran IV programming, including program development and maintenance, component stress analysis, finite element modal analysis, dynamic testing techniques used for seismic qualification of equipment, impedance testing techniques used for determining the dynamic characteristics of equipment, and fatigue analysis. In addition, he is familiar with several codes and standards, including ASME B&PV Code Sections III and XI; AISC Steel Construction Manual; AWS standards; IEEE-323, 344; and NRC regulatory guides. Mr. Tjernlund joined Sargent & Lundy in 1975.
Membership	American Society of Mechanical Engineers

Nuclear Power Plant Projects

Station - Unit	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Clinton 1	985	1986	Illinois Power Company	Project Engineer (equipment qualification)	1984 to present
Zimmer 1	839	1986 (suspended)	The Cincinnati Gas & Electric Company	Project Engineer (equipment qualification)	1979 to 1984
Carroll County 1,2	1175 (each)	2000/2001	Commonwealth Edison Company	Project Engineer (equipment qualification)	1977 to 1979
Clinton 1	985	1986	Illinois Power Company	Engineering Analyst (penetration design and analysis)	1976 to 1979
La Salle 1,2	1122 (each)	1982/1984	Commonwealth Edison Company	Engineering Analyst (penetration design and analysis)	1975 to 1976

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Title	Supervisor Engineering Mechanics Division
Education	University of Illinois - B.S.M.E. - 1973
Responsibilities	Mr. Olson is responsible for the coordination of project and design work pertaining to the analysis of power plant piping systems. Working with engineering project teams, he supervises design efforts related to all aspects of piping analysis in accordance with ASME and ANSI codes.
Experience	Mr. Olson's assignments over the last eleven years have included all phases of fossil and nuclear plant piping layout, design, and analysis. He has been actively involved in analysis work for three major nuclear facilities and has supervised various aspects of engineering work on ten major projects, including PWR and BWR plant designs. Other areas of experience include preparation of design specifications, review of component support designs, preparation of licensing documents, pipe rupture studies, and all interdivisional and client/vendor communications to resolve design problems, identify interfacing procedures, and set project schedules.
Memberships	ASME Special Working Group on Faulted Conditions Past Member - Mark III Containment Owners SRSS Subgroup

Title

Control & Instrumentation Project Engineer
Control & Instrumentation Division

Education

Purdue University - B.S.E.E.T. - 1975
Purdue University - Associate in Industrial Supervision - 1975

Responsibilities

As a control and instrumentation project engineer, Mr. Crumpacker has primary responsibility for the development of control and instrumentation systems for nuclear generating stations. He must perform or delegate all tasks required to be performed on his project. These include preparation of design criteria and Safety Analysis Reports; general arrangements of control rooms, computer rooms, and other C&I areas; control and instrumentation diagrams; instrument portions of Piping and Instrumentation Diagrams; preparation of instrument indexes, data sheets, logic diagrams, master diagrams, loop schematics, instrument location drawings, and installation details; control board layouts and arrangements; preparation of C&I specifications, evaluation of proposals, and purchase recommendations; monitoring of vendor's engineering and manufacturing schedules, and review of vendor's drawings. He also trains C&I engineers in the performance of these tasks.

Experience

Mr. Crumpacker has experience in the design and engineering of control and instrumentation systems for nuclear power plants and for modifications to nuclear power plants. He is currently responsible for the engineering design of TMI-related modifications to the Clinton Power Station. He previously served as the C&I engineer for the initial design, system instrumentation, procurement, control room panel design and specifications of control room instrumentation for the Radwaste Control and Operation Center. This design included engineering of the liquid, gaseous, and solid radioactive waste processing and disposal systems.

During a 3-month absence from the firm, before rejoining in January 1982, Mr. Crumpacker worked for another major consulting engineer and was assigned to projects involving TMI modifications.

Prior to joining Sargent & Lundy in 1976, he was employed by Inland Steel Company as an instrument technician responsible for field maintenance and instrument repairs.

Membership

Instrument Society of America

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Clinton 1	Nuclear	985	1986	Illinois Power Company	C&I Engineer (initial design, system instrumentation and procurement for the Radwaste Operation Center)	9-78 to 10-81
					C&I Engineer (control room panel design and specifications of control room instrumentation)	5-77 to 9-78
					Design Engineer (wiring design)	5-76 to 5-77

Power Plant Betterment Projects

Station - Unit	Fuel	Rated Gross MW	Client	Assignment	Assignment Date(s)
Clinton 1	Nuclear	985	Illinois Power Company	C&I Engineer (TMI modifications)	6-82 to present
Zimmer 1	Nuclear	839	Illinois Power Company	C&I Engineer (TMI modifications)	1-82 to 6-82

Title	Senior Project Planning Engineer
Education	Illinois Institute of Technology - B.S.C.E. (Management Option) - 1966
Registration	Structural Engineer - Illinois
Responsibilities	As a senior project planning engineer, Mr. Fortunski works with the project team to implement the Engineering Project Monitoring System (EPMS) and any other schedule, progress, and man-hour monitoring systems that may be required to meet the needs of the client, Sargent & Lundy's management, and the project team. From the project scope of work, he develops the project scope work breakdown structure and assists the project team in developing precedence networks with task durations and imposed milestone and significant event dates. He inputs man-hour, schedule, and progress data to produce the Project Progress Report for distribution to the project team, Sargent & Lundy management, and the client. He analyzes schedule and man-hour performance and prepares variance analysis reports for project team resolution. He also sees that the engineering schedule and progress interface with the requirements of the construction schedule.
Experience	Mr. Fortunski has considerable experience in the civil and structural design and engineering of nuclear and fossil power plants, including project planning and scheduling functions. He was lead planning and scheduling engineer on a two-unit nuclear power plant functioning as a primary interface between Sargent & Lundy and client engineering and construction staff. He has been associated with fossil-fueled and nuclear-powered design projects at increasing levels of responsibility. Before assuming his current responsibilities, he was a structural project engineer. As a structural project engineer, Mr. Fortunski directed the work of structural engineers and draftsmen who were engaged in the design and engineering of the structural and civil portion of a central power plant, including the complete coal handling facilities.

Experience, Continued

Prior to joining Sargent & Lundy in 1965, he worked for a number of firms as a senior structural engineer responsible for the design of a major portion of a paper mill plant; as a structural designer for steel mills and industrial process plants; and as a design engineer and vice-president for a firm that designed specialized materials handling equipment.

Membership

American Society of Civil Engineers

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Major Project Assignments

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Marble Hill 1,2	Nuclear	1175 (each)	1988/1990 (suspended)	Public Service Indiana	Senior Project Planning Engineer	1982 to 1984
Pleasant Prairie 1,2	Coal	570	1980/1985	Wisconsin Electric Power Company	Structural Project Engineer	1975 to 1981
Newton 1	Coal	567	1977	Central Illinois Public Service Company	Supervising Structural Design Engineer	1973 to 1975
Baldwin 3	Coal	585	1975	Illinois Power Company	Supervising Structural Design Engineer	1971 to 1973

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B. Senior Review Committee

Title Associate and Mechanical Design Director

Education Virginia Polytechnic Institute - B.S. Engineering Mechanics - 1964

Registration Professional Engineer - Illinois

Appointed Associate - 1973

Responsibilities

Mr. Branch is the mechanical design director with responsibility for the Engineering Mechanics Division and the Mechanical Design and Drafting Division. He is responsible for the integration and coordination of the divisions' output with that of other divisions and departments. He assigns areas of responsibility to each division and ensures that the divisions perform all assigned work within budget, within schedule, and with an acceptable level of quality. He performs other functions and tasks as required by the assistant department manager or the department manager.

Experience

Mr. Branch has extensive experience in the stress analysis of piping systems and mechanical equipment for power plants. Before assuming his position as mechanical design director, he was the head of Sargent & Lundy's Engineering Mechanics Division. In this capacity, Mr. Branch directed a group of systems analysts, component analysts, and computer specialists. The division's scope of work involved stress analysis of the piping systems and associated mechanical equipment for major steam-electric generating stations, both nuclear- and fossil-fueled. The division has been responsible for evaluating the seismic qualifications of the safety-related mechanical and electrical equipment used in nuclear plants and provided the piping and equipment criteria used in Safety Analysis Reports. The division also has done design and analysis for penetration assemblies and performed hydraulic and thermal transient analyses for piping and mechanical equipment.

Before joining Sargent & Lundy in 1969, Mr. Branch did stress analysis of piping systems for naval nuclear power plants. He determined the specification requirements for the purchase of piping, fittings, and valves, and qualified certain pieces of equipment for shock analysis and testing.

Memberships

American Society of Mechanical Engineers
- Boiler and Pressure Vessel Code
  - Section III Committee
  - Section III Subgroup on Design
  - Section III Working Group on Piping
- PVRC Technical Committee on Piping Systems

Publications

"Stress Limits for Class 2 and Class 3 Components Under Upset, Emergency, and Faulted Conditions" (coauthor J. Gascoyne), ASME Paper No. 76-PVP-61

"The Impact of ASME Section III," Power Magazine, October 1975

"Economic Impact of Seismic Requirements in Nuclear Power Stations," (coauthor R. Small), Sargent & Lundy General Engineering Conference, 1971

"Transient Thermal Gradient Stress," Heating/Piping/Air Conditioning, January 1971

Nuclear Power Plant Design Projects

Station - Unit	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Zion 1,2	1085 (each)	1973/1974	Commonwealth Edison Company	Division Head	1974 to 1981
Quad Cities 1,2	850 (each)	1972	Commonwealth Edison Company	Division Head	1973 to 1981
Marble Hill 1,2	1175 (each)	Suspended	Public Service Indiana	Division Head	1973 to 1981
Clinton 1,2	985 (each)	1986/Cancelled	Illinois Power Company	Division Head	1972 to 1981
Braidwood 1,2	1175 (each)	1986/1987	Commonwealth Edison Company	Division Head	1972 to 1981
Byron 1,2	1175 (each)	1985/1986	Commonwealth Edison Company	Division Head	1971 to 1981
Dresden 2,3	850 (each)	1971	Commonwealth Edison Company	Division Head	1970 to 1981
La Salle 1,2	1122 (each)	1982/1984	Commonwealth Edison Company	Division Head	1970 to 1981
Zimmer 1	839	Suspended	The Cincinnati Gas & Electric Company	Division Head	1970 to 1981
Bailly N-1	684	Cancelled	Northern Indiana Public Service Company	Division Head	1970 to 1981
Enrico Fermi 2	1123	1984	The Detroit Edison Company	Division Head	1970 to 1981
Carroll County 1,2	1175 (each)	2000/2001	Commonwealth Edison Company	Division Head	1978 to 1979
Fort St. Vrain 1	330	1979	Public Service Company of Colorado	Division Head	1970 to 1979

Title	Associate and Head Quality Assurance Division
Education	Ohio State University - B.E.E. - 1972 Appointed Associate - 1983
Responsibilities	Mr. Taylor is responsible to the Director of Services for formulating and administering the Quality Assurance Programs for both nuclear- and fossil-fired power plants. He develops the general Quality Assurance procedures necessary for implementation of the programs and coordinates the preparation of detailed procedures prepared by other departments and divisions. He is responsible for interfacing with the client's Quality Assurance organizations and the Nuclear Regulatory Commission (NRC). He also takes responsibility for training sessions in the use and implementation of the Quality Assurance program and procedures for all personnel involved in safety-related activities. He directs internal and external audits of consulting organizations retained by Sargent & Lundy. He is also responsible for establishing and maintaining controls for identification, storage, and retrieval of quality assurance records.
Experience	Mr. Taylor has served in his present capacity since May of 1982 and has extensive experience in Quality Assurance administration. Since January of 1974, when Mr. Taylor was appointed senior Quality Assurance instructor, he has developed and maintained Quality Assurance procedures that meet established government and industry requirements for nuclear power plant quality assurance. In 1979 he developed the Sargent & Lundy Quality Assurance Program for fossil-fueled power plants. Before assuming the position of head of the Quality Assurance Division, Mr. Taylor served as assistant head for 6 years. He was responsible for assisting the head of the Division in the operation, planning, and supervision of the Quality Assurance Division. Previous to this, Mr. Taylor served as senior Quality Assurance administrator for nearly 2 years. During this time, he was responsible for the preparation and maintenance of the Sargent & Lundy Quality Assurance Manual and ensuring its continued conformance to applicable codes, standards, and regulatory requirements.

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Experience, Continued

Prior to moving to the Quality Assurance Division in January of 1974, Mr. Taylor served as an electrical engineer for 1-1/2 years on a 985-MW nuclear-fueled generating station. His responsibilities included design engineering on various electrical plant systems. Mr. Taylor joined Sargent & Lundy in 1972.

Membership

American Society of Mechanical Engineers (ASME) Committee on Nuclear Quality Assurance - Main Committee
- Design and Procurement Subcommittee
- Procurement Control Work Group

Power Plant Design Project

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Clinton 1	Nuclear	985	1986	Illinois Power Company	Electrical Engineer	6-72 to 1-74

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Title Associate and Structural Design Director

Education
Purdue University - M.S.C.E. - 1970
Purdue University - B.S.C.E. - 1969

Registration
Structural Engineer - Illinois

Appointed Associate - 1979

Responsibilities

Mr. Erler directs the following four Structural Design Divisions, the Structural Engineering Division, the Structural Drafting Division, the Architectural Design Division, and the Structural Engineering Specialist Division. The principal responsibilities for the four divisions include preparation review, and approval of all Structural Engineering calculations for reinforced concrete and steel structures; and preparation, and review of Structural, Civil, and Architectural drawings for all power plant structures. This would include all structural aspects of Sargent & Lundy projects, including foundations, structural steel, reinforced concrete, air and gas duct work, prestressed concrete, siding, roofing, windows, and interior architectural work. In order to perform the above primary responsibilities, personnel from these four Divisions participate in many support activities, such as developing General Arrangements, performing design studies, reviewing procurement specifications, and reviewing vendor drawings.

Experience

Mr. Erler has been responsible for the design and analysis of all containment vessels in Sargent & Lundy nuclear power plants. He has supervised the design of prestressed and reinforced concrete containments for many plants and has been responsible for seismic analysis of these stations as well. Mr. Erler has also been active in the development of several national standards for the structural design of nuclear power plants. Through his work with professional committees he has been involved in the development of criteria for nuclear containment design and design for other extreme loads on nuclear plant structures, such as high energy line break effects and seismic excitation. Mr. Erler joined Sargent & Lundy in 1970.

Memberships
American Concrete Institute
American Society of Civil Engineers
Post-Tensioning Institute

Committees

ASME/ACI Joint Technical Committee on Concrete Pressure Vessels for Nuclear Application
ACI-348 Structural Safety

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Marble Hill 1,2	Nuclear	1175 (each)	Suspended	Public Service Indiana	Containment Design and Seismic Analysis	1973 to 1975
Clinton 1	Nuclear	985	1986	Illinois Power Company	Containment Design and Seismic Analysis	1972 to 1975
Braidwood 1,2	Nuclear	1175 (each)	1986/1987	Commonwealth Edison Company	Containment Design and Seismic Analysis	1972 to 1975
Byron 1,2	Nuclear	1175 (each)	1985/1986	Commonwealth Edison Company	Containment Design and Seismic Analysis	1971 to 1975
La Salle 1,2	Nuclear	1122 (each)	1982/1984	Commonwealth Edison Company	Containment Design and Seismic Analysis	1971 to 1975
Zimmer 1	Nuclear	839	Suspended	The Cincinnati Gas & Electric Company	Containment Design	1971 to 1975
Zion 1,2	Nuclear	1085 (each)	1973/1974	Commonwealth Edison Company	Containment Design	1971 to 1973
D.C. Cook 1,2	Nuclear	1126 (total)	1975/1978	Indiana & Michigan Electric Company	Auxiliary Building Design Reinforced on Concrete	1970 to 1971

Leonard R. Stensland

Title

Associate and Electrical Design Director
Electrical Design & Drafting Division

Education

Illinois Institute of Technology - M.S.E.E. - 1956
Illinois Institute of Technology - B.S.E.E. - 1952

Registrations

Professional Engineer:

Arkansas	Illinois	Indiana	Kentucky	Louisiana
Michigan	New York	Ohio	Texas	Wisconsin

Appointed Associate - 1969

Responsibilities

Mr. Stensland develops and monitors the effectiveness of procedures for the efficient flow of design information from the Electrical Project Engineering Division and other departments to the Electrical Design and Drafting Division in order to enhance the quality of the work and minimize the man-hours needed to perform it. He also develops and monitors the effectiveness of the Electrical Drafting Standards and the Drafting and Field Standards. Mr. Stensland is responsible for establishing and monitoring Electrical Design and Drafting offices at power plant sites; recommending hirings, promotions, transfers, terminations, and salary adjustments for the individuals at those offices; and approving expense accounts. He is responsible for negotiating, preparing, and maintaining contracts for contract personnel for Electrical Design and Drafting, for both main office assignments and power plant site assignments. In addition, he supervises the work of the Electrical Department Computer Applications Coordinator, including investigation of methods of utilizing new technology to reduce the man-hours for Electrical Department work (computers, computer-aided drafting, microfiche, aperture cards, etc.).

Experience

Mr. Stensland has 30 years of experience in the electrical engineering and design of major steam-electric generating stations, both nuclear- and fossil-fueled, and associated substations. He has held numerous responsible positions at Sargent & Lundy, including head of the Electrical Project Engineering Division and head of the Electrical Design and Drafting Division, since he joined the firm in 1952. He is currently Sargent & Lundy's specialist in transformers.

Memberships	Illinois Society of Professional Engineers National Society of Professional Engineers Institute of Electrical and Electronics Engineers - Transformer Committee
Publication	"A Study of Twin Conductor Arrangement" (coauthor Dr. E.T.B. Gross), AIEE Transactions, Vol. 72, Pt. 3 (1958)

Power Plant Design Projects

Station - Unit	Fuel	Rated Gross MW	Operating Date(s)	Client	Assignment	Assignment Date(s)
Havana 6	Coal	439	1978	Illinois Power Company	Senior Electrical Project Engineer	1974 to 1976
Newton 1	Coal	567	1977	Central Illinois Public Service Company	Senior Electrical Project Engineer	1973 to 1976
Meredosia 4	Oil	194	1975	Central Illinois Public Service Company	Senior Electrical Project Engineer	1973 to 1975
Ghent 1,2	Coal	511 (each)	1974/1977	Kentucky Utilities Company	Senior Electrical Project Engineer	1972 to 1975
Baldwin 1-3	Coal	1655 (total)	1970/1973/ 1975	Illinois Power Company	Senior Electrical Project Engineer	1968 to 1974
Coffeen 2	Coal	612	1972	Central Illinois Public Service Company	Senior Electrical Project Engineer	1970 to 1973
Kincaid 1,2	Coal	580 (each)	1967/1968	Commonwealth Edison Company	Electrical Project Engineer	1964 to 1968
Wood River 5	Coal	356	1964	Illinois Power Company	Electrical Engineer	1961 to 1964
State Line 4	Coal & Gas	325	1962	Commonwealth Edison Company	Electrical Engineer	1955 to 1961
Hennepin 2	Coal & Gas	200	1959	Illinois Power Company	Electrical Engineer	1956 to 1959

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EXHIBIT C

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

Public Service Electric and Gas Company, et al.	)	
	)	Docket No. 50-354-OL
(Hope Creek Generating Station)	)	

JOINT MOTION TO DISMISS PROCEEDING

Pursuant to published notice by the U.S. Nuclear Regulatory Commission, the Public Advocate of the State of New Jersey ("Public Advocate") filed a petition for leave to intervene and request for a hearing on the application of Public Service Electric and Gas Company, et al. ("Applicants") for an operating license for the Hope Creek Generating Station and was admitted as a party to the captioned proceeding by the Atomic Safety and Licensing Board ("Licensing Board"). The Public Advocate and Public Service have entered into a settlement agreement, a copy of which is attached hereto for the information of the Licensing Board. As part of that agreement, the Public Advocate has agreed to withdraw as a party to this proceeding. Accordingly, by their undersigned respective attorneys, pursuant to the provisions of the settlement agreement and in accordance with the provisions of 10 C.F.R. Part 2:

1. The Public Advocate hereby requests the Licensing Board for leave to withdraw as a party to this proceeding

and for dismissal of its admitted contentions.

2. The Public Advocate and Applicants hereby move the Licensing Board to enter an order in the form attached approving the withdrawal of the Public Advocate as a party to this proceeding and dismissal of its contentions.

The NRC Staff, the only other party to the proceeding, has stated that it has no objection to these motions.

Respectfully submitted,

_____
for the Public Advocate

_____
for the Applicants

February __, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges
Marshall E. Miller, Chairman
Dr. Peter A. Morris
Dr. David R. Schink

In the Matter of	)	
	)	Docket No. 50-354-OL
PUBLIC SERVICE ELECTRIC AND GAS COMPANY, et al.	)	
	)	
	)	February , 1985
(Hope Creek Generating Station)	)	

ORDER TERMINATING PROCEEDING

On February , 1985, the Public Advocate of the State of New Jersey ("Public Advocate") and Public Service Electric and Gas Company, et al. ("Applicants") submitted a pleading entitled "Joint Motion to Dismiss Proceeding". Therein these parties requested the following relief based upon a settlement agreement which had been executed between the Public Advocate and Public Service:

1. The Public Advocate requested leave to withdraw as a party to this proceeding and dismissal of its admitted contentions.

2. The Public Advocate and Applicants moved for the entry of an order approving the withdrawal of the Public Advocate as a party to this proceeding and dismissal of its contentions.

The movants stated that the NRC Staff, the only other party to the proceeding, had no objection to their motion.

Upon consideration of the Joint Motion and the entire record in this matter and pursuant to the authority contained in 10 C.F.R. Part 2, the motions of the parties are granted, and this proceeding is terminated.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

_____
Marshall E. Miller, Chairman
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland
this _____ day of February, 1985.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

Public Service Electric and Gas Company	)	
	)	Docket No. 50-354-OL
(Hope Creek Generating Station)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Joint Motion to Dismiss Proceeding", dated February 19, 1985 in the captioned matter have been served upon the following by deposit in the United States mail on this 19th day of February, 1985:

* Marshall E. Miller, Esq.
Chairman
Atomic Safety and
Licensing Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

* Dr. Peter A. Morris
Atomic Safety and
Licensing Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

** Dr. David R. Schink
Texas A&M University
Oceanography & Meteorology
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College Station, TX 77840

Atomic Safety and
Licensing Appeal Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Atomic Safety and
Licensing Board Panel
U.S. Nuclear Regulatory
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Washington, D.C. 20555

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