

HOPE CREEK GENERATING STATION
INITIAL OPERATING LICENSE REVIEW REPORT
(50-354/86-25)

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TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 FACILITY CONSTRUCTION	
2.1 Overview and Construction Status	2
2.2 Inspection Program History and Findings	2
2.3 Third Party Audits and Evaluations	9
2.4 Quality Assurance for Construction	11
2.5 Facility Construction Summary and Conclusions	12
3.0 FACILITY PREOPERATIONAL TESTING	
3.1 Overview and Testing Status	13
3.2 Inspection Program History and Findings	14
3.3 Third Party Audits and Evaluations.	15
3.4 Quality Assurance for Testing	16
3.5 Facility Preoperational Testing Summary and Conclusions	16
4.0 FACILITY PREPARATIONS FOR OPERATIONS	
4.1 Overview and Program Status	16
4.2 Inspection Program History and Findings	17
4.2.1 Facility Operations - Staffing and Programs.	17
4.2.2 Quality Assurance for Operations	18
4.2.3 Emergency Preparedness Facilities and Programs	19
4.2.4 Radiological Controls Facilities and Programs	20
4.2.5 Security Facilities and Programs	20
4.2.6 Fire Protection Facilities and Programs	21
4.2.7 Technical Specifications	21
4.3 Startup Test Program	21
4.4 Facility Preparations Summary and Conclusions	22
5.0 ALLEGATIONS	22
6.0 SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE	23
7.0 REGION I FUTURE ACTIONS	26
8.0 SUMMARY AND CONCLUSION	26

List of Enclosures

1. Special Assessment of the Quality of Construction at the Hope Creek Generating Station - Unit 1
2. SALP Evaluation Summary
3. Inspection Program Annual Breakdown
4. Inspection Report Characterization

1.0 Introduction

Hope Creek Generating Station is the third nuclear plant to be built by Public Service Electric and Gas Company (PSE&G) on the 740-acre Artificial Island site on the Delaware River in New Jersey. The plant is jointly owned by PSE&G (95%) and Atlantic City Electric Company (5%). The Construction Permit for the Hope Creek Generating Station was issued on November 4, 1974. Bechtel Power Corporation is the architect/engineer and constructor. PSE&G currently operates the Salem Generating Station, consisting of two Westinghouse Pressurized Water Reactors, adjacent to the Hope Creek site.

Hope Creek is similar to the Peach Bottom and Brown's Ferry units in that it is a Boiling Water Reactor (BWR)-4 using a Mark I containment. Except for the containment, it is also similar to the Limerick and Susquehanna units, BWR's also constructed by Bechtel. Many of the lessons learned during the construction of the Limerick and Susquehanna units and other projects have been applied to Hope Creek. Examples include design modifications to the Condensate Demineralizer System, Redundant Reactivity Control System and the Recirculation System discharge valves. Hope Creek has also reviewed the startup operating experiences of recently licensed plants in an effort to make a smooth transition from construction to operations. These reviews have enabled Hope Creek to preset many equipment controllers and to perform operator/technician training to minimize personnel errors.

Public Service Electric and Gas Company corporate management, engineering, QA, and licensing personnel are knowledgeable of the requirements associated with the design, construction and operation of a nuclear facility. This knowledge coupled with the applicant's nuclear experience has contributed positively to a high quality construction effort at Hope Creek.

NRC Region I began performing inspections at Hope Creek in 1973 and has completed about 200 inspections totalling over 12,000 hours since that time. These inspections involved observation of work in progress, examination of completed work, examination of work control documents, independent measurements and calculations, and the examination of quality records.

This report presents the basis for NRC Region I determination that the Hope Creek Generating Station has been constructed substantially in accord with Construction Permit CPPR-120, with the FSAR, and with NRC regulations, and that Public Service Electric and Gas Company is ready to assume safe operation of the facility.

This report describes the process used by the applicant to monitor and control quality of construction and preoperational testing, discusses the results of independent evaluations of the applicant's performance, and addresses both the inspection program and the Systematic Assessment of Licensee Performance (SALP) program conducted by NRC Region I. The report also discusses facility preparations for operation. Regional staff has gained sufficient information to assess the performance of

PSE&G and its major contractors and subcontractors at Hope Creek. The staff conclusion is that overall, licensee performance and compliance with NRC requirements and safety objectives have been acceptable.

This report was prepared by the Region I staff. Those statistics supplied by the utility are so noted in the text.

2.0 Facility Construction

2.1 Overview and Construction Status

Construction of the Hope Creek Generating Station (HCGS) is essentially complete. Systems not totally completed and for which deferral requests have been submitted include the area radiation monitoring solid radioactive waste, process radiation monitoring traversing in-core probe, and gaseous radioactive waste. NRR has reviewed and approved these deferral requests, and acceptable schedules for completion of these systems have been established. These systems are not needed during fuel load and their completion should not interfere with fuel load.

Senior PSE&G management has been involved at Hope Creek since its inception. This has led to PSE&G managers maintaining close contact with the conditions at the site and closely monitoring the contractors and subcontractors working at the site. PSE&G management has not hesitated to take corrective action when problems have been identified. This action has included dismissing one subcontractor for poor performance.

2.2 Inspection Program History and Findings

2.2.1 Region I Inspection Program and History

Region I inspections of construction activities at Hope Creek have been conducted in accordance with the program established by the Office of Inspection and Enforcement. The objective of these safety inspections is to obtain sufficient information through direct observation in the field, personnel interviews, and review of procedures and records to determine whether construction and installation of safety-related components, structures, and systems meet applicable requirements. A significant portion of the inspection effort is directed toward inspection of the applicant's Quality Assurance Program and its implementation in both the Preliminary and Final Safety Analysis Reports. This program has been reviewed by the NRC and accepted as documented in the appropriate Safety Evaluation Reports.

The NRC inspection program is currently performed by both resident and region-based inspectors. This program has been developed over a period of years to place emphasis on potentially generic deficiencies and on areas experience has shown to have problems.

From February 1980 to September 1985, a Senior Construction Resident Inspector was assigned to Hope Creek. In early November 1984, a Senior Operations Resident Inspector with prior resident inspector experience at an operating BWR facility was assigned to the site to specifically follow the preoperational testing program and monitor plant readiness for operations. There are currently 2 operations resident inspectors and an entry level engineer assigned to Hope Creek. The direct observation, independent verification, and daily presence of resident inspectors at the facility provide a measure of assurance that the quality of construction and testing is maintained.

Initial inspection of the applicant's QA program, performed by Region I in 1973 when the facility was originally planned for Newbold Island, identified numerous deficiencies. Followup inspections were then performed to verify implementation of the necessary changes, resulting in an acceptable QA program. NRC inspections were conducted at a frequency consistent with the pace of construction activities as work at the Hope Creek site progressed.

On February 5, 1981 a management meeting between PSE&G and NRC Region I management was conducted in the Region I office. The purpose of this meeting was to discuss ongoing performance problems of a piping subcontractor and the applicant's response to these problems. Results of the conference included additional, more aggressive applicant corrective action, and more comprehensive responses to items of noncompliance.

Region I inspection monitored activities including soils and foundations, concrete work, safety-related structures, piping, welding, electrical activities, safety-related mechanical components, instrumentation, and related areas. Enclosure 2 identifies the inspections performed, the areas inspected, and significant inspection findings. At present, about 200 inspection reports have been issued or are pending for the Hope Creek facility. A comparison of inspection hours expended at BWR facilities at a similar stage of construction (90% construction complete) is shown below:

<u>Hope Creek</u>	<u>Shoreham</u>	<u>Susquehanna 1</u>	<u>Limerick</u>
7600 Hours	6500 Hours	7100 Hours	8100 Hours

2.2.2 NRC Special Inspections

Several special team inspections have been conducted along with the normally prescribed inspection program to provide assurance of construction quality. These inspections are discussed below.

Regional Construction Team Inspection

An in-depth assessment, to gain further insight as to construction quality, was made by the Regional Construction Team Inspection (RCTI) during September 19-30, 1983. The inspection purpose was to determine the applicant's management effectiveness in directing the construction of Hope Creek. This was accomplished through in-depth examination of construction management, quality assurance and controls, engineering and design controls, construction, procurement and training. Electrical, welding and piping, and mechanical aspects were considered within the area of construction. The team (eight region-based inspectors, the senior resident inspector and a section chief) had expertise in a variety of technical disciplines. The inspection involved 707 hours of direct inspection effort at the Hope Creek site and at the offsite fabrication shop.

Construction Management - The inspection indicated that both Public Service Electric and Gas Company and Bechtel were exerting effective control of work through an adequately experienced onsite staff. PSE&G and Bechtel counterparts appeared to work well together and the decision-making managers were concentrated onsite. For example, the PSE&G Vice-President for Engineering and Construction, the Bechtel Construction Manager and representatives of the Bechtel Engineering and Design groups were all located on site and in close contact with one another. These shortened lines of communication were supplemented by a computerized management information system. The construction management organization and the high general level of performance of that organization were cited as particular strengths by the regional construction team.

Quality Assurance and Control - The program was found to be effective and to be based upon adequate policies and procedures. The PSE&G QA staff were judged to be well-qualified by education and experience. Quality Assurance surveillance and audits were well-scheduled and effectively conducted. Reports of QA activities addressed programmatic concerns and provided recommendations for corrective actions. The regional construction team cited the assignment of Bechtel Supplier QA representatives directly to the site and the Bechtel QA Tracking System as particular strengths in the area of Quality Assurance. One area of concern was lack of direct QC involvement in contractor welder qualification.

Engineering and Design Control - The Bechtel San Francisco Home Office (SFHO) Project Engineering group was heavily involved in safety-related design activities. SFHO Project Engineering was represented onsite by a Resident Project Engineering Group which had the same authority as SFHO onsite but whose actions and decisions were reviewed by the SFHO. The regional construction team found that the engineering and design control program at Hope Creek was being effectively implemented.

Construction - This area received very close scrutiny by the team. The inspection results included one violation involving a failure to identify non-conformance of cable raceways to specifications. This was deemed not to be indicative of a programmatic breakdown in construction verification. A weakness was identified in the control of rework activities after initial QC inspection.

Procurement - While the procurement of major components was performed by Bechtel SFHO, Bechtel Field Procurement purchased bulk items, piping, valves, and other related items. Additionally, Field Procurement held responsibility for receiving, storing, and controlling material obtained from the SFHO. The inspection team found the Field Procurement staff to be well-qualified for their positions and knowledgeable of the interfaces between Field Procurement and QC, QA, Field Engineering, and Supplier QA.

Training - Considerable RCTI effort was devoted to evaluating Quality Assurance training of personnel involved in the PSE&G and Bechtel quality programs. Personnel interviews and document reviews led to the conclusion that training programs met NRC requirements and adequately served site needs.

Conclusion - The overall conclusion was that the construction management performance at Hope Creek was adequate to the task at hand, with particular strengths in construction management controls, the Bechtel offsite fabrication shop activities, and supplier quality assurance. Overall weaknesses included unauthorized rework, and lack of QC involvement in contractor welder qualification, and unusual complexity in the drawings used for electrical raceway installation. The applicant corrected these weaknesses subsequent to the inspection.

Independent Non-Destructive Examination (NDE) Inspection

An independent Non-Destructive Evaluation (NDE) verification by NRC Region I was conducted during Fall 1982 using the Region's mobile NDE laboratory. The inspection involved 598 inspection hours.

The purpose of the inspection was to verify the adequacy of the applicant's quality control program for NDE through independent testing. This was accomplished by performing the same tests that the applicant had performed, and then comparing Region I results to those of the applicant. The program also performed pipe wall thickness measurements and radiographic film comparison.

The inspection sample selection was made by the regional inspectors and was designed to provide a representative sample of piping systems, components, pipe sizes, materials, and shop and field welds including ASME III Class 1, 2 and 3 welds.

The Region I examinations were performed using detailed procedures specifically written for compliance with the licensee's PSAR commitments to the ASME III Boiler and Pressure Vessel Code. The intent was to duplicate, to the extent practicable, the techniques and methods of the original examinations. The results of these independent examinations were as follows:

Radiograph (RT) - Twenty-two welds were examined by radiography using an Iridium-192 source. The weld sample included ASME III Class 1, 2 and 3 carbon and stainless steels. All welds were found acceptable.

Liquid Penetrant (PT) - Three welds and the adjacent base metal were examined by liquid penetrant. All areas examined were found acceptable.

Magnetic Particle Examination (MT) - Two ASME III Class 2 pipe welds and four American Welding Society (AWS) structural welds were examined using magnetic particle techniques. All areas examined were acceptable.

Visual Examination (VT) - Twenty-six weldments and adjacent base material were visually inspected for weld reinforcement, overall workmanship, and surface condition. All areas inspected were acceptable.

Thickness Measurement - Four welds and adjacent pipe material were examined using an ultrasonic thickness gauge. Minimum wall thicknesses were determined from ASTM standard pipe size and nominal thickness charts. All areas examined were within tolerance requirements.

The Region I independent NDE verification showed very good agreement with the applicant's determinations.

On April 8 through May 3, 1985, an additional NRC Independent Measurements Inspection was conducted. As in the initial inspection, the purpose of this examination was to verify the adequacy of the licensee's welding and nondestructive examination quality control programs. This was accomplished by duplicating those examinations required of the applicant and evaluating the results. In addition to the required examinations, several other confirmatory examinations designed to verify conformance with material specifications were performed and compared to quality assurance records. No discrepancies were identified.

2.2.3 Construction Team Inspection

An "As-Built" team inspection was conducted December 2-13, 1985. The team was composed of Region I personnel. The Technical Specification, FSAR, SER and corresponding design drawings were compared. Portions of safety systems were physically verified during walkdown inspections to compare the installed hardware to the design. Preoperational tests

and surveillance test procedures were reviewed to verify that testing has been, and will be, conducted to fulfill FSAR requirements, and prove system functionality. No significant concerns were identified. Typical examples of concerns that were identified are: 1) spacing of rigid pipe supports and velocity-limiting non-rigid supports (so-called mechanical "snubbers"), 2) minor discrepancies in elevations for anchor bolts and floor slabs on drawings, and 3) identification tags on vent valves had been inadvertently exchanged between valves to the North and South (a condition previously identified and documented by the licensee test group).

Enforcement History

The inspection program uses enforcement measures to promote adherence to regulatory requirements, reduce repeated nonconformances, and encourage self-identification and correction of nonconformances. NRC enforcement measures, that is, Notices of Violations, have been issued when necessary. The applicant has been required to respond to these Notices of Violation and provide the proposed actions to correct the nonconforming conditions and to prevent recurrence of similar violations. NRC inspectors and management have reviewed and evaluated these responses for acceptability. The inspection staff confirms, during subsequent inspections, that corrective actions are properly completed. The following table gives a comparison of the Hope Creek enforcement statistics with those of three other plants at a similar point in construction. Early enforcement actions were classified as "violations," "infractions," and "deficiencies" (in descending order of severity) while the more recent reports contain violations categorized into severity levels ranging from I to VI (again, in descending order). Below is an enforcement comparison through 90% construction completion:

<u>FACILITY</u>	<u>CPPR</u>	<u>VIOL</u>	<u>INF</u>	<u>DEF</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>TOTAL</u>
Limerick	6/19/74	0	45	20	0	0	0	11	19	5	100
Shoreham	4/14/73	0	38	6	0	0	0	17	13	1	77
Susquehanna 1	11/2/74	0	47	15	0	0	0	18	19	3	103
Hope Creek	11/2/74	0	19	5	0	0	0	19	13	2	58

In evaluating the NRC inspection enforcement history for Hope Creek, Region I has not identified any significant programmatic weaknesses in the quality of the construction of the facility since those identified during the initial program review in 1973. The comparatively low number of violations issued to Hope Creek is indicative of an overall well managed and high quality construction effort, and management responsiveness to concerns identified by the NRC.

2.2.4 Review of Construction Deficiencies

Significant deficiencies in design and construction, as defined in 10 CFR 50.55(e), are required to be reported to the NRC. The responsiveness of the applicant to this requirement, and the applicant's management attention to this reporting activity, shows a commitment to quality and an ability to identify abnormal conditions.

Continuing review by Region I indicates that the applicant's program of significant deficiency reporting is effective. This program involves a multiple sequential review of identified nonconformances and deficiencies. Reports of nonconformances, and deficiencies per 10 CFR Part 21, are initially reviewed and analyzed by the appropriate Bechtel field engineering discipline. Final screening for reportability of significant deficiencies, and corrective action in accordance with 10 CFR 50.55(e), is conducted by PSE&G Quality Assurance - Engineering and Construction. This process provides reasonable assurance that the requirements of the regulations are met. The process also provides an appropriate level of evaluation and followup to assure that the quality of construction is maintained.

To date, the applicant has evaluated 112 potentially reportable construction deficiencies. Twenty eight were determined to not be reportable. Eighty four deficiencies were reported under 10 CFR 50.55(e). Of these, 24 were subsequently withdrawn after further evaluation.

The reportable significant deficiencies cover a wide range of topics. Of the deficiencies reported the most significant involve components supplied by Bailey Control for use in the Hope Creek control room design. These problems have received extensive review by NRC Region I and NRR.

The Bailey Model 862 Logic Modules have experienced a number of problems: 1) Susceptibility to Electromagnetic Interference (EMI) with induced voltages in the input circuits causing or preventing actuations at random. This problem was resolved by changing the input impedance and adding a filter circuit on the input. 2) Susceptibility to Radio Frequency Interference (RFI) with electromagnetic fields directed at the logic cards affecting actuation. This problem is to be resolved by administrative controls on the use of radios, welding machines, and other sources of radio frequency emissions. 3) Corrosion of jumper clips on the front-panel reset pushbutton switches prevented the logic memories from assuming the correct status. This problem was resolved by doing away with the jumper clips and hard-wiring the switch circuits. 4) High humidity (>60%) could cause the logic memories to assume improper states and fail to respond to set or reset signals. This problem was resolved by increasing the gap between the printed circuit pads and very carefully cleaning the surface of the cards.

2.3 Third Party Audits and Evaluations

In addition to evaluations and audits routinely conducted by quality assurance and project management, the applicant has participated in several independent reviews. These reviews, with regard to construction, were conducted by the Institute of Nuclear Power Operations (INPO), the Joint Utility Management Audit program (JUMA), Theodore Barry & Associates and an independent design verification program (IDVP) by Sargeant and Lundy.

INPO Evaluations

A team of INPO personnel evaluated activities at Hope Creek during June and July 1984. The evaluation addressed design control processes, interfaces, and verification; control of construction processes; the quality of workmanship, quality control and assurance; and test planning, performance, and documentation. A formal report of the evaluation was prepared and presented to PSE&G in November 1984. PSE&G has reviewed the findings and recommendations and has initiated appropriate actions in response. In summary, INPO stated that the systems in place to control the quality of design and construction are being implemented effectively. NRC Region I staff have reviewed the final report and found no need to pursue additional action.

Theodore Barry & Associates - Hope Creek Generating Station Management Review

Public Service and the New Jersey Public Advocate (NJPA), in early 1985, reached an agreement on resolving contentions which the NJPA had raised before the Atomic Safety and Licensing Board (ASLB). This resolution was formalized as the Joint Agreement and Settlement, and was accepted by the ASLB. The study of project management conducted by Theodore Barry & Associates addresses certain requirements of the Joint Agreement and Settlement.

The study examined several areas including Project Management, Construction Management and Quality Assurance. The study consisted of two phases; an initial review resulting in 26 recommendations for improving management, and an update evaluating ongoing management performance and response to the initial recommendations. The overall conclusion of the review was that the Hope Creek project has been, and continues to be, a well managed project, comparing favorably with other nuclear projects. Management was responsive to the review findings, taking action on all 26 of the presented recommendations. Project and construction management were found to be involved and effective. A summary of study results regarding the preoperational test program is included in paragraph 3.3. of this report.

Independent Design Verification Program

The independent Design Verification Program was conducted by Sargent & Lundy (S&L) at the Hope Creek Generating Station (HCGS) for Public Service Electric and Gas Company (PSE&G). The purpose of the IDVP was to provide additional independent assurance that the design of HCGS met licensing requirements through a review of the technical adequacy of the design of representative HCGS systems and structures and the design process utilized on HCGS.

The IDVP was a comprehensive design review conducted in accordance with an NRC-approved Program Plan, which included an internal S&L Quality Assurance Program, and a formal Protocol governing S&L's communications with PSE&G and Bechtel Power Corporation (BPC). The review was performed by a dedicated project team comprised of qualified S&L personnel experienced in the design of nuclear power plants. Over a 6 month period, 120 engineers from every major design discipline participated in the project. The IDVP team reviewed more than 4,000 design documents, and held 31 technical meetings and 700 telephone conversations with personnel from the NRC, PSE&G, BPC, and other HCGS contractors.

The completed design work reviewed during the IDVP was found to be technically adequate. In general, the concerns identified were resolved by additional calculations and analyses or by the verification of engineering judgment used in the design. In no case was a design or hardware change required to resolve an issue raised. This constitutes evidence of the adequacy of the design of HCGS.

However, the IDVP team identified a need for additional attention to detail, accuracy, and completeness of documentation, particularly in the areas of hazards analysis, environmental qualification of equipment, and instrument setpoint, piping, and civil/structural calculations.

The conclusion from the IDVP was that completed design work reviewed during the IDVP was technically adequate and conformed to applicable licensing requirements and that ongoing programs were adequate to ensure satisfactory resolution of weaknesses that were identified. The results of the IDVP and BPC's and PSE&G's ongoing design activities provide reasonable assurance that the design process is adequate to control the HCGS design and that the overall design of the HCGS will be technically adequate and conform to the applicable licensing requirements.

Joint Utility Management Audits

The Joint Utility Management Audit (JUMA) program provides independent audits, by utility senior management, of an applicant's QA activities. This type of audit can be helpful in assuring that quality is maintained at a high level. The audits evaluate an applicant's

performance and make recommendations for improvements as deemed appropriate. Audit teams evaluated the PSE&G Quality Assurance Program performance at the Newark, New Jersey corporate offices and at the Hope Creek site. There have been six such audits. Past audits have led to improvements in such areas as: (1) nonconformance control, (2) as-built drawing development, and (3) QA audit documentation. At Hope Creek, this has resulted in a better defined approach to QA/QC coverage of the preoperational and start-up activities.

2.4 Quality Assurance for Construction

The applicant's construction quality assurance program is described in the PSAR and FSAR. This program was implemented through the Engineering and Construction Quality Assurance Manual. With the implementation of the Hope Creek Transition Plan, as described in paragraph 4.1, responsibilities were shifted from the Engineering and Construction Department to the Nuclear Department. The Nuclear Operations QA program is described in the Nuclear Quality Assurance Department Manual. In order to facilitate completion of construction QA activities under the operations QA program certain sections of the construction QA Manual were incorporated into the Nuclear QA Manual. This ensured continuity in the QA program as the project focus shifted toward operations.

Region I inspections indicate the applicant is: (1) responsive to facility construction needs and 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) as discussed in Section 2.2.2.

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 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 was initiated in 1980.
- 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 employees (past or present) was established in October 1984. The program, known 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.

Overall, Region I finds the construction program quality at Hope Creek to be acceptable. 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.

2.5 Facility Construction Summary and Conclusions

In summary, Region I has expended over 7600 hours of inspection effort evaluating the quality of construction at Hope Creek. This effort has included several special team inspections utilizing inspectors with a broad range of expertise. The findings from these inspections have indicated a well managed, quality construction program. In addition to the NRC inspection program, several third party audits and evaluations have been conducted. The results of these activities were consistent with the NRC inspection results. The results of the NRC inspection program including review of PSE&G quality assurance program, and the findings of third party audits provide adequate assurance that the Hope Creek facility has been constructed with an acceptable level of quality and in substantial accordance with NRC requirements.

3.0 Facility Preoperational Testing

3.1 Overview and Testing Status

Preoperational testing conducted prior to system turnover to Hope Creek operations consists of two phases. Phase I testing is the construction test program and is conducted by Public Service Engineering and Construction Department. Phase II is the preoperational test program conducted by the Public Service Startup Group.

The phase II testing consists of numerous component level tests and 151 integrated system preoperational tests (PTP). To date 130 of these 151 tests have been completed and results approved. Hope Creek operations has accepted for turnover 130 of these results approved tests. The balance of the PTPs are in progress, in the results review process or will be deferred until after license issuance. Those in progress or in review tests will be complete prior to issuance of a low power license. Those systems/tests which will be deferred are discussed below.

The applicant has requested deferral of construction completion, preoperational testing and post-test review of the following systems until after fuel load:

- Solid Radwaste System
- Radiation Monitoring System, Area/Process
- Traversing In-Core Probe Monitoring
- Gaseous Radwaste

Completion of the deferred work is keyed to post fuel load milestones. Detailed technical descriptions of the requested deferrals have been submitted to both NRR and Region I for review. The results of the Station Operation Review Committee and the Offsite Safety Review Group safety evaluations of the deferrals have been submitted to and reviewed by NRC. Acceptance of the applicant's deferral request is based upon the fact that all Technical Specification requirements will be satisfied and where necessary temporary systems will be installed and operable. All required area radiation monitors will be operable at fuel load, but the deferral is necessary since the entire preoperational test may not be formally approved.

PSE&G had projected a fuel load date of December 1, 1985. This date was revised to February 15, 1986 due to construction and testing delays. The February date has slipped due, in large measure, to difficulties encountered during the preoperational test program. Many systems were released for testing prior to full completion. This led to large numbers of test exceptions, since the test procedures had been based upon complete and fully operational systems. Tracking and resolving these exceptions has required expenditure of many man-hours. A related problem has been system rework and design

changes after testing. In some cases this has resulted in test invalidation, and the need for test procedure revisions and retesting.

Based upon the large number of test exceptions and the range of the identified discrepancies, Region I management determined that credit for the Mode 5 Surveillances could not be taken based upon the preop test results, as originally requested by PSE&G. The utility committed to conduct Mode 5 surveillances prior to loading fuel. The resident inspectors have been closely monitoring the surveillance testing program and reviewing the test results, with assistance from region-based specialist inspectors.

3.2 Inspection Program History and Findings

The preoperational test inspection program began October, 1984. The program was conducted by both resident and region-based specialist inspectors. Inspections conducted to verify management controls and procedures, including quality assurance programs, have not identified any significant programmatic weaknesses. Inspection of test procedures, test performance and test results has progressed consistent with the applicant's scheduled activities.

NRC preoperational test procedure review and test observation are essentially complete at this time. NRC results evaluation is also complete.

NRC review of selected test procedures indicates an acceptable level of technical adequacy. The applicant's test group is well staffed with qualified personnel. NRC observation of testing in progress showed that involvement of quality assurance was considerable. Review of test results by NRC indicates that while results appear generally adequate, the large number of in-process test changes, test exceptions, and post-test design changes creates the potential for test invalidation/inadequacies. The applicant has committed to performing the required surveillance testing without reliance on preoperational test results. This commitment, in conjunction with examination of preoperational test results provides assurance that systems will function as designed and as required by Technical Specifications.

Based on review of inspection report 766 forms, the following hours have been expended on preop test inspections at Hope Creek: over 410 inspector hours for procedure review, 455 inspector hours for test witnessing, and 208 inspector hours for test results evaluation. These numbers do not include hours devoted to programmatic inspections related to preop testing, such as QA training, etc. Observations have been conducted for portions of those preop tests where witnessing is either considered mandatory by the IE program or where the inspectors have considered that specific additional observation is warranted. In fact, the region has exceeded the IE manual requirements for witnessing preop tests inspection.

3.3 Third Party Audits and Evaluations

The applicant's Nuclear Quality Assurance group and the Engineering and Construction Quality Assurance group have performed several audits of the preoperation test program. These audits focused on program development and implementation with respect to system turnover and test performance. In addition to the internal QA audits, the applicant has undergone two independent reviews. These reviews were conducted by the Cooperative Management Audit Program and Theodore Barry & Associates.

Cooperative Management Audit Programs (CMAP)

CMAP is an organization composed of several utilities involved in the generation of nuclear power. During the period of October 14-25, 1985 a CMAP team consisting of representatives from three utilities, audited selected activities at the Salem and Hope Creek units. For Hope Creek this included review of QA involvement in the system turnover process and test program. Audit results indicated that QA involvement was evident and generally effective.

Hope Creek Generating Station Management Review

This review was conducted by Theodore Barry and Associates at the direction of PSE&G as part of an understanding between PSE&G and the New Jersey Board of Public Utilities. The background and scope of this review are discussed in more detail in paragraph 2.3 of this report. Objectives of the study as it relates to the preoperational test program included 1) construction/operation department interaction during the turnover process; 2) startup Quality Assurance program implementation; 3) the SAFETEAM program.

Results of the evaluation indicate that the turnover process was well coordinated and managed. Problems identified during turnover were well documented and effectively tracked to resolution. The Startup Quality Assurance Program was found to function effectively. Management was found to be committed to ensure quality work, and aggressively sought new methods of attaining this goal. The SAFETEAM process was evaluated and results indicated that the process was generally well organized and conducted. One concern identified was the SAFETEAM staffing levels and close out rates. A recommendation that near-term management attention be placed on improving these areas was made.

3.4 Quality Assurance for Testing

The Startup Quality Assurance program applies to "Q" designated components, systems and facilities during phase I and II testing. Startup Quality Assurance and Quality Control perform monitoring and

auditing functions in those areas applicable to the preoperational test program. The presence of Startup QA/QC throughout the preoperational test procedure review, test performance, and test results review process has been evident.

3.5 Facility Preoperational Testing Summary and Conclusions

Region I's inspections of the Hope Creek preoperational test program included programmatic reviews, test procedure reviews, test witnessing and test results evaluations. Although it appears that the somewhat premature turnover from construction to startup resulted in a large number of test changes and test exceptions, the end result appears to satisfy all regulatory requirements. In addition, the applicant's commitment to perform all mode 5 surveillance tests, with the exception of a limited number of static tests, without taking credit for preoperational tests gives an added degree of assurance that safety related systems will function as designed.

4.0 Facility Preparations for Operations

4.1 Overview and Program Status

The applicant's activities in preparation for initial fuel load were closely monitored by Region I. Facility staffing, personnel qualifications and training, procedure development and implementation, and establishment of operational organization interfaces have been reviewed. The areas reviewed and inspection findings to date are summarized in Enclosure 2. New fuel receipt commenced on September 3, 1985 and was completed on November 1, 1985. This activity was performed in a well-controlled, safe manner.

The corporate and on-site organizations for the support of Hope Creek operations were reviewed in the Safety Evaluation Report issued in October 1984. The organization proposed and reviewed at that time was found acceptable pending assignment of individuals to key managerial positions. Subsequent to the above described review the incumbent Vice President - Nuclear was replaced, and both corporate and on-site management reorganized. The staff thoroughly reviewed the final organization and has indicated that it is acceptable.

The applicant's effort to prepare for the licensing and subsequent operation of Hope Creek has been guided by, and focused through, two major documents. The Hope Creek Operational Readiness Plan identifies all major tasks required prior to fuel load, assigns applicable portions of each task to the responsible department/individual, and establishes a schedule for their completion. The Hope Creek

Transition Plan addresses the transfer of functions, people, and records necessary for the orderly transition of the Hope Creek project from its construction phase to its operations phase. Together, these two documents provide an outline of the applicant's preparation for operations.

4.2 Inspection Program History and Findings

4.2.1 Facility Operations - Staffing and Programs

Plant Operations, under the operations manager, is responsible for safe and efficient plant operation. The operations manager is responsible for managing, directing, and controlling the department activities. The operations manager ensures that plant operation complies with the facility operating license, Technical Specifications, and all government and company regulations. He ensures that a properly trained, licensed and non-licensed staff is available to provide safe and efficient operation.

Hope Creek Operations will be a separate organization from that at the neighboring Salem station. The two sites will share physical security and fire-fighting organizations, but the operations staffs will be separate organizations reporting to a common corporate Vice-President.

The applicant plans to operate Hope Creek with five shift crews. Each shift crew will be under the direction of a senior nuclear shift supervisor. Reporting to the senior nuclear shift supervisor will be a nuclear shift supervisor. Reporting to the nuclear shift supervisor will be two nuclear control operators and at least two equipment operators. The senior nuclear shift supervisor and the nuclear shift supervisor will hold senior reactor operator (SRO) licenses and the nuclear control operators will hold reactor operator licenses. In addition, the applicant intends to have an electrician, instrument and control technician, radiation protection technician, chemistry technician, and additional equipment operators and utility operators on each shift.

The applicant plans to have each shift technical advisor (STA) obtain an SRO license. In cases where the STAs are senior licensed and have a bachelor's degree in a scientific or engineering discipline, the applicant plans to use them in a dual role as a shift supervisor-engineer. If they do not meet these qualifications, there will be an STA on that shift.

The applicant plans to have on each shift a senior shift supervisor or shift supervisor who will have at least 6 months of onshift hot participation experience, including startup and shutdown experience on a boiling-water reactor. This experience has been obtained at the Susquehanna Steam Electric Station for individuals not having previous hot participation experience. Therefore, the applicant does not plan to use shift advisors.

The first set of operator and senior operator license examinations were conducted July 8 through July 17, 1985 with the following results:

- 11 SRO Candidates - 8 passed
- 8 RO Candidates - 8 passed
- 1 Inst. Cert. Candidate - 1 passed

The three SRO candidates who were unsuccessful, failed the simulator portion of the examination only. Generic strengths were recognized by all examiners in the candidates' familiarization of control panels and inplant components. This overall strength was also noted during the grading of the RO/SRO written examination. All candidates were generally familiar with plant operating procedures and operating surveillance test requirements.

The second set of license examinations was conducted during the week of October 14, 1985, with the following results:

- 13 SRO Candidates - 11 passed
- 8 RO Candidates - 6 passed
- 1 Inst. Cert. Candidate - 1 passed

The third set of license examinations was conducted during the week of February 24, 1986, with the following results:

- 12 SRO candidates - 10 passed
- 7 RO candidates - 5 passed
- 1 RO candidate is still being evaluated
- 1 Inst. Cert. candidate - 1 passed

These results are above average for cold license examinations, and indicate an effective licensed operator training program.

The Hope Creek training program benefited greatly from the existence of the Salem training program. Although each reactor site has its own unit specific simulator, the simulators and the training staffs are located in a combined training facility located in Salem, N. J. The Salem training program is fully accredited by INPO and accreditation is scheduled for Hope Creek in 1987.

Based on the examinations conducted to date, the availability of a plant specific simulator and the strength of the licensed and non-licensed operator training programs the performance of personnel examined is not expected to be a concern.

4.2.2 Quality Assurance For Operations

The quality assurance program for operations, as described in the HCGS FSAR, was reviewed in the SER and the staff concludes the QA program is in compliance with applicable NRC regulations and is acceptable for

the operations phase of the HCGS. The operational quality assurance program was implemented, in accordance with the HCGS Transition Plan, on July 28, 1985.

The NRC staff has conducted a series of inspections to assess the adequacy of the applicant's operations QA program as implemented at Hope Creek. Programs reviewed include design change and modification, surveillance, calibration, measuring and test equipment, independent review groups, equipment control, plant staff training and qualifications, procurement and maintenance. No areas of concern were identified.

4.2.3 Emergency Preparedness Facilities and Program

The HCGS SER, issued in October 1984, provided the staff's review of the Hope Creek Emergency Plan through Revision 4. In response to open and confirmatory items cited in the SER, Revisions 5 through 7 to the plan were issued. The staff review of the emergency plan through Revision 7 identified a number of additional items requiring action by PSE&G. These items are being addressed by the applicant and will be confirmed by the staff in a future supplement to the SER. Based on the review of the plan and the applicant's commitment to correct the identified deficiencies, the staff has concluded that the emergency plan is adequate.

The Hope Creek and Salem Generating Stations are located in close proximity. At present it is the applicants intention to maintain separate emergency plans for the two facilities until after issuance of the Hope Creek operating license. In the longer term the two facilities will be combined under one site emergency plan.

A preliminary Region I Emergency Preparedness appraisal was conducted in August 1985. It was determined, due to the incomplete state of the applicants emergency facilities and the numerous emergency plan changes in process, that an additional appraisal would be necessary at a later date. The additional appraisal was conducted during November 1985 and it was determined that the physical facilities and procedures were adequate to support plant operation.

The Hope Creek Generating Station has been incorporated into the Artificial Island Generating Station Offsite Radiological Emergency Preparedness Plan. This plan was exercised by the Federal Emergency Management Agency (FEMA) on October 29, 1985. There was 1 identified deficiency during the exercise which resulted from failure to complete public alerting and notification within 15 minutes of the initial evacuation decision. Officials of the State of Delaware promptly addressed and resolved this deficiency during a remedial exercise conducted on November 15, 1985. Based on the results of this exercise and the remedial exercise, FEMA considers that offsite radiological emergency preparedness is adequate to provide reasonable assurance that appropriate measures can be taken offsite to protect the health

and safety of the public living in the vicinity of the site in the event of a radiological emergency.

4.2.4 Radiological Controls Facilities and Programs

Region based inspections have assessed the applicant's chemistry, environmental monitoring, health physics, radiation monitoring and radioactive waste management programs and facilities. As discussed in section 3.1 of this report the applicant's radiation monitoring and radioactive waste processing systems are considerably behind schedule. Construction and/or startup testing of these systems will be incomplete at the time of OL issuance. The impact of these deferrals on the safe operation of the unit, and the radiological safety of persons both on and offsite, has been carefully examined by region based specialists, resident inspectors, and NRR. Sufficient portions of the deferred systems will be operable to allow safe conduct of fuel load activities and all Technical Specification requirements will be satisfied.

4.2.5 Security Facilities and Programs

The staff has reviewed the physical security and safeguards contingency plans. Preoperational inspection of the equipment and security facilities at Hope Creek has been conducted. As part of the new fuel receipt inspection team, region based specialists examined the applicant's implementation of the security plan for new fuel receipt. Resident inspectors have verified, on a sampling basis, actual implementation of this plan during fuel receipt and movement. No discrepancies have been identified.

Presently Hope Creek and Salem Generating Stations are treated as separate sites under their respective security plans. Access to each site is through a common security center, with passage from site to site only through the security center. Public Service has indicated that future plans are to combine the sites into one for security purposes. However, this action will not be completed by PSE&G until after OL issuance.

The security force at Hope Creek will be provided by the same contractor currently utilized for Salem.

The security program plans for Hope Creek were approved by NRC and the readiness review indicated no impediments to adequate implementation. Portions of the security plan were implemented on February 16, 1986, to allow the security staff to exercise the program prior to plant operations. Full security program implementation will occur just prior to receipt of an operating license.

4.2.6 Fire Protection Facilities and Programs

On May 20-24, 1985 an audit team composed of Region I and NRR representatives, and consultants conducted a joint NRR fire protection/Region I Appendix R-type audit. Fourteen items, including nine licensing related items, remained unresolved at the end of the inspection. Region I conducted a followup inspection to close the above open items and to verify proper implementation of the fire protection program. No open significant items or concerns remained at the completion of the inspection.

4.2.7 Technical Specifications (TS)

The "proof and review" copy of the Hope Creek Technical Specifications was distributed for comment in October 1985. A general review of the proof and review copy was conducted by region-based and resident inspectors. Region I comments were submitted to NRR on November 1, 1985. A technical specification team inspection composed of contractor personnel was conducted during December. System configuration, technical specifications and surveillance tests were compared to assess correctness and consistency. Both the program and procedures appear to be adequate. The final draft of the Technical Specifications was reviewed by the Region and found acceptable.

4.3 Startup Test Program

Review of the startup test program is progressing. The applicant has undertaken a program to compress the power ascension test program. The philosophy and justification for the compression have been discussed with NRR and Region I personnel. Changes to the program fall into 5 general categories:

1. replacing some testing with Technical Specification surveillance
2. deleting non-essential testing
3. simplifying some tests
4. replacing tests with data from other tests
5. deleting certain Regulatory Guide 1.68 testing

A schedule for submittals justifying the above described changes was submitted to NRR/Region I in September 1985. The applicant has, in accordance with the schedule, submitted a number of detailed technical

analyses for the proposed changes. These analyses, as well as the final test procedures, have received thorough review by both NRR and Region I.

The applicant has, in cooperation with Bechtel and General Electric, begun a program designed to identify and resolve possible problem areas which could impact the power ascension test schedule. This effort involves drawing on the General Electric/Bechtel experience base accumulated during testing at numerous other BWRs. Design, procedural and scheduling problems experienced at other sites are assessed to determine their validity for the Hope Creek design. Detailed system walkdowns are conducted by teams of PSE&G, GE, and Bechtel personnel. Through this program the applicant hopes to minimize unscheduled outage time during the test program.

Power ascension test procedures will be test run on the Hope Creek site specific simulator. These simulated test runs should aid in identifying any technical procedure inadequacies or logistics problems. The dry runs will also serve as valuable training for the operations staff and should aid in reducing the number of unplanned scrams due to operator error.

4.4 Facility Preparation for Operation Summary and Conclusions

Region I has performed readiness for operations inspections in accordance with the IE inspection program and generally found the applicant's programs to be well organized and in accordance with regulatory requirements. The areas inspected included operational staffing, training, procedures, quality assurance, fire protection, emergency preparedness, water chemistry control, radiological controls and security. The transition of project responsibility from engineering and construction to operations on December 2, 1984 promoted the development of an "operating" attitude among the applicant's staff. Because of previous licensed experience or experience gained at Susquehanna Steam Electric Station the use of shift advisors in the control room will not be required during the power ascension program. Based upon our programmatic reviews and observation of activities, Region I feels that the Hope Creek facility and staff will be ready to conduct low power operations upon completion of the preoperational test program and applicable surveillance testing.

5.0 Allegations

PSE&G initiated a program early in plant construction to handle employee concerns. The program was initially operated by QA Engineering and Construction Department. In October of 1984, early in the final phase of construction, the program was replaced by the SAFETEAM program. This was intended to reduce possible delays at the end of construction and improve overall plant quality. The SAFETEAM is responsible to the Senior Vice President, Nuclear Engineering. The manager is the only SAFETEAM

employee that works directly for PSE&G . All others work for consultants under Syndeco (a subsidiary of Detroit Edison Company). The interviewers are employed by Management Decision Systems, and the investigators by National Inspection Consultants. PSE&G believes that this type of independent organization increases employee confidence in the anonymity of the SAFETEAM process.

A special inspection of the Hope Creek employee concern program, SAFETEAM, was conducted during the week of February 3, 1986. The inspection involved 73 hours of onsite inspection by a Region I Section Chief and two inspectors. The SAFETEAM program was reviewed from a programmatic point of view and a sampling of specific concerns was inspected. It was concluded that the SAFETEAM process has done a generally satisfactory job of identifying and resolving employee concerns and that it has had a positive effect on overall plant quality and safety.

To date, 14 allegations have been received and investigated by Region I. One allegation related to seismic supports in the radwaste area was substantiated. Several other allegations were substantiated, but found to be without merit, due to a lack of nuclear safety significance. There are currently 3 allegations open at Hope Creek. Two of these are related to employee concerns previously reported to SAFETEAM and the third is related to interpretation of administrative controls which had been brought to corporate management attention. These issues remain open pending responses from the licensee.

There are no open safety concerns at this time.

6.0 Systematic Assessment of Licensee Performance (SALP)

The SALP Program was established by the NRC staff to improve the NRC regulatory program, by evaluating applicant performance in a number of functional areas and communicating those findings to the applicant via a SALP report. The SALP process serves to permit sound decisions regarding NRC resource allocation, as well as to better understand the reasons for the performance level of each applicant. This program involves an integrated subjective assessment of applicant/licensee by NRC management using inputs from Region I inspectors, NRR and NMSS project managers, and AEOD. Following the formal assessment, senior NRC regional managers meet with senior utility managers to discuss the findings of the assessment. For facilities under construction, the discussions at the management meetings are oriented toward the quality of construction practices. Potential problems identified by the SALP process are also presented and discussed by the NRC staff at these meetings, and reiterated in a formal report issued after the meeting.

Since the inception of the SALP program in late 1979, the performance of the applicant at Hope Creek has been assessed six times. SALP Boards convened on January 19, 1981; October 20, 1981; November 8, 1982; August 29, 1983; December 21, 1984; and January 16, 1986.

The first SALP addressed performance during the period from November 1, 1979 to October 31, 1980. The SALP found performance to be average in 11 of 12 functional areas evaluated. Increased inspection activity was prescribed in one area, Piping and Hangers. This was based on the number and nature of noncompliances associated with piping and hangers (all of which involved a single subcontractor), and on the finding that the applicant had not implemented effective corrective action to control that subcontractor. A management meeting was held with the applicant on April 30, 1981 to discuss NRC concerns in this regard. The applicant eventually replaced Schneider Inc., the subcontractor for containment piping erection.

The second SALP addressed performance during the period from July 1, 1980 to May 30, 1981. The SALP found performance to be "Category 1" in seven of nine functional areas, including the area of Piping and Hangers which had been rated "below average" during the preceding cycle. The areas of Safety Related Structures, Safety Related Components, Electrical, and Training which had been rated "average" during the preceding cycle were also rated "Category 1". A management meeting was held with the applicant on November 21 1981 to discuss the SALP report results.

The third SALP addressed performance during the period from September 1, 1981 to August 31, 1982. The applicant's performance was assessed as Category 1 in two of five functional areas, including Soils and Foundation, and Piping Systems and Supports. Category 2 performance was observed in the remaining three areas, indicating a decline in the areas of Containment and Structures, and Safety Related Components. No basis for assessment was found in three assessment areas.

The fourth SALP addressed performance from August 1, 1982 to July 31, 1983. Assessments were made in seven functional areas. Performance in all seven areas was judged to be either "Category 1" or "Category 2". The applicant's performance was considered to be satisfactory overall, with no major construction problems found. Performance improvements, through more thorough planning and oversight of construction activities, were suggested in the SALP report.

The fifth SALP addressed performance from August 1, 1983 to October 31, 1984. 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 programs improved this condition.

The construction 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.

The sixth SALP period addressed performance from October 31, 1984 to October 31, 1985, with a Region I SALP Board convening on January 16, 1986.

The applicant's performance was satisfactory in all areas. Project personnel displayed a quality-conscientious attitude and good safety perspective relative to completing construction, performing testing, and preparing the facility for operation. There was good management involvement in all areas, and areas requiring improvement were generally aggressively pursued.

Construction management maintained a positive attitude, was appropriately involved in resolving issues, and used a variety of approaches to maintaining quality awareness among workers. Areas needing improvement include (1) housekeeping, which has generally lagged other areas of progress, and (2) communications and interfaces among various groups having responsibilities for electrical and I&C activities.

The preoperational testing function is well-staffed with experienced personnel. Nonetheless, some problems have been noted in procedure scope and review. Procedural adherence and test control have been generally good, but have varied depending on personnel involved.

NRC inspection of the applicant's performance of preoperational tests and preparations for plant operation were not conducted during this assessment period. However, as previously indicated in section 3.2, weaknesses have been noted in the preoperational test program. As a result, credit was not given toward satisfying surveillance test requirements and Mode 5 surveillance tests will be required prior to fuel load.

SALP evaluations performed to date have found the applicant's performance to be acceptable, providing reasonable assurance that satisfactory quality is being maintained during construction of Hope Creek. The SALP currently in progress, and the subsequent assessment period will focus on preoperational testing and readiness for operation. A summary of SALP functional areas and ratings is included as Enclosure 2.

7.0 Region I Future Actions

Region I resident and specialist inspections will continue throughout the startup test program. Results evaluation will be closely monitored.

A Readiness Assessment Team inspection is currently planned for near the end of the Power Ascension Test Program and prior to commercial operation.

8.0 Summary and Conclusions

Region I has expended over 12,000 inspection hours at the Hope Creek facility and has determined that the project has been well managed with a clear focus on quality. Adequate management attention to all facets of the project and a commitment to QA/QC have been evident during the twelve years since the issuance of construction permit CPPR-120. A Regional Construction Team Inspection conducted during September 1983 concluded that construction management was adequate with particular strengths in construction management control, fabrication shop activities and supplier quality assurance. The weaknesses noted during this inspection were promptly corrected. An "As-Built" team inspection conducted during December 1985 compared the FSAR, SER, design drawings, and the proposed Technical Specifications with the as-built plant. No significant concerns were identified. Region I has not identified any significant programmatic weaknesses in the quality of construction since construction activities commenced.

A high degree of confidence in the applicant's non-destructive examination (NDE) program was established as a result of two NRC Independent Measurement inspections conducted during November 1982 and April 1985.

Region I has found the construction and preoperational testing program quality to be acceptable. Although problems have been identified with respect to the preoperational test program, the applicant has taken strong actions to provide added assurance of safety related system operability. The Region I staff has determined that PSE&G has adequately demonstrated a commitment and capability to build a quality nuclear plant.

We therefore conclude that Hope Creek Generating Station has been constructed substantially in accordance with Construction Permit CPPR-120, the FSAR and NRC requirements. We further conclude that the applicant has taken all necessary actions to permit initial license issuance.

Enclosures

1. Special Assessment of the Quality of Construction at Hope Creek Generating Station Unit 1.
2. SALP Evaluation
(Tabulation of previous SALP functional area ratings)
3. Inspection Program Annual Breakdown
(Breakdown by calendar year showing reports issued and hours of inspection per program (2512, 2513, 2514, 2515))
4. Inspection Report Characterization
(Breakdown by inspection report including general subject, and violations identified.)

ENCLOSURE 1

SPECIAL ASSESSMENT OF THE QUALITY OF CONSTRUCTION

OF HOPE CREEK GENERATING STATION

1. Region I has expended over 12000 manhours of direct inspection time at Hope Creek during the construction and preoperational test phases. These inspections have covered the applicable inspection programs and have addressed the required areas involved in facility construction. The number of inspections conducted is as follows:

<u>Year</u>	<u>Number of Inspections</u>
1973	1
1974	1
1975	2
1976	7
1977	14
1978	14
1979	10
1980	22
1981	18
1982	16
1983	18
1984	29
1985	66
(through 3/18/86)	20

2. Special inspections conducted by the Region included:
- Regional Construction Team Inspection (1983) - Inspection of overall construction management, QA and design control. One violation for failure to perform adequate QC inspection. Several general strengths and weaknesses were noted.
 - NDE Van (1982) - Verification of applicant's QC through independent testing. No findings were identified. Independent testing showed good agreement with the applicant's results.
 - NDE Van (1985) - Verification of applicant's QC through independent testing. Again no discrepancies were identified.
 - Fire Protection Audit (1985) - Joint NRR/Region I audit to determine the state of applicant compliance with fire protection commitments. Fourteen items were identified. These items were generally administrative in nature, and were subsequently resolved.

- As-Built Team Inspection (1985) - Comparison of as-built plant to the FSAR, SER, Technical Specifications and design bases. Five findings were identified. None of the items required modifications.
- 3. Region I inspectors have generally received adequate response to concerns from the applicant. Corrective actions to identified problems have been generally timely and effective.
- 4. The quality assurance and quality control organizations have adequately controlled the quality of work at Hope Creek. Public Service Electric & Gas retained review and approval rights for all contractor's inspections and work procedures. These quality assurance reviews provided the necessary measures resulting in good quality controls over safety-related structures, systems, components and materials. Early in the work process the applicant identified problems with several subcontractor QA practices. Two subcontractors were removed from the project while the QC function of a third was transferred to Bechtel.
- 5. PSE&G established a three-phase approach to obtain required quality in materials, equipment, installation, and construction. This approach results in multiple reviews of QA/QC activity during procurement, fabrication, handling, shipment, storage, cleaning, construction, installation, inspection and test of safety-related items, systems and structures.

Phase A is the Quality Control Inspection function performed by principal contractors and their subcontractors engaged in manufacture and/or construction. Both the principal contractors and their subcontractors are required to have Quality Control and Inspection Programs appropriate to the product which they fabricate or construct. They are responsible for their work and for testing, inspection, and quality control programs needed to verify and document that their completed product has the specified degree of quality.

Phase B consists of the Quality Control Surveillance function, which is performed by the principal contractors (i.e. the NSSL contractor and the architect-engineer). They are responsible for surveillance activities over their QA/QC and inspection functions and those of their subcontractors.

These principal contractors have quality groups responsible for this quality effort. Their quality groups include personnel with technical backgrounds in materials, special processes (such as welding and non-destructive testing), and in mechanical, electrical, structural, instrumentation and controls disciplines.

Phase C is the Quality Assurance Auditing function which is performed by each of the principal contractors over their own QA program and those of their subcontractors. In addition, PSE&G audits both its internal operations and those of its principal contractors in order to verify conformance to applicable Quality Assurance Programs in each case. To accomplish this the documented Quality Control programs of the principal contractors are subject to PSE&G QA review and approval.

The Quality Assurance organization is staffed with well qualified personnel. The staff consists of graduate engineers with several years of engineering or nuclear industry experience, technologists with several years of nuclear industry experience, and non-degreed technicians with several years of nuclear experience. Several of the key individuals additionally possess graduate degrees, professional engineering licenses and other industry certifications. This quality organization is functionally and administratively independent of the Hope Creek project organization.

To date, PSE&G's quality assurance personnel have, on a planned and periodic basis appropriate to the status of the design and construction activities, conducted over 140 audits and 879 surveillances. These audits have confirmed the first two levels of the quality program are working effectively to assure that the Hope Creek Generating Station will be a safe and reliable plant. (This data provided by PSE&G)

Public Service has initiated a number of additional programs designed to enhance the quality of construction and aid in the transition from construction to operations. These initiatives include:

- Development of a formal transition plan to ensure a smooth transition from construction to operations.
- A review by Bechtel QA of all past 10 CFR 21 reports to determine if any were applicable to Hope Creek.
- PSE&G QA established a program to ensure that corrective actions taken to correct past violations are still in effect.
- PSE&G established an independent program to receive and evaluate safety concerns of any site employee - either past or present. (SAFETEAM)
- A documentation and records turnover (DART) team was assembled to identify all records and schedule their format, turnover and storage location. The team contacted other utilities to learn from their experience and factored this information into their plans.
- A pride program was implemented to upgrade the morale of the Hope Creek work force. It featured attitude surveys, a suggestion program, quality awareness, work study and problem solving teams, employee recognition and improved communications.

The quality assurance program at Hope Creek has also been subject to review by several outside organizations:

- The American Society of Mechanical Engineers (ASME)

Bechtel Construction Inc. has received and maintained its ASME certification to install nuclear pressure retaining components. ASME teams audit every three years with welding being one of the major areas covered.

- Hartford Steam Boiler Inspection and Insurance Company

Hartford maintains a staff of Authorized Nuclear Inspector's (ANI) on site as required by the ASME Code. These inspectors monitor ASME related activities and have the authority to assign hold points on construction activities past which construction cannot proceed until their inspection is satisfactorily completed. In addition, Hartford supervision performs semi-annual audits of applicable Bechtel activities associated with ASME Code welding.

- Joint Utility Management Audits (JUMA)

PSE&G is a participating member in a Joint Utility Management Audit Group (JUMA). This group periodically audits the PSE&G quality assurance organization's activities. The JUMA audits are conducted by senior supervisory quality assurance personnel from other utilities.

- Institute of Nuclear Power Operations (INPO) - Construction Project Evaluation (CPE)

The INPO Construction Project Evaluation was developed as a standard method of evaluating utilities' nuclear construction programs. PSE&G supports INPO CPE and has actively participated in the development and trial of the Phase I evaluation.

- Independent Design Verification Program

PSE&G contracted Sargent and Lundy to conduct the independent design verification program at Hope Creek. The IDVP was conducted in accordance with an NRC-approved plan.

- Hope Creek Generating Station Management Review - Theodore Barry & Associates

As part of an agreement with the New Jersey Public Advocate, PSE&G contracted Theodore Barry & Associates to assess the effectiveness of the project construction management.

The above organization's evaluations, auditing and verifications of the Hope Creek project have all been positive. The ASME audits have resulted in the extension of Bechtel's ASME Certificate of Authorization. The

on-site Authorized Nuclear Inspector has verified that ASME work is done in accordance with the Code requirements. The semi-annual audits by Hartford have never identified a major problem, and all JUMA audits and INPO evaluations have concluded that the Hope Creek Station quality assurance program is effective and is being effectively implemented.

The INPO evaluations and JUMA audits go beyond verifying conformance with the established programs. INPO and JUMA also evaluate the programs and recommend improvements. PSE&G has evaluated the INPO and JUMA recommendations and has adopted many of the recommendations. The results of these outside agencies' evaluations and audits have been beneficial to PSE&G. They have reported to the Company's management on the effectiveness of the program from a different perspective and this has further increased the confidence the Company has in its quality assurance program which, in turn, leads to a higher degree of confidence in the quality.

6. The Public Service Gas & Electric Company Quality Assurance organization has the authority to stop work independent of the Construction organization and has not shown a reluctance to do so when conditions warrant this action. The following summarizes stop work actions initiated by the Quality Assurance Organization.

<u>Year</u>	<u>Description</u>	<u>Remarks</u>
1979	Lack of documented procedures for drywell knuckle installation by PDM	Proper procedures were developed with review and concurrence by PSE&G and Bechtel
1979	installation of unqualified cable	Qualification data received. A change to electrical construction specifications requiring applicable testing was issued.
1980	Lack of procedures for installation of SRV lines resulted in alignment by "cold springing"	Analysis of the effect on piping and supports was conducted. Use of "cold springing" without prior engineering approval is disallowed.
1980	Improper alignment techniques	Alignment procedures revised and applicable QC hold points added to ensure proper alignment practice.
1981	Concrete pour causes (Unit #2) bulge in drywell liner	Analysis of concrete used, damage to liner conducted. Repairs were made and evaluated.

<u>Year</u>	<u>Description</u>	<u>Remarks</u>
1981	Concrete pour causes (Unit #2) bulge in drywell liner	Similar analysis/repair. Additional procedures/precautions implemented to preclude placement overpressurization.
1982	Elimination of welding controls for electrical equipment	Review of drawings conducted to preclude misapplication of specifications.
1982	Improper modification of ASME component	Training/procedure modifications implemented to ensure proper QC involvement and weld history records are maintained.
1985	Inadequate protection of class 1E electrical equipment	Proper protective measures established. Additional training and protective measures checklists implemented.

ENCLOSURE 2

Summary of SALP Evaluations

<u>Functional Area</u>	<u>Rating (for period ending)</u>					
	<u>10/80</u>	<u>6/81</u>	<u>8/82</u>	<u>7/83</u>	<u>10/84</u>	<u>10/85</u>
1. Soils and Foundation	Avg.	---	1	1	---	
2. Piping Systems and Supports	Below Avg.	1	2	2	---	
3. Safety Related Components	Avg.	1	2	1	1	
4. Support Systems (Including HVAC & Fire Protection)	---	---	2	2	1	
5. Electrical Power Supply and Distribution	Avg.	1	---	---	2	
6. Instrument and Controls	---	---	---	2	2	
7. Licensing Activities	---	---	---	2	2	2
8. Containment Structures	Avg.	2	2	2	1	
9. Safety Related Structures	Avg.	1	*	*	*	
10. Preoperational Testing	---	---	---	---	2	2
11. Quality Assurance/Control	Avg.	2	---	---	1	1
12. Reporting	Avg.	1	---	---	---	
13. Design and Design Changes	---	1	---	---	---	
14. Training	Avg.	1	---	---	---	
15. Environmental	Avg.	---	---	---	---	
16. Management	Avg.	---	---	---	---	---
17. Concrete	Avg.	---	---	---	---	---
18. Construction Activities	---	---	---	---	---	1**
19. Electrical and I&C Construction	---	---	---	---	---	2**
20. Operational Readiness						1
21. Maintenance						2
22. Radiological Controls						2
23. Security and Safeguards						1
24. Emergency Preparedness						2

Notes: "----" indicates that this functional area was not evaluated or there was no basis for assessment during the subject period.

"*" Functional area 9 was combined with functional area 8 for evaluation purposes during these assessment period.

"**" Functional areas 18 and 19 are combinations of areas which were previously reported separately.

ENCLOSURE 3

HOPE CREEK UNIT 1 INSPECTION PROGRAM

ANNUAL BREAKDOWN (Hours)

Year	Reports	Construction	Preops.	Startup	Operations	Total
1973	1	--	--	--	--	--
1974	1	No record of hrs.	--	--	--	--
1975	2	40	--	--	--	40
1976	7	99	--	--	--	99
1977	14	207	--	--	--	207
1978	14	293	--	--	--	293
1979	10	292	--	--	--	292
1980	22	987	--	--	--	987
1981	18	901	--	--	--	901
1982	16	1922	--	--	--	1922
1983	18	1728	--	--	--	1728
1984	29	526	623	--	42	1191
1985	<u>66</u>	<u>1647</u>	<u>2374</u>	<u>61</u>	<u>78</u>	<u>4160</u>
TOTALS	218	8642	2997	61	120	11820

ENCLOSURE 4

INSPECTION SUMMARY FOR HOPE CREEK

<u>Inspection No.</u>	<u>Date/No. of Inspectors</u>	<u>Areas</u>	<u>Findings</u>
73-05	11/27-20/73 1	Meeting to outline NRC inspection functions and review of storage procedures and their implementation.	Several storage deficiencies were identified both with records and equipments.
74-02	6/19/74 1	QA program implementation	
75-01	2/4-6/75 2	Long term storage.	Storage Violations of: 10 CFR 50, Appendix Criterion XVI Criterion XVIII.
75-02	8/12-14/75 2	Long term storage and site QA activities.	
75-03	11/25-26-75 1	Determination of status of site construction and staffing and resolution of open items.	None
76-01	1/15-16 1/22/76 2	Review of receipt inspection and handling procedures for reactor pressure vessel.	None
76-02	2/24-25/76 2	Environmental.	None
76-03	3/5/76 1	Reactor vessel handling and related procedures.	None
76-04	8/19-20/76 2	Dewatering, excavation, ground water control, and foundation requirements.	None

76-05	9/22-24/76 2	QA manuals reviewed to determine the basic requirements of the QA program and consistency with PSAR commitments.	None
76-06	11/18-19/76 1	Reactor vessel handling activities.	None
76-07	12/8-10/76 12/13/76 1	Dewatering, excavation, specifications for concrete batch plant and test lab.	None
77-01	2/8-9/77 1	Document control and groundwater control procedures and site preparation work activities and quality records.	None
77-02	2/22-25/77 3/7/77 1	Inspection of the quality aspects of the excavation and dewatering work, work activities as related to foundations, concrete batch plant activities, and civil/structural lab activities.	None
77-03	3/15-16/77 1	Environmental monitoring.	None
77-04	4/20-22/77 1	Dewatering, foundations, soils testing, backfill records, batch plant and solid test lab certifications, concrete specs, and civil QC inspection plans.	None
77-05	5/5-6/77 2	Implementation of contractor's and subcontractor's QA manuals.	None
77-06	7/13-15/77 1	Reactor vessel storage and related records, implementation of concrete QA procedures.	None
77-07	7/27-29/77 1	Onsite and offsite equipment storage, Bechtel and PSE&G QA audits.	None
77-08	8/2-5/77 1	Installation of rebar and cadweld splices for reactor basemat, review of cadwelder qualifications and cadweld inspection requirements, backfill records.	None

77-09	8/9-11/77 1	QA program for primary containment	None
77-10	9/6-7/77 9/12-14/77 1	Concrete placement of basemat section of power block.	1 Violation Failure to follow procedures during concrete placement
77-11	9/27-28/77 3	Bulletin and Circular Review.	None
77-12	10/19-21/77 3	Storage and maintenance procedure reviews, installation of structural steel, storage of steel and equipment, applicant's audit program.	None
77-13	11/7-10/77 11/14/77 2	Concrete placement, cadwelding, removal of defective concrete, review of concrete records.	None
77-14	12/14/77 1	Status review of construction and schedule.	None
78-01	1/31/78 2/1-1/78 1	Concrete activities, rebar installation, ground water control records, batch plant audits.	None
78-02	2/15/78 2	In process work and records review of containment erection, storage, receiving.	None
78-03	3/8-10/78 1	Environmental	1 Violation Discharging motor oil to the river
78-04	3/15-17/78 2	M&TE program, QC and audit personnel qualification records, QC subcontractor surveillance, supports.	Improper issuance of material instruction
78-05	3/21-23/78 1	Concrete activities, concrete/soils test	None
78-06	4/11-14/78 2	QC program for reactor vessel storage, 10 CFR 21 program, vendor documentation for structural embedments, subcontractors' QA/QC procedures.	None

78-07	5/2-4/78 2	Containment erection, concrete placement, backfill.	None
78-08	5/24-25/78	Applicant's audit program, Bulletin and Circular review, Dames & Moore QA program, and 10 CFR 21 conformance program.	None
78-09	6/6-9/78 2	QC program for concrete placement, cement storage, equipment storage, structural steel documentation, CDR reporting	None
78-10	7/11-14/78 1	QC program for mechanical equipment, spacer material for structural joints.	None
78-11	7/31-8/3/78 1	Concrete placement activities, qualification and training of QC personnel, inspection of honeycomb voids in concrete partition wall.	None
78-12	8/21-23/78 3	QC program for concrete placement, storage and maintenance of reactor vessel and reactor internals.	None
78-13	10/16-18/78 1	Fabrication and installation of torus.	None
78-14	11/18-30/78 4	QC programs for piping and structural steel, weld material control, examination of radiographs, soils, concrete lab QA program and its implementation.	None
79-01	1/30-2/1/79 1	QC program for structural steel	None
79-02	2/27-3/1/79 2	QC program for installation of pipe hangers and supports, containment fabrication and erection.	None
79-03	4/16-19/79 2	QC program for fabrication and installation of containment penetrations, structural steel equipment supports, containment welding.	1 Viol. Inadequate storage of penetration pipes

79-04	9/12-14/79 1	Receipt, installation, and welding of safety-related piping.	1 Viol. Failure to perform required surface examination
79-05	6/18-21/79 4	QC program for structural welding; pipe welding; receipt and storage of equipment.	None
79-06	7/31-8/2/79 2	QC program for installation and welding of piping	None
79-07	8/25-27/79 2	Bulletin and Circular review, review of ASME Certificates of Authorization.	1 Viol. Inadequate corrective actions in response to non-conformances
79-08	10/30-11/2/79 1	Structural integrity test	None
79-09	11/26-30/79 2	Concrete placements and records, subcontractor QA program, storage and storage records of	1 Viol. Inadequate concrete repair/poor records reactor vessel and internals.
79-10	12/19/79 1	Inspection of onsite facilities for Resident Inspector's Office.	None

80-01	1/14-17/80 2	Concrete placements, hanger and small bore pipe fabrication shop, subcontractor QA program, dewatering settlement studies.	1 Viol. Inadequate documentation of conditions adverse to quality
80-02	2/4-29/80 1	Concrete related activities, reactor pressure vessel cleaning activities, sandblasting and painting inside the drywell, storage and maintenance, welding, rebar fabrication, pipe joint fitup, hanger installations, storage of radioactive sources.	1 Viol. Improper storage of materials
80-03	3/3-28/80 1	Weld rod control, equipment maintenance and construction, structural steel welding and bolting, reactor vessel nozzle modification, pipe welding, status of electrical work.	None
80-04	3/31-4/30/80 1	Reactor vessel nozzle modification, pipe welding, equipment supports, hanger and restrains, bolting, torus vent line bellows repairs, maintenance of installed equipment, concrete activities cadwelding, pipe specs, PQR's, allegation investigation involving painting.	1 Viol. Failure of QC program execution for preventing segregation of concrete
80-05	4/21-25/80 1	Reactor vessel nozzle safe end replacement, safety-related pipe welding.	None
80-06	4/23-25/80 4/29/80 1	Nonconformance control, trend analysis, and control of field change requests.	None

80-07	5/5-30/80 1	RPV nozzle modifications, vent line bellows repairs, equipment maintenance, structural steel welding, piping erection and storage, backfill, cadwelds, bioshield welding, NDE records, containment penetrations, painting. allegation.	3 Viol. Welds made without a procedure Failure to meet storage requirements for RHR and core spray pumps Failure to identify weld defects and missing records for bioshield
80-08	5/12-16/80 1	Weld material control, RPV safe end welding, pipe welding.	None
80-09	6/2-27/80 1	RPV nozzle mods, vent line bellows repair, backfill and compaction, in place storage and maintenance, installation of torus piping, structural steel installation, containment welding.	None
80-10	6/30-8/1/80 2	Backfill, pipe fitup, torus welding, NDE of bioshield, storage of materials and equipment, vent line bellows repair, drywell penetrations, structural steel installation and welding, core boring, control rod drive housing restraint beam installation, concrete repairs.	None
80-11	8/5/80 2	Information management meeting	None
80-12	8/6-9/1/80 1	Backfill, storage, vent line repairs, concrete repairs, control rod drive housing support beam installation, containment spray header installation, pneumatic testing of drywell penetrations, cadwelding, repair of defective bioshield welds, concrete placement.	None

80-13	8/26-29/80 9/2,3,9/80 1	Concrete placement for lower bioshield wall, heave/settlement program, cadweld spliced rebar test program, and dewatering activities.	None
80-14	9/2-10/5/80 2	Vent line bellows repair, structural steel installation, back-fill operations, pipe welding, equipment storage, drywell penetration testing, drawing drawing control, weld filler material control, rebar installation, and equipment lifting and handling.	3 Violations Failure to establish code basis for installation of CRDM housing support brackets Failure to establish controls over welding preheat Failure to follow bolt tensioning procedures 1 Deficiency Failure to follow procedures for issuing weld filler material
80-15	9/9/80	Cable tray installation and QA	None
80-16	10/6-11/2/80 1	Vent line bellows repair, structural steel installation, back-fill operations, pipe welding, equipment storage, rebar installation, biological shield installation, reactor vessel placement preparations, pipe support installation, NDE, and rebar splicing.	3 Violations Failure to correctly install SRV piping supports Failure to cap pipe spools Failure to identify and correct deficiencies

80-17	11/4-7/80 1	Structural steel erection and handling and installation of major components.	None
80-18	11/12-14/80 1	Receiving, storage, and maintenance of equipment, including associated QA records.	None
80-19	11/3-30/80	Valve internals inspection, structural steel welding inside containment, structural steel erection, containment upper spray header pipe support welding, storage, of piping, hangers, and equipment; pipe installation including rigging and welding, rebar installation including mechanical splicing, concrete pre-placement, placement and curing; load testing of reactor pressure vessel (RPV) lifting rig, upper bioshield welding and painting, and concrete test lab activities.	1 Violation Failure to follow procedures when making bolted connections
80-20	12/2-5/80 1	Concrete construction and inspector certification	1 Violation Improperly certified personnel
80-21	12/1/80 - 1/4/81 1	Bioshield rework, bioshield and reactor vessel placement, vent line bellows repair weld testing, structural steel welding inside containment upper spray header pipe support welding, storage of piping, hangers, and equipment; pipe installation, and concrete batch plant activities.	1 Violation Failure to maintain internal piping cleanliness
80-22	12/4,13,22 &31/80 2	QA and procedures for transporting, lifting and setting the reactor vessel.	None
81-01	1/5-2/1/81 1	Vent line bellows repair testing, pipe handling, fitup and welding, concrete placement, weld preheat in cold weather, structural steel erection, and equipment storage.	None

81-02	2/2-3/1/81 1	Structural steel erection, pipe installation and repair, equipment storage, mechanical splicing of rebar, concrete placement, and upper bioshield installation.	None
81-03	2/5/81 2	Enforcement conference-piping subcontractor performance and responses to notices of violations.	
81-04	3/2-4/5/81 3	Reactor vessel internals installation, pipe hanger installation, structural steel erection, pipe installation and repair, equipment storage and concrete placement.	2 Violations Incorrect thickness qualification Failure to radiograph in accordance with procedure
81-05	4/6-5/3/81 3	Reactor vessel internals installation, pipe hanger installation, structural steel erection and welding, pipe installation, material storage, concrete placement, and electrical installations.	1 Violation Defects in ACME Embed
81-06	4/30/81 1	SALP	NA
81-07	5/4-31/81 2	Supplier QA program, safety relief valve piping, upper bioshield welding, pipe whip restraint installation, house-keeping, equipment maintenance, and pipe hanger installation.	None
81-08	5/26-29/81 1	Structural steel erection, installation and documentation.	None
81-09	6/1-7/5/81 2	Upper bioshield welding, structural steel erection, concrete placement, Cadweld program, hanger installation, batch plant material storage, cable tray and conduit installation, and pipe installation.	None

81-10	6/18,19,22-26/81 2	Structural steel installation, component maintenance and storage, and reactor vessel installation.	1 Viol. Failure to document maintenance inspections
81-11	7/6-8/2/81 2	Hydrostatic testing, piping installation, rebar installation, backfill activities, hanger installation, concrete placement, equipment storage, electrical installation, diesel generator design, and batch plant operations.	None
81-12	8/3-31/81 1	Concrete placement, reactor vessel hold-down bolt torquing, and pipe and hanger installation.	1 Viol. Failure to adequately train pipefitters
81-13	8/14-21/81 1	Concrete placement and QA.	None
81-14	9/1-10/4/81 1	Structural steel installation, pipe and hanger installation, material storage, reactor vessel installation, HVAC duct installation, service water intake structure excavation, concrete placement.	1 Viol. Failure to add filler while welding
81-15	10/5-11/1/81 1	Pipe and hanger installation, material storage, housekeeping, service water pipe backfill, reactor vessel internals installation, service water intake structure excavation, fluid head penetration installation, and contractor QA.	None
81-16	11/2-30/81 2	Intake structure installation, rebar installation, equipment storage, housekeeping, testing of embedded piping, fire protection, and radiography.	None

81-17	11/12/81	SALP	NA
81-18	12/1/81- 1/3/82 2	Rebar splicing, structural steel installation, pipe and hanger installation, welder qualifications, cable tray installation, concrete placement, reactor internals installation, material storage, fire protection, house-keeping, and wall pour operations.	2 Viol. Failure to implement corrective action Failure to translate design basis into drawings/specifications
82-01	1/4-31/82 2	Intake structure foundation construction and design, PSAR commitment implementation, pipe and hanger installation, reactor vessel internals installation, control rod drive pipe installation, concrete placement, and response to NRC Bulletins.	1 Violation Failure to implement procedures for M&TE
82-02	1/18-22/82 2	QA performance for ongoing work in the following areas: reactor internals, reactor controls supports, HVAC, and concrete placement; QA audits and surveillance.	None
82-03	2/1-28/82 1	Intake structure foundation cleanup, equipment storage and maintenance, structural steel installation, rebar installation, and valve installation.	None
82-04	3/1-4/4/82 2	Intake structure underwater concrete placement, structural steel welding, reactor internal installation, electrical penetration installation, pipe and hanger installation, ductwork installation.	1 Violation Failure to implement weld filler material control procedure

82-05	4/5-5/2/82 1	Upper bioshield placement preparations, intake structure dewatering and concrete placement, structural steel welding, HVAC duct installation, anchor bolt installation, and electrical penetration installation.	2 Violations Failure to indicate inspection status of expansion anchor bolts Failure to initiate a design change prior to modification
82-06	5/3-31/82 2	Cable tray supports, diesel generator installation, electrical penetrations, weld qualifications, and QC inspector qualifications.	None
82-07	6/1-7/5/82 1	Installation of reactor internals, pipe and hangers, electrical penetration, and HVAC ductwork, anchor bolting, NDE, housekeeping, and QC inspector qualifications.	3 Violations Failure to bend test Nelson studs Failure to obtain excavation permit
82-08	7/6-8/1/82 1	Structural steel erection, concrete placement, service water pipe trench excavation, cable tray and support installation, pipe whip restraints, and welding.	None
82-09	8/2-9/6/82 1	Bioshield installation, concrete placement, filler metal control, hanger and pipe installation, housekeeping, polar crane assembly, diesel generator installation and structural steel erection.	None
82-10	8/30-9/2/82 1	Electrical installation, instrumentation, and field design control.	None
82-11	9/8-10/82 2	Welding on vessel internals and reactor vessel cleanliness control.	1 Violation Failure to follow cleanliness controls

82-12	9/9-10/3/82 2	Polar crane rail installation, concrete placement, pipe and support installation, HVAC duct installation, rebar installation, backfill and compaction activities, welding and NDE.	2 Violations Failure to QC to inspect MCC's Failure to control weld activities
82-13	10/4-31/82 1	Cable tray installation, HVAC ductwork installation, pipe fit-up and welding, pipe support and pipe whip restraint welding, concrete curing, and structural steel welding.	None
82-14	10/25-12/1/82 2	Mobile Van (NDE) inspection involving independent measurements to verify adequacy of welding QC and NDE program.	None
82-15	11/1-12/5/82 3	Piping and support installation, concrete curing, polar crane and reactor building dome installation, housekeeping, HVAC ductwork installation, and QA audits.	1 Violation Failure of QC to identify pipe support deficiencies
82-16	12/6/82- 1/2/83 1	Reactor internals installation, cold weather concreting, hydrostatic testing, measuring and test equipment, and expansion anchor bolt testing.	None
83-01	1/3-31/83 1	Cable tray installation, HVAC duct and support installation, materials storage, housekeeping, concrete activities, welding, and structural steel installation.	None
83-02	2/1-28/83 2	Reactor internals installation, concrete curing, equipment storage, pipe and hanger installation, and housekeeping.	1 Violation Failure to follow procedures for concrete curing
83-03	2/14-18/83 1	Design, procurement, receipt and installation of electrical components.	None

83-04	2/28-3/4/83 1	Soil compaction testing, equipment storage, and construction deficiency correction.	None
83-05	3/1-4/17/83 1	Electrical cable storage and installation, water-tight door installation, structural steel weld inspection, HVAC ductwork installation, and housekeeping,	1 Violation Failure of QC to identify HVAC ductwork deficiencies
83-06	3/14-18/83 1	Electrical component procurement, receipt inspection, qualification and installation.	None
83-07	4/18-22/83 1	Installation of electrical raceways, cables, instruments, and valves.	None
83-08	4/18-6/5/83 1	Structural steel bolting and welding, cable tray and conduit installation, reactor vessel cleanliness, materials traceability, and pipe supports.	1 Violation Failure of QC to identify weld and installation discrepancies
83-09	5/31-6/3/83 1	Electrical component and system installation and QA	None
83-10	6/6-7/4/83 1	Backfill activities, structural steel bolting and welding, housekeeping and concrete placement.	None
83-11	7/11-15,21/83 3	Pipe, pipe supports, and anchor bolts, QA/QC, and documentation of construction deficiencies.	None
83-12	7/5-31/83 1	Pipe and hanger installation, housekeeping, response to NRC Bulletins and Circulars, and training.	None
83-13	8/18-10/16/83 1	Battery charging, backfill activities, pipe and hanger installation, materials storage, and housekeeping.	None

83-14	9/19-30/83 10	Regional Construction Team Inspection of construction management, QA, design control, electrical construction, welding and piping, mechanical equipment, procurement, and training.	1 Violation Failure of QC to identify raceway non- conformances
83-15	9/19-23/83 1	Preservice inspection (PSI) activities.	None
83-16	10/17-12/4/83 1	Torus modifications, installa- tion of instrument tubing, electrical cable trays and conduits, piping, pipe supports, HVAC ductwork, housekeeping, and Construction Deficiency Reporting.	None
83-17	12/20-23/83 1	Welding and QA/QC for primary containment modifications.	None
83-18	12/4/83- 1/5/84	HVAC ductwork and support installation, rebar drawings, pipe and support installation, torus modifications, and housekeeping.	1 Violation Failure of QC to identify inadequate weld prep
84-01	1/10-13/84 2	Procurement, installation, inspection, and maintenance of electrical components and systems.	1 Violation Failure to energize diesel alternator heaters
84-02	1/9-2/20/84 1	Pipe and support installation, NRC trending, torus mods, house- keeping, documentation reviews, CDR's, potentially generic issues.	None
84-03	1/20/84 1	Corrective action on discrepan- cies identified in the original seismic analysis of the auxiliary building.	None
84-04	2/21-4/1/84 1	Torus mods, pipe and hanger installation, implementation of snubber protection program, cable pulling, housekeeping, potentially generic issues, Bulletin and Circular review.	None

84-05	5/14-6/24/84 1	Torus mods, raceway and cable installation, seismic II/I program, HVAC ductwork supports, instrumentation, housekeeping, NCR and SDR trending, hydrostatic testing, electrical terminations, pipe and hanger installation, Startup and Test program manual, CDR's.	1 Violation 4 Examples Failure to maintain ty-wrap spacing Failure to ty-wrap cables to tray Failure of QC to identify shim installation deficiencies Failure to follow rework control procedures
84-06	4/30-5/4/84 2	Pipe and support installation and related QA/QC activities.	2 Violations QC acceptance of nonconforming snubber installation Failure to notify QC of snubber removal
84-07		CANCELLED	
84-08	6/5-8/84 1	Heave/settlement measurement program records and actions taken and records generated relating to the CDR of grout intrusion into the drywell air gap.	None
84-09	6/11-15/84 4	Work observation and records associated with electrical cables and terminations and HVAC.	None
84-10	6/25-8/5/84 1	Equipment maintenance, turnover packages, seismic II/I program, instrumentation, proposed drywell mod to accommodate reactor water level sensing lines, housekeeping, CDR's, allegation investigation.	None

84-11		CANCELLED	
84-12	8/6-9/16/84 1	Hydrostatic testing, pipe hanger installation, torus sand blasting, core boring, startup group personnel qualifications, turnover packages, Bulletin and Circular review.	1 Violation, 3 Examples Failure of startup program to control action items Failure to assure test author attendance at PORC Failure to implement adequate PORC review
84-13	8/20-24/84 1	Safety-related equipment, vendor documentation and QC records of piping and equipment, QA audit records.	None
84-14		CANCELLED	
84-15	9/19-21/84 9/26-28/84 3	Piping system as-built turnover inspection, welding, PSI/ISI program.	None
84-16	9/24-28/84 3	QA program for turnover including QA/QC overview and interfacing activities.	None
84-17	10/1-4/84 2	Preoperational environmental surveillance program, radiological environmental monitoring program, meteorological program, facilities and equipment, documentation, quality assurance, and contractor programs.	None
84-18	9/17-11/4/84 1	Mechanical and piping system walkdowns, instrumentation, potentially generic issues, falsification of records of soils test lab, QA audits of turnover packages, CDR's, SAFETEAM, piping system walkdowns.	None

84-19	10/29-11/2/84 2	Preoperational QA including surveillances and audits.	None
84-20	10/30-11/1/84 2	This inspection opened the preop test program.	None
84-21	11/5-9/84 4	Work observation and quality record review of the installation of cabling and instrumentation systems and components in the areas of receipt inspection routing, storage, terminations, and maintenance.	1 Violation, 2 Examples Unsupported cable Bend radius violation
84-22	10/22/84	This was a second corporate management meeting to discuss construction status and Region I activities during the preop and startup phases.	NA
84-23	10/23-10/26/ 84 1	Preop instrumentation, management action to address previously identified problems in the instrumentation area, CDR's.	None
84-24	11/5/84-12/ 16/84 3	Routine resident inspection of construction work in progress, preoperational testing and preventative maintenance	None
84-25	11/14/84- 11/29/84 1	Preservice Inspection Program activities, personnel qualification records and QA surveillance reports	None
84-26		SALP	
84-27	12/10/84- 12/14/84 2	System turnover process and procedures	None
84-28	12/17/84- 12/20/84 3	Preoperation test program and procedures	None
84-29	12/17/84- 1/27/85 2	Routine resident inspection of preoperational test programs and ongoing construction activities	1 Violation Failure to follow test equipment control procedures

85-01	1/1/85- 1/10/85 4	Preventive maintenance and preparations for reactor vessel hydrostatic test.	1 Violation Failure to maintain storage conditions for a heat exchanger.
85-02	1/8/85- 1/10/85	Preoperational radiation protection, chemistry, and radioactive waste programs.	None
85-03	1/14/85- 1/18/85 1	Installation of safety-related instrument components and systems.	1 Violation 2 Examples of failure to follow procedures.
85-04		Cancelled	
85-05	1/28/85- 3/3/85 2	Routine resident inspection of preoperational test program and ongoing construction activities.	1 Violation Control of fluid and pipe temperatures during piping system flushes.
85-06	2/12/85- 2/15/85 4	Preoperational tests and construction work in progress.	None
85-07	2/11/85 & 2/15/85 N/A	Management Meeting on system turnover and control room design.	None
85-08	4/8/85- 5/3/85 3	Independent measurements of safety-related piping.	None
85-09		Cancelled	

85-10	3/4/85- 3/8/85 1	Safety related electrical equipment	1 Violation Failure to maintain safety related cables and trays in a safe and clean condition.
85-11	4/8/85- 4/12/85 4	Quality Assurance Program for Preoperational and Startup Testing.	None
85-12	3/1/85- 3/5/85 2	Reactor Vessel and Related Piping Hydrostatic Test.	None
85-13	3/12/85- 3/15/85 2	Preoperational test review and verification.	None
85-14	3/14/85- 4/14/85 3	Routine resident inspection of work in progress and pre-operational testing.	None
85-15	3/18/85- 3/22/85 4	Piping systems and supports, PSI	None
85-16	3/19/85- 3/25/85 1	Preoperational radiation protection program.	None
85-17	4/15/85- 4/18/85 3	Safety related electrical systems.	1 Violation Failure to perform maintenance in a timely manner.
85-18	4/16/85- 4/19/85 3	Preoperational test procedure review and verification.	None

85-19	4/15/85- 5/27/85 5	Routine resident inspection of Preoperational testing, ongoing construction work, and Emergency Planning program development.	None
85-20	4/22/85- 4/26/85 2	Class 1 small pipe and pipe supports.	None
85-21	4/29/85- 5/3/85 2	Maintenance, Surveillance, Document Control.	None
85-22	4/29/85- 5/3/85 2	Reactor Pressure Vessel Internals Installation.	None
85-23	5/13/85- 5/17/85 2	Preventive Maintenance Program and installation of safety-related electrical equipment	None
85-24	5/20/85- 5/24/85 5	Emergency Lighting and safe shutdown capability in the event of a fire	None
85-25	5/14/85- 5/17/85 2	Preoperational Security Program Review	None
85-26	6/10/85- 6/14/85 1	Preoperational Testing	None
85-27	5/28/85- 7/7/85 4	Routine resident inspection of preoperational testing and work in progress	1 Violation Failure to follow procedures for implementing preoperational tests.
85-28	6/10/85- 6/14/85 1	Pre-Service Inspection Program	None

85-29	7/8/85- 7/17/85 8	RO & SRO Initial Cold License Examinations	None
85-30	6/24/85- 6/28/85 2	Preoperational Test Program Implementation	None
85-31	6/24/85- 6/28/85 1	Soils and Foundations	None
85-32	5/8/85- 5/10/85 & 6/4/85-6/6/85 9	Review of Independent Design Verification Program	
85-33	7/8/85-7/12/ 85 & 7/15/85- 7/18/85 4	Quality Assurance Program for Operations	None
85-34	7/8/85- 7/11/85 1	Safety related electrical systems and equipment	None
85-35	7/18/85- 8/11/85 3	Routine resident inspection of Preoperational testing and ongoing construction work	1 Violation
85-36	7/22/85- 7/26/85 3	Preoperational Testing Program	None
85-37	7/30/85- 7/26/85 3	Preservice Inspection Program	None
85-38	7/30/85- 8/2/85 2	Operations Quality Assurance Program	None
85-39	8/5/85- 8/9/85 2	Instrumentation and controls support systems	None
85-40	8/12/85- 8/16/85 7	Emergency Preparedness Program Appraisal	None

85-41	8/19/85- 8/30/85 9	Readiness inspection for new fuel receipt	
85-42	8/12/85- 9/23/85 3	Routine resident inspection of New Fuel Receipt Preoperational Testing, and ongoing construction work	1 Violation Inadequate design control
85-43	8/1/85 N/A	Management Meeting on operator licensing examination results	None
85-44	9/10/85- 9/13/85 3	Preoperational Radiation Protection, Chemistry, and Radioactive Waste Program	None
85-45	9/24/85- 10/27/85 3	Routine resident inspection of new fuel receipt, preoperational testing, and ongoing construction work	1 Violation Excessive cable restraint spacing
85-46	9/23/85- 9/30/85 1	Preservice Inspection Program	None
85-47	9/25/85 and 10/1/85- 10/11/85 3	Preoperational Test Program	None
85-48	10/14/85- 10/23/85 7	Operator Licensing Examinations	None
85-49		Cancelled	
85-50		Cancelled	
85-51	10/21/85- 10/25/85 2	Instrumentation systems, components, and control circuits	2 Violations Failure to follow instructions, procedures, drawings; Inadequate design control
85-52	10/28/85- 11/15/85 1	Preoperational Radiation Protection and Radioactive Waste programs	None

85-53	10/28/85- 10/30/85 7	Observation of annual emergency exercise	None
85-54	9/30/85- 10/3/85 7	Independent Design Verification Program Final Report	None
85-55	11/4/85- 11/15/85 2	Preoperational Test Program and Startup Test Program	None
85-56	10/28/85- 12/1/85 5	Routine Resident Inspection of Preoperational testing and ongoing construction work	None
85-57	11/12/85- 11/15/85 2	Preoperational Security Program Review	None
85-58	12/2/85- 12/13/85 10	As-Built Team Inspection	None
85-59	11/18/85- 11/22/85 2	Chemical and Radiochemical Measurements Programs	None
85-60	11/18/85- 11/22/85 1	Preservice Inspection Program	None

85-61	12/1/85- 1/12/86 2	Routine Resident Inspection of Preoperational Test Program and ongoing construction activities	2 Violations Quality Control witness points bypassed and procedure changed without proper controls; final QC inspection failed to identify substandard bolt installed in flange in safety-relat- ed system
85-62	9/9/85- 9/18/85 3	Preoperational Testing and Local Leak-Rate Testing	None
85-63	12/16/85- 12/19/85 and 12/23/85 2	Heave/Settlement Measurement Program, HVAC Ductwork & Supports, Pipe Support Designs	None
85-64	12/2/85- 12/13/85 3	Technical Specification Review and As-built comparison	None
85-65	12/23/85- 1/3/86 2	Integrated Leak-Rate Test Review/witnessing	1 Violation Closure of containment isolation valve by other than normal mode of motor operation

85-66	12/30/85- 1/3/86 2	ATWS Event Followup Items, QA Records and Measuring and Test Equipment	None
86-01	1/7/86- 1/24/86 3	Fire Detection and Prevention Program	None
86-02	1/27/86- 1/31/86 and 2/3/86-2/7/ 86 & 2/14/86 3	Administrative, Operations, and Maintenance Procedures Review	None
86-03	1/7/86- 1/17/86 3	Preoperational Test Program Review	None
86-04	1/7/86- 1/10/86 and 1/13/86-1/15/86 1	Operations QA Program	None
86-05	1/13/86- 1/24/86 1	Water Chemistry Control Program Review	None
86-06	1/13/86- 2/9/86 6	Routine Resident Inspection of Preoperational Testing Activities	1 Violation Failure to fully demonstrate system functionality
86-07	1/21/86- 2/14/86	Health Physics	*
86-08	1/27/86- 1/30/86 1	Preoperational Security Program Review	None
86-09	2/3/86- 2/7/86	Emergency Planning	*
86-10	1/27/86- 2/7/86	Pre-operational Testing	*
86-11	1/27/86- 1/31/86 1	Preservice Inspection Program Review	None

86-12	2/10/86- 2/21/86	Start-up Program	
86-13	2/10/86- 2/14/86 2	Open Item Closeout and Snubber Activity Review	None
86-14	2/3/86- 2/7/86	Safeteam	*
86-15	2/10/86- 3/16/86	Routine Resident	*
86-16	2/24/86- 4/24/86	Operator Licensing	*
86-17	2/24/86- 2/28/86	Start-up Program	*
86-18	3/3/86- 3/14/86	Start-up Program	*
86-19	3/3/86- 3/6/86	Bulletin/Open Items Closeout	*
86-20	3/17/86- 4/30/86	Routine Resident	*
86-21	3/12/86- 3/21/86	Surveillance Testing/ Start-up Program	*

*Report Not Issued