U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-354/84-16
Docket No. 50-354

License No. CPPR-120

Licensee: Public Service Electric & Gas Company
80 Park Plaza - 17C
Newark, New Jersey 07101

Facility Name: Hope Creek Generating Station Unit 1

Inspection At: Hancocks Bridge, New Jersey

Inspectors: _____ 10/25/84
G. Shapuda, Lead Reactor Engineer date

_____ 10-25-84
H. F. Van Kessel, Reactor Engineer date

_____ 10-25-84
W. Oliveira, Reactor Engineer date

Approved by: _____ 10-25-84
J. G. Spraul, Acting Chief date
Engineering Programs Branch
Division of Engineering and Technical Programs

Inspection Summary: Inspection on September 24 - 28, 1984 (Report No. 50-354/84-16)

Areas Inspected: Routine unannounced inspection of the "Turnover" portion of the Quality Assurance Program for pre-operational testing including QA/QC overview and interfacing activities. The inspection involved 117 inspector hours by three region based inspectors.

Results: No violations were identified.

Details

1.0 Person Contacted

1.1 Public Service Electric and Gas Company (PSE&G)

*A. Barnabei, Principle QAE
R. Bravo, Principle Startup Engineer
S. Chawaga, Principle Staff QC
J. Cicconi, Startup Manager
J. Cox, Startup Engineer
*E. Devoy, Site Engineer
*R. Donges, Lead Engineer
C. Fuhrmeister, QA Engineer
*A. Giardino, Manager QA-Q&C
*R. Griffith, QA Engineer
S. Hilditch, QA Engineer
C. Jaffe, Startup Engineer
*M. Metcalf, QA Startup Engineer
*J. Nichols, Hope Creek Operations
*G. Owen, Plant Construction Engineer
A. Smith, Site Manager
D. Smith, Lead Startup Engineer
A. Steinberg, Principle QA Engineer
*J. Tishes, QC Supervisor
W. Valaika, Principle QA Engineer
R. Webster, Startup Director

1.2 Bechtel Power Corporation (BPC)

G. Capture, Field Engineer
*E. Cochrane, Contracts
*W. Cole, Lead Site QA Engineer
J. Danhert, Piping QA Supervisor
M. Drucker, QA Engineer
*W. Goebel, QA Engineer
*G. Goldsmith, Assistant Resident Plant Engineer
C. Headrick, QC Engineer
J. Johnanson, Assistant Projects Field Engineer
*D. Laver, System Management
D. McGrath, QC Engineer
*G. Moulten, QA Engineer
*B. Mukherjee, Resident Plant Engineer
*D. Sakers, QC Engineer
E. Steiner, QC Engineer
*R. Tringale, Field Engineer
S. Vizendy, Assistant Project QC Engineer

1.3 NRC

*W. Bateman, Senior Resident Inspector

*Denotes personnel present at exit meeting

2. QA Program for Turnover

2.1 References/Requirements

-- Hope Creek Generating Station (HCGS) FSAR Chapters 14 & 17

-- Startup Administrative Procedures (SAP) No. 3, Bechtel/Public Service Startup Interface, Rev. 1

-- SAP No. 6, Startup Quality Assurance Interface, Rev. 0

-- SAP No. 10, Startup Deviation Report Program, Rev. 3

-- Quality Control Instruction (QCI) P-100, Piping Completed Line Installation, Rev. 1

-- QCI T-1.00, Hydrostatic & Pneumatic Leak Test, Rev. 4

-- QCI P-2.00, Pipe Hanger, Support, Restraint and Shock Suppressor Installation - Final, Rev. 4

-- Specific Work Plan/Procedure (SWP/P)-112, Preparation of Field Change Order, Rev. 15

-- SWP/P-132, Installation and Checkout of Pipe Support, Rev. 4

-- SWP/P-134, Component/System Turnover to PSE&G, Rev. 1

-- SWP/P-135, Release of Equipment/Devices to PSSUG for Calibration or Testing (RFT), Rev. 0 (PSSUG is the PSE&G Startup Group)

-- SWP/P-136, Turnover of Facility to PSE&G, Rev. 3

-- SWP/P-137, Bechtel Processing and Implementation of SDR's, Rev. 1

-- Construction Quality Control Manual, Rev. 0

-- Bechtel Technical Specification P-202, Field Fabrication and Installation of Piping for Nuclear Services, Rev. 10

-- Bechtel Technical Specification P-205, Piping System Erection Fit-up Control Requirements in Power Plants, Rev. 8

-- Bechtel Technical Specification P-410(Q), Installation, Inspection and Documentation of Pipe Supports in Nuclear Services, Rev. 14

-- Bechtel Power Corporation Quality Assurance Manual, Rev. A

2.2 Program Review

2.2.1. The procedures in paragraph 2.1 were reviewed and discussed with Bechtel and licensee representatives. A presentation was also given by Bechtel and licensee representatives to describe the turnover system used at HCGS and its supporting documentation.

2.2.2 A flow/decision tree diagram was developed and licensee/Bechtel representatives were requested to review the diagram for accuracy and provide corrections and/or additional information. The final version of the diagram will be used by NRC inspectors to improve the efficiency and effectiveness of their efforts.

The following observations were made in the course of preparing the flow diagram:

2.2.2.1 Open items which must be completed prior to turnover, to perform meaningful tests on the subsystem, are identified by the system test engineer with an asterisk. These items are given priority in the completion schedule of the system and are tracked in a manually prepared Exception List.

2.2.2.2 There is only one turnover from Construction to the PSE&G Startup Group (PSSUG).

2.2.2.3 The hydrostatic tests of the piping are performed prior to system turnover. The flushing operation, however, is treated as a preoperational test.

2.2.2.4 Separate walkdowns are performed prior to hydrostatic test to determine, among other things, if the piping system is supported adequately to perform the test.

2.2.2.5 Also, separate walkdowns are performed prior to system flushing to determine if the piping system is supported adequately to sustain hydrodynamic loadings. Snubbers may be required in certain locations even though seismic snubbers are not needed yet at this stage.

2.2.2.6 There is an "8 week" (prior to the scheduled date for turn over) walkdown and a "2 week" walkdown for all subsystems and for each of the disciplines (Mechanical, Piping, HVAC, Electrical, Instrumentation and Controls). In addition, there are independent Bechtel QC walkdowns after the 2 week walkdown by the discipline for the same subsystem. The objective of the

8 week walkdown is to obtain a good status of completion record by noting what is left to be done in the Construction Punch List.

The objective of the 2 week walkdown is to verify the completion of construction of the subsystem to the point where meaningful pre-operational testing can be performed, i. e., the test results will be valid.

2.2.2.7 The Exception List is prepared after the completion of the 2 week walkdown. At that point the Construction Punch List has been reduced to manageable proportions. The Exception List, therefore, can have a more detailed format than the Construction Punch List. The System Engineer studies the remaining work items to determine if the work must be completed for his tests. If that is the case, he will identify such items with an asterisk.

2.2.3 Discussions with Bechtel's System Project Field Engineer on turnover matters related to piping revealed the following:

2.2.3.1 Systems to be hydrostatically tested have their own boundaries within the boundaries of the system to be turned over. Straddling systems across system boundaries will not be permitted.

2.2.3.2 A separate walkdown is performed for the piping to be hydrostatically tested. These walkdowns are performed by Bechtel Field Engineers as a prerequisite of the hydrostatic test procedure.

2.2.3.3 It is the Piping Hanger Engineer (PHE) who makes the decision on the adequacy of the hangers installed to support the piping and water weight during the hydrostatic test. The PHE signs the statement to that effect in the test record (check list).

2.2.3.4 The PHE does not have to prepare a separate report on what is found in this walkdown nor what corrective measures were introduced, if any, for unsatisfactory situations.

2.2.3.5 Bechtel relies heavily on the field experience of the PHE in the making of decisions with regard to adequate pipe support during hydrostatic tests. Piping analysis background is not mandatory.

2.2.3.6 Bechtel (San Francisco) does not enter into the supply of piping analysis to support the decisions of the PHE.

2.2.3.7 Comments 2.2.3.3 through 2.2.3.6 apply verbatim to the pre-flush walkdown performed after the turnover under SWP/P-134.

Exhibit D, item 6 of this procedure requires sign-off of adequate support for full flow between 35-120°F.

2.2.3.8 Deficiencies found by the PHE during the walkdown are entered into the Exception List.

2.2.4 SWP/P-1.10 and 2.10 are the initial QC phase 1 installation checks for piping and piping supports, respectively. Final installation checks described in SWP/P-1.00 and 2.00, supposedly, begin when phase 1 is completed. Construction and system turnover work activities, however, determine the sequencing of QC final inspection. SWP/P-1.00 and 2.00 recognize this. The inspector was shown an instance where initial and final checks were done concurrently.

2.3 Implementation Review

2.3.1 The inspectors witnessed three final QC piping subsystems walkdowns, a two week system turnover walkdown (prior to turnover), and a prehydro walkdown. The walkdowns were:

(1) Inspection Record (IR) 1-P-AE-01-1-P-1.00 for feedwater piping and 1-P-AE-01-P-2.00 for feedwater pipe hangars

(2) IR 1-P-AP-01-3-P-2.00 for Condensate Supply pipe hangers

(3) IR 1-P-S13-204-1-P.1.00 for Reactor Protection System Line from condenser to Pressure Transmitter N075D

(4) Pre-hydro walkdown of fuel pool piping as depicted on piping isometric drawings 1-P-EC-025, Rev. 9 and 1-P-EC-026, Rev. 7

(5) Service water system turnover walkdown as depicted on piping and instrumentation drawings M-10-1, Rev. 6 and M-15-0, Rev. 9)

The inspectors followed-up the QA walkdowns by reviewing the initial walkdown package and the corrective actions verified during the final walkdown, the qualifications of the QC inspectors, the NDE records, and the completeness of the final walkdown package.

2.3.2 It was noted that the inspection record for hanger 1P-AP 021-H16(Q) (QC file 303M-08-02) showed a PT request for a weld. The reason for this request, however, was not mentioned. The inspector was informed that the details of this request would be mentioned in the log book of the Authorized Nuclear Inspector (ANI). This log book, however, is not an official part of the record at this time and is not kept in the vault (document control center).

2.3.3 The inspector participated in a pre-hydro walkdown of fuel pool piping as depicted on piping isometric drawings 1-P-EC-025, Rev. 9, -026, Rev. 7, and 1P-EE-001, Rev. 12. This walkdown was performed under procedure T-1.00 to satisfy the prerequisites of the hydrostatic test.

These three isometric drawings represent the complete subsystem to be hydrostatically tested. The walkdown (inspection) was performed by a Bechtel QC Engineer. It was noted by the Inspector that the inspection did not cover all of the prerequisites of procedure T-1.00. The valve positions, for instance, were not checked. This check would be made by others prior to the test. The signature on the prerequisite block of the checklist would have to be qualified by taking exception for the items not covered during the inspection. The QC Engineer indicated that he would identify any such exceptions before putting his initials on the block.

Several arc strikes were found on the piping. The acceptance criteria for such damage are given in procedure T-1.00 by referencing another document. The QC engineer was not familiar with the requirement and did not have the referenced document with him. His corrective action would consist of having the damaged areas buffed and re-inspected. If residual damage was negligible, no further action would be taken. If not, an nonconformance report (NCR) would be written to determine what repair, if any, would be required.

A support (1EC-202 H10-9 on isometric drawing 1-P-E-C-026) over the shop welds of a spool piece was found to be loosened in accordance with requirement of the procedure. The Inspector asked if this loose hanger would be needed to support the piping during the hydrostatic test. The QC Engineer assumed that the PHE would have made that judgement on his pre-hydro walkdown.

2.3.4 The review of the P-1.00 and P-2.00 procedures indicated the same format as the T-1.00 procedure:

a. The checklists consist of line entries identifying general areas of inspection. For specific inspection items within a given area, the procedure refers to other documents (specific actions, procedures) by paragraph.

b. The procedures do not provide acceptance criteria for individual inspection items directly. This, again, is done by referencing other documents.

2.4 Findings

2.4.1 The most serious weakness in the turnover program appears to be

the absence of checklists with individual entries of specific inspection items requiring individual sign-off. The procedures (and check lists) only indicate the general areas of inspection and refer to other procedures to obtain the complete scope of inspection for each area and the acceptance criteria applying to the specific inspection items.

In the absence of a well defined scope of work for the inspections to be performed under the procedure and acceptance criteria, the QC Inspectors have the choice of either memorizing the information supplied by the references or carrying those references along during the inspection. It was found in one case (see 2.3.3) that the QC Inspector did not know what the acceptance criterion was for gouges and cuts in piping and could not find it in the reference material he was carrying. It was later established that there was a criterion and that the reference shown in the procedure was the correct one. The example clearly demonstrates the potential for poor quality QA/QC results and for programmatic breakdown of the same.

The licensee acknowledged this problem and is planning to take action to correct the problem. The corrective action will be reviewed during a subsequent inspection. (354/84-16-01)

2.4.2 In T-1.00, the prerequisites on the checklist are initialed by the QC Engineer in a single block after the pre-hydro walkdown inspection which is supposed to cover all of the line items. In reality he may inspect only some line items and may sign off for the entire block of activities assuming that others will perform the remaining inspections in the future or have performed them in the past under some other procedure. The valve line up prior to hydro for instance (see 2.3.3) is part of that check list. It was assumed that valve positions would be checked by others prior to the hydro. This was confirmed, but a sign-off of the prerequisite block at that point would mean the approval of a future activity. The QC Inspector may or may not record the exceptions taken on the inspection scope. The above finding indicates a generic administrative problem with the checklist format. Since this falls in the same category as 2.4.1, the corrective action will be done under the same open item (354/84-16-01)

3. QA/QC Interface and Overview Activities

3.1 References/Requirements

-- FSAR Chapter 17, Quality Assurance

-- Quality Assurance Instruction (QAI) 2-7, Qualification and Certification of Personnel, Rev. 9

-- QAI 2-11, QA Program for Phase I and II Startup, Rev. 2

-- QAI 10-1, Contractors' Site Inspection and Surveillance, Rev. 3

-- QAI 10-2, Surveillance of Balance of Plant Activities, Rev. 1

-- QAI 10-3, Surveillance Program, Rev. 0

-- QAI 11-1, Control of Testing Activities Performed by Contractors, Rev. 3

-- QAI 14-2, As-Built Verification Program, Rev. 0

-- QAI 18-1, Audits by Quality Assurance E&C, Rev. 11

-- Applicable procedures listed in Section 2.1 above

3.2 Program and Implementation Review

The procedures listed in 3.1 were reviewed, discussions and interviews were held with personnel, various activity logs and reports were reviewed, and the plant was toured to observe QA/QC overview of ongoing activities. The foregoing was to determine the level of overview effort and adequacy of personnel qualifications. Staffing, scheduling of overview activities, and quality trending were also reviewed. Additionally, QA/QC activities were observed during the two walkdowns discussed in paragraph 2.

3.3 Findings

3.3.1 The BPC onsite QC Department consists of approximately 200 technical and 20 non technical personnel. The organizational structure follows classical engineering disciplines (e.g. hangers/piping, mechanical, electrical, civil). The QC Department is responsible for inspections, review of turnover records, and participation in designated walkdowns. The latter activity includes visual re-examination of approximately ten percent of items previously accepted by QC (excluding NDE unless identified conditions warrant this).

3.3.2 The BPC onsite QA group consists of ten engineers (two are currently located at the San Francisco engineering office), and it is responsible for auditing, monitoring (i.e. QA surveillance) and performing the quality trend analysis.

The quarterly Monitoring Schedule shows the QA surveillances planned for given weeks in 47 functional activity areas. This QA overview is based on the level of ongoing activities and

therefore the observing of civil engineering activities monthly vs. welding activities weekly is to be expected at this stage of construction. Also, this QA overview is scheduled on a three shift basis when work is so planned.

Audits are conducted in 48 functional activity areas and the turnover process will be audited as an entity. The first such audit, Program Audit 30.20-1, Release of Equipment/Devices to Startup, was completed in August, 1984. A review of the audit package indicated that in-plant observations such as verification of jurisdicational/status tags were included in the audit checklist. The onsite audit group is in turn audited by an offsite Management Audit Group.

The in-line review of turnover QC documentation includes examination of approximately ten percent of previously QC accepted hardware.

Quality trending analysis is accomplished through the Quality Action Tracking System (QATS) that includes BPC, PSE&G, and NRC negative finding items. These items are reviewed by a Trend Analyst and coded (e.g. work responsibility, type of finding). The QATS analysis is used to re-direct QA/QC overview efforts toward apparent problem areas and although almost entirely quantitative in format, there is evidence that benefits are derived from its use. BPC management has emphasized the responsibility of the field engineer to present an acceptable product (i.e. system/sub system) for final QC inspection by including a performance factor to this effect in the QATS. BPC management acknowledged a statement that assigning significance to items (i.e. a qualitative factor) would result in a more sophisticated system from which improved benefits would be derived.

3.3.4 The PSE&G Engineering and Construction Quality Assurance Department under the direction of a manager is located onsite and consists of approximately 30 engineers and eight QC technicians. The department is organizationally structured into QA Services, Program and Audit (PA), QA Contractor Control, QA Construction Management (QACM), and QA Start-Up groups. The last group includes the QC technicians and will provide PSEG overview of activities occurring after turnover (this group was not reviewed). The PA and QACM groups conduct audits and QA surveillances respectively with greater emphasis placed on surveillances.

Turnover activities will be audited as an entity and the one currently in progress is expected to span two-three months. The results of this audit will be used to determine the extent and frequency of future audits. Although a major portion of

the audit is review of records, it does include verifying that selected portions of systems do indeed meet established configuration requirements, i.e. contractor decision verification.

QA surveillance is keyed to the level of ongoing activities and BPC as well as PSE&G trending analyses results. Multi-shift overview is normally scheduled as needed.

3.3.5 The PSE&G trending analysis effort includes items from BPC and the NRC. Startup deficiencies reports (SDRs) are analyzed in accordance with INPO Startup Deviation Codes and assigned a level of significance, i.e. qualitative factor. The results of quantitative vs. qualitative analysis or solely qualitative analysis are not currently analyzed. NRC findings are also analyzed and assigned a significance level, but this is utilized only by the QA Engineer coordinating licensee responses to Notices of Violations.

The histograms, pie-graphs and other visual presentations are entirely quantitative and therefore their usefulness is restricted even when presented to attendees of the quarterly BPC/PSE&G management meeting. It was also noted that a procedure for the trending analysis had not yet been issued.

No violations were identified.

4. Management Meetings

Licensee management was informed of the scope and purpose of the inspection at an entrance interview conducted on September 24, 1984. The findings of the inspection were discussed with licensee representatives during the course of the inspection. An exit interview was conducted on September 28, 1984 at the conclusion of the inspection (see paragraph 1 for attendees) at which time the findings were presented to licensee management.

At no time during this inspection was written material other than the turnover flow/decision tree diagram provided to the licensee by the inspectors.