

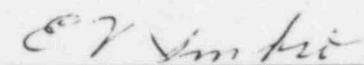
U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

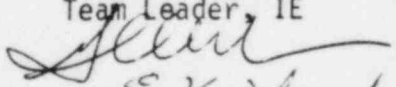
Division of Quality Assurance, Vendor, and Technical Training Center Programs

Quality Assurance Branch

Report No.: 50-354/85-32
Docket No.: 50-354
Licensee: Public Service Electric & Gas Company
Facility Name: Hope Creek Generating Station Unit 1
Inspection At: Sargent & Lundy Engineers
Chicago, Illinois
Inspection Conducted: May 8-10 and June 4-6, 1985
Inspection Team Members:
Team Leader: E. V. Imbro, Sr. Inspection Specialist, IE
Project Manager: Hai-Boh Wang, Inspection Specialist, IE
Mechanical Systems: T. DelGaizo, Consultant, WESTEC Services
Mechanical Components: J. Blackman, Consultant, WESTEC Services
Civil/Structural: G. Harstead, Consultant, Harstead Engineering
Instrumentation & Control: J. Kaucher, Consultant, WESTEC Services
Electrical Power: C. Crane, Consultant, WESTEC Services
Present at Exit Meeting: J. L. Milhoan, Section Chief, IE

Approved By:



Eugene V. Imbro
Team Leader, IE


for James L. Milhoan
Section Chief
Quality Assurance Branch

7/5/85

Date

7/5/85

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Date

HOPE CREEK UNIT 1
INDEPENDENT DESIGN VERIFICATION PROGRAM
IMPLEMENTATION INSPECTION

May 8 through 10, and June 4 through 6, 1985

1. BACKGROUND

On April 11, 1985, the NRC staff approved the Program Plan (Revision 1) for the Independent Design Verification Program (IDVP) of Hope Creek Unit 1. S&L had been retained by the applicant, Public Service Electric and Gas Company (PSE&G), to perform the IDVP for the purpose of providing additional assurance that the design of the Hope Creek Generating Station meets licensing requirements and NRC regulations through a review of the technical adequacy of selected systems and the design process, including both vertical- and horizontal-type reviews.

NRC inspection activities associated with the IDVP are as follows:

- a. An inspection at S&L with review work in progress to ensure that the program is implemented in accordance with the approved plan and also to ensure that the reviews are conducted in sufficient technical depth to achieve program objectives. (This inspection is the subject of this report).
- b. An inspection at S&L following publication of the IDVP report to review back-up information to ensure that S&L's conclusions in the report are technically supported by the documentation.
- c. An inspection of the applicant and/or the architect-engineer, Bechtel Power Corporation (BPC), to verify performance of any corrective actions resulting from the IDVP.

2. PURPOSE

The purpose of this inspection was to inspect implementation of the approved program plan and to ensure that the S&L reviews were conducted in sufficient technical depth to achieve program objectives.

3. NRC INSPECTION TEAM

The inspection was conducted by NRC personnel, with support of contractor personnel as follows:

Assignment	Name, Position
Team Leader	E. Imbro, Sr. Inspection Specialist, IE
Project Manager	H. Wang, Inspection Specialist, IE
Mechanical Systems	T. DelGaizo, Consultant, WESTEC Services
Mechanical Components	J. Blackman, Consultant, WESTEC Services
Electrical Power	C. Crane, Consultant, WESTEC Services
Instr. & Control	J. Kaucher, Consultant, WESTEC Services
Civil/Struct.	G. Harstead, Consultant, Harstead Engineering
Attended Exit Meeting	J. Milhoan, Chief, Licensing Section, QAB, IE

4. PERSONNEL CONTACTED

A large number of S&L personnel were contacted during the inspection. The following is a brief list of key personnel contacted during the inspection:

Name	Position
W. G. Hegener	Director of Engineering
Paul Wattleit	Project Director
H. S. Taylor	Chairman, Internal Review Committee
W. A. Bloss	IDVP Project Manager
E. V. Abraham	Manager, Mechanical Department
E. B. Branch	Mechanical Design Director
B. A. Erler	Structural Design Director
C. M. Chiappetta	Assistant Manager, Electrical Department
R. M. Schiavoni	Sr. Electrical Project Manager
T. J. Duffy	Structural Project Manager
D. P. White	Mechanical Project Manager
R. L. Givan	Assistant Head, C&I Division

In addition, the individual NRC Team members contacted the S&L lead discipline engineer in each of the technical discipline areas. The S&L lead discipline engineers arranged for contact with the specific S&L reviewers at the request of the NRC Team members.

5. GENERAL CONCLUSIONS

The NRC inspection was performed in two phases. The first phase was performed from May 8 through May 10, 1985 with the second phase from June 4 through 6, 1985. The first phase was essentially limited to review of plans and checklists prepared by S&L for conduct of their audit, since at the time of the NRC visit, the S&L review had just begun. The second phase focused on review of work in progress by S&L. NRC conclusions and comments from each phase of the inspection were provided orally to S&L at exit meetings held upon the conclusion of each of the phases. The general conclusions and comments provided in this report are a summary of both phases of the inspection.

- a. During the NRC's first visit, the NRC team raised questions relative to the completeness of electrical discipline checklists and the scope of the HELB/MELB review. The revised electrical checklists and the scope of the HELB/MELB review, as observed during the second NRC visit are considered to be sufficient.

- b. The detail in observation report (OR) forms reviewed by the NRC Team during the second visit was substantially improved over the first visit, particularly in the area of documenting the exact design requirement in question.
- c. Through discussions with S&L program management, the NRC understands that the following items will be incorporated in the S&L program:
 - (1) There will be a clear auditable trail from the checklists to the potential observation reports (PORs) to the observation reports (ORs) to the resolutions.
 - (2) A number of substantive field change notices (FCNs) and design change notices (DCNs) will be reviewed and their impact on the design and design process will be evaluated.
 - (3) The final report will consolidate ORs on the same specification or component in order to help focus on the areas of concern.
 - (4) The checksheets will be expanded to include space for supplemental data.

On June 5, 1985, NRC inspectors observed a meeting of the S&L Internal Review Committee, while the committee was considering various potential observation reports for possible classification as observation reports. The NRC inspectors gained valuable insight into the S&L processing of potential observation reports by attendance at this meeting.

Based on the results of this inspection, our overall observation of the Hope Creek IDVP is that the review is being conducted in a professional manner by experienced engineers. In addition, the review is being conducted at a level of detail comparable to an Integrated Design Inspection (IDI) and should be able to reach meaningful conclusions regarding the design process for the Hope Creek Generating Station.

6. SPECIFIC COMMENTS

Specific comments of each NRC discipline reviewer are provided in Attachment 1 to this report.

Attachment 1

HOPE CREEK UNIT 1

SPECIFIC DISCIPLINE COMMENTS

MECHANICAL SYSTEMS DISCIPLINE

OBS. No. 1.1 SACS Hydraulic Transient Analysis

During its review of the SACS Hydraulic Transient Analysis, S&L raised several questions regarding the process used to review and approve the document, including documentation of inputs, assumptions, review procedures, etc. BPC has preliminary indicated that back-up calculations and documentations may not be available to them (work was done by a subcontractor). Depending on BPC's ability to produce back-up documentation, an observation report questioning the design process may be appropriate.

OBS. No. 1.2 SACS Hydraulic Transient Analysis

The report references a computer code which, according to the report, has been certified as a BPC program. The S&L review should verify the appropriateness of the program.

OBS. No. 1.3 NPSH Calculation for the HPCI Pump

The calculation (BJ-1(Q), Rev 2) indicates there is very little margin (2.5 feet of water) between NPSH available and NPSH required. The calculation indicates suppression pool pressure to be 14.7 psia which is obtained from a GE process diagram as an "operating pressure". There is a question as to whether this is "minimum pressure". In view of the margin involved, this calculation is very sensitive to the value of suppression pool pressure. S&L has agreed to look at this in greater detail.

OBS. No. 1.4 Design Adequacy Specification Checklists

The checklist doesn't provide much space for reviewer comments. In some cases we observed that several pages of notes are attached to a checklist. Because of this, an audit of the back-up information supporting the S&L final report may be difficult. S&L has agreed to expand checklists to include space for supplemental data.

MECHANICAL COMPONENTS

OBS. No. 2.1 Calculation Design Process Continuity - Floor Response Spectra

The piping calculation C-1750-2Q involved the use of an enveloped floor response spectrum (EL. 102'-0" and EL. 132'-0") which was developed in a separate referenced calculation (#131-2). Calculation 131-2 did not list the result of the enveloping process. When posed with the problem of determining if the enveloping of the response spectrum was correctly performed, the S&L reviewer manually performed the enveloping and concluded that it was correct. However,

this should have resulted in a POR, in that there is an apparent gap in the flow of design information. In this case it is not possible to directly determine whether the enveloped spectrum was correctly input in the piping calculation referenced.

OBS. No. 2.2 Dispositioning of Observed Calculation Errors

During the review of Calculation C-33-2Q, the S&L reviewer determined that the transformation of nozzle load components into the local coordinate system of the nozzle had been performed improperly. The reviewer corrected the error, compared the loads to the allowable, and concluded that the nozzle design was still within allowable. However, the reviewer did not note this discrepancy in the checklist. Since one purpose of the IDVP is to reach a conclusion regarding design process, all errors should be identified so that a trend analysis of errors can be performed.

OBS. No. 2.3 Inconsistencies in Piping Design Documentation

The piping schedules in the line list of the BPC Piping Design Specification M-068 are sometimes inconsistent with the piping isometrics. The S&L reviewers determined from conversations with BPC that the isometrics govern. However, the matter should be confirmed by reviewing the documentation.

OBS. No. 2.4 Field Change Review Plans

It is understood that after discussion with S&L, the review of FCNs will address the following points:

- ° Is the problem correctly posed (i.e., does it accurately reflect the field problem)?
- ° Have all affected disciplines properly dispositioned the field change?
- ° Where judgment is used to disposition minor problems, has it been correctly applied?

STRUCTURAL DISCIPLINE

OBS. No. 3.1 Maximum Rebar Spacing of R.B. Basemat (OR-7)

Both horizontal reinforcing bars for flexure and vertical reinforcing bars for shear exceed the maximum spacing per ACI 318-71. The S&L review committee has indicated that this is not significant to safety since the capability of the mat to perform its function is not in question. It is our understanding that S&L will pursue this as a design process concern despite the apparent technical adequacy since ACI 318-71 is a licensing commitment.

OBS. No. 3.2 Reactor Building Basemat (OR-40)

The design of the basemat did not include torus uplift loading in determining design moments and shears. This raises questions of adequate anchorage and strength of supporting structures. S&L agreed that these questions would be addressed in their review.

ELECTRICAL POWER

OBS. No. 4.1 Unjustified Assumption

S&L reviewed BPC Calculation 17A(Q) to determine maximum permissible circuit length for AC Control Circuits. Calculation 17A(Q), Assumption 1, states that the operating temperature of the cable conductor is assumed to be 50 degrees C. The team noted that BPC design guide E.2.11.2.3, Section 3.1, advises that an assumed temperature of 55-60 degrees C will be adequate based on 90 degrees C rated cable. No justification was provided in calculation 17A(Q) for the use of an assumed conductor temperature of 50 degrees C in variance with the design guide. The NRC inspection team noted that S&L had not addressed this in their review. A POR was subsequently generated by S&L questioning this discrepancy.

OBS. No. 4.2 Panel Separation Criteria Evaluation

Review of the S&L developed Electrical Separation Checksheets indicates that "specific" separation criteria used in the design is not accounted for with respect to internal components in GE supplied panels. The GE design specification should be referenced in the Electrical Separation checksheets. This design specification will provide a basis for the S&L review. S&L has agreed to incorporate this item in their checksheets.

CONTROL & INSTRUMENTATION

OBS. No. 5.1 Evaluation of Setpoint Compliance with Safety Limits

The current review plans do not contain a requirement to evaluate the setpoint calculations including tolerance and calculation errors against established safety limits. S&L should assure that this is addressed in its review or indicate in its final report why this subject need not be addressed.

OBS. No. 5.2 Design Change Documents

At this point in the audit process, design changes (FCNs and DCNs) have not been reviewed, nor have specific change notices been requested. S&L should assure that the FCNs and DCNs reviewed form a representative sample. FCNs and DCNs that are reviewed should be selected by S&L.

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Local PDR

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QAVT Reading

JMTaylor

RHVollmer

BKGrimes

GTAnkrum

JLMilhoan

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JStrosnider, Region I

SDEbnetter, Region I

RHWagner, NRR

WRButler, NRR

HKister, Region I

*See previous concurrence

*IE:QAB	*IE:QAB	*IE:QAB	*IE:QAB	*IE:DIR/QAVT
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