UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

February 5, 1986

Docket Nos. 50-498
and 50-499

Houston Lighting and Power Company
ATTN: Mr. J. H. Goldberg
Group Vice President - Nuclear
P. O. Box 1700
Houston, TX 77001

Gentlemen:

SUBJECT: CONSTRUCTION APPRAISAL TEAM INSPECTION 50-498/85-21 AND 50-499/85-19

Enclosed is the report of the Construction Appraisal Team (CAT) inspection conducted by the Office of Inspection and Enforcement (IE) on October 21-November 1 and November 12-22, 1985, at the South Texas Project site. The Construction Appraisal Team was composed of members of IE, Region IV, and a number of consultants. The inspection covered construction activities authorized by NRC Construction Permits CPPR-128 and CPPR-129.

This inspection is the fourteenth in a series of construction appraisal inspections conducted by the Office of Inspection and Enforcement. The results of these inspections are being used to evaluate the management control of construction activities and the quality of construction at nuclear plants.

The enclosed report identifies the areas examined during the inspection. Within these areas, the effort consisted primarily of detailed inspection of selected hardware subsequent to quality control inspections, a review of selected portions of your Quality Assurance Program, examination of procedures and records, and observation of work activities.

Appendix A to this letter is an Executive Summary of the results of this inspection and of conclusions reached by this office. This inspection identified a number of significant deficiencies. These included hardware and design control deficiencies which in most cases resulted from weaknesses in your construction program. The significance of the identified deficiencies was generally acknowledged in the actions taken by your site organizations during and immediately after the NRC CAT inspection. These actions included: the initiation of appropriate nonconformance reports and other corrective action documentation; a voluntary stop work order for all construction and startup activities involving the modification of wiring for motor operated valves; and your notifications to our Region IV office of certain deficiencies potentially reportable under 10 CFR 50.55(e).

We are concerned by the significance, implications and the occurrence of identified deficiencies in various areas of construction which were inspected.

IE01
A001 Copy to RCPB, IE

1/1

These areas include: the modifications of wiring for motor operated valves; the uncontrolled modification of design change documents; the configuration of molded case circuit breakers with load-side terminal extensions and insulation barriers in vendor supplied motor control centers; the retrievability, location and availability of radiographic film and documentation from balance of plant suppliers; and certain quality control accepted installations of instrumentation and tubing, socket welds in 2-inch Schedule 160 piping, mechanical equipment, and bolting for structural steel sliding connections. Additional management attention is required for these and the other areas of construction discussed in Appendix A to ensure that completed installations meet design requirements and that appropriate and timely corrective action is taken to prevent the recurrence of construction program weaknesses which were the cause of the identified hardware deficiencies.

The significance of certain NRC CAT findings were mitigated due to the corrective actions you have already initiated to resolve like findings of your self-initiated pre-CAT inspection. Examples of these include: the planned corrective action for the identification of deficiencies in the separation of electrical raceways, the program improvements you have implemented for the inspection or reinspection of piping supports/restraints, and your reported plans for the reinspection of structural steel. These activities are recognized as contributing directly to providing the required assurance of the quality of construction for your project. However, we are concerned with the timeliness of some of these planned corrective actions. An example is your plan for delaying plant walkdowns for the identification of problems with electrical raceway separation and the delay in implementing the program you have developed for the identification of improper clearance between piping, supports/restraints and other hardware. The delay in implementation of these corrective actions, in our opinion, increase the likelihood of further problems and could cause delays in the satisfactory completion of construction at the South Texas Project.

We have recently received a copy of your January 10, 1986 letter to Mr. Robert D. Martin relating to actions being taken to address project areas requiring improvement. Your letter will be included as part of our continuing review of this matter.

Appendix B to this letter contains a list of potential enforcement actions based on the NRC CAT inspection. These are being reviewed by the Office of Inspection and Enforcement and the NRC Region IV Office for appropriate action. In addition, Region IV will be following your corrective action for deficiencies identified during this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room. No reply to this letter is required at this time. You will be required to respond to these findings after a decision is made regarding appropriate enforcement action.

Should you have any questions concerning this inspection, please contact us or the Region IV Office.

Sincerely,

James M. Taylor, Director
Office of Inspection and Enforcement

Enclosures:
1. Appendix A, Executive Summary
2. Appendix B, Potential Enforcement Actions
3. Inspection Report

cc w/enclosures:
See next page

cc w/enclosures:

Houston Lighting & Power Company
ATTN: Mr. M. Wisenberg, Manager
Nuclear Licensing
P. O. Box 1700
Houston, Texas 77001

Brian Berwick, Esquire
Asst. Attorney General
Environmental Protection Division
P. O. Box 12548, Capitol Station
Austin, Texas 78711

Lanny Alan Sinkin
Citizens Concerned About
Nuclear Power, Inc.
3022 Porter Street, N.W., #304
Washington, D.C. 20008

Charles Bechhoefer, Esquire
Chairman, Atomic Safety & Licensing
Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. James C. Lamb, III
313 Woodhaven Road
Chapel Hill, North Carolina 27514

Frederick J. Shon
Administrative Law Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Ray Goldstein, Esquire
Gray, Allison and Becker
100 Vaughn Building
807 Brazos
Austin, Texas 78701

Texas Radiation Control Program Director
(need to get address from Region IV)

Distribution

DCS (Docket No. 50-498 and 50-499)
NRC PDR
Local PDR
DI Reading
RCPB Reading
JMTaylor
RVollmer
JPartlow
RSpessard
BGrimes
EJordan
JAxelrad
HThompson
TNovak
VNoonan
P. Kadambi
WPaton
AEOD
OELD
NMSS
RES
ACRS (10)
NSIC
NTIS
Regional Administrators
Regional Division Directors
HBoulden, OIA
SECY
OPE
OCA (3)
VStello
HDenton
CAT Members
Resident Inspector
RHartfield
INPO
All Licensees (Distribution 1S)

[illegible]:DI:IE	RCRB:DI:IE	DD:DI:IE	DIR[illegible]:IE	DD:IE	DI[illegible]:IE
[illegible]eranich/vj	RHeishman	RSpessard	JPartlow	RVollmer	JTaylor
01/22/86	01/ /86	01/ /86	01/24/86	02/ /86	02/3 /86

Final CK. 2/5/86 H.M. Chiang

APPENDIX A

EXECUTIVE SUMMARY

An announced NRC Construction Appraisal Team (CAT) inspection was conducted at Houston Lighting and Power's South Texas Project (STP), Units 1 and 2, during the period October 21-November 1 and November 12-22, 1985.

OVERALL CONCLUSIONS

Hardware and documentation for construction activities were generally in accordance with requirements and licensee commitments. However, the NRC CAT did identify a number of hardware deficiencies that in most cases have resulted from construction program weaknesses. These include:

1. A lack of effective design change control between the architect/engineer (AE) and the nuclear steam system supplier (NSSS) which has resulted in the inability to correlate the actual wiring configuration of valve motor operators with design. The actions taken for prior site organization audit findings involving the adequacy of AE/NSSS design interface of the wiring design in another area also indicate a weakness in the application of corrective action measures. In addition, a significant number of hardware and workmanship deficiencies were identified with the wiring of motor operated valves.

2. Significant deficiencies in the configuration of Class 1E molded case circuit breakers with load-side terminal extensions and insulating barriers indicate that the licensee's inspection program was ineffective. The indicators of this ineffectiveness include source surveillance, receipt, and field cable termination inspections that failed to identify and correct these conditions.

3. A number of installation and procedural deficiencies were identified in mechanical equipment and in bolting of valve flange pipe installations for which Quality Control (QC) inspections had been completed. The omission of a vendor tolerance dimension on the installation instructions for the mounting of annubar flow probe devices indicates a weakness in the design/construction interface.

4. The numerous instances of overtightened bolts in structural steel sliding connections indicates that the licensee's installation and inspection programs were particularly ineffective in this area. Certain licensee evaluations performed during the inspection to address NRC CAT concerns are considered questionable. These include questions related to the extent the clay layer beneath the Essential Cooling Water (ECW) piping will expand pon cessation of the dewatering system and the potential of this occurrence to over stress the ECW piping, the potential for additional forces to be exerted on the Unit 2 tendon access wall due to the omission of the 3-inch seismic joint, and the effect of the practice of cross flange welding on the design strength of loaded structural steel.

5. A lack of traceability of fasteners for electrical equipment, certain vendor supplied equipment assemblies and bolting used in cable tray and conduit supports was identified by the NRC CAT. These deficiencies were magnified by the AE's change to a specification in the electrical area to delete the requirement for the manufacturers' marking on fasteners.

6. Certain areas of weakness were experienced during the inspection of design change control. In addition to the matter of motor operated valves discussed above, these included the control of the modification of design changes during their incorporation into design drawings; the undocumented use of engineering judgment in lieu of explicit or generic calculations for ensuring the adequacy of design in certain design change documents; and the conflicting definitions for configuration control packages in issued revisions of governing procedures (Bechtel, EDP 4.72 and WPP-22.0, and Ebasco, ASP-17).

7. Additional areas of weakness were found in the application of corrective action measures for the previously identified significant deficiencies in the maintenance of permanent plant equipment during the construction phase. The operations maintenance program does not address whether an identified deficiency could affect the equipment's ability to perform its design function or its operational maintenance program. Also, weakness was found in the control of "HOLD" tags.

8. Weaknesses were found in the area of nondestructive examination records for balance of plant suppliers. This included a weakness in the licensee program for audit review and acceptance of these records. In addition, after the radiographs for the reactor vessel head were discovered to be missing in May 1985, the licensee's scope of corrective actions did not address whether the records of balance of plant suppliers performing nondestructive examination activities may be similarly affected.

9. A significant number of reworked conduit installations were lacking QC reinspection for bolt torque. This indicates a weakness in the program for inspection of installations reworked after initial QC acceptance.

10. The project's response to identified deficiencies in electrical raceway separation was questioned. The decision was made to postpone further separation inspections until the time of area turnover. The NRC CAT is concerned with modifications to correct separation deficiencies that may adversely affect plant systems already accepted and turned over to startup or operations, in addition to being more difficult to identify after construction is completed. This concern was also raised by the STP pre-CAT verification team.

These construction program weaknesses indicate that additional management attention is required to assure that completed installations meet design requirements.

AREAS INSPECTED AND RESULTS

Electrical and Instrumentation Construction

The samples of electrical construction inspected generally met the applicable design requirements and installation specifications. However, several significant design and construction deficiencies in electrical construction, and numerous installation discrepancies in instrumentation construction were identified.

The configuration of molded case circuit breakers with load-side terminal extensions and insulating barriers in installed Class 1E motor control centers was found to be deficient in that the potential for phase-to-phase faulting or inadvertent circuit interruption exist. Relevant inspection activities, which had been completed, including source surveillance, receipt inspection, and field cable termination inspection did not identify these deficiencies. Additionally, the seismic qualification of equipment which exhibits this configuration could not be verified.

Hardware and workmanship deficiencies were found in all of the 16 installed motor operated valves inspected by the NRC CAT. In addition, lack of adequate design and installation control for the wiring of motor operators supplied by Westinghouse Corporation (NSSS vendor) and further modified by the architect/engineer resulted in various organizations not being supplied the required wiring configuration documents.

Numerous dimensional and workmanship deficiencies were found in the instrumentation construction sample inspected. This included an installation which had undergone the licensee's QC Effectiveness Inspection conducted after final construction QC inspection and turnover to the startup organization. Examples of these deficiencies include dimensions exceeding tolerance limits on five installations, an incorrect weld configuration on a support, a missing support clamp, and a support installed in accordance with an incorrect drawing detail. In addition, attachments were being made to existing supports without the required engineering review and approvals.

Several items of Class 1E equipment were found to deviate from their applicable specification requirements. These included the mislocation of terminal strips and fewer than the required minimum number of terminal block points in several switchgear cubicles, the absence of required vendor installed terminal lugs on three fan motors, and the incorrect insulation class for a pump motor.

The conduit strap bolts for a significant number of the conduit installations inspected did not exhibit the required torque seal. Since this is due to their removal and reinstallation without reinspection by QC, increased controls are required for inspection of rework of QC accepted conduit installations.

Mechanical Construction

Piping, pipe supports/restraints, concrete expansion anchors and heating ventilation and air conditioning hardware (supports/restraints, duct sections, fire dampers) were generally found to be installed in accordance with requirements or with deficiencies that generally had previously been identified. However, significant deficiencies were identified in two areas of piping

installation. These included the design tolerance dimension error applicable to the mounting of numerous annubar flow probes and the alternate bolting used in lugged wafer valves.

A significant number of hardware deficiencies were identified in ten of the twelve mechanical equipment items inspected. The sample of equipment was diverse and included: the reactor water makeup tank, various pumps (RHR, containment spray, and low and high head safety injection), charging pump coolers, EAB return air fan, and a fuel handling building filter. The identified deficiencies included items such as: the uncontrolled removal of specified tank cushion material (FLEXCELL), incorrect/indeterminate fastener material, missing shim for an equipment mounting pad, a damaged foundation beam flange, welding of a gussett plate to the edge of embed which exceeded specified tolerances, missing and undersized welds, and bolt holes not per drawing. The number and significance of the deficiencies identified, indicated a lack of overall effectiveness in the installation and inspection programs for mechanical equipment.

Welding and Nondestructive Examination

Welding and nondestructive examination activities were generally found to be conducted in accordance with the governing codes and specifications. However a number of examples were found where completed structural welds in pipe supports/restraints were smaller than that specified in the design drawings and some skewed welded connections were not supported by calculations. Also, a number of undersized socket welds were found in 2-inch schedule 160 piping spools.

Some vendor supplied tanks and heat exchangers were found to have undersized weld reinforcement in "nozzle to shell" and "manway to shell" joints. The NRC previously issued Information Notice 85-33 on the subject of undersized "ASME category D" joints in tanks and heat exchangers notifying the licensees of potentially significant deficiencies in this area. The NRC CAT inspectors did not find evidence that the project had reviewed the content of the information notice for applicability to their facility.

The NRC CAT inspectors also found a small number of radiographs which had unacceptable weld quality. In addition, the team encountered difficulties in retrievability and location of vendor NDE film and documentation covering the Balance of Plant (BOP). This indicated a need for a means to identify NDE requirements, and the location and existence of NDE film and documentation for BOP equipment supplied by vendors. In May 1985, the project had identified missing radiographs for the reactor head and as a result has instituted a program requiring Westinghouse to submit monthly reports concerning status and availability of NDE film and documentation. The NRC CAT findings indicate that the licensee's corrective action should have also covered the BOP suppliers.

Civil and Structural Construction

General quality of reinforced concrete construction was observed to be adequate. The issue of omission of the 3-inch seismic joint relative to the tendon access wall of the Unit 2 Reactor Containment Building at azimuth 304° and elevation (-)13 ft and 3 inches needs to be adequately evaluated and

appropriate actions taken. In general, structural steel installation appeared to be adequate. However, a high rate of deficiencies was identified in the overtightening of bolting for structural steel sliding connections for which the licensee has committed to perform a 100 percent reinspection to ensure that bolting is torqued to the proper level.

The extent to which the underlying and adjacent clay soil layer supporting the Essential Cooling Water (ECW) piping will swell when the dewatering system is discontinued remains a question which requires further review by the licensee and NRC.

Material Traceability and Control

The licensee's material traceability and control program was generally found to be acceptable. However, lack of traceability was found for fastener materials for certain large vendor supplied mechanical equipment assemblies mounted on skids and for certain electrical equipment. It was also found that engineering had deleted the requirement of the specified national standard for manufacturers marking of fasteners intended for electrical cable tray and conduit supports, which contributed to the resulting uncertainty of control and traceability during and after installation.

Design Change Control

The design change control program was determined to be generally in accordance with site procedures with several exceptions. These include:

- The deficiencies identified with respect to the installation of Westinghouse supplied motor operated valves indicates that a design control weakness exists in the AE/NSSS interface at STP.

- The controls for posting unincorporated design changes on design documents were not adequately implemented at one reference station.

- The control of modifications being made to change documents upon their incorporation into the design drawings. Identified changes to the original scope or technical content of the change document were not being adequately documented, reviewed and approved.

- The conflicting definitions for configuration control packages in issued revisions of governing procedures of the AE and constructor organizations.

Corrective Action Systems

Appropriate corrective action systems and procedures were generally found to be in place except for certain areas. These include: weaknesses in areas involving control of fastener materials, preventive maintenance, audits and records of radiographs, unidentified deficiencies with certain electrical items (motor operated valves, motor control centers, and instrumentation construction), and control of "HOLD" tags.

APPENDIX B

POTENTIAL ENFORCEMENT ACTIONS

As a result of the NRC CAT inspection of October 21-November 1 and November 12-22, 1985 at the South Texas Project site, the following items are being referred to Region IV as Potential Enforcement Actions. Section references are to the detailed portion of the inspection report.

1. 10 CFR 50 Appendix B, Criterion III, as implemented by the South Texas Project (STP) Quality Assurance Plan (QAP) Section 3.0, requires that measures be established for the identification and control of design interfaces and coordination among design organizations. These measures shall include the review, approval, release, distribution, and revision of documents involving design interfaces.

   Contrary to these requirements, at the time of this inspection:

   a. The licensee failed to provide adequate interface between the design organizations (architect/engineer (AE), and the nuclear steam system supplier (NSSS)), and the organizations performing the physical work. This was evidenced by the inability of the licensee to provide a design baseline wiring drawing for NSSS supplied motor operated valves, the AE's revised designs not being provided to the NSSS for their review and incorporation into NSSS drawings, and the inability to correlate the actual wiring with current design documents. (Section II.B.3.b.(8))

   b. Vendor tolerance requirements for the mounting dimension of the annubar flow probe on essential cooling water piping were not included on installation drawings and subsequently a number of annubar mounting flanges were mislocated with respect to the distance from the pipe outer wall. (Section III.B.1.b).

2. 10 CFR 50 Appendix B, Criterion III, as implemented by the STP QAP Section 3.0, requires that design control measures provide for verifying or checking the adequacy of design and that design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design.

   Contrary to these requirements, at the time of this inspection:

   a. The licensee could not provide calculations or documented engineering judgment to substantiate the design adequacy of the addition of four bays of structural steel detailed on the November 5, 1984 revision of Bechtel drawing No. 3M01-9-S-4043. (Section VII.B.3.b.(5))

   b. Six field change request (Nos. BC-01202, CC-03426, CC-04949, CC-04461, BS-1-0194, and BS-1-0235) and one drawing change notice (No. 7) were modified upon incorporation into the design drawings without being adequately reviewed, approved and documented to reflect changes in technical content or scope. (Section VII.B.3.b.(2))

3. 10 CFR 50 Appendix B, Criteria VII, as implemented by the STP QAP Section 7.0., requires that measures be established to assure that purchased equipment conform to the procurement documents. These measures shall provide objective evidence of the quality furnished by the contractor or subcontractor.

   Contrary to these requirements, at the time of this inspection:

   a. The licensee failed to identify the deficiencies in the bolting of load-side terminal extensions and in the insulating barriers supplied with certain molded case breakers in motor control centers. These deficiencies have the potential for causing phase-to-phase faulting or inadvertent circuit interruption. Further, the licensee was not able to confirm that the load-side terminal extensions or insulating barriers were seismically qualified. (Section II.B.3.b.(4))

   b. The NRC CAT inspectors found several deficiencies in vendor supplied components. The deficiencies included undersized welds in tanks and heat exchangers and radiographs which did not have the required weld and film quality. These also include 5KV switchgear cubicles with mislocated terminal strips and terminal blocks with less than the minimum required terminal points, fan motors which did not have the required vendor installed terminal lugs, and a pump motor without the required class of insulation. (Sections II.B.3.b and IV.B.10.b with Table IV-5 and Table IV-6)

4. 10 CFR 50 Appendix B, Criterion VII, as implemented by the STP QAP Section 7.0, requires documentary evidence that material and equipment conform to the procurement requirements shall be available at the plant site prior to installation or use of such material and equipment. This documentary evidence shall be retained at the nuclear power plant site and be sufficient to identify the specific requirements, such as codes, standards, or specifications, met by the purchase material and equipment.

   Contrary to the requirements, at the time of this inspection the licensee could not determine the location of NDE film and documentation required by engineering specifications as documented evidence of the quality of welding for equipment and hardware procured from various vendors for the balance of plant equipment. (Section IV.B.10.b)

5. 10 CFR 50 Appendix B, Criterion VIII, as implemented by the STP QAP Section 8.0, requires that measures be established for the control of materials, parts and components to prevent the use of incorrect or defective items.

   Contrary to these requirements, at the time of this inspection it was determined that traceability and control of some fasteners, including bolting for mechanical and electrical equipment of various types, and the unmarked bolting for electrical cable tray and conduit supports, has not been adequate to assure the use of correct materials. Also, the deletion of the requirement for marking of fasteners required to comply with national standards contributed to the loss of traceability and control of the referenced unmarked bolting. [Section VI.B.1.b (3)(c), (d) and (f)]

6. 10 CFR 50 Appendix B, Criterion X, as implemented by the STP QAP Section 10.0, requires that a program for inspection of activities affecting quality be established and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures and drawings for accomplishing the activity.

   Contrary to the above requirements, at the time of this inspection, the licensee's inspection program was ineffective in that:

   a. Numerous deficiencies were identified with the installation of QC accepted instrumentation and instrument tubing. Examples of these deficiencies include dimensions exceeding tolerance limits on five installations inspected, an incorrect weld configuration on a tubing support, a missing support clamp, and a support installed in accordance with an incorrect drawing detail. The specific installations and deficiencies are detailed on Table II-7 of the report. (Section II.B.4.b)

   b. A number of undersized socket welds were found in 2-inch schedule 160 piping. Additional examinations of approximately 200 QC accepted field welds of this type found at least 15 percent to be undersized. (Sections III.B.1.b and IV.B.1.b)

   c. On six lugged wafer valves, hex-head cap screws had been substituted for threaded studs and nuts inconsistent with the applicable essential cooling water piping installation isometric drawing and/or bill of materials. (Section III.B.1.b)

   d. Ten of the twelve mechanical equipment items selected for NRC CAT examination included components which were not constructed or otherwise installed in accordance with applicable design or specified installation requirements. (Section III.B.4.b. and Table III-5)

   e. A number of examples were found where completed structural welds in pipe supports/restraints in welded joints were smaller than that specified in the design drawings. The list of these welds is in Table IV-1. (Section IV.B.1.b)

   f. More than 60 percent of the inspection sample of 68 high strength bolts for structural steel sliding connections were installed overtight. Installation and inspection requirements had not been translated into appropriate procedures ensuring proper installation of the bolts in a "snug tight" condition. (Section V.B.2.b)

   g. Strap bolts on 8 of the 28 conduit runs inspected did not exhibit the required torque seal. Reinspections for torque had not been accomplished following rework to QC accepted conduit installations. (Section II.B.1.b.(2))

7. 10 CFR 50 Appendix B, Criterion XVI, as implemented by the STP QAP Section 16.0, requires that measures shall be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

Contrary to these requirements, at the time of the inspection the licensee's corrective actions were found to be inadequate in that the balance of plant suppliers of NDE film and documentation were not included in the corrective actions taken after the radiographs for the reactor vessel head were discovered to be missing in May 1985.