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RELATED CORRESPONDENCE

NEWMAN & HOLTZINGER, P. C.

1615 L STREET, N. W.

WASHINGTON, D.C. 20036

202-955-6600

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USNRC

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DOCKETING & SERVICE
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OF COUNSEL

May 3, 1985

Charles Bechhoefer, Esq.
Chairman, Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. James C. Lamb, III
Administrative Judge
313 Woodhaven Road
Chapel Hill, NC 27514

Ernest E. Hill
Administrative Judge
Hill Associates
210 Montego Drive
Danville, CA 94526

Re: Houston Lighting & Power Co., et al.
South Texas Project, Units 1 & 2
Docket Nos. STN 50-498, STN 50-499OL

Dear Members of the Board:

Applicants' motion filed in the Houston Lighting & Power Co., et al. v. Brown & Root, Inc., et al., litigation, applying for the release of the protected documents listed in Attachment B to Applicants' April 19, 1985 letter to the Board and the parties has been granted, and an appropriate order was executed on May 1, 1985. Accordingly, the documents previously withheld pursuant to the court's

D503

protective order are being provided to the Board and the parties pursuant to the Board's February 26, 1985 Memorandum and Order.

Respectfully submitted,

Maurice Axelrad

Jack R. Newman
Maurice Axelrad
Alvin H. Gutterman
Steven P. Frantz
Donald J. Silverman
1615 L Street, N.W.
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BAKER & BOTTS
3000 One Shell Plaza
Houston, Texas 77002

ATTORNEYS FOR HOUSTON LIGHTING & POWER COMPANY, Project Manager of the South Texas Project acting herein on behalf of itself and the other Applicants, THE CITY OF SAN ANTONIO, TEXAS, acting by and through the City Public Service Board of the City of San Antonio, CENTRAL POWER AND LIGHT COMPANY, and CITY OF AUSTIN, TEXAS

cc: Service List

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
HOUSTON LIGHTING & POWER	)	Docket Nos. 50-498 OL
COMPANY, ET AL.	)	50-499 OL
	)	
(South Texas Project, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that a copy of Applicants' letter to the Atomic Safety and Licensing Board dated May 3, 1985 (including attachments where designated by (*)) has been served on the following individuals and entities by deposit in the United States mail, first class, postage prepaid, on this 3rd day of May, 1985.

Charles Bechhoefer, Esq.*
Chairman, Administrative Judge
Atomic Safety and Licensing
Board Panel
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

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Administrative Judge
313 Woodhaven Road
Chapel Hill, NC 27514

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Hill Associates
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Danville, California 94526

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

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

Docketing and Service Section*
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Donald J. Silverman

Brown & Root Inc.

INTEROFFICE MEMORANDUM

TO: D. Prelewicz

DATE: May 8, 1981

FROM: J. A. Signorelli

SUBJECT: QUADREX STP Review

Per our telecon this morning, please advise on responses to the attached Nuclear Analysis questions as soon as possible. HL&P has been asked that B&R respond by noon today whether these items constitute a potentially reportable problem in accordance with 10CFR50.55(e).

J. A. Signorelli

JAS/iyg

cc: J. N. Sorenson
S. M. Mirsky
W. Gallagher
P. D. Arrowsmith
F. E. Muellner
J. L. Renehan
R. D. Jain
J. F. Pinto
J. L. Hawks

B 0100515

(a) Nuclear Analysis did not control the use of temperature values issued for equipment design, nor is there any analytical basis for temperatures used outside of containment (see Question N-15). The use of saturation temperatures rather than actual temperatures inside containment is not conservative in all cases as there has been no analysis performed to support the implied assumption that equipment will not respond to actual temperatures. This approach is not in accordance with IEEE-323 which requires qualification to actual temperatures (see Question N-1).

(b) There is an insufficient number of environmental analyses in place, and those analyses previously done contained many errors. The only environmental analysis performed by B&R contained a gross error (see Question N-13). Obvious errors were also discovered in an NUS analysis for inside containment (see Question N-1). The only NUS analysis currently valid is the containment environmental analysis for a LOCA (see Question N-1).

There is no currently valid mass energy release or environmental analysis for outside of containment (see Question N-3). The few analyses previously performed were not for currently postulated breaks and/or contained errors (see Questions N-3 and N-13). Brown and Root was uncertain of any need to perform analyses for the high energy lines in the MAB (see Question N-3). The failure to perform any valid environmental analyses outside of containment is untimely, and could possibly result in either retrofit in the MAB or incorrectly designed equipment in the IVC.

A review of work performed by or under the direction of the Nuclear Analysis Group indicates problems or the potential for problems in all areas analyzed, namely, environmental analysis, reactor-shield wall annulus pressurization analysis, verification of release of environmental data, essential cooling pond

analysis, and battery room hydrogen concentration. Except for a containment heat sink surface areas analysis, and an NUS LOCA environmental analysis (see Question N-1), there were no analyses found that were sufficient, correct and current. Other analyses were either obsolete, insufficient in basis, or contained errors (see Questions N-1, N-2, N-8, N-10, N-11, N-12, N-15, N-17, and N-25).

The following findings may have a serious impact on plant licensability or deserve licensing attention:

(c) Nuclear Analysis has failed to scope, perform, or have analyses performed that should have been completed (including correction of reports containing obsolete or erroneous analysis) given the present state of STP design and construction.

(d) An identification of Nuclear Analysis calculations needed to support other disciplines was not evident (see Question N-1).

(e) The annulus pressurization analysis performed by NUS was well modeled but used an inappropriate computer program (RELAP3). They should have used COMPARE as they had done earlier for another plant. Brown and Root should have pursued re-analysis as the annulus pressurization analysis as an input to structural analyses. Both of these analyses require considerable elapsed time, as does NRC approval of the results. The failure to submit such an analysis in a timely manner could cause licensing delays or retrofits. B&R does not appear to be sufficiently concerned about the timeliness of analysis in relation to construction schedules or licensing (see Question N-2).

(f) Awareness of the proper methodology for handling potential flow paths during environmental analysis was not evident (see Question N-8).

(g) Awareness of the need to model makeup supplies of water for long term environmental analysis was not evident (see Question N-10).

(h) Awareness of W trip logic for MSIVs appeared weak (see Question N-11).

(i) Nuclear Analysis did not appear to be sufficently knowledgeable in the area of valve performance and qualifications (see Question N-12).

(j) Analysis for a double ended break rather than a crack break disagrees with a FSAR commitment (see Question N-13).

(k) B&R does not appear to be sufficiently aware of high energy lines in the MAB (see Question N-13).

(l) B&R stated that documents are not issued without verified analysis. However, SDD 4E010EQ004-A, "Qualification of Class 1E Equipment," was issued without any reasonable analytical basis (see Question N-15). Only a fortunate series of coincidences will prevent a situation in which some equipment is overdesigned and other equipment is underdesigned.

(m) Differences in ECP initial temperature assumptions were observed between Nuclear Analysis and Heavy Civil (see Question N-17).

(n) Assumptions regarding the availability of various heat sinks under varying plant conditions should be re-examined (see Question N-17).

(o) The battery room hydrogen analysis did not address the true problem of hydrogen concentration near the top of the room. This analysis was not properly classified as safety related (see Question N-25).

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Revised 5/9/81
OTR

ENCLOSURE (2)

SUMMARY OF BROWN AND ROOT FINDINGS ON
SOUTH TEXAS PROJECT QUADREX ENGINEERING REVIEW (May 1981)
ITEM 4.4.2.1 (a)/(b)

Rec'd at Pullman 16

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rown & Root Inc.

NRC

SUBJECT

Inadequacy of the following STP HVAC Systems:

- MAB
- Fuel Handling Building
- EAB

and requested B&R to review the overall safety class HVAC requirements for the plant

DESCRIPTION OF POTENTIAL PROBLEM

On April 7, 1980, Houston Lighting & Power (HL&P) informed Brown & Root of a potential problem of cooling the Radwaste Control Room in the MAB. A B&R study group was formed (Special Problem #16) with representation from the (B&R) Mechanical, Electrical, I&C, Structural, ~~Nuclear Analysis~~ and HVAC Disciplines. On September 18, 1980 a preliminary assessment concerning candidate areas for additional study was released. The candidate areas included: the electrical penetration space in the EAB; the radwaste control room, which contains the hot shutdown panel, the reactor make-up water pump cubicle, the boric acid transfer pump cubicle, the CVCS valve cubicle at elevation 41'-0" and 10'-0" in the MAB; the spent fuel pool cooling pump cubicles in the fuel handling building (FHB) and the valve cubicles in the FHB where containment isolation valves in discharge lines from the High Head Safety Injection, Low Head Safety Injection and Containment Spray pumps are located. At this time a possible need for supplemental air cooled chillers to handle additional anticipated (based on engineering judgement) HVAC loads were discussed.

Insert A

From January 7, 1981 thru January 27, 1981, calculations were informally received from the HVAC group confirming the need for additional HVAC cooling capacity. On March 12, 1981, a draft report was issued by the B&R Special Problems Group which summarized the thermal environmental data which had been received and confirmed the need for supplemental cooling of the equipment described in Table 1 (Attached).

Insert B

On March 19, 1981, representatives of QUADREX, under contract to HL&P, conducted a technical audit of B&R's HVAC System design and in a report received by B&R on May 7, 1981, confirmed B&R's earlier assessment that there may be insufficient HVAC cooling capacity for equipment located in the MAB and FHB.

Although we do not yet have actual heat load data, including maximum allowable operating temperature information, for all potentially affected systems, we believe that there is currently sufficient uncertainty concerning the adequacy of the HVAC Systems designed for the MAB, FHB and EAB to consider the matter to be potentially reportable at this time.

Insert A

HVAC service for these areas would be inoperative during a loss of off-site power; this could compromise equipment qualification temperatures. Not all of the equipment identified is considered "safety related," however, electrical components are Class 1E and the items could be used ~~to~~ in achieving safe shutdown depending on the accident scenario and the procedures used.

Insert B

Calculations to determine environmental temperatures without HVAC service in the candidate areas were started after work was authorized in mid-September, 1980. Preliminary results of these calculations were informally received from January 7, 1981 through the first week in February 1981 from the HVAC group. (In mid February work on these calculations was stopped ~~on Special Problem #6~~ due to the priority of the Qualtrex Audit.) On March 12, 1981 a draft report was issued by the B/R Special Problems Group summarizing the preliminary thermal environmental data received to date, and recommending supplemental cooling of the equipment described in Table 1 (attached).

Brown & Root Inc.

APPROACH TO RESOLUTION

A supplemental HVAC system composed of in-room fan-coil units and air cooled chillers is currently being considered for incorporation into the STP Units. Sketches showing proposed physical arrangements are currently being prepared for candidate locations and additional thermal operating data is being sought from [redacted] equipment vendors.

STATUS OF PORPOSED RESOLUTION

A final determination concerning the need for additional safety grade HVAC capacity will be completed upon receipt of the following evaluations: pipe breaks outside containment (QUADREX Audit Question 4.4.4.1.a); and, special problem 16 (QUADREX Audit Question 4.4.4.1.b). These evaluations will consider the equipment and piping heat losses and the maximum environment for which the safety related components are qualified. Without performing these evaluations we cannot determine the exact magnitude of the impact on plant safety.

Based on these uncertainties, we feel that this problem is potentially reportable under 10CFR50.55(e) and is currently being investigated as a potential 10CFR21.

REASONS FOR FINAL REPORTABILITY DELAY

Project Engineering had not completed sufficient thermal calculations to indicate a clear need for a supplemental HVAC System. A major cause for the delay in completing these calculations was the priority placed on the Quadrex audit which caused work on Special Problem 16 to be stopped in the HVAC and I&C disciplines in mid February, 1981.

PROJECTED COMPLETION OF CORRECTIVE ACTION

The projected completion date for the following Special Problem #16 activities is currently June 15, 1981 to have a definition of design qualification temperatures for ~~safety-related~~ the Class 1E and the safety related equipment, a preliminary assessment of heat losses and area temperatures and a conceptual design and preliminary layout for a supplemental HVAC system. A logic for these activities is attached.

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TABLE 1

CANDIDATES FOR NEW HVAC SERVICE

LOCATION	EQUIPMENT REQUIRING TEMP CONTROL	EQUIP. QUALIF. TEMP. F	POST-ACCIDENT TEMPERATURE w/o HVAC, F (1)	POST-ACCIDENT HEAT LOAD Btu/hr	EQUIPMENT STATUS
Radwaste Control Room, MAB	H_2 Monitoring Equip.	104	184	270,000	ON SITE
Electrical Penetration Space, EAB (2)	Class 1E Cables	~~400~~ (80 ea)	1st Fl: 193 2nd F.: 204 3rd Fl.: 185	211,260 (3) 251,940 (3) 255, 620 (3)	*
Reactor make-up water Pumps Cubicle, MAB	Reactor make-up Water Pumps	120	195	61,000	*
Spent Fuel Pool Pump Cubicles, FHB	SFPCCS Pumps	120	268	66,300	*
Boric Acid Transfer Pumps Cubicle, MAB	Boric Acid Transfer Pumps (4)	120	197	42,000	*
Cont. Iso. Valve Cubicles, FHB (3 cubicles)	Cont. Iso. Valves (5) B&R Valve Nos.: XSI 004A, B, C XSI 018A, B, C XCS 001A, B, C	120	(later)	31,800	*
Valve Cubicles in MAB (3 cubicles)	CVCS Valves used for boration (4) B&R Valve Nos.: XCV 218 XCV 112C XCV 113B XCV 112B XCV 113A	120	El. 10'-0": 150 El. 41'-0": 150	33,400 38,400	*
Elect. Aux. Bldg. Chiller Area (located in MAB)	EAB Chillers	(later)	(later)	(later)	*

Footnotes (see Page 2)

FOOTNOTES - TABLE 1 - CANDIDATES FOR NEW HVAC SERVICE - Page 2

1. Calcualted environmental temperature in the cubicle or area when only safety related equipment is operating, and with no HVAC service.

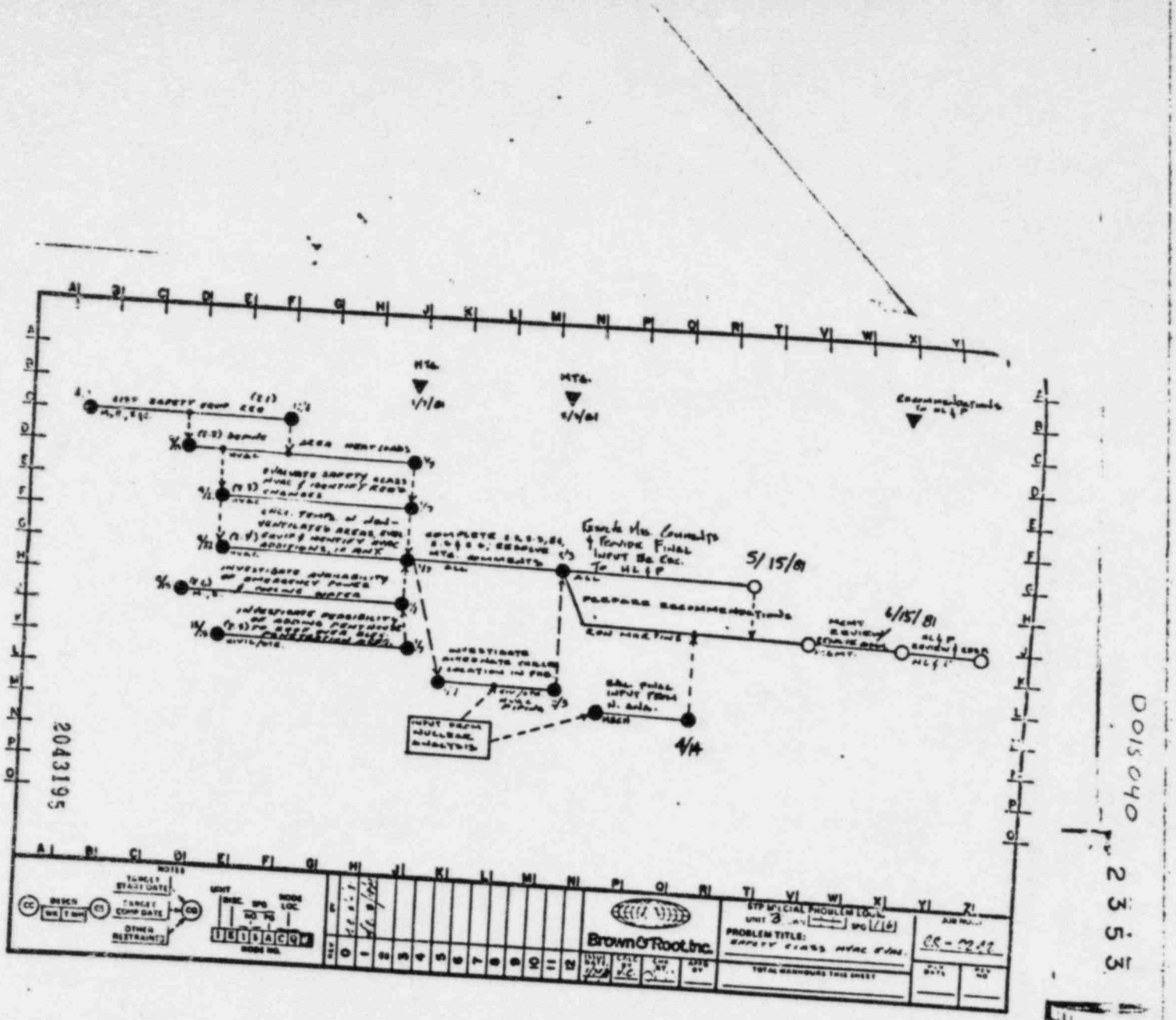
2. HVAC for this area has been identified as critical concern No. 11-5 (1979). The equipment listed requires environmental temperature control during operating conditions, and 180°F for 30 days post accident.
   normal
   at 104°F max

3. During normal operation, heat loads are:

1st Floor	81,200 Btu/hr.
2nd Floor	123,350 Btu/hr.
3rd Floor	121,400 Btu/hr.

4. Capacity for cooling this area should be included when sizing the chiller. However, since alternative methods of boration are available, no further design toward adding coolers should be performed until Westinghouse is appraised of the calculated cubicle temperatures, and the preferred boration method is identified.

5. Requalification or replacement of the valve actuators are possible alternatives to adding HVAC Coolers. Capacity for cooling these cubicles should be included when sizing the chillers. However, no further design toward adding coolers should be performed until Westinghouse is appraised of the calculated cubicle temperatures and assesses the alternatives.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Brown & Root, Inc.
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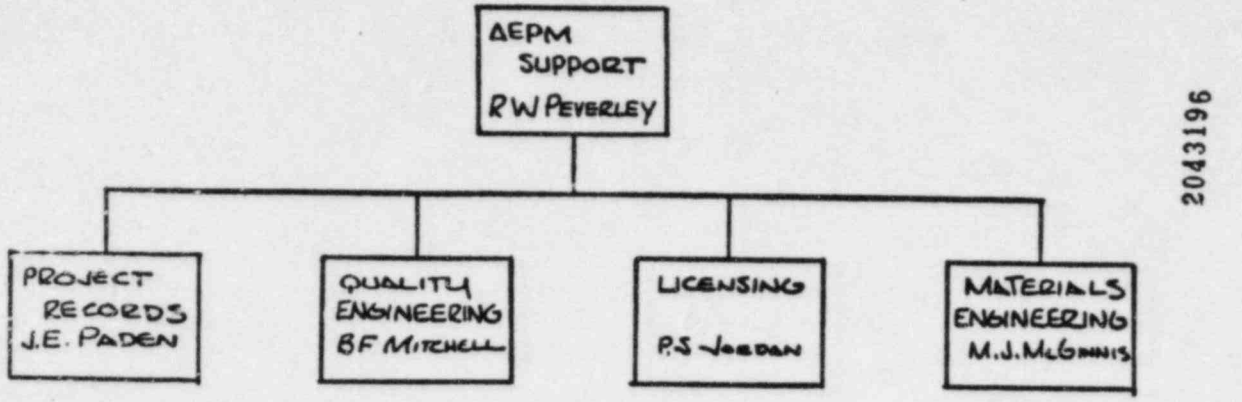

1. DOCUMENT CONTROL CNTR
2. RECORDS TURNOVER
3. INTERFACE WITH B&R AND CLIENT TURNOVER ORGANIZATIONS
4. SOFTWARE TRACKING*
5. TECH EDITING

1. QA INTERFACE
2. PROCEDURE CONTROL
3. DOCUMENT APPROVAL
4. FREA/NCR/SDR COORDINATION, TRACKING, & TRENDING
5. AUDITS & EDD'S
6. DOC. CHECKS & SHIPPING RELEASES
7. REPORTABLE DEF.

1. MAINTAIN FSAR
2. COORD LICENSING DOC REV.
3. CLIENT LICENSING INTERFACE
4. SPECIAL TASKS
5. INCIDENT REVIEW COMMITTEE

1. MATS. ORG. INTERFACE
2. MATERIAL TAKEOFF
3. MATERIAL REQS & SPEC. STATUS
4. PWR REPORT
5. COST UPDATE OF PURCHASED MAT
6. OPEN ITEMS LISTS
7. MAINTAIN PO FILE
8. PO CLOSEOUT (FORM 200.59)

* UNDER AEPM SUPPORT UNTIL THE SYSTEM HAS BEEN ESTABLISHED.

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NUS CORPORATION

INTERNAL CORRESPONDENCE

TO: J. A. Signorelli

DATE: CD-SA-627 May 11, 1981

FROM: D. A. Prelewicz

COPIES: P. D. Arrowsmith
W. J. Gallagher
S. M. Mirsky
F. E. Muellner
J. L. Renchan
H. Renner
J. N. Sorensen

SUBJECT: NUS Responses to QUADREX STP Review

In response to our telephone conversations and your telecopied QUADREX Design Review Comments of May 8, 1981, we have prepared the following NUS responses to those design review comments which are applicable to NUS:

a) Analyses have been performed by B&R to support the implied assumption that equipment will respond to saturation temperature instead of superheat temperature because of condensation heat transfer. However, it is noted that not all equipment has been checked. Since this will be done, and no problem is currently expected because of the large margin between LOCA T_{sat} and MSLB T_{sat}, NRC need not be advised of a potential problem at this time.

b) A technically correct but conservative analysis was performed by NUS for the mass and energy release due to a main steam line break. The analysis predicted highly superheated steam conditions in the containment. At the time of the audit, the analysis had been superceded by a Westinghouse calculation which also predicted a superheated steam environment due to a main steam line break.

At the time of the audit, valid mass and energy release calculations were in place for both main feedwater line and main steam line break in the IVC. In general, the analyses of breaks outside containment is a recent requirement. Many operating plants do not have such analyses in place.

e) The NUS annulus pressurization analysis was previously performed with the RELAP3 code which was and is acceptable to the NRC. A current reactor annulus redesign effort, when completed, will be used to provide new reactor annulus design input for a revised analysis with the COMPARE code. However, the previous annulus pressurization analysis performed by NUS with RELAP3 was conservative and used a computer code and methods acceptable to the NRC.

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f) NUS is aware of the methods for handling doors, blowout panels and vents in environmental analyses and has performed such analyses for other clients.

j) Analyses for a split break short term mass and energy release of the main steam and main feed water lines, both inside containment and in the I.V.C., were performed by NUS for B&R last year. These analyses were verified, done to QA Level 1, and transmitted to B&R last year.

k) B&R is in the process of examining high energy line breaks and their environmental impact outside of containment and is addressing this subject on as timely a basis as many other power plants in the construction phase.

BROWN & ROOT, INC.

INTEROFFICE MEMORANDUM

DATE: May 11, 1981

TO: J. L. Hawks

FROM: E. A. Saltarelli

SUBJECT: Quadrex Design Review

Knox Broom and I discussed with Jerry Goldberg the potentially reportable items resulting from the subject Design Review on May 8, 1981. Mr. Goldberg had no problem with our assessment of items 4.4.2.1 (a)/(b). However, he will report two other items as "potentially reportable" under 10CFR 50.55 (e); namely, verification of computer codes in the nuclear analyses area, and verification of shielding codes. In his opinion, all shielding is safety-related. Broom and I had no problem with his position on nuclear analyses since one cannot be sure that there is a problem until all the codes are verified. However, we did not agree with his position on shielding codes. It was explained to him that we intended to verify shielding codes but we did not agree that all shielding is safety-related.

In addition to the above, Mr. Goldberg did not agree with three other items. These are not considered "reportable" but he does not agree with our assessment. It is therefore necessary that the following items be pursued with HL&P for resolution:

Item 4.4.2.1 (g)

Although our design verification process meets the NRC requirements, he wants to see a complete list of criteria which qualifies verifiers in each specific discipline. We need to discuss this since this approach has been resisted by the industry for years.

Item 4.5.5.1 (a)

There is a question whether the Standard Review Plan allows analysis in lieu of testing to determine operability of active components. I would like to review this one with you. There may be some confusion in HL&P's mind on qualification of components versus operability in a system when called upon to perform.

Item 4.5.2.1 (c) - Secondary Effects of Pipe Break

Mr. Goldberg does not agree to our response and believes secondary effects from the pipe rupture event should be considered. We made a generic statement. It probably needs some specific examples to prove the point.

E. A. Saltarelli

EAS:dk

cc: W. M. Rice
K. M. Broom
C. L. Buck
J. R. Geurts
J. A. Signorelli
S. M. Dew

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DEPOSITION EXHIBIT
MUELLNER 51

INTEROFFICE MEMORANDUM
BROWN & ROOT, INC.

80

DATE: June 22, 1981

TO: E. A. Saltarelli

ENL-91311

FROM: F. E. Muellner

SUBJECT: STP HL&P/Quadrex Engineering Review

References:
1. STP Quadrex Engineering Review of May 8, 1981
2. HL&P Letter of May 6, 1981
3. B&R Letter ST-BR-HL-38718 of May 8, 1981
4. B&R Letter Rice to Stalle of May 12, 1981
5. B&R Letter ST-BR-HL-38566 of May 4, 1981

The purpose of this memorandum is to summarize the Brown & Root actions taken to date relative to the STP HL&P/Quadrex Engineering Review of May 8, 1981, and to present our position relative to the "Most Serious Generic Findings" contained in the report of the above review (Reference 1).

Brown & Root performed an initial, expedited review of Reference 1 in accordance with Reference 2 and advised Houston Lighting & Power as to whether the "most serious" items identified in Reference 2 constitute a reportable problem in accordance with 10CFR50.55(e), Reference 3. All items were judged not reportable except for 4.4.2.1(a)/(b), which was considered potentially reportable as described in Enclosure 1 to Reference 3. Brown & Root subsequently reported one item in accordance with 10CFR21 in Reference 4.

In addition, Brown & Root has accelerated implementation on the following programs which, for the most part, were already in place or were planned:

1. Computer Programs. The computer code assessment program was initiated as a result of findings from Brown & Root internal audit performed in December 1980. These audit findings were consistent with the findings of the Quadrex review. The computer code assessment program is continuing. Because of the increased importance identified with this activity, the effort is being accelerated. The program includes CPMR review to judge the qualification of the codes used on STP and review of calculations for appropriate application of computer codes. This is a phased program with immediate emphasis being placed on nuclear analysis. Assistance for this effort by a consultant (Energy Incorporated) has been solicited.

2. HVAC. Accelerated review of pertinent STP HVAC systems has been underway with NUS and Westinghouse consulting assistance.

3. Pipe Breaks Outside Containment. Efforts are being accelerated with consulting assistance being solicited from Westinghouse and NUS.

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4. ALARA. An ALARA program has been established with joint HL&P, NUS, and B&R participation. Phase I, Model Review, has been completed.

5. Interference Review. An Interference Review program has been established as outlined in Reference 5. Augmented internal review procedures are being implemented to reduce development of new interferences, and a multi-discipline interference review committee has been established to accelerate interference resolution.

6. ISI and Access/Maintenance Review. A program is being accelerated through augmented staffing of existing B&R ISI task force. Participation by HL&P will be solicited.

Due to the potential licensing impact of the "Most Serious Generic Findings" discussed in Reference 1, we have performed an evaluation of these items as reported in Enclosure 1. We have concluded that the detailed discussions in Volume II and III of Reference 1 do not support the generic findings as presented in Volume I.

Although a Quadrex Problems Tracking System has been developed to establish a schedule to respond to all 288 "concerns" expressed in the Quadrex report, we believe these items should not be pursued on a high priority basis. The programs outlined above which are already in place will handle the "concerns" raised by Quadrex in the normal evolution of the design process. Pursuing response to the 288 items on a high-priority basis interferes with the effort being expended on the reestimate due in August 1981 and the normal on-going engineering work identified in the 1981 schedule. The effort expended to date (over 7,000 manhours) in participating in this design review has already significantly impacted the engineering schedule. Enclosure 2 documents our work to date in connection with the 288 detailed "concerns."

Unless directed otherwise, we do not plan to pursue these matters further, other than in the programs already established.

F. E. Muellner

avs

Enclosures 1 and 2

File No.: A0106

cc: C. L. Buck
S. M. Dew
J. L. Hawks
W. M. Rice
J. A. Signorelli

GENERIC FINDING 3.1(a)

In reviewing Quadrex Generic Finding 3.1(a), it has been noted that the response can be broken basically into five concerns. They are:

1. Concern relative to effect of integration of system design.
2. Concern that design review process could easily overlook equipment physical arrangement and separation requirements.
3. The discipline structure is too tightly organized on a purely discipline basis.
4. The ability to achieve internal consistency due to high personnel turnover.
5. The lack of a single failure criteria document.

The following information is offered in response to these five areas.

1. During the Quadrex audit, Quadrex did not review the efforts of the Brown & Root System Design Assurance Group. Quadrex verbally commented that the effects of this group had not yet been evident in design documents; therefore, they did not consider the existence of this group. It should be noted that the basic reasoning in forming the System Design Assurance Group some 18 months ago was to provide an overview function within the Brown & Root design process for ensuring the effectiveness of our system integration process. The System Design Assurance Group has completed its first phase of this activity and has identified to the various disciplines additional items to be incorporated into the design. The workings of this group is documented in Project Procedures and they have proven to be effective in providing the overall integration required.

2. Similarly, it was recognized about two years ago that plant arrangements needed to be reviewed and systematically evaluated to assure that interferences and other physical concerns relative to equipment layout were being adequately addressed. The Physical Design Assurance Group was formed comprised of two major components, physical modeling and computerized modeling. This group has been evaluating the major plant areas for interference of basic components, and accessibility for maintenance and in-service inspection. Brown & Root does concur with the fact that the concentration of this group has been, to date, primarily on the physical interference aspect. We are currently in the process of increasing the attention of this group to maintenance, ISI, ALARA, and other similar activities. Also, a series of systems hazards review drawings have been prepared which evaluate all physical areas for factors such as fires, missiles, pipe break, etc.

3. Quadrex expressed a concern over the fact that the technical disciplines were organized very tightly and they infer that there was not a routine follow-through with the discipline input/output interface. It is very difficult to ascertain from any of the specific Quadrex responses the basis for this assessment. The one specific statement where Quadrex claims that the Mechanical Group was not permitted to review I&C logic diagrams is incorrect. There is significant evidence in the files in the Document Control Center showing review and comments from the Mechanical Group to the I&C Group concerning system logics.

4. Quadrex expressed a concern relative to the consistency of various documents due to the high turnover of personnel, particularly in the area of plant separation. Brown & Root had previously recognized such a need and in fact, has issued a Separation Criteria TRD. The activity of the safety system hazards analysis is providing the very criteria for use by our engineers that Quadrex appeared to criticize Brown & Root for lacking.

5. Quadrex expressed a concern that there was not in a controlled document a multi-disciplinary interpretation of single failure criteria. This is a correct statement; however, as the design demonstrates, we have adequately addressed single failure criteria and have through the System Design Assurance Group, provided a single activity to review all discipline interpretations to assure that the single failure criteria has been applied consistently by all the Project disciplines.

In summary, we concur with some of the Quadrex findings; however, all have been previously identified and actions taken within the Project to assure that the STP design was totally adequate. It should be noted that the only specific reference given to this generic concern by Quadrex was Question M-6, which was a question regarding how the HVAC system design incorporates single failure into its separation criteria. The Quadrex response or assessment stated that we had no written criteria for physical separation to protect against postulated fires, high energy lines, and also that the fire hazards analysis performed by a contractor directly for HL&P had not been converted into a controlled document. It appears that Quadrex did not discover that we were in fact in the process of issuing the criteria document as part of our recent system hazards analysis and in fact, negotiating a contract with NUS to revise the previous fire hazards analysis and issue it as a controlled Project document.

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GENERIC FINDING 3.1(b)
BROWN & ROOT REVIEW
OF ENGINEERING DATA

Generic Finding 3.1(b) notes the following:

1. "Input data to a technical group does not appear to be consistently reviewed by that group for its reasonableness prior to use...".

2. "Calculations containing errors are being reviewed and verified as correct with a higher frequency than should be encountered."

3. "B&R review of vendor submitted reports is not consistent."

As Quadrex pointed out, this generic concern can be broken into three items. First, concern relative to technical groups not adequately reviewing input data from other groups for its reasonableness prior to use. Secondly, the calculations containing errors are being reviewed and verified with a higher frequency than should be encountered; and third, our review of vendor submitted reports is not consistent.

1. Quadrex appears to have a different concept on how Engineering activities are performed than does Brown & Root. Quadrex appears to think that one discipline should somehow formally be responsible for the input given to it by other disciplines. It always has been the practice on this Project that if information transmitted from one group to another appears to be totally out of line with what that engineer is accustomed to, he will discuss his concerns with the group transmitting the data. However, the responsibility for the accuracy and reasonableness of such data must lie with the originating group. In reviewing the specific questions referenced relative to this finding, it is very difficult to trace the specific concern of Quadrex to these items. Brown & Root statements made as to how heat loads were assumed in the HVAC area or how input from Westinghouse was utilized are totally defensable, and do not indicate or in any way infer that information is not reviewed for reasonableness prior to being used. The approach being used by Brown & Root is not inconsistent with good engineering practice exercised by other Architect-Engineers.

2. This concern alleges that subsequent to review and verification, calculations were found to contain errors with a higher frequency than should have been encountered. In reviewing the specific review questions, once again, it was impossible to ascertain the degree of significance that Quadrex placed with the wording of this finding. This item is indicative of the difficulty we find in responding to generalized Quadrex findings even in specific areas; for example, a review of the four questions referenced here provides the following:

   Question C-16, Quadrex assessment quotes that "Brown & Root's design verification procedure appears to be adequate or above industry standards on paper." On the otherhand, they express a concern of how effective we have implemented the procedure

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and state that there was evidence that a significant number of mistakes had passed through the verification process. However, no specific reference to any calculation or calculation number was given and no basis was given for the statement of "a significant number of mistakes" or how the results compare with experience at another Architectural Engineers.

Question M-15, which is referenced, basically states that we did not take into account the effects of restriction of air flow in the Reactor Cavity area. This was a potential reportable condition which had been identified by Brown & Root prior to the Quadrex audit, and was under evaluation. This in itself, is not an indication of significant errors in calculations.

Similarly in Question M-1, a single concern relative to a large temperature error was identified; however, in the Quadrex assessment, it stated that the occurrence of such an error is neither uncommon nor a sign of inadequacy. Further, in their response, they stated that calculations reviewed were well organized, as were the verifications. Again, this single concern does not provide the basis for a significant large number as referenced in thier generic finding.

Finally, in referenced Question M-17, Quadrex assessment indicated that there was either an error or an inconsistency with a calculation and that this condition needed to be evaluated; however, once again there was not specific reference to a significant number of mistakes as indicated by the generic finding.

3. Quadrex indicated that they felt that our review of vendor submitted reports was not consistent. They also indicated a concern that the interface we have with such major subcontractors, as EDS and Westinghouse, raise many questions regarding overall technical adequacy of the interface with these suppliers. Brown & Root again is confused as to Quadrex's concern in this area, particularly relative to the EDS interface, in that in response to the questions on the EDS area, Quadrex reported on Page 4-74, "In general, EDS in containment design analysis appears to be technically adequate." "There were no findings in EDS scope that are expected to seriously impact plant licensability." In addition, on Page 4-75, the following quote appears, "In the EDS scope, there were no findings that pose a concern for the plant to generate reliable power." With these findings from Quadrex, we would assume that they have concluded that the interface between Brown & Root and EDS has been adequate. Brown & Root interface with Westinghouse is such that we are responsible for evaluating technical adequacy of the interfaces; however, it is not our responsibility to evaluate their internal analysis methods. In summary, we share Quadrex concerns in some isolated areas relative to a specific review of a vendor package; however, once again, we do not feel that the back-up information supports the degree in which Quadrex expresses this concern.

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GENERIC FINDING 3.1(c)
PLANT OPERATING MODES AND
ENVIRONMENTAL CONDITIONS ANALYSIS

Generic Finding 3.1(c)notes the following:

1. "Thorough and consistent treatment of various plant operating modes and environmental conditions was not evident" and "no written design basis are provided to guide designer in combination of events and plant modes to be considered."

2. "Consideration of degraded equipment not evident".

3. "Design criteria do not adequately reflect recent developments."

4. "Assumed 'worst case' conditions may not properly bound the set of anticipated plant conditions." (Questions M-3 and M-17).

5. "Assumptions regarding door and hatch positions seem unrealistic..."

6. "Failure to consider off-site power condition in a timely manner has led to recent studies and the need to upgrade certain safety-related HVAC systems to safety related (Question M-5)."

7. "The absence of postulated line cracks and breaks outside containment is inadequate (Question M-3, M-5, M-1, and M-3)." "Similarly, the inability of Nuclear Analysis to develop appropriate environmental conditions for these areas in a timely manner is also inadequate."

The following information is offered in response to these areas:

1. Operation requirements are covered in SD005, Engineering Procedure for Design Assurance Reviews, and the operations section of the respective System Design Descriptions; these requirements are defined in Appendix A to SDO 002, "Outline for Active System Design Descriptions" Operational Requirements (9.2 and 9.3). Normal environmental conditions were covered in the system designs and are evident in Section 2, (Design Requirements) and Section 3, (Operating Modes and Design Features) of individual SDO's. Estimates were made for off-normal and accident conditions based on experience with other similar nuclear plants. There is an on-going program to review the design for environmental conditions such as pipe breaks and loss of power.

2. Degraded equipment performance is incorporated into the plant design in the form of fouling factors and filter loading contributing to increased system pressure drop and degraded heat exchanger heat transfer capacity. Further, safety systems take such degration into account through the "single failure" design feature. Consideration of other possible equipment degradation is scheduled for review during Phase II of the Design Assurance Program.

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3. The adequacy of the Brown & Root design process is acknowledged by the Quadrex statement, "Design criteria provided in issued System Design Descriptions (SDDs) and Technical Reference Documents (TRDs) appear to adequately reflect industry issues for the 1973-1975 time frame, however, they do not adequately address more recent developments...". It is noted that the 1973-1975 time frame is precisely when the initial STP plant design occurred.

   More recent developments including TMI are being addressed as on-going programs, both within the disciplines and by the Design Assurance Group.

4. Two cases are cited by Quadrex as examples of where assumed worst case design conditions were not bounding. Contrary to the implication that these were a "finding" by Quadrex, these cases were specifically identified by Brown & Root to Quadrex and were being worked on prior to initiation of the Quadrex Engineering Review. These are: H-3, HVAC design, and H-17, ECP design. The HVAC design was reported in B&R letter ST-BR-HL-38718 of May 8, 1981. This was identified as a potentially reportable problem in accordance with 10CFR50.55(e) and a summary of the problem was given in Enclosure (1) to the above letter.

   A change has been scheduled in the ECP Technical Specification Temperature limits to incorporate updating of the calculation for the most severe plant and weather conditions. Satisfactory equipment performance under the slightly higher temperatures is being verified.

   HL&P will be kept apprised of the status of the above items.

5. This "most serious generic finding" by Quadrex that B&R's "assumptions regarding door and hatch positions seem unrealistic" is totally unsupported by the example cited (H-14). In this example, the complete Quadrex assessment reads: "B&R control room pressurization HVAC calculation is adequate."

6. Contrary to the Quadrex implication, loss of off site power has been considered since the early stages of the Project dating as far back as pre-PSAR era. This requirement is periodically reviewed and updated as part of the normal design evaluation and the need for upgrading has been identified in such instances as Special Problem #16. The fact that this HVAC problem had been identified and is being worked on was pointed out to Quadrex but apparently was not considered in the "most serious generic finding" section of the report. On the other hand, in the detailed discussion of Question H-3 in Vol. II, Quadrex acknowledged the following: "Quadrex was informed by HL&P that a special task is now underway to study the need for additional safety related HVAC systems."

7. As Quadrex was informed, the program for break analysis outside of containment is underway. Results for pipe breaks outside of containment in the IVC are in final stages of completion. Since remaining high energy lines outside containment are minimal, work on those has been scheduled for 1981 implementation. These will form the basis for the environmental conditions evaluation by Nuclear Analysis.

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GENERIC FINDING 3.1(d)

SAFETY RELATED VS. NON-SAFETY RELATED DISTINCTIONS

Generic Finding 3.1(d) notes:

1. "It was observed on many occasions that B&R uses a very sharp distinction between S/R and non-S/R categorizations for both equipment and calculations. A non-S/R designation results in the design outputs not being subjected to design verification."

2. "It was frequently stated during the design review that only NRC requirements must be met whether or not those requirements are accurate, reasonable, or even meet the intent of the regulations."

3. "There has been no planned effort to review new NRC requirements (excluding TMI-2 concerns) to determine their impact on STP."

The following is offered in response to these areas:

1. All B&R design documents as well as supplier documents are reviewed and checked by B&R. The sharp distinction cited deals with a project procedure for formal documentation of these reviews and the resolution of any comments generated during the reviews. The existing B&R procedures and document designations are adequate in this regard. In the design of a nuclear power plant, it is mandatory that a sharp distinction be maintained between S/R and non-S/R systems from a licensing point of view. B&R concedes, however, that regardless of system classification, computer codes should be verified as a matter of good engineering practice. This action is being taken.

2. The statement that, "It was frequently stated during the design review that only NRC requirements must be met, whether or not those requirements are accurate, reasonable, or even meet the intent of the regulations" is a misrepresentation of the Brown & Root position. B&R endeavors to satisfy regulatory requirements as a mandatory requirement. However, the B&R position is that regulations and standards are not substitutes for technical understanding, or engineering judgment. In the final analysis, engineering judgment prevails. The designer interprets the requirements and implements these requirements by placing emphasis on those considered to have the most serious impact on the design. Secondary effects are considered but these cannot become overriding to the extent that the fundamental function of the system is compromised by a postulated event with a low probability of occurrence.

3. This statement is not correct. Brown & Root consistently reviews NRC requirements applicable to STP at both the discipline level and the licensing level. In addition, the Special Projects Group will evaluate, where appropriate, the implementation of such requirements.

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GENERIC FINDING 3.1(e)
FMEA AND SINGLE FAILURE CRITERION

The Generic Finding 3.1(e) notes the following:

1. The supporting specific "most serious finding" (4.3.2.1) to this generic finding "suggests that B&R is not sufficiently experienced in the performance of Failure Mode and Effect Analysis that crosses discipline boundaries."

2. "No guidelines exist on what types of failures should be considered for various types of equipment." "There is no documented evidence that the single failure criterion has been satisfied." "One concern is the varied interpretation by individual disciplines that can be given to 'direct and consequential failures' resulting from a postulated event."

3. "An HVAC/I&C single failure criterion violation has been noted (Questions R-6 and E-15)."

The following is offered in response to these areas:

1. Brown & Root disagrees with this statement. Quadrex has used an isolated incident to assume this conclusion. Examples of B&R FMEA's crossing discipline boundaries are as follows:

FSAR Table Ref.	System FMEA
7.3-12	Control Room Ventilation Isolation Actuation
7.3-13	Containment Building Purge Isolation Failure
8.3- 8	D.C. Power Systems
8.3- 9	Auxiliary AC Power System
8.3-13	120-Vac Vital Instrumentation Power System
9.2.1-2	Essential Cooling Water System
9.2.2-3	Component Cooling Water System
9.3- 2	Air-Operated Valves
9.3-12	Chemical and Volume Control System
9.4- 5.1	Control Room & Elect. Aux. Building HVAC System
9.4- 5.2	Fuel Handling Building HVAC System
9.4- 5.3	Mechanical Aux. Building HVAC System
9.4- 5.4	Turbine Generator Building HVAC System
9.4- 5.5	Reactor Containment Building HVAC System
9.4- 5.6	Diesel Generator Building HVAC System
9.4- 5.7	Miscellaneous Buildings HVAC System
9.5- 2	Fire Protection System
9.5.5-2	Diesel Generators
10.4- 3	Aux. Feedwater System
10.4- 4	Turbine Bypass System (TBS)

Contrary to Quadrex statements, the FMEA approach has also been used after the FSAR period where appropriate to ensure adequate design.

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Finally, updating of Failure Mode and Effects Analysis has been assigned to the System Design Assurance Group. This discipline was established in late 1979 to ensure that systems level integration was in fact present on the Project. The group has been assigned the responsibility of performing FMEA's on the components of the system, the system itself, and all interfacing systems, and will use written procedures reflecting present day FMEA practices.

2. STP Procedure SD-002, Engineering Procedure for System Design Descriptions Appendix A, Section 9.3, requires that Section 4.3, "Casualty Events and Recovery Procedures" include a "list of all casualty events considered in the design such as:

   - o Loss of offsite power.
   - o Loss of instrument air.
   - o Single failures.
   - o Operator errors, etc."

   Therefore, the SDD's specifically address all failures that have been considered. These documents are being reviewed by all design disciplines including the System Design Assurance Group, to ensure a consistent approach.

   It is acknowledged that updating of System Design Descriptions is required in certain areas to reflect design evolution. However, this was recognized well before the Quadrex review and a program was developed in October of 1980. This work has been scheduled and is being incorporated into the Re-estimate Plan in the normal conduct of the design.

   Through the influence of the Design Assurance Group, B&R feels that a consistent interpretation of failure analysis will be achieved. This is borne out in the results of the Phase I reviews to date.

3. In the alleged "single failure criterion violation" cited, the following conditions exist: Dampers to the two redundant HEPA-charcoal filter trains are held closed by air pressure. High radiation in the Fuel Building actuates a three-way solenoid valve. This action both removes supply air pressure to the dampers and vents the line causing the dampers to open. The Quadrex contention is that a common exhaust line may become blocked thus disabling the system with a single failure. This contention is not credible for the following reasons:

   a. Blockage of exhaust lines is precluded by the following design features:

      1. Exhaust lines to the damper actuators are larger in size than supply lines. Therefore, if foreign matter were large enough to become lodged in an exhaust line, it would be unable to pass through supply lines.

2. Air supply is filtered to preclude introduction of foreign matter.

3. Instrument air driers are installed to preclude foreign matter due to corrosion.

4. Possibility of crimping precluded by a physical barrier around the exhaust lines.

b. If a non-mechanistic blockage of the exhaust line were assumed, damper will still open since supply air is cut off and venting would be accomplished through normal system leakage.

c. Finally, if a non-mechanistic failure of the system to operate were assumed, the stack radiation monitor (albeit Non-1E) will warn the operator to take the necessary action (i.e., manually secure system).

Based upon the above considerations, Brown & Root does not consider the postulated accident credible and does not plan to modify the design. It should be pointed out, however, that the System Design Reviews being conducted on the plant systems do encompass a systematic review of non-mechanistic failures to determine the impact of the ability of the system to function when called upon to perform.

GENERIC FINDING 3.1(f)
FSAR COMMITMENT TRACKING

This Generic Finding 3.1(f) notes the following:

1. "There was no documented evidence for assuring that individual FSAR commitments for systems, equipment or calculations were being systematically implemented into the design."

2. "There is a potential for a lack of awareness of individual FSAR commitments by STP site personnel. This could represent a significant problem for field initiated design changes."

3. "One group conspicuous by its absence during this design review program was Licensing."

4. "A consistent and documented B&R position regarding code and standards interpretations was not evident." "These interpretations are left to individuals or to vendor suppliers. The ASME code interpretation area appears to be particularly weak (see Question M-30)."

In response to the above:

1. Required modifications to the FSAR have been identified during the Design Assurance Review; (see SD005, Sec. 3.1.3.c and 3.2.3.e), the FSAR is scheduled for update during our upcoming systems design freeze. In addition, Project procedures require identifying all changes that affect the FSAR on the Design Change Notice form. Also, the Vendor Control Program performs a complete FSAR review for safety class equipment and materials to ensure any disconnects between equipment specifications and FSAR commitments are identified and rectified.

2. The statements made by Quadrex concerning B&R's site activities were made without the benefit of a B&R Site Engineering review. As a result, it is not clear how this conclusion was reached. STP Site Engineering personnel are an extension of the Home Office Engineering organization working through the same management. All field initiated design changes must receive the same scrutiny as a change generated in the Home Office.

3. Quadrex did not review the activities of B&R's Licensing Group as a special topic. There is periodic and systematic interface between Licensing and the disciplines which is closely controlled.

4. The ASME code problems identified by Quadrex are unique to specific components and will be addressed on an individual basis. The cited reference Question M-30 addresses no other codes and standards than ASME, hence, we assume that Quadrex's generic concerns relative to codes and standards is unfounded.

GENERIC FINDING 3.1(g)
PLANT DESIGN BASIS

Generic Finding 3.1(g) notes the following:

1. "There was very little evidence of a well-thought-out and consistent basis for design."..."A number of key front-end criteria documents are missing for STP."

2. "No document exists that identifies the interface design information required by each discipline from the other technical discipline."

3. "B&R indicated that WNES has reviewed portions of the intial STP design, but the quality and completeness of their review is uncertain."... "The interface between B&R, WNES, and KL&P needs to be improved."

4. "EDS indicated that B&R drawing changes are not reviewed on a routine basis."

5. "In numerous instances, WNES design bases for the nuclear island portion have been directly carried over to the balance-of-plant design without confirming their appropriateness for this application."

6. "In other instances, design details have been obtained from other P&R plants and used without confirming their applicability to the STP plant."

7. "B&R has not adopted a consistent requirement for design margin to be achieved by each discipline. There was ample evidence that individual engineers make the determination of the margin to be included in the design (see Questions C-12 and H-8)."

In response to the above:

1. The need for strengthening B&R's front end criteria documentation was identified by B&R during mid-1980 as acknowledged by Quadrex and problems in this area are in the process of being rectified. As stated by Quadrex on P. 3-9, "..., a number of these documents have either been recently issued or are currently undergoing review prior to initial issue,...". The absence of selected front end criteria documentation does not preclude the existence of "a well-thought-out and consistent basis for design." We, therefore, consider Quadrex's comments concerning this matter to be purely subjective.

2. As stated previously, the handling of design interface information is the responsibility of the B&R Systems Engineering Group and the use of preliminary information is for the most part due to be phased out during the upcoming design freeze of the individual plant systems.

3. Westinghouse received all B&R piping composite drawings for Westinghouse NSSS systems during 1977-78. From these drawings, they prepared PSDFTE 285, Rev. 0, which is the system state point analysis for all operating modes of NSSS systems. They also issued Westinghouse P&ID's for construction. In addition, the Westinghouse design manuals are used regularly by B&R during the design process. Westinghouse has also reviewed the logic diagrams for NSSS systems. Documentation of this review exists in the Project files. We consider Quadrex's comments in this area to be unjustified. We do, however, agree that the current B&R, Westinghouse and HL&P interface agreement needs to be improved and we have had discussions with HL&P in this regard.

4. The results of B&R's review of the EDS work was addressed earlier and based on Quadrex's comments, seems adequate.

5. B&R did evaluate the application of Westinghouse criteria throughout the design of the STP systems. Systems which interface with Westinghouse systems and which have interface criteria specified by Westinghouse were designed to meet those criteria. Other plant systems were designed to meet the presumed worst case operating criteria, e.g., plant water treatment systems.

6. B&R encourages the design engineers to factor previous experience into their designs. The Quadrex conclusion that "...design details have been obtained from other PWR plants and use without confirming their applicability of the STP plant...." is unfounded. Experience and first-hand knowledge of the applicable material is a prerequisite.

7. We have difficulty interpreting Quadrex's remarks concerning design margins because the various design basis codes and standards include margin. We presume that Quadrex is referring to the additional margins placed upon equipment and systems during the preliminary stages of design. These will be verified during the design freeze process and again during system pre-ops. We acknowledge Quadrex's comment concerning our response to Question C-12, "...some A/E's do consider this phenomenon similar to the manner in which Brown & Root did." We acknowledge Quadrex's findings relative to Question H-8, "...a quick assessment of the adequacy of margins in the HVAC system design is not possible."

8. Brown & Root has 20 volumes of Design Manuals which occupy 5 ft. of a standard bookshelf. In retrospect, the use of engineers log books may have helped to ease some of the problems resulting from the high personnel turnover experienced by B&R during the late 1970's. The turnover situation was unanticipated and had never been experienced on previous B&R jobs.

GENERIC FINDING 3.1(h)
EQUIPMENT RELIABILITY REQUIREMENTS

Generic Finding 3.1(h) notes:

1. "Specific reliability requirements, such as for the ESF sequencer, have not been established (see Questions E-7 and E-8)."

2. "If the ESF sequencer reliability should turn out to be incompatible with the remainder of the ESF equipment, then B&R's dependence upon meeting only the single failure criterion would be unsatisfactory from a systems viewpoint."

3. "The absence of specific reliability requirements in both mechanical and electrical equipment specifications,....casts doubt on the rigor of the safety-related evaluation process."

4. "Throughout the design review, specifications to constrain spurious operation were absent."

The following is offered in response to these areas:

1. Reliability requirements have been specifically addressed in the ESF load sequencer spec. ES-071, Section 3.4, Reliability Analysis, which requires the vendor to implement the method of fault tree analysis, as per IEEE Std. 352.

2. Regarding the possibility of incompatability, the vendor is required to conform to the codes and standards listed in Section 2 of the above specification. B&R feels that these requirements are sufficient to ensure compatability with the ESF equipment supplied by WNES. Additionally, the design satisfies single failure criterion. Should failure of one sequencer occur, two other safety class trains would be available.

3. B&R does not concur with Quadrex's generalization of an "absence of specific reliability requirements in...specifications." The requirements imposed by the codes and standards cited in our specifications are, in our judgment, sufficient to ensure adequate reliability. Evaluation of vendor documents reflecting the implementation of the required standards is reviewed by the responsible engineer who at that time ensures the adequacy of the design. See STP Procedure STP-DC-004 for the methodology for approving vendor drawings and documents.

4. Although the comment regarding "spurious operation" is general, our response specifically addresses the sequencer. Spurious operation of the sequencer is prevented by a matrix recognition requirement of 2 out of 4 signals for undervoltage recognition (modes II or III), or 4 out of 6 signal recognitions for safety injection (mode I or III). Further details can be found in the sequencer specification in the section describing mode of operations. Also, spurious valve movements have been considered as early as the PSAR stage. A review of the Safety Evaluation Report and the appropriate logic diagrams would have made this evident.

GENERIC FINDING 3.1(1)
NUCLEAR-RELATED ANALYSIS

Generic Finding 3.1(1) notes the following:

1. "The chosen analysis methods demonstrate a sharp paradox between the more conventional engineering work and the uniquely nuclear engineering work required for portions of the STP design." "In certain disciplines, such as Civil/Structural and Electrical, technically adequate methods have been chosen. However, for the nuclear aspects of the project, Brown & Root has been much less adequate in its choice of analysis methods and assumptions." "In addition, an abnormally high error rate was observed in these calculations. In many instances, insufficient work has been accomplished for the present state of STP design, procurement, and construction."

2. "The amount of nuclear-related analysis that is subcontracted by B&R is higher than a typical A/Es practice. The technical guidance provided by some of these groups for subcontracted consultants, such as EDS and NUS, does not appear to be adequate. Review of these subcontracted analyses does not appear to be sufficient."

The following is offered in response to these areas:

1. Changes to correct past difficulties in the Nuclear Analysis Group were implemented in 1980. Plans to complete outstanding work are evident in the Project schedules. Responses to specific concerns will be addressed on a case bases.

2. The work done by EDS and NUS has been shown to be of high quality and adequately coordinated and interfaced with affected disciplines. The "amount" of analysis that is subcontracted is irrelevent with respect to this review.

GENERIC FINDING 3.1(J)
FINAL DESIGN VERIFICATION

Generic Finding 3.1(J) notes the following:

1. "The B&R design verification process permits the use of preliminary data up to the point of STP fuel loading."

2. "There are no documented standards regarding the minimum qualifications required for a design verifier. Typically, the Discipline Project Engineer selects the design verifier from within the discipline, but his basis for selection is not documented."

The following is offered in response to these areas:

1. We do not see how this finding can be consistent with Quadrex's assessment of B&R's response to Question C-16 which is referenced as a basis for the finding; i.e., "Brown & Root's design verification procedure appeared to be adequate or above industry standards on paper; however, we (Quadrex) were unable to evaluate the effectiveness of this procedure."

2. Quadrex acknowledges in the text of the review that this approach does not violate NRC requirements.

ENCLOSURE 1

GENERIC FINDING 3.1(a)

In reviewing Quadrex Generic Finding 3.1(a), it has been noted that the response can be broken basically into five concerns. They are:

1. Concern relative to effect of integration of system design.

2. Concern that design review process could easily overlook equipment physical arrangement and separation requirements.

3. The discipline structure is too tightly organized on a purely discipline basis.

4. The ability to achieve internal consistency due to high personnel turnover.

5. The lack of a single failure criteria document.

The following information is offered in response to these five areas.

1. During the Quadrex audit, Quadrex did not review the efforts of the Brown & Root System Design Assurance Group. Quadrex verbally commented that the effects of this group had not yet been evident in design documents; therefore, they did not consider the existence of this group. It should be noted that the basic reasoning in forming the System Design Assurance Group some 18 months ago was to provide an overview function within the Brown & Root design process for ensuring the effectiveness of our system integration process. The System Design Assurance Group has completed its first phase of this activity and has identified to the various disciplines additional items to be incorporated into the design. The workings of this group is documented in Project Procedures and they have proven to be effective in providing the overall integration required.

2. Similarly, it was recognized about two years ago that plant arrangements needed to be reviewed and systematically evaluated to assure that interferences and other physical concerns relative to equipment layout were being adequately addressed. The Physical Design Assurance Group was formed comprised of two major components, physical modeling and computerized modeling. This group has been evaluating the major plant areas for interference of basic components, and accessibility for maintenance and in-service inspection. Brown & Root does concur with the fact that the concentration of this group has been, to date, primarily on the physical interference aspect. We are currently in the process of increasing the attention of this group to maintenance, ISI, ALARA, and other similar activities. Also, a series of systems hazards review drawings have been prepared which evaluate all physical areas for factors such as fires, missiles, pipe break, etc.

3. Quadrex expressed a concern over the fact that the technical disciplines were organized very tightly and they infer that there was not a routine follow-through with the discipline input/output interface. It is very difficult to ascertain from any of the specific Quadrex responses the basis for this assessment. The one specific statement where Quadrex claims that the Mechanical Group was not permitted to review I&C logic diagrams is incorrect. There is significant evidence in the files in the Document Control Center showing review and comments from the Mechanical Group to the I&C Group concerning system logics.

4. Quadrex expressed a concern relative to the consistency of various documents due to the high turnover of personnel, particularly in the area of plant separation. Brown & Root had previously recognized such a need and in fact, has issued a Separation Criteria TRD. The activity of the safety system hazards analysis is providing the very criteria for use by our engineers that Quadrex appeared to criticize Brown & Root for lacking.

5. Quadrex expressed a concern that there was not in a controlled document a multi-disciplinary interpretation of single failure criteria. This is a correct statement; however, as the design demonstrates, we have adequately addressed single failure criteria and have through the System Design Assurance Group, provided a single activity to review all discipline interpretations to assure that the single failure criteria has been applied consistently by all the Project disciplines.

In summary, we concur with some of the Quadrex findings; however, all have been previously identified and actions taken within the Project to assure that the STP design was totally adequate. It should be noted that the only specific reference given to this generic concern by Quadrex was Question H-6, which was a question regarding how the HVAC system design incorporates single failure into its separation criteria. The Quadrex response or assessment stated that we had no written criteria for physical separation to protect against postulated fires, high energy lines, and also that the fire hazards analysis performed by a contractor directly for HL&P had not been converted into a controlled document. It appears that Quadrex did not discover that we were in fact in the process of issuing the criteria document as part of our recent system hazards analysis and in fact, negotiating a contract with NUS to revise the previous fire hazards analysis and issue it as a controlled Project document.

Enclosure 1

GENERIC FINDING 3.1(b)
BROWN & ROOT REVIEW
OF ENGINEERING DATA

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Generic Finding 3.1(b) notes the following:

1. "Input data to a technical group does not appear to be consistently reviewed by that group for its reasonableness prior to use...".

2. "Calculations containing errors are being reviewed and verified as correct with a higher frequency than should be encountered."

3. "B&R review of vendor submitted reports is not consistent."

As Quadrex pointed out, this generic concern can be broken into three items. First, concern relative to technical groups not adequately reviewing input data from other groups for its reasonableness prior to use. Secondly, the calculations containing errors are being reviewed and verified with a higher frequency than should be encountered; and third, our review of vendor submitted reports is not consistent.

1. Quadrex appears to have a different concept on how Engineering activities are performed than does Brown & Root. Quadrex appears to think that one discipline should somehow formally be responsible for the input given to it by other disciplines. It always has been the practice on this Project that if information transmitted from one group to another appears to be totally out of line with what that engineer is accustomed to, he will discuss his concerns with the group transmitting the data. However, the responsibility for the accuracy and reasonableness of such data must lie with the originating group. In reviewing the specific questions referenced relative to this finding, it is very difficult to trace the specific concern of Quadrex to these items. Brown & Root statements made as to how heat loads were assumed in the HVAC area or how input from Westinghouse was utilized are totally defensable, and do not indicate or in any way infer that information is not reviewed for reasonableness prior to being used. The approach being used by Brown & Root is not inconsistent with good engineering practice exercised by other Architect-Engineers.

2. This concern alleges that subsequent to review and verification, calculations were found to contain errors with a higher frequency than should have been encountered. In reviewing the specific review questions, once again, it was impossible to ascertain the degree of significance that Quadrex placed with the wording of this finding. This item is indicative of the difficulty we had in responding to generalized Quadrex findings even in specific areas; for example, a review of the four questions referenced here provides the following:

   Question C-16, Quadrex assessment quotes that "Brown & Root's design verification procedure appears to be adequate or above industry standards on paper." On the otherhand, they express a concern of how effective we have implemented the procedure

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and state that there was evidence that a significant number of mistakes had passed through the verification process. However, no specific reference to any calculation or calculation number was given and no basis was given for the statement of "a significant number of mistakes" or how the results compare with experience at another Architectural Engineers.

Question H-15, which is referenced, basically states that we did not take into account the effects of restriction of air flow in the Reactor Cavity area. This was a potential reportable condition which had been identified by Brown & Root prior to the Quadrex audit, and was under evaluation. This in itself, is not an indication of significant errors in calculations.

Similarly in Question N-1, a single concern relative to a large temperature error was identified; however, in the Quadrex assessment, it stated that the occurrence of such an error is neither uncommon nor a sign of inadequacy. Further, in their response, they stated that calculations reviewed were well organized, as were the verifications. Again, this single concern does not provide the basis for a significant large number as referenced in thier generic finding.

Finally, in referenced Question N-17, Quadrex assessment indicated that there was either an error or an inconsistency with a calculation and that this condition needed to be evaluated; however, once again there was not specific reference to a significant number of mistakes as indicated by the generic finding.

3. Quadrex indicated that they felt that our review of vendor submitted reports was not consistent. They also indicated a concern that the interface we have with such major subcontractors, as EDS and Westinghouse, raise many questions regarding overall technical adequacy of the interface with these suppliers. Brown & Root again is confused as to Quadrex's concern in this area, particularly relative to the EDS interface, in that in response to the questions on the EDS area, Quadrex reported on Page 4-74, "In general, EDS in containment design analysis appears to be technically adequate." "There were no findings in EDS scope that are expected to seriously impact plant licensability." In addition, on Page 4-75, the following quote appears, "In the EDS scope, there were no findings that pose a concern for the plant to generate reliable power." With these findings from Quadrex, we would assume that they have concluded that the interface between Brown & Root and EDS has been adequate. Brown & Root interface with Westinghouse is such that we are responsible for evaluating technical adequacy of the interfaces; however, it is not our responsibility to evaluate their internal analysis methods. In summary, we share Quadrex concerns in some isolated areas relative to a specific review of a vendor package; however, once again, we do not feel that the back-up information supports the degree in which Quadrex expresses this concern.

GENERIC FINDING 3.1(c)
PLANT OPERATING MODES AND
ENVIRONMENTAL CONDITIONS ANALYSIS

Generic Finding 3.1(c)notes the following:

1. "Thorough and consistent treatment of various plant operating modes and environmental conditions was not evident" and "no written design basis are provided to guide designer in combination of events and plant modes to be considered."

2. "Consideration of degraded equipment not evident".

3. "Design criteria do not adequately reflect recent developments."

4. "Assumed 'worst case' conditions may not properly bound the set of anticipated plant conditions." (Questions H-3 and N-17).

5. "Assumptions regarding door and hatch positions seem unrealistic..."

6. "Failure to consider off-site power condition in a timely manner has led to recent studies and the need to upgrade certain safety-related HVAC systems to safety related (Question H-5)."

7. "The absence of postulated line cracks and breaks outside containment is inadequate (Question M-3, M-5, N-1, and N-3)." "Similarly, the inability of Nuclear Analysis to develop appropriate environmental conditions for these areas in a timely manner is also inadequate."

The following information is offered in response to these areas:

1. Operation requirements are covered in SD005, Engineering Procedure for Design Assurance Reviews, and the operations section of the respective System Design Descriptions; these requirements are defined in Appendix A to SDD 002, "Outline for Active System Design Descriptions" Operational Requirements (9.2 and 9.3). Normal environmental conditions were covered in the system designs and are evident in Section 2, (Design Requi-ements) and Section 3, (Operating Modes and Design Features) of individual SDD's. Estimates were made for off-normal and accident conditions based on experience with other similar nuclear plants. There is an on-going program to review the design for environmental conditions such as pipe breaks and loss of power.

2. Degraded equipment performance is incorporated into the plant design in the form of fouling factors and filter loading contributing to increased system pressure drop and degraded heat exchanger heat transfer capacity. Further, safety systems take such degration into account through the "single failure" design feature. Consideration of other possible equipment degradation is scheduled for review during Phase II of the Design Assurance Program.

Enclosure 1

Generic Finding 3.1(c)
Page 2

3. The adequacy of the Brown & Root design process is acknowledged by the Quadrex statement, "Design criteria provided in issued System Design Descriptions (SDDs) and Technical Reference Documents (TRDs) appear to adequately reflect industry issues for the 1973-1975 time frame; however, they do not adequately address more recent developments...". It is noted that the 1973-1975 time frame is precisely when the initial STP plant design occurred.

   More recent developments including TMI are being addressed as on-going programs, both within the disciplines and by the Design Assurance Group.

4. Two cases are cited by Quadrex as examples of where assumed worst case design conditions were not bounding. Contrary to the implication that these were a "finding" by Quadrex, these cases were specifically identified by Brown & Root to Quadrex and were being worked on prior to initiation of the Quadrex Engineering Review. These are: H-3, HVAC design, and N-17, ECP design. The HVAC design was reported in B&R letter ST-BR-HL-38718 of May 8, 1981. This was identified as a potentially reportable problem in accordance with 10CFR50.55(e) and a summary of the problem was given in Enclosure (1) to the above letter.

   A change has been scheduled in the ECP Technical Specification Temperature limits to incorporate updating of the calculation for the most severe plant and weather conditions. Satisfactory equipment performance under the slightly higher temperatures is being verified.

   HL&P will be kept apprised of the status of the above items.

5. This "most serious generic finding" by Quadrex that B&R's "assumptions regarding door and hatch positions seem unrealistic" is totally unsupported by the example cited (H-14). In this example, the complete Quadrex assessment reads: "B&R control room pressurization HVAC calculation is adequate."

6. Contrary to the Quadrex implication, loss of off site power has been considered since the early stages of the Project dating as far back as pre-PSAR era. This requirement is periodically reviewed and updated as part of the normal design evaluation and the need for upgrading has been identified in such instances as Special Problem #16. The fact that this HVAC problem had been identified and is being worked on was pointed out to Quadrex but apparently was not considered in the "most serious generic finding" section of the report. On the other hand, in the detailed discussion of Question H-8 in Vol. II, Quadrex acknowledged the following: "Quadrex was informed by HL&P that a special task is now underway to study the need for additional safety related HVAC systems."

Enclosure 1

7. As Quadrex was informed, the program for break analysis outside of containment is underway. Results for pipe breaks outside of containment in the IVC are in final stages of completion. Since remaining high energy lines outside containment are minimal, work on these has been scheduled for 1981 implementation. These will form the basis for the environmental conditions evaluation by Nuclear Analysis.

Enclosure 1

GENERIC FINDING 3.1(d)

SAFETY RELATED VS. NON-SAFETY RELATED DISTINCTIONS

Generic Finding 3.1(d) notes:

1. "It was observed on many occasions that B&R uses a very sharp distinction between S/R and non-S/R categorizations for both equipment and calculations. A non-S/R designation results in the design outputs not being subjected to design verification."

2. "It was frequently stated during the design review that only NRC requirements must be met whether or not those requirements are accurate, reasonable, or even meet the intent of the regulations."

3. "There has been no planned effort to review new NRC requirements (excluding TMI-2 concerns) to determine their impact on STP."

The following is offered in response to these areas:

1. All B&R design documents as well as supplier documents are reviewed and checked by B&R. The sharp distinction cited deals with a project procedure for formal documentation of these reviews and the resolution of any comments generated during the reviews. The existing B&R procedures and document designations are adequate in this regard. In the design of a nuclear power plant, it is mandatory that a sharp distinction be maintained between S/R and non-S/R systems from a licensing point of view. B&R concedes, however, that regardless of system classification, computer codes should be verified as a matter of good engineering practice. This action is being taken.

2. The statement that, "It was frequently stated during the design review that only NRC requirements must be met, whether or not those requirements are accurate, reasonable, or even meet the intent of the regulations" is a misrepresentation of the Brown & Root position. B&R endeavors to satisfy regulatory requirements as a mandatory requirement. However, the B&R position is that regulations and standards are not substitutes for technical understanding, or engineering judgment. In the final analysis, engineering judgment prevails. The designer interprets the requirements and implements these requirements by placing emphasis on those considered to have the most serious impact on the design. Secondary effects are considered but these cannot become overriding to the extent that the fundamental function of the system is compromised by a postulated event with a low probability of occurrence.

3. This statement is not correct. Brown & Root consistently reviews NRC requirements applicable to STP at both the discipline level and the licensing level. In addition, the Special Projects Group will evaluate, where appropriate, the implementation of such requirements.

GENERIC FINDING 3.1(e)
FMEA AND SINGLE FAILURE CRITERION

The Generic Finding 3.1(e) notes the following:

1. The supporting specific "most serious finding" (4.3.2.1) to this generic finding "suggests that B&R is not sufficiently experienced in the performance of Failure Modes and Effect Analysis that crosses discipline boundaries."

2. "No guidelines exist on what types of failures should be considered for various types of equipment." "There is no documented evidence that the single failure criterion has been satisfied." "One concern is the varied interpretation by individual disciplines that can be given to 'direct and consequential failures' resulting from a postulated event."

3. "An HVAC/I&C single failure criterion violation has been noted (Questions R-6 and E-15)."

The following is offered in response to these areas:

1. Brown & Root disagrees with this statement. Quadrex has used an isolated incident to assume this conclusion. Examples of B&R FMEA's crossing discipline boundaries are as follows:

FSAR Table Ref.	System FMEA
7.3-12	Control Room Ventilation Isolation Actuation
7.3-13	Containment Building Purge Isolation Failure
8.3- 8	D.C. Power Systems
8.3- 9	Auxiliary AC Power System
8.3-13	120-Vac Vital Instrumentation Power System
9.2.1-2	Essential Cooling Water System
9.2.2-3	Component Cooling Water System
9.3- 2	Air-Operated Valves
9.3-12	Chemical and Volume Control System
9.4- 5.1	Control Room & Elect. Aux. Building HVAC System
9.4- 5.2	Fuel Handling Building HVAC System
9.4- 5.3	Mechanical Aux. Building HVAC System
9.4- 5.4	Turbine Generator Building HVAC System
9.4- 5.5	Reactor Containment Building HVAC System
9.4- 5.6	Diesel Generator Building HVAC System
9.4- 5.7	Miscellaneous Buildings HVAC System
9.5- 2	Fire Protection System
9.5.5-2	Diesel Generators
10.4- 3	Aux. Feedwater System
10.4- 4	Turbine Bypass System (TBS)

Contrary to Quadrex statements, the FMEA approach has also been used after the FSAR period where appropriate to ensure adequate design.

Finally, updating of Failure Mode and Effects Analysis has been assigned to the System Design Assurance Group. This discipline was established in late 1979 to ensure that systems level integration was in fact present on the Project. The group has been assigned the responsibility of performing FMEA's on the components of the system, the system itself, and all interfacing systems, and will use written procedures reflecting present day FMEA practices.

2. STP Procedure SD-002, Engineering Procedure for System Design Descriptions Appendix A, Section 9.3, requires that Section 4.3, "Casualty Events and Recovery Procedures" include a "list of all casualty events considered in the design such as:

   - o Loss of offsite power.
   - o Loss of instrument air.
   - o Single failures.
   - o Operator errors, etc."

   Therefore, the SDD's specifically address all failures that have been considered. These documents are being reviewed by all design disciplines including the System Design Assurance Group, to ensure a consistent approach.

   It is acknowledged that updating of System Design Descriptions is required in certain areas to reflect design evolution. However, this was recognized well before the Quadrex review and a program was developed in October of 1980. This work has been scheduled and is being incorporated into the Re-estimate Plan in the normal conduct of the design.

   Through the influence of the Design Assurance Group, B&R feels that a consistent interpretation of failure analysis will be achieved. This is borne out in the results of the Phase I reviews to date.

3. In the alleged "single failure criterion violation" cited, the following conditions exist: Dampers to the two redundant HEPA-charcoal filter trains are held closed by air pressure. High radiation in the Fuel Building actuates a three-way solenoid valve. This action both removes supply air pressure to the dampers and vents the line causing the dampers to open. The Quadrex contention is that a common exhaust line may become blocked thus disabling the system with a single failure. This contention is not credible for the following reasons:

   a. Blockage of exhaust lines is precluded by the following design features:

      1. Exhaust lines to the damper actuators are larger in size than supply lines. Therefore, if foreign matter were large enough to become lodged in an exhaust line, it would be unable to pass through supply lines.

2. Air supply is filtered to preclude introduction of foreign matter.

3. Instrument air driers are installed to preclude foreign matter due to corrosion.

4. Possibility of crimping precluded by a physical barrier around the exhaust lines.

b. If a non-mechanistic blockage of the exhaust line were assumed, damper will still open since supply air is cut off and venting would be accomplished through normal system leakage.

c. Finally, if a non-mechanistic failure of the system to operate were assumed, the stack radiation monitor (albeit Non-1E) will warn the operator to take the necessary action (i.e., manually secure system).

Based upon the above considerations, Brown & Root does not consider the postulated accident credible and does not plan to modify the design. It should be pointed out, however, that the System Design Reviews being conducted on the plant systems do encompass a systematic review of non-mechanistic failures to determine the impact of the ability of the system to function when called upon to perform.

Enclosure 1

GENERIC FINDING 3.1(f)
FSAR COMMITMENT TRACKING

This Generic Finding 3.1(f) notes the following:

1. "There was no documented evidence for assuring that individual FSAR commitments for systems, equipment or calculations were being systematically implemented into the design."

2. "There is a potential for a lack of awareness of individual FSAR commitments by STP site personnel. This could represent a significant problem for field initiated design changes."

3. "One group conspicuous by its absence during this design review program was Licensing."

4. "A consistent and documented B&R position regarding code and standards interpretations was not evident." "These interpretations are left to individuals or to vendor suppliers. The ASME code interpretation area appears to be particularly weak (see Question M-30)."

In response to the above:

1. Required modifications to the FSAR have been identified during the Design Assurance Review; (see SDOOS, Sec. 3.1.3.c and 3.2.3.e), the FSAR is scheduled for update during our upcoming systems design freeze. In addition, Project procedures require identifying all changes that affect the FSAR on the Design Change Notice form. Also, the Vendor Control Program performs a complete FSAR review for safety class equipment and materials to ensure any disconnects between equipment specifications and FSAR commitments are identified and rectified.

2. The statements made by Quadrex concerning B&R's site activities were made without the benefit of a B&R Site Engineering review. As a result, it is not clear how this conclusion was reached. STP Site Engineering personnel are an extension of the Home Office Engineering organization working through the same management. All field initiated design changes must receive the same scrutiny as a change generated in the Home Office.

3. Quadrex did not review the activities of B&R's Licensing Group as a special topic. There is periodic and systematic interface between Licensing and the disciplines which is closely controlled.

4. The ASME code problems identified by Quadrex are unique to specific components and will be addressed on an individual basis. The cited reference Question M-30 addresses no other codes and standards than ASME, hence, we assume that Quadrex's generic concerns relative to codes and standards is unfounded

Enclosure 1

GENERIC FINDING 3.1(g)
PLANT DESIGN BASIS

Generic Finding 3.1(g) notes the following:

1. "There was very little evidence of a well-thought-out and consistent basis for design."..."A number of key front-end criteria documents are missing for STP."

2. "No document exists that identifies the interface design information required by each discipline from the other technical discipline."

3. "B&R indicated that WNES has reviewed portions of the intial STP design, but the quality and completeness of their review is uncertain."... "The interface between B&R, WNES, and HL&P needs to be improved."

4. "EDS indicated that B&R drawing changes are not reviewed on a routine basis."

5. "In numerous instances, WNES design bases for the nuclear island portion have been directly carried over to the balance-of-plant design without confirming their appropriateness for this application."

6. "In other instances, design details have been obtained from other PWR plants and used without confirming their applicability to the STP plant."

7. "B&R has not adopted a consistent requirement for design margin to be achieved by each discipline. There was ample evidence that individual engineers make the determination of the margin to be included in the design (see Questions C-12 and M-8)."

In response to the above:

1. The need for strengthening B&R's front end criteria documentation was identified by B&R during mid-1980 as acknowledged by Quadrex and problems in this area are in the process of being rectified. As stated by Quadrex on P. 3-9, "..., a number of these documents have either been recently issued or are currently undergoing review prior to initial issue,...". The absence of selected front end criteria documentation does not preclude the existence of "a well-thought-out and consistent basis for design." We, therefore, consider Quadrex's comments concerning this matter to be purely subjective.

2. As stated previously, the handling of design interface information is the responsibility of the B&R Systems Engineering Group and the use of preliminary information is for the most part due to be phased out during the upcoming design freeze of the individual plant systems.

3. Westinghouse received all B&R piping composite drawings for Westinghouse NSSS systems during 1977-78. From these drawings, they prepared PSDFTE 285, Rev. 0, which is the system state point analysis for all operating modes of NSSS systems. They also issued Westinghouse P&ID's for construction. In addition, the Westinghouse design manuals are used regularly by B&R during the design process. Westinghouse has also reviewed the logic diagrams for NSSS systems. Documentation of this review exists in the Project files. We consider Quadrex's comments in this area to be unjustified. We do, however, agree that the current B&R, Westinghouse and HL&P interface agreement needs to be improved and we have had discussions with HL&P in this regard.

4. The results of B&R's review of the EDS work was addressed earlier and based on Quadrex's comments, seems adequate.

5. B&R did evaluate the application of Westinghouse criteria throughout the design of the STF systems. Systems which interface with Westinghouse systems and which have interface criteria specified by Westinghouse were designed to meet those criteria. Other plant systems were designed to meet the presumed worst case operating criteria, e.g., plant water treatment systems.

6. B&R encourages the design engineers to factor previous experience into their designs. The Quadrex conclusion that "...design details have been obtained from other PWR plants and use without confirming their applicability of the STP plant...." is unfounded. Experience and first-hand knowledge of the applicable material is a prerequisite.

7. We have difficulty interpreting Quadrex's remarks concerning design margins because the various design basis codes and standards include margin. We presume that Quadrex is referring to the additional margins placed upon equipment and systems during the preliminary stages of design. These will be verified during the design freeze process and again during system pre-ops. We acknowledge Quadrex's comment concerning our response to Question C-12, "...some A/E's do consider this phenomenon similar to the manner in which Brown & Root did." We acknowledge Quadrex's findings relative to Question H-8, "...a quick assessment of the adequacy of margins in the HVAC system design is not possible."

8. Brown & Root has 20 volumes of Design Manuals which occupy 5 ft. of a standard bookshelf. In retrospect, the use of engineers log books may have helped to ease some of the problems resulting from the high personnel turnover experienced by B&R during the late 1970's. The turnover situation was unanticipated and had never been experienced on previous B&R jobs.

Enclosure 1

GENERIC FINDING 3.1(h)
EQUIPMENT RELIABILITY REQUIREMENTS

Generic Finding 3.1(h) notes:

1. "Specific reliability requirements, such as for the ESF sequencer, have not been established (see Questions E-7 and E-8)."

2. "If the ESF sequencer reliability should turn out to be incompatible with the remainder of the ESF equipment, then B&R's dependence upon meeting only the single failure criterion would be unsatisfactory from a systems viewpoint."

3. "The absence of specific reliability requirements in both mechanical and electrical equipment specifications,....casts doubt on the rigor of the safety-related evaluation process."

4. "Throughout the design review, specifications to constrain spurious operation were absent."

The following is offered in response to these areas:

1. Reliability requirements have been specifically addressed in the ESF load sequencer spec. ES-071, Section 3.4, Reliability Analysis, which requires the vendor to implement the method of fault tree analysis, as per IEEE Std. 352.

2. Regarding the possibility of incompatability, the vendor is required to conform to the codes and standards listed in Section 2 of the above specification. B&R feels that these requirements are sufficient to ensure compatability with the ESF equipment supplied by WNES. Additionally, the design satisfies single failure criterion. Should failure of one sequencer occur, two other safety class trains would be available.

3. B&R does not concur with Quadrex's generalization of an "absence of specific reliability requirements in...specifications." The requirements imposed by the codes and standards cited in our specifications are, in our judgment, sufficient to ensure adequate reliability. Evaluation of vendor documents reflecting the implementation of the required standards is reviewed by the responsible engineer who at that time ensures the adequacy of the design. See STP Procedure STP-DC-004 for the methodology for approving vendor drawings and documents.

4. Although the comment regarding "spurious operation" is general, our response specifically addresses the sequencer. Spurious operation of the sequencer is prevented by a matrix recognition requirement of 2 out of 4 signals for undervoltage recognition (modes II or III), or 4 out of 6 signal recognitions for safety injection (mode I or III). Further details can be found in the sequencer specification in the section describing mode of operations. Also, spurious valve movements have been considered as early as the PSAR stage. A review of the Safety Evaluation Report and the appropriate logic diagrams would have made this evident.

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GENERIC FINDING 3.1(1)
NUCLEAR-RELATED ANALYSIS

Generic Finding 3.1(1) notes the following:

1. "The chosen analysis methods demonstrate a sharp paradox between the more conventional engineering work and the uniquely nuclear engineering work required for portions of the STP design." "In certain disciplines, such as Civil/Structural and Electrical, technically adequate methods have been chosen. However, for the nuclear aspects of the project, Brown & Root has been much less adequate in its choice of analysis methods and assumptions." "In addition, an abnormally high error rate was observed in these calculations. In many instances, insufficient work has been accomplished for the present state of STP design, procurement, and construction."

2. "The amount of nuclear-related analysis that is subcontracted by B&R is higher than a typical A/Es practice. The technical guidance provided by some of these groups for subcontracted consultants, such as EDS and NUS, does not appear to be adequate. Review of these subcontracted analyses does not appear to be sufficient."

The following is offered in response to these areas:

1. Changes to correct past difficulties in the Nuclear Analysis Group were implemented in 1980. Plans to complete outstanding work are evident in the Project schedules. Responses to specific concerns will be addressed on a case bases.

2. The work done by EDS and NUS has been shown to be of high quality and adequately coordinated and interfaced with affected disciplines. The "amount" of analysis that is subcontracted is irrelevent with respect to this review.

Enclosure 1

GENERIC FINDING 3.1(j)
FINAL DESIGN VERIFICATION

Generic Finding 3.1(j) notes the following:

1. "The B&R design verification process permits the use of preliminary data up to the point of STP fuel loading."

2. "There are no documented standards regarding the minimum qualifications required for a design verifier. Typically, the Discipline Project Engineer selects the design verifier from within the discipline, but his basis for selection is not documented."

The following is offered in response to these areas:

1. We do not see how this finding can be consistent with Quadrex's assessment of B&R's response to Question C-16 which is referenced as a basis for the finding; i.e., "Brown & Root's design verification procedure appeared to be adequate or above industry standards on paper; however, we (Quadrex) were unable to evaluate the effectiveness of this procedure."

2. Quadrex acknowledges in the text of the review that this approach does not violate NRC requirements.

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Brown & Root, Inc.
P. O. Box 3, Houston, Texas 77001

M-17 (8-77)

MESSAGE

To F. E. Muellner

DATE 9/8/81

I called J. Sumpter today to get the input on the categorization of the Quadrex 238 items. He will send the draft to me Monday.

J. Sumpter called later today and requested another copy of the memo I sent him 8/28/81 summarizing the Quadrex - part 21 - 50.55(e) correspondence. This

BY

INSTRUCTIONS TO SENDER:
1. SEND TO JOB FILE 2. SEND WHITE AND PINK COPIES WITH CARBON INTACT.

REPLY

DATE

was for Gilbert's meeting with NRC. Sumpter said he needs another copy to give to Tyree for a meeting today at Noon.

A copy of the 3/28 memo is attached.

Joe Sig.

cc. E.A. Saltarelli

SIGNED

INSTRUCTIONS TO RECEIVER:
1. WRITE REPLY. 2. KEEP PINK COPY, RETURN WHITE COPY TO SENDER.

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cc: F. E. Mueller
J. Signorelli
9-23-81

From the desk of....
F. E. MUELLNER

670-3888

September 25, 1981

J. L. Marks

I have asked Signorelli to prepare responses to Items 1 and 2 for our review.

Frank

0501633

...d specific B&R input:

...d with a Quadrex finding, we need ...viously been identified by B&R, ...f treatment.

...e, we find no response, either in ...er in the 8/31/81 package sent to ... an oversight?

...

... has agreed to confore to a Quadrex ...t necessarily feel you should. Such ...rivate list, separate from our report.

..., we elect not to address the follow...

... 21)

...egree of seriousness, of a given item.

c) Comments by Quadrex on B&R Organization, personnel, or general capabilities.

d) Solutions to matters identified by Quadrex.

We have identified to Bill Mitchell some info or documents we need, and will contact Joe Signorelli on any further needs identified.

I will keep you apprise of our progress and further thoughts as we go along.

Good Luck!

Harvey
9-23-81

Harvey

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cc: F. E. Mueller
J. Signorelli
9-23-81

Gene:

There are two points on which we need specific B&R input:

1. In each case where B&R has agreed with a Quadrex finding, we need to know whether the item had previously been identified by B&R, and was already in some stage of treatment.

2. In case of some Quadrex findings, we find no response, either in your 9/11/81 in-house package, or in the 9/8/81 package sent to NLAP. Was this intentional, or an oversight?

Item 1 is of special importance.

Also: In some cases, where B&R has agreed to conform to a Quadrex comment or suggestion, we do not necessarily feel you should. Such items will be given you as a private list, separate from our report.

In terms of scope of our report, we elect not to address the following:

a) Reportability (55-E or Part 21)

b) Impact on the project or degree of seriousness, of a given item.

c) Comments by Quadrex on B&R Organization, personnel, or general capabilities.

d) Solutions to matters identified by Quadrex.

We have identified to Bill Mitchell some info or documents we need, and will contact Joe Signorelli on any further needs identified.

I will keep you apprise of our progress and further thoughts as we go along.

Good Luck!

Harvey
9-23-81

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