UNITED STATES OF AMERICA

BEFORE THE NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
HOUSTON LIGHTING AND POWER CO. (South Texas Project, Units 1 and 2)	)	Docket Nos. 50-498 50-499

CITIZENS FOR EQUITABLE UTILITIES' PETITION TO SUSPEND CONSTRUCTION OF THE SOUTH TEXAS PROJECT

I. INTRODUCTION

1. This petition to the Nuclear Regulatory Commission ("NRC") is brought by Citizens for Equitable Utilities ("CEU"). The petition seeks the immediate suspension of construction of the South Texas Project ("STP") on the basis of new information that reveals the design of the South Texas Project to be fundamentally flawed in areas bearing directly on reactor safety. It is brought before the Commission rather than the staff for the reasons discussed below.

2. The managing partner of the South Texas Project is Houston Lighting and Power Company ("HL&P"), which entered into contracts on October 31, 1972, and June 11, 1974, with Brown and Root, Inc. ("B&R"), under which B&R was to perform all services as architect/engineer and constructor of the South Texas Project, including particularly the design of the project. HL&P obtained construction permits CPPR-128 and CPPR-129 for the project on December 25, 1975.

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3. Construction proceeded at the South Texas Project until the issuance of an immediately effective Order to Show Cause by the NRC Office of Inspection and Enforcement on April 30,

1980, which was based on the results of an intensive, three month special investigation of construction and quality assurance at the project. In response to the Order to Show Cause, HL&P effectively admitted the findings in the NRC's investigation and instituted reviews of several areas of plant construction, including safety-related concrete, safety-related welding, and structural backfill. Based on these reviews and other HL&P actions, the NRC Staff has permitted construction to continue.

4. Largely as a result of the serious questions raised by the NRC's special investigation and Order to Show Cause, the Commission directed the Atomic Safety and Licensing Board considering HL&P's request for an Operating License to issue an expedited, partial initial decision on the questions raised by the NRC investigation, and particularly on the issue of the basic competence and character of HL&P. Houston Lighting and Power Co. (South Texas Project, Units 1 and 2), CLI-80-33 (1980). The expedited hearings began on May 12, 1981. CEU is an intervenor in the Operating License proceeding.

5. On September 24, 1981, HL&P informed the Licensing Board and the parties that it had dismissed Brown and Root as architect/engineer and construction manager of the South Texas Project, but said it expected B&R to continue as constructor. In dismissing B&R, HL&P took the public position that its actions were not the result of inadequacies or flaws in the design or design process, but of B&R's failure to produce enough of the design in time to allow construction to proceed smoothly.

6. In a letter to the Licensing Board on September 28, 1981, HL&P revealed the existence of an extensive report on the

Brown and Root design of the South Texas Project by the Quadrex Corporation. CEU received the Quadrex Report, "Design Review of Brown and Root Engineering Work for the South Texas Project," several days later.

7. The Quadrex Report is a devastating critique of the STP design. It reveals a project floundering in chaos. More importantly, more than five years after construction began, it reveals that Brown and Root does not understand, and the STP design does not adequately address, the most fundamental principles that govern nuclear reactor safety.

8. According to the Quadrex Report, the Brown and Root Design of the South Texas Project suffers from, among other things, inadequate consideration of safety-related versus non-safety-related issues, and a poorly considered design basis for the plant that does not take into account the full range of postulated accidents.

9. Although the Quadrex Report was apparently presented to HL&P in May 1981, it was not revealed to the public, the NRC Staff, or the Atomic Safety and Licensing Board until five months later. In the interim, HL&P has continued construction at the project, and by letter of October 16, 1981, to Mr. Karl Seyfrit of NRC Region IV (Exhibit 1), HL&P indicated that it would continue construction at the project, including safety-related construction, where the work would be irreversible.

10. If the conclusions of the Quadrex Report are correct, all aspects of the South Texas Project may be improperly designed. Continued construction, particularly if it is irreversible, may render safe completion and operation impossible.

11. Based on the Quadrex Report, CEU requests an immediate halt to all construction at the South Texas Project pending a thorough independent review of all aspects and details of the Brown and Root design.

II. DESCRIPTION OF PETITIONER

12. Citizens for Equitable Utilities is a state-wide organization of Texas citizens who are concerned with actions of public utilities in Texas and with the safety of nuclear projects in the state. It has been admitted as an intervenor in the Operatting License proceeding concerning the South Texas Project and has actively participated in that proceeding.

III. JURISDICTION

13. This petition is brought before the Commission pursuant to the authority granted to it in 42 U.S.C. §§2233(d), 2236(a), and 2237, and 10 C.F.R §§2.204, 2.206(c)(1), and 50.54. Furthermore, this petition invokes the inherent supervisory authority of the Commission to oversee all aspects of the regulatory and licensing process and its "overriding responsibility for assuring public health and safety in the operation of nuclear power facilities." In the Matter of Consolidated Edison Co. of New York, Inc. (Indian Point, Units 1, 2 and 3). CLI-75-8, NRCI 7518, 173, (1975).

14. This inherent authority of the Commission has been exercised on a number of occasions, despite the absence of express procedural authorization in the regulations for Commission oversight or review. Petition for Emergency and Remedial Action, CLI-78-6, 7 NRC 400 (1978); see also, U.S. Energy Research and Development Administration (Clinch River Breeder Reactor Project),

CLI-76-13, NRCI-76/8, 67, 75-76 (1976); Consumers Power Co. (Midland Units 1 and 2), CLI-78-38, RAI-73-12, 1084 (1973). This authority is necessary for the Commission to carry out its mission to see that "public safety is the first, last, and a permanent consideration in any decision on the issuance of a construction permit or license to operate a nuclear facility." Power Reactor Development Corp. v. International Union, 367 U.S. 396,402 (1961).

15. The Commission's inherent authority is explicitly recognized in 10 C.F.R. §2.206(c)(1). 10 C.F.R. §2.206(a) and §2.206(b) provide a mechanism for petitions requesting show cause orders to be filed with the Director of Nuclear Reactor Regulation or the Director of Inspection and Enforcement, as appropriate, and reviewed sua sponte by the Commission. However, §2.206(c)(1) states:

> This review power does not limit in any way either the Commission's supervisory power over delegated staff actions or the Commission's power to consult with the staff on a formal or informal basis regarding institution of proceedings under this section.

16. In this case, it is necesssary for the Commission itself to take action. The NRC Staff has had the opportunity and responsibility for well over five years to review the design of the South Texas Project and find the serious deficiencies reported by the Quadrex Corporation. In that time, the Staff has conducted many investigations of the project, including a special investigation, and it has had a Resident Reactor Inspector on site since 1979. It has even gone so far as to take the position that HL&P has the character and competence to receive an operating license, although HL&P's failure to uncover the

flaws in Brown and Root's design earlier has a clear bearing on that issue. It would be futile to refer this petition back to the Staff for action because, regrettably, the Staff's failure to exercise its own duties is partially responsible for the fact that construction at the South Texas Project has been allowed to proceed for so long with an inadequate design.

IV. BASES FOR IMMEDIATE SUSPENSION OF CONSTRUCTION

17. The Quadrex Report is the basis for this petition.1/ As discussed below, it demonstrates that continued construction would adversly affect the safety of the South Texas Project.2/

18. The construction that is now in progress at the South Texas Project and that HL&P hopes to continue for the next four months is outlined in HL&P's letter of October 16, 1981, to Mr. Seyfrit (Exhibit 1). In the safety-related area, it includes particularly (1) continue concrete pours to complete "Reactor Coolant Building Unit 1,"3/ (2) continue Unit 1 reactor

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1/Due to the expense of copying this massive three volume report, we request that the Commission have the NRC Staff provide its own copies for use by the Commission.

2/The Quadrex Report also touches on areas that may not be relevant to the current status of construction. CEU is at a disadvantage in this regard because we are not fully aware of the status of all aspects of construction or of the extent to which continued construction would adversely affect safety in some areas. For example, we do not know whether construction of the project has reached the point at which environmental qualification of equipment or pipe rupture design matters are relevant to the work. We suspect that the former is probably not relevant yet, while the latter probably is. The Quadrex Report severely criticized the Brown and Root Design in both areas, Vol. I, pages 3-4, 3-12, 4-59, and 4-42. If construction relevant to either issue has begun, it must be stopped so that the Quadrex criticisms can be addressed.

3/We assume HL&P meant "Reactor Containment Building Unit 1."

coolant loop welding, (3), continue RCB Unit containment shell concrete placements, and (4) continue other safety-related concrete pours and welding.

A. The Basic Conclusions of the Quadrex Report Demonstrate a Pervasive Inadequacy of Design that Relates to Ongoing and Near Term Construction.

19. The Quadrex Report reaches several broad conclusions concerning design inadequacies that demonstrate the need for a complete design review before construction continues. The most significant findings appear to be the following:

A. "There is no indication that an effective systems integration and overview function exists within the B&R design process. . . . . A major concern is with the achievement of internal consistency among various design documents and the maintenance of that consistency over time with personnel turnover." (Section 3.1(a), pages 3-1 - 3-2).

B. "Based solely on the findings of this review, a determination of current adequacy [of the Civil/ Structural design] cannot be made." (Section 4.1.2, page 4-4).

C. "The technical adequacy of the Mechanical discipline is not presently adequate." (Section 4.5.5, page 4-49).

D. "The nuclear analyses performed by B&R to date are either not complete or are not adequate. The B&R Nuclear Analysis Group has not demonstrated either the ability to perform or to direct others in the performance of nuclear analyses, and has shown no concern for the timeliness of analysis relative to the needs of other interfacing disciplines. Although STP is well advanced in the construction stage, no evidence has been seen that the Brown and Root Nuclear Analysis Group has produced a significant contribution to the STP design." (Section 4.6.2, page 4-57).

E. "The B&R Radiological Control design program is not currently adequate." (Section 4.8.2, page 4-85).

20. The scope of the failings indicated by these conclusions brings the entire design into question. That is particularly true of the finding that Brown and Root's design

process lacks an effective systems integration and overview function, since both are crucial to achieving a safe and effective design for a project as complex as a nuclear power plant. Without effective systems integration, it is quite possible, indeed likely, that various aspects of the design will be inconsistent and incompatible with each other. In terms of current construction at the project, we would expect that to be a particular problem with respect to the proper location of penetrations in concrete pours since concrete pours are irreversible.

21. More specifically, the Quadrex conclusions concerning the inadequacies of the Civil/Structural design and the Mechanical discipline require that all concrete, welding, and other work within those disciplines be halted immediately. Since these are areas that HL&P has itself identified as irreversible, independent design review is particularly crucial before construction can be allowed to proceed.

22. The Quadrex conclusions with respect to inadequate nuclear analyses and radiological control are extremely troubling, since they indicate that the design would fail in its most basic purpose- protecting the public health and safety from nuclear and radiological hazards. There is no question that work cannot proceed in those areas before design review is completed. However, we suspect that construction has not reached that point, so that this is more of a long-term concern.

B. The Design Basis for the South Texas Project is Poorly Thought Out and Inadequately Justified.

23. Nothing is more important to the ultimate safety

of a nuclear power plant than a correct and complete design basis. The entire design and construction hinges on the design basis, and the ability of a nuclear reactor to withstand an accident of any sort depends upon the development of a sound design basis that takes into account all relevant plant operating modes, accident conditions, and other events that may affect safety.

24. According to the Quadrex Report, the design basis of the South Texas Project does not come close to providing the requisite degree of precision or protection. Quadrex reached two broad conclusions that bring into question any further construction activity at the site since they indicate that the entire design may be faulty:

> A. There are no written design bases to guide the designer, and there is no evidence that the design takes into account the fact that equipment will degrade over time or accident situations. Many design criteria appear to come from the 1973-1975 period and have not been updated. In many instances the design is based on "normal plant conditions," not the severe accident conditions that must be taken into account. (Section 3.1(c), page 3-4).
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> B. There is little evidence of a well thought out and consistent design basis, and much of the design is based on engineering judgment, without adequate justification. In addition, a number of key front-end criteria documents are missing. (Section 3.1(c), page 3-8 to 3-9).

These conclusions apply to the entire project, and therefore encompass the construction work now underway. With respect to the Civil/Structural work in particular, Quadrex notes that the lack of verified data may have produced a very conservative design, but warns that verified data may later show the design to be inadequate. The lesson of these conclusions is that Brown and Root tailored the design to the demands of the construction schedule rather than basing it on sound information. If the

the Brown and Root design. Quadrex reached the following conclusions:

A. There is no multi-disciplinary interpretation of the single failure criterion in controlled documentation. (Section 3.1(a), page 3-2).

B. No documented evidence exists that the single failure criterion has been complied with. (Section 3.1(e), page 3-7).

C. The design disciplines do not know the postulated single failures on which the design is based. (Section 3.1.(e), page 3-7).

D. The single failure criterion is not met for the

D. The single failure criterion is not met for the common instrument air line. (Sections 4.3.2.1(a), page 4-21, and 4.8.2.1(a), page 4-86).

29. To the extent that the South Texas Project does not comply with the single failure criterion, we can expect an accident comparable to Three Mile Island, and probably worse, to occur at the plant, with a significant threat to the public health and safety. TMI, after all, was believed to meet the single failure criterion.

30. At this point, we cannot tell precisely how failure to meet the single failure criterion affects near-term construction. However, a conservative approach requires assuming such an effect unless HL&P can show otherwise, since none of the design disciplines knew the postulated single failures on which the design was based, and apparently none even had the same interpretation of the single failure criterion. In light of these conclusions, the burden is on HL&P to demonstrate that construction will be consistent with a valid design. Until that is accomplished, construction must be halted.

D. The Brown and Root Design Violates ALARA Requirements.

31. 10 C.F.R. 50.34(a) requires that certain radioactive

Civil/Structural design is, in fact, conservative, it may be adequate. Today, however, the point is that we do not know whether it is adequate or not, and construction must be halted until an independent review is completed.

25. In addition to the above, Quadrex reached two further conclusions with respect to the STP design basis. One goes directly to ongoing work at the site, while the other may not relate to near-term construction, but clearly indicates the deficiencies discovered by Quadrex.

26. According to Quadrex, analysis of the essential cooling water (ECW) pond failed to consider all design bases, such that it appears that shut-down of one unit would result in operation of the other unit being in violation of technical specifications. In addition, Brown and Root did no analysis of simultaneous, normal shutdown of both units, although that has happened in the past. (Section 4.6.2.4(v), page 4-63). The ECW aluminum bronze piping is one of the areas in which HL&P specifically intends to continue construction. It should not be allowed to do so until the design is reviewed and corrected.

27. Finally, the design bases are not well defined for safety-related HVAC systems. Plant operating modes, including accident conditions, have not been adequately addressed. (Section 4.4.2.1(a), page 4-31). From these examples, it appears that Brown and Root either did not understand or simply ignored the entire design basis principle.

C. Brown and Root's Design Does Not Meet the Single Failure Criterion.

28. One of the major principles of nuclear safety, the single failure criterion, is neither understood nor met by

emissions be limited to a level "as low as reasonably achievable" (ALARA). According to Quadrex, the Brown and Root design does not meet this requirement:

A. Consideration of ALARA radiation exposures related to access for maintenance and inspection has been inadequate. (Section 3.2(n), page 3-16).

B. Brown and Root reviews of plant design from an ALARA viewpoint have not been adequate. (Section 4.8.2.2(i), page 4-87).

32. The probable violation of ALARA requirements does not relate simply to particular pieces of equipment, or similar items that could be replaced or corrected, but to the basic design itself as it relates to access for maintenance and inspection. Therefore, any construction that irreversibly establishes the location and relationships of major components of the plant may well preclude correction of the ALARA deficiencies. In particular, this may be true of shell wall penetrations that determine the locations of piping and various conduits. Construction of the shell wall of Reactor Containment Building Unit 2 would clearly influence the penetration and equipment location issue and may prevent compliance with ALARA requirements in some areas. The same may well be true of other aspects of near term construction. Accordingly, all construction must be halted until a complete independent review of the ALARA issue has been carried out and has identified those aspects of the design that would in no way affect compliance with ALARA requirements.

E. Brown and Root's Distinctions Between Safety-Related and Non-Safety-Related Aspects of the Design May Not Be Valid.

33. Among the most disturbing findings of the Quadrex Report is that Brown and Root's distinctions between safety-

related and non-safety-related aspects of the design may be invalid. In particular, Quadrex found:

A. In several instances, design activities that affected plant safety were designated as non-safety-related. (Section 3.1(d), page 3-6).

B. There is doubt about the rigor of the safety-related evaluation process. (Section 3.1(h), page 4-86).

34. At any plant, this would mean that there may be aspects of the design and construction crucial to reactor safety that do not meet rigorous standards and have not been reviewed under a quality assurance program that meets the requirements of 10 C.F.R. Part 50, Appendix B. In short, it would mean that those aspects of the plant could not be relied upon to function properly and protect the public health and safety in event of an accident. This deficiency is particularly acute at the South Texas Project, however, not only because the distinction itself was invalid in some cases, but also because Brown and Root seemed to follow a policy of minimal compliance for items designated as non-safety-related. These items received such cursory consideration that Brown and Root did not even verify the design outputs for non-safety related aspects of the design. (Section 3.1(d), pages 3-5 - 3-6).

35. The lack of any certainty that Brown and Root's distinctions between safety-related and non-safety-related areas are valid requires the conclusion that all aspects of the design must be considered safety related until an independent review determines which aspects are not. Accordingly, even those areas of construction designated as non-safety-related in HL&P's letter of October 16, 1981, to Mr. Seyfrit, must be halted until such a review is completed.

F. The Quadrex Report Indicates Serious Deficiencies in All Aspects of Brown and Root's Design, Including Areas Not Specifically Studied by Quadrex.

36. The Quadrex Report clearly explains that the design review from which it is derived did not encompass all aspects of the Brown and Root design, but involved a careful sampling program that "would provide sufficient insight regarding the adequacy of the technical work performed by each discipline." (Section 1.0, page 1-1). As a result, Quadrex specifically concluded that its report could not be taken as having identified all of the deficiencies in the design. Rather,

> (2) there may still be other concerns in the STP design that were not detected by this design review program because of the nature of the sampling process used;
>
> (3) the identified concerns are regarded to be "indicative" of the technical problems present in the design. . ." (Section 1.0, page 1-3).

37. Accordingly, the inescapable conclusion is that all aspects of the Brown and Root design must be considered to be deficient to the same degree as those aspects reviewed by Quadrex until an independent review of the entire design is completed. For the reasons discussed previously respecting specific design deficiencies, construction must be halted until the independent review confirms design such that safety will be assured.

V. CONCLUSION AND REQUEST FOR RELIEF

38. The Quadrex Report raises serious questions about the adequacy of the most fundamental aspects of the design of the South Texas Project. It clearly demonstrates that the facility could not be considered to be in compliance with NRC requirements

or to be safe if it were completed according to the Brown and Root design. Although it was not intended to and does not address the specific question of the safety impacts of continuing near term construction, it indicates that any irreversible construction activities may adversely affect safety both because the design basis itself is deficient and because flaws exist in the design and design process for particular disciplines, including particularly Civil/Structural and Mechanical. In light of these findings, there can be no reasonable assurance that continued construction of any aspect of the facility will not be detrimental to the public health.

39. Accordingly, CEU seeks the following relief:

A. Immediate suspension of all aspects of construction at the South Texas Project.

B. Commencement of an immediate independent review of the Brown and Root design of the South Texas Project, with initial emphasis on a reanalysis of the safety-related versus non-safety-related distinction and identification of all inadequate areas of the design for which construction has previously been begun or completed.

C. A prohibition on any further construction at the South Texas Project until the safety-related versus non-safety related analysis has been completed, at which time non-safety related construction may proceed, subject to Paragraph 39(E), below.

D. A prohibition on further safety-related construction at the South Project until the independent review of the entire Brown and Root design has been completed, subject to Paragraph 39(E) below.

E. Establishment of an Atomic Safety and Licensing Board to hold a full adjudicatory hearing with respect to

(1) the adequacy of the safety-related versus non-safety-related analysis prior to permitting the renewal of non-safety-related construction, and

(2) the adequacy of the independent design review and the design itself prior to

permitting tthe renewal of safety-related construction.

40. In addition, CEU believes that the Quadrex Report raises questions about the competence and character of HL&P to complete and operate the South Texas Project that are at least as serious as those that prompted the Commission to institute the expedited phase of the operating license proceeding with respect to those issues. Given the gross deficiencies at the project thus far under HL&P's stewardship, CEU requests the following additional relief:

> A prohibition on any further construction at the South Texas Project until the issue of HL&P's lack of corporate competence and character has been resolved and action has been taken to replace the company as managing partner of the project.

41. In requesting the relief stated in the previous paragraphs, CEU recognizes that an Atomic Safety and Licensing Board is already in existence and is examinining the issues of the first phase of the operating license proceeding. We recommend that the issues raised in this Petition be referred to that Board for resolution, particularly because it is already familiar with the project and is already addressing the issue of HL&P's corporate competence and character.

Respectfully submitted,

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Dated: October 28, 1981