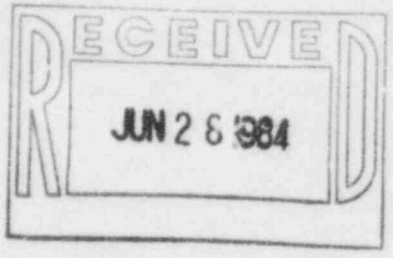
The Light company Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

June 25, 1984
ST-HL-AE-1089
File No.: G12.189



Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Final Report Concerning the
ESF Load Sequencer Logic Design

On February 24, 1984, pursuant to 10CFR50.55(e), Houston Lighting & Power Company (HL&P) notified your office of an item concerning the Engineered Safety Features (ESF) Load Sequencer logic design. Attached is the final report concerning this item.

If you should have any questions concerning this matter, please contact Mr. Michael E. Powell at (713) 993-1328.

Very truly yours,

G. W. Oprea, Jr.
Executive Vice President

MEP/mpg
Attachment: Final Report Concerning the ESF Load Sequencer Logic Design

W2/NRC1/n

IE-27 1/1

cc:

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Victor Nerses, Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20016

D. P. Tomlinson
Resident Inspector/South Texas Project
c/o U.S. Nuclear Regulatory Commission
P. O. Box 910
Bay City, TX 77414

M. D. Schwarz, Jr., Esquire
Baker & Botts
One Shell Plaza
Houston, TX 77002

J. R. Newman, Esquire
Newman & Holtzinger, P.C.
1025 Connecticut Avenue, N.W.
Washington, DC 20036

Director, Office of Inspection
and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

E. R. Brooks/R. L. Range
Central Power & Light Company
P. O. Box 2121
Corpus Christi, TX 78403

H. L. Peterson/G. Pokorny
City of Austin
P. O. Box 1088
Austin, TX 78767

J. B. Poston/A. vonRosenberg
City Public Service Board
P. O. Box 1771
San Antonio, TX 78296

Brian E. Berwick, Esquire
Assistant Attorney General for
the State of Texas
P. O. Box 12548, Capitol Station
Austin, TX 78711

Lanny Sinkin
Citizens Concerned About Nuclear Power
114 W. 7th, Suite 220
Austin, TX 78701

Robert G. Perlis, Esquire
Hearing Attorney
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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

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

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

William S. Jordan, III, Esquire
Harmon & Weiss
1725 I Street, N.W.
Suite 506
Washington, DC 20006

Citizens for Equitable Utilities, Inc.
c/o Ms. Peggy Buchorn
Route 1, Box 1684
Brazoria, TX 77422

Revised 04/03/84

South Texas Project
Units 1 & 2
Final Report Concerning the
ESF Load Sequencer Logic Design

DER 84-003

I. Summary

Upon the loss of offsite power (LOOP), the ESF Load Sequencer initiates a bus strip signal and loads the standby diesel generators on the ESF buses. In the case of a safety injection signal (SI) immediately followed by a LOOP or a LOOP immediately followed by an SI, the timing of the bus strip and initiation of the loading sequence results in the first and second loads being applied to the diesel generators without a sufficient intervening time delay. The result is potential degradation of the standby diesel generator performance and potential failure to establish adequate emergency core cooling following a loss of coolant accident (LOCA) or main steam line break (MSLB).

II. Description

On February 24, 1984, pursuant to 10CFR50.55(e), Houston Lighting and Power (HL&P) notified the NRC Region IV of an item concerning the Engineered Safety Features (ESF) Load Sequencer logic design. The logic design is such that upon entering the Mode III (SI + LOOP) recognition under the two scenarios delineated below, the ESF Load Sequencers initiate bus strip and apply the first load in a manner that potentially degrades the standby diesel generator performance.

For completeness, Mode I conditions are SI with offsite power available, and Mode II conditions are LOOP with otherwise normal plant status.

Scenario I: An accident generates a SI signal and the Mode I recognition is entered by the load sequencer. The standby diesel generator is also automatically started by the SI signal through the Solid State Protection System (SSPS). The standby diesel generator is not connected to the electrical distribution system since offsite power is available. Assuming a LOOP is now experienced, the sequencer enters Mode III recognition and initiates the bus strip function, sending bus strip signals for 2 seconds. The electrical breakers for loads on the Class 1E bus will trip. The closing springs on the breaker for the first load require approximately 5 seconds to charge before the breaker can reclose.

The standby diesel generator is already at rated speed and voltage, so the standby diesel generator feeder breaker is almost instantaneously closed following the completion of the bus strip, putting power on the bus. The feeder breaker closure initiates the sequence of load application. The sequencer connects the first load at 1 second following feeder breaker closure. However, the chargings springs on the breakers for the first load are still charging when the connect signal is provided. The breaker will close after the springs charge; however, this will result in application of the first load without adequate delay before application of the second load.

Scenario II: A LOOP is experienced and the sequencer enters into Mode II recognition. The standby diesel generator is loaded, providing power to its corresponding distribution system. Then an accident generating an SI occurs, sending an SI signal to the sequencer. The sequencer then enters Mode III recognition and initiates bus strip. The standby diesel generator is already at rated speed and voltage. As soon as the bus strip signal is completed the standby diesel generator feeder breaker closes, initiating sequencer operation. Again, the events described in the first scenario occur, resulting in application of the first load without adequate delay before application of the second load.

Since all load sequencers perform their functions according to the same logic, all first load breakers in all three distribution systems of each unit would experience the same scenario. This could cause degraded standby diesel generator performance resulting in loss of emergency core cooling system functions following a LOCA or MSLB.

III. Corrective Action

The ESF Load Sequencer logic will be revised to inhibit closure of the standby diesel generator feeder breaker in the case of Scenario I as follows. The logic change will inhibit the closure of the feeder breaker for 5 seconds following Mode III entry when the standby diesel generator is already at rated speed and voltage. This 5-second delay will allow sufficient time for the closure springs to recharge on the breaker for the first load.

The ESF Load Sequencer logic will be revised to eliminate the restrip of the first load in the case of Scenario II as follows. When a LOOP occurs and the Mode II sequence of events has processed past the application of the first load, the Mode III recognition process detects that the breaker is already loaded onto the standby diesel generator and does not restrip it.

IV. Recurrence Control

The deficiency was found as a result of a design review. Bechtel has established procedures for design review and design verification. These design reviews provide assurance that the design requirements are appropriately factored into the design.

V. Safety Analysis

Assuming a worst case scenario, i.e., application of the first load after a full five (5) seconds for charging of the closing springs, results in the first and second load being placed on the standby diesel generators at the same time. This would be an overload and consequently degradation of all three standby diesel generators could occur. The loss of the standby diesel generators would result in a failure to establish emergency core cooling following a LOCA or MSLB.