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

October 21, 1985
ST-HL-AE-1441
File No.: G9.17

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Responses to DSER/FSAR Items Concerning
SG Level Reference Leg Compensation Algorithum

Dear Mr. Knighton:

The attachments enclosed provide STP's response to Draft Safety Evaluation Report (DSER) or Final Safety Analysis Report (FSAR) items.

The item number listed below correspond to those assigned on STP's internal list of items for completion which includes open and confirmatory DSER items, STP FSAR open items and open NRC questions. This list was given to your Mr. N. Prasad Kadambi on October 8, 1985 by our Mr. M. E. Powell.

The attachments include mark-ups of FSAR pages which will be incorporated in a future FSAR amendment unless otherwise noted below.

The items which are attached to this letter are:

Attachment	Item No.*	Subject
1	D 0.0-7, F 7.2-2	SG Level Reference Leg Compensation Algorithm

Note: The software Common Mode Failure Concern will be addressed through the QDPS Verification and Validation Program. Refer to Open Item 0.0-4.

* Legend
D - DSER Open Item
C - DSER Confirmatory Item
F - FSAR Open Item
Q - FSAR Question Response Item

L1/DSER/av

B001
1/1

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

Very truly yours,

M. R. Wisenburg
Manager, Nuclear Licensing

MEP/bl

Attachments: See above

Ll/DSER/av

cc:

Hugh L. Thompson, Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Robert D. Martin
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

N. Prasad Kadambi, Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20814

Claude E. Johnson
Senior Resident Inspector/STP
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.
1615 L Street, 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 A. Sinkin
3022 Porter Street, N.W. #304
Washington, DC 20008

Oreste R. Pirfo, 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 Frederick J. Shon
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Ray Goldstein, Esquire
1001 Vaughn Building
807 Brazos
Austin, TX 78701

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

Docketing & Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(3 Copies)

Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
1717 H Street
Washington, DC 20555

Revised 9/25/85

Ll/DSE?/av

b. Reactor coolant pump (RCP) undervoltage

This trip is required to protect against low flow that can result from loss of voltage to more than one RCP motor (e.g., from loss of offsite power (LOOP) or RCP breakers opening). 43

For each pump, there is an undervoltage sensing relay in the Class 1E cubicles located between the RCP breakers and the motors. These relays provide an output signal when the voltage goes below approximately 70 percent of rated voltage. Signals from these relays are time-delayed to prevent spurious trips caused by short-term voltage perturbations. The coincidence logic and interlocks are given in Table 7.2-1. 43

c. RCP underfrequency

This trip is required to protect against low flow resulting from bus underfrequency (e.g., a major power grid frequency disturbance). Its function is to trip the reactor for an underfrequency condition. The setpoint of the underfrequency relays is adjustable between 54 and 60 Hz.

For each pump, there is an underfrequency sensing relay in the Class 1E cubicles located between the RCP breakers and the motors. Signals from any two relays (time-delayed to prevent spurious trips caused by short-term frequency perturbations) trip the reactor if the power level is above P-7. The coincidence logic and interlocks are given in Table 7.2-1. 43

5. Steam Generator Low-Low Water Level Trip

The low-low steam generator (SG) water level trip protects the reactor from loss of the heat sink. This trip is actuated on two-of-four low-low water level signals occurring in any SG. The logic is shown on Figure 7.2-7.

add INSERT A →

6. Reactor Trip on a Turbine Trip (Anticipatory)

The reactor trip on a turbine trip is actuated by two-of-three logic from emergency trip fluid pressure signals or by two-of-four closed signals from the turbine steam stop valves. A turbine trip causes a reactor trip above P-9. The reactor trip on turbine trip provides additional protection and conservatism beyond that required for the health and safety of the public. This trip is included as part of good engineering practice and prudent design. No credit for this trip is taken in any of the safety analyses (see Section 15.0.6). 43

The turbine provides anticipatory trips to the RTS from contacts which change position when the turbine stop valves close or when the turbine emergency trip fluid pressure goes below its setpoint.

One of the design bases considered in the RTS is the possibility of an earthquake. With respect to these contacts, their functioning is unrelated to a seismic event in that they are anticipatory to other diverse

Insert A

new paragraph

The input signals for this trip are continuously compensated for the effect of temperature changes in the reference leg fluid. Two strap-on RTDs are installed on each narrow range reference leg. These RTD's provide reference leg temperature signals to the compensation system algorithim. The reference leg temperature inputs are used to calculate the change in density of the reference leg fluid, which in turn is used to determine the steam generator narrow range level error. The calculated lvel error is then combined with the uncompensated level signal, resulting in a compensated level signal that is input to the low-low steam generator water level trip logic.

The compensated level signal is calculated using the following equation:

$$L_C = L_{UC} - L_{ERR}$$

WHERE

L_C = COMPENSATED LEVEL SIGNAL

L_{UC} = UNCOMPENSATED LEVEL OUTPUT SIGNAL

L_{ERR} = LEVEL ERRORS DUE TO REFERENCE LEG TEMPERATURE CHANGES

clouded areas should all be lower case

THEN:

$$L_{ERR} = H_1/H\ (\rho_{1c} - \rho_1)/(\rho_{fc} - \rho_{gc})$$

WHERE:

ρ_1 = WATER DENSITY IN REFERENCE LEG (LBM/FT^3)

ρ_{1c} = WATER DENSITY AT TEMPERATURE AND PRESSURE FOR WHICH LEVEL INDICATION SYSTEM WAS CALIBRATED (LBM/FT^3)

ρ_{fc} = SATURATED WATER DENSITY AT THE PRESSURE FOR WHICH LEVEL INDICATION SYSTEM WAS CALIBRATED (LBM/FT^3)

ρ_{gc} = DRY SATURATED STEAM AT THE PRESSURE FOR WHICH LEVEL INDICATION SYSTEM WAS CALIBRATED (LBM/FT^3)

H_1 = VERTICAL DISTANCE FROM LOWER TAP TO WATER LEVEL IN CONDINSING POT (FT)

H = VERTICAL DISTANCE BETWEEN UPPER AND LOWER TAPS (FT)

03306:81/GEL/685

ATTACHMENT 1
ST-HL-AE- 1441
PAGE 8 OF 2