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

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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 DC Power Systems

Dear Mr. Knighton:

The attachment enclosed provides 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 attachment includes 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	Q430.36N	DC Power System

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

L1/DSER/aat

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

JSP/bl

Attachments: See above

L1/DSER/aat

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

L1/DSER/aat

Each battery is sized to provide a minimum of 1.78 V/cell at the discharge state after 2 hours. | 49

8.3.2.1.3 Battery Chargers: Each Class 1E Battery System consists of two battery chargers associated with each 125 Vdc battery. | 2 | 36

Battery chargers are sized to recharge the battery within 12 hours from the discharged state (1.78 V/cell) to the nominally fully charged state (when the charging current has stabilized at the charging voltage, 2.27 (±1%) V/cell, even though specific gravities have not stabilized) while supplying loads indicated in Table 8.3-6. | 36 | 29 Q 280 03X | 49

The output voltage of each battery charger is adjustable to ±10 percent of the value required for periodic equalizing charging of the battery (i.e., ±10 percent of 141 Vdc). | 29 Q 280 37N | 43

AC power to the Class 1E battery chargers associated with a given battery is supplied from independent MCCs connected to double-ended sections of switchgear. The switchgear sections are energized from the ESF buses and supplied with power from the standby DGs when offsite sources are unavailable.

Independence of the four battery systems is ~~secured~~ achieved by separation of cables and equipment and by prohibiting cross-ties between load groups in different trains. | 36

Each battery charger is equipped with a dc voltmeter and ammeter. Protection against power feedback from the battery to the charger and ac source, upon loss of the ac source, is provided. | 43

8.3.2.1.4 Testing: Periodic testing of Class 1E DC Power System equipment is performed in accordance with RG 1.32 to verify its ability to perform its safety function.

The batteries and chargers are inspected and tested in accordance with the Technical Specifications. | 36

Visual inspection, liquid level, specific gravity, and cell voltage and temperature checks are performed routinely on the batteries. | 36

Additional testing in accordance with RG 1.129 is performed. | 36

8.3.2.1.5 Service Equipment: All Equipment of the DC Power System is located in ventilated, controlled environments outside of the Reactor Containment Building. | 2

Class 1E DC Power System ~~cables or supporting structures~~ circuits penetrating into the RCB are designed to operate in the post-accident environment for the period of time required to maintain the plant in a safe shutdown conditions following a Design Basis Accident (DBA), as discussed in Section 3.11.

8.3.2.1.6 Non-Class 1E Battery Systems: The non-Class 1E Battery Systems in each unit consist of one 48 Vdc distribution panel bus, two 125 Vdc distribution panel buses and one 250 Vdc distribution panel bus. These buses are energized by two battery chargers and a battery. | 43

FSAR CR# 774

as shown in Figure 8.3-3. There are separate batteries provided with the plant computer, and other data acquisition systems. These batteries do not interface with the rest of the plant ~~DC~~ Power System. | 36

8.3.2.1.1 Class 1E Battery Systems: The Class 1E 125 Vdc Battery Systems of each unit consists of four independent, physically separated buses, each energized by two battery chargers and one battery. Voltage on any seperate bus varies between 105-~~140~~ 135 Vdc depending on the operating mode of battery charging equipment and system loads. The batteries are sized in accordance with IEEE 485-1978. | 49 Q430.107N

Emergency power required for plant protection and control is supplied by the batteries without interruption when the power from ac sources is interrupted. Each battery system also supplies power to its associated inverter system, which converts the dc power to ac power ~~at 118 vac, 60 Hz single phase~~ for the vital instrumentation and protection system, ~~The six vital ac buses supply power to instrumentation channels I, II, III,~~ and IV. ~~There are two vital ac buses each for channels I and IV, and one vital ac bus each for channels II and III.~~ as discussed in Section 8.3.1.1.4.5. | 29 Q280.03N | 36 FSAR CR# 537

The ampere-hour capacity of each battery is sufficient to provide, for a minimum of 2 hours, the power required by emergency dc controls and the vital ac instrumentation and protection system. Only small dc loads and dc controls are supplied from the 125 Vdc batteries. | 43 | 49 | 29 Q28 03N

The two battery chargers associated with each of the four 125 Vdc buses are connected to separate ac buses of the same train to enhance the reliability of ~~each dc~~ bus. Only one charger each is required for channels II and III and both chargers for each of channels I and IV are required. | 13 | 36

The four 125 Vdc batteries are each located in separate rooms in a seismic Category I building which inhibits the propagation of fire and provides protection against missiles. Battery chargers and distribution panels associated with a given battery are located outside of the battery room. Each battery room is ventilated by the Heating, Ventilating, and Air Conditioning (HVAC) System (Section 9.4.1) ~~through seperate intake and exhaust~~ wiring fans which are energized from the ESF buses. | 49

The Class 1E ~~DC~~ Power Systems are designed to withstand the effects of tornadoes, fires, and the Safe Shutdown Earthquake (SSE) without loss of function. Flooding of the battery rooms is precluded by the elevation and location of the battery rooms in the Mechanical-Electrical Auxiliaries Building (MEAB).

The environmental and seismic qualification programs of the Class 1E Battery System are discussed in Sections 3.10 and 3.11. The Class 1E Battery System ~~are~~ is designed to comply with the requirements of NRC RGs 1.6 and 1.32. | 39

Each ~~DC~~ System is provided with an annunciator window having inputs from each of the two chargers and the switchboard. The computer may be used to identify which of the three inputs is being alarmed. ESF | 43 Q430.35N

Each battery charger is provided with the following alarm circuits which are connected in common to the control room annunciator/computer to indicate battery charger trouble: ESF

FSAR CR#774

Question 430.36N

In section 8.3.2.1.3 you state the output of each battery charger is adjustable to ± 10% of the value required for periodic equalizing charging of the battery (i.e. ± 10% of 141 vdc). Operation of this equipment may cause overvoltage on the DC buses. Performance of test discharges may additionally cause undervoltage conditions on these buses. Provide the details of your design of the DC power systems that assures equipment will be protected from damaging over/undervoltages that could occur due to operator error, equipment malfunction or the performance of battery charges/discharges.

Response

The battery chargers are provided with circuitry to adjust the output voltage to ± 10% of the nominal value for equalizing charge (141 vdc) of the battery when required. All DC distribution system equipment and loads are designed for operation in the voltage range of 105 - 140 V and during normal plant operation an equalizing charge exceeding 140 V will not be applied.

135 135

Periodic discharge tests and equalizing charge above the operating voltage, if required, will be performed at least once per 18 months during shutdown only as will be described in the Technical Specifications.

Each train of class 1E DC distribution system is provided with alarms in the control room for under/over voltage condition in addition to visual indication of the DC system voltage. These monitoring devices will indicate and alarm any abnormal system conditions in the control room.

For additional discussion on mode of operation of battery chargers see response to question 430.37N.