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10CFR50.63

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Revised Position on 10CFR50.63,
"Loss of All Alternating Current Power"

Houston Lighting & Power (HL&P) submits the attached revised position addressing compliance of the South Texas Project Electric Generating Station (STPEGS) with 10CFR50.63, "Loss of All Alternating Current Power." This submittal documents the proposed HL&P position for compliance with 10CFR50.63, as interpreted by NUMARC Guideline 87-00, Revision 0 and Regulatory Guide 1.155.

Houston Lighting & Power personnel met with the Nuclear Regulatory Commission (NRC) staff on February 7, 1995 to discuss details of the format and content of the revised Station Blackout (SBO) submittal. In accordance with the discussions in this meeting, the attached submittal supersedes all previous HL&P submittals regarding the SBO initiative and is prepared in the generic NUMARC 87-00 format for plants utilizing an Alternate AC source.

Four attachments are provided to facilitate compliance with the agreements of the February 7, 1995 discussions.

- Attachment 1 includes the revised STPEGS Station Blackout submittal in the generic response format for plants utilizing an Alternate AC power source.

- A list of previous HL&P correspondence regarding the SBO issue superseded by this submittal is provided in Attachment 2.

- Attachment 3 provides a mark-up of the Station Blackout Safety Evaluation Report to reflect the new position taken in this submittal.

- Attachment 4 provides a mark-up of the Station Blackout Contractor Technical Evaluation Report to reflect the new position taken in this submittal.

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No plant modifications are required for implementation of the revised SBO position for STPEGS. The associated plant operating procedure changes identified in Part B.6 of Attachment 1 will be completed 30 days after the notification provided by the Director, Office of Nuclear Reactor Regulation, in accordance with 10CFR50.63 (c) (3).

Houston Lighting & Power requests that the NRC provide notification of staff acceptance of the revised SBO position by June 30, 1995. Should you have any questions on this revised response, please contact Mr. K. J. Taplett at (512) 972-8416 or me at (512) 972-8787.

T. H. Cloninger
Vice President,
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BAN/lf

Attachment 1: Revised STPEGS Station Blackout Submittal
Attachment 2: Listing of Superseded HL&P-to-NRC Correspondence
Attachment 3: Station Blackout Safety Evaluation Report Mark-up
Attachment 4: Station Blackout Contractor Technical Evaluation Report Mark-up

c:

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ATTACHMENT 1

South Texas Project Electric Generating Station
Revised Station Blackout Submittal

South Texas Project Electric Generating Station
Units 1 and 2
Revised Response to 10CFR50.63
"Loss of All Alternating Current Power"

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INTRODUCTION

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10CFR Part 50. A new section, 50.63, was added which requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Utilities are expected to have the baseline assumptions, analyses and related information used in their coping evaluation available for NRC review. 10CFR50.63 also identifies the factors that must be considered in specifying the station blackout duration. Section 50.63 requires that, for the station blackout duration, the plant be capable of maintaining core cooling and appropriate containment integrity. Section 50.63 further requires that each licensee submit the following information:

1. A proposed station blackout duration including a justification for the selection based on the redundancy and reliability of the onsite emergency AC power sources, the expected frequency of loss of offsite power, and the probable time needed to restore offsite power;

2. A description of the procedures that will be implemented for station blackout events for the duration (as determined in 1 above) and for recovery therefrom; and

3. A list and proposed schedule for any needed modifications to equipment and associated procedures necessary for the specified SBO duration.

The NRC has issued Regulatory Guide (RG) 1.155 "Station Blackout" which describes a means acceptable to the NRC Staff for meeting the requirements of 10CFR50.63. RG 1.155 states that the NRC Staff has determined that NUMARC 87-00 Revision 0, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout At Light Water Reactors," also provides guidance that is in large part identical to the RG 1.155 guidance and is acceptable to the NRC Staff for meeting these requirements.

Table 1 to RG 1.155 provides a cross-reference between RG 1.155 and NUMARC 87-00 and notes where the RG takes precedence.

Houston Lighting & Power Company (HL&P) has evaluated the South Texas Project Electric Generating Station (STPEGS) against the requirements of the SBO rule using guidance from NUMARC 87-00 and notes where RG 1.155 takes precedence. The results of this evaluation are detailed below.

A. STATION BLACKOUT DURATION

<u>NUMARC Generic Response:</u>

NUMARC 87-00, Section 3 was used to determine a proposed Station Blackout duration of **four hours**.

The following plant factors were identified in determining the proposed station blackout duration:

A.1. AC POWER DESIGN CHARACTERISTIC GROUP IS P3* BASED ON:

NUMARC Generic Response:

a) Expected frequency of grid-related loss of offsite power events **DOES NOT** exceed once per 20 years.

STPEGS Position:

The industry average frequency of grid-related events is approximately 0.020 per site-year, with most events isolated to a few systems. According to NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," the average occurrence for the majority of systems is about once per 100 site-years. NUREG-1032 notes sites having a frequency of grid-related events at the once per 20 site-year frequency are limited to St. Lucie, Turkey Point and Indian Point. Accordingly, no other sites are expected to exceed the once per 20 site-year frequency of grid-related loss of offsite power events. Since STPEGS is not included among the noted plants, further evaluation of Parts (b), (c), (d) and (e) is necessary to determine the AC Power Design Characteristic Group.

NUMARC Generic Response:

b) Estimated frequency of loss of offsite power due to extremely severe weather places STPEGS in Extremely Severe Weather **(ESW) GROUP 5**.

STPEGS Position:

The estimated frequency of loss of offsite power due to extremely severe weather is determined by the annual expectation of storms at the site with wind velocities equal to or greater than 125 mph. These events are normally associated with the occurrence of great hurricanes where high windspeeds may cause widespread transmission system unavailability for extended periods. Since electrical distribution systems are not designed for these conditions, it is assumed that the occurrence of such windspeeds is assumed to directly result in the loss of offsite power.

STPEGS has elected to utilize Method "B" to determine the annual estimated frequency of loss of offsite power due to extremely severe weather. NUMARC 87-00, Table 3-2, summarizes site-specific National Oceanic Atmospheric Administration (NOAA) data for the estimated frequency of occurrence of extremely severe weather. As published in this table, STPEGS has an event frequency of 0.012, and therefore is in ESW Group 5.

<u>NUMARC Generic Response:</u>

c) Estimated frequency of loss of offsite power due to severe weather places STPEGS in Severe Weather **(SW) GROUP 1**.

<u>STPEGS Position:</u>

Four factors are used to calculate the estimated frequency of loss of offsite power due to severe weather:

(1) Annual expectation of snowfall for site, in inches [factor h_1];

(2) Annual expectation of tornadoes of severity f_2 or greater at the site (i.e., windspeeds greater than or equal to 113 miles per hour), in events per square mile [factor h_2];

(3) Annual expectation of storms for the site with wind velocities between 75 and 124 mph [factor h_3]; and,

(4) Annual expectation of storms with significant salt spray for the site [factor h_4].

From NUMARC 87-00 Table 3-3; the following are the four severe weather data values specific to the STPEGS site:

$h_1 = 0$
$h_2 = 0.000031$
$h_3 = 0.12$
$h_4 = 0$

These four factors are utilized in the severe weather frequency formula presented on NUMARC 87-00 Page 3-7. The STPEGS offsite power system design connects eight 345 kV transmission circuits to the plant switchyard via three independent rights-of-way. Thus, the "b" factor in the severe weather frequency formula is:

$b = 12.5$

From NUMARC 87-00 Table 3-3; the STPEGS site is not considered vulnerable to the effects of salt spray. Thus, the "c" factor in the severe weather frequency formula is:

$c = 0$

These factors, when combined in the severe weather frequency formula presented on NUMARC 87-00 Page 3-7, yield an estimated frequency of loss of offsite power due to severe weather of:

$f = 0.0018275$

From NUMARC 87-00, Table 3-4, this places STPEGS in SW Group 1.

NUMARC Generic Response:

d) The offsite power system is in the **I-1/2 GROUP**.

STPEGS Position:

Two plant groupings are specified in this part for classifying the interface of the preferred power supply to the safe shutdown bus: I-1/2 and I-3. The I-1/2 group is characterized by features associated with greater independence and redundancy of sources, and a more desirable transfer scheme. I-3 sites have simpler, less desirable offsite power systems and switchyard capabilities.

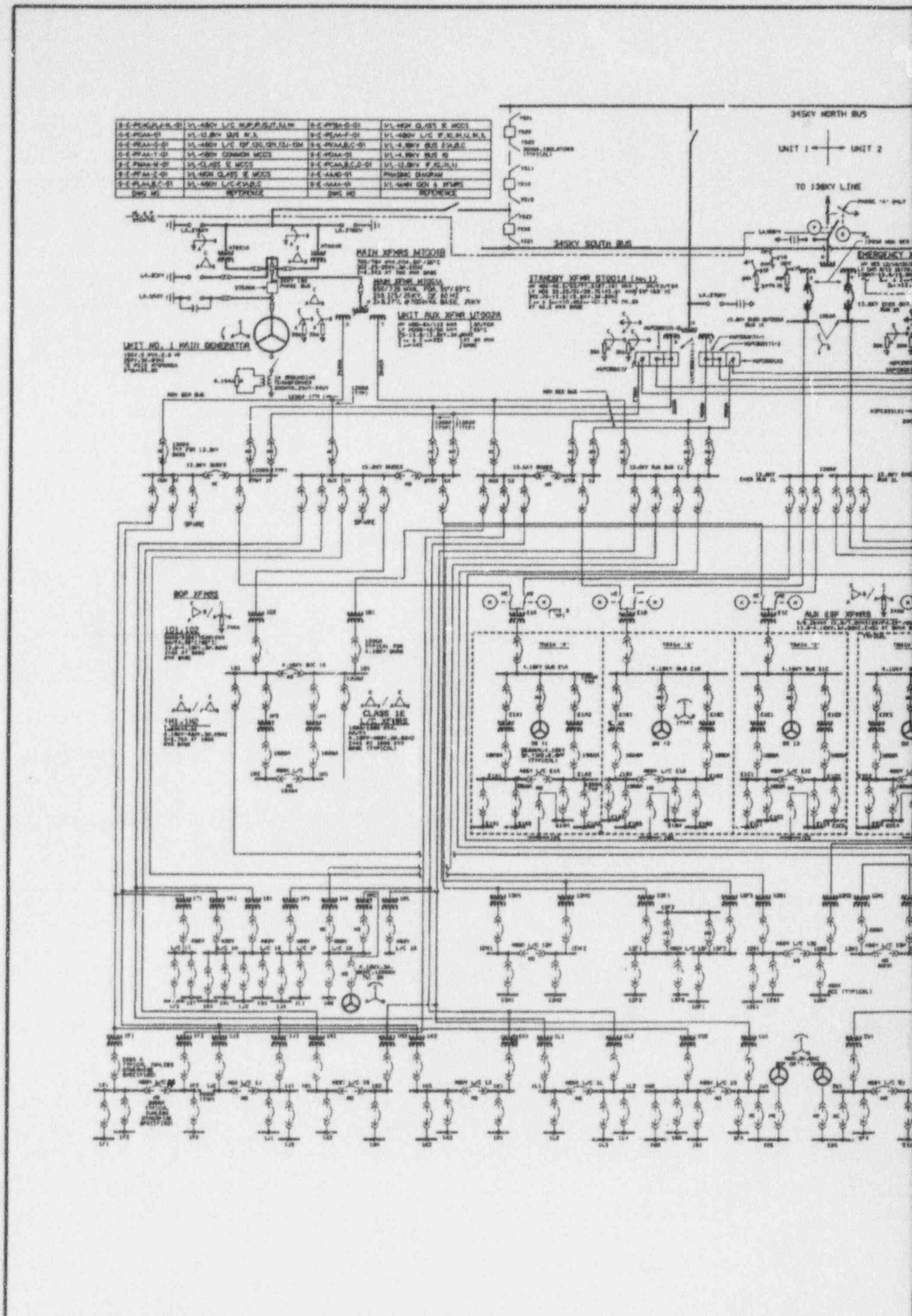
A functional diagram of the STPEGS offsite power system design, showing a typical lineup of the preferred power sources to the Engineered Safety Feature (ESF) buses, is provided as Figure 1. The STPEGS offsite power system design is evaluated against Conditions A, B(1), and B(2) presented on NUMARC 87-00 Page 3-11.

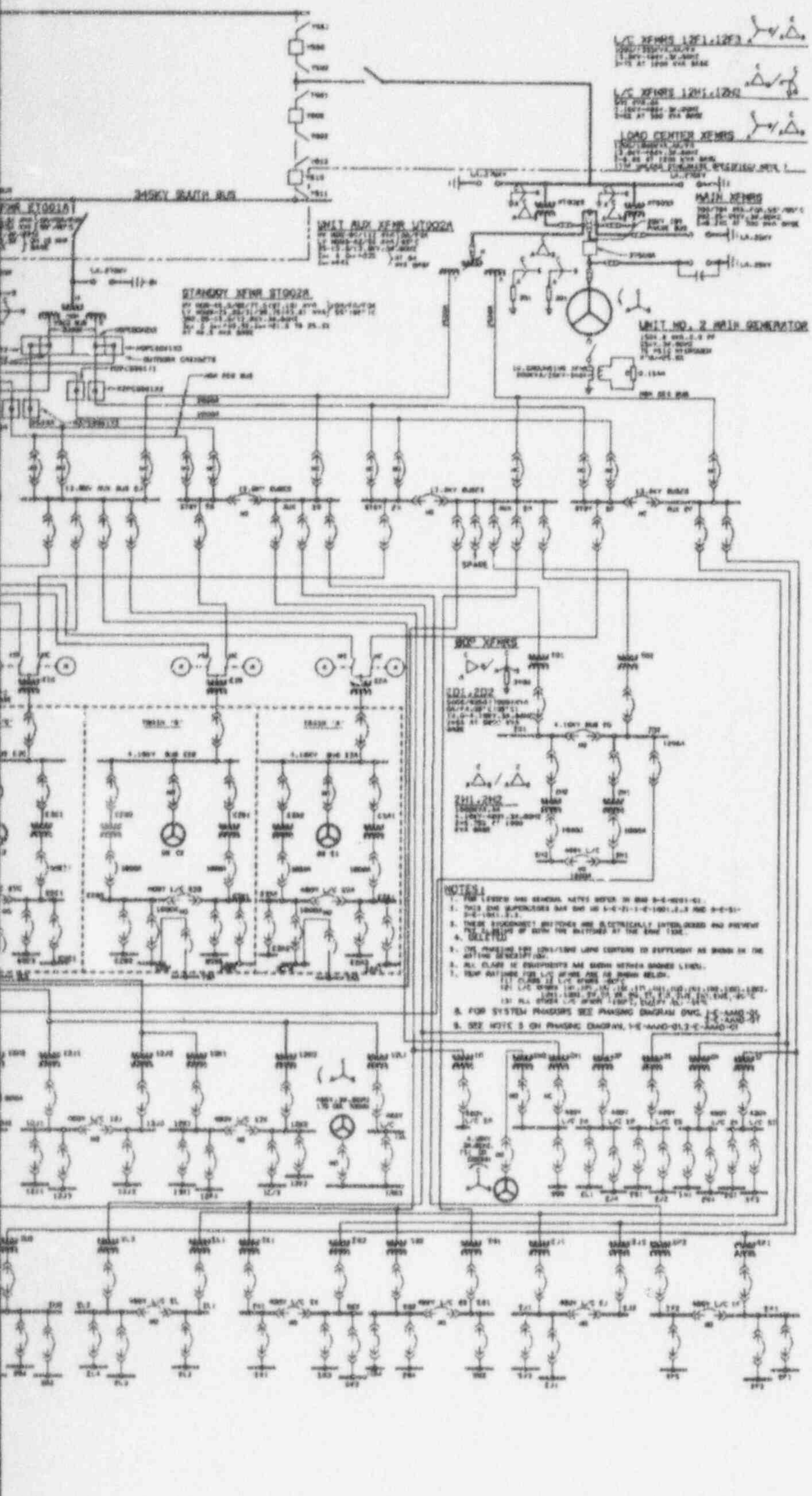
Condition A: The STPEGS offsite power system consists of eight (8) 345 kV transmission circuits, connected via three separate rights-of-way, to a single breaker-and-a-half switchyard which serves both STPEGS units. In addition, a single 138 kV transmission circuit provides power to the STPEGS Emergency Transformer, which is physically located in the STPEGS switchyard and indirectly connected electrically to the STPEGS switchyard. On this basis, the answer to Condition A is considered to be "YES" for the STPEGS site.

Condition B(1): The STPEGS auxiliary power distribution system provides four possible offsite power connections to the ESF buses of each unit:

(1) Unit Auxiliary Transformer (UAT)
(2) Standby Transformer #1 (SBT1)
(3) Standby Transformer #2 (SBT2)
(4) Emergency Transformer (ET)

The unit main generators are considered to be the primary source of power to the plant auxiliary power distribution system, including the ESF buses of each unit. There are several alternate alignments, utilizing the various UAT/SBT1/SBT2 windings, which are also acceptable means of providing power to the ESF buses of each STPEGS unit. An additional source of offsite power to the ESF buses of each unit is possible through use of the ET.


345KV NORTH BUS
UNIT 1
UNIT 2
TO 138KV LINE
345KV SOUTH BUS
MAIN XFMRS
STANDBY XFMR
UNIT AUX XFMR
UNIT NO. 1 MAIN GENERATOR
BOP XFMRS
CLASS 1E
L/C XFMRS
AUX ESF XFMRS
EMERGENCY



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SOUTH TEXAS PROJECT
UNITS 1 & 2

SINGLE LINE DIAGRAM
MAIN ONE LINE DIAGRAM
UNIT NO. 1 & 2

DWG. NO. 0000-0-E-0AAAA-01 REV 14

FIGURE 8.3-1 REVISION 4

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L0413.041

When the normal source of power to each STPEGS unit (the main generator) is lost, there are no manual or automatic transfers required to provide power to the ESF buses. Any ESF bus which is aligned to the UAT, at the time of main generator breaker trip, will continue to receive uninterrupted power from the 345 kV switchyard via backfeed through the Main Transformers. Any ESF bus which is aligned to either SBT1 or SBT2, at the time of main generator breaker trip, will continue to receive uninterrupted power from the 345 kV switchyard via the associated North Bus or South Bus connection. On this basis, the answer to Condition B(1) is considered to be "NO" for the STPEGS site.

Condition B(2): When the normal source of power to each STPEGS unit (the main generator) is lost, there are no manual or automatic transfers required to provide power to the ESF buses. Any ESF bus which is aligned to the UAT, at the time of main generator breaker trip, will continue to receive uninterrupted power from the 345 kV switchyard via backfeed through the Main Transformers. Any ESF bus which is aligned to either SBT1 or SBT2, at the time of main generator breaker trip, will continue to receive uninterrupted power from the 345 kV switchyard via the associated North Bus or South Bus connection. On this basis, the answer to Condition B(2) is considered to be "NO" for the STPEGS site.

The criteria on Page 3-11 of NUMARC 87-00 state that the offsite power system is in the "I-3" Group if :

The answer to Condition A is "YES"; AND
The answer to EITHER Question B(1) OR B(2) is "YES."

Otherwise, the site is assigned to the "I-1/2" Group. The STPEGS responses to Conditions A, B(1), and B(2) are "YES," "NO" and "NO," respectively. On this basis, the STPEGS site is considered to be in the "I-1/2" Group.

Using the criteria of NUMARC 87-00, STPEGS is in Offsite Power Group **I-1/2**.

NUMARC Generic Response:

e) Plant-specific pre-hurricane shutdown requirements and procedures which meet the guidelines of Section 4.2.3 of NUMARC 87-00 **HAVE BEEN IMPLEMENTED**. The potential for hurricane, and the implementation of the pre-hurricane shutdown requirements places STPEGS in Offsite AC Power Design Characteristic Group P3*.

STPEGS Position:

Site susceptibility to loss of offsite power is separated into three basic groups, based upon combinations of features. The determining features are:

1) Independence of offsite power;
2) Severe weather potential, measured either by experience or recurrence intervals; and
3) Extremely severe weather potential.

STPEGS characteristics are as follows:

Offsite Power Group:	I-1/2
SW Group:	1
ESW Group:	5

NUMARC 87-00, Tables 3-5b and 3-6b, are used for sites which have a hurricane exposure and have hurricane response procedures which meet the guidelines of NUMARC 87-00, Section 4.2.3. STPEGS hurricane response procedures are described in Section B.2.c of this report. These procedures comply with the pre-hurricane shutdown requirements of NUMARC 87-00, Section 4.2.3. Therefore, based on NUMARC 87-00, Table 3-5b, STPEGS is in Offsite Power Design Characteristic Group P3*.

A.2. EMERGENCY AC POWER CONFIGURATION GROUP

NUMARC Generic Response:

The emergency AC power configuration group is **C**, based on the following discussion.

a) There are **TWO** emergency AC power supplies not credited as alternate AC power sources.

STPEGS Position:

The STPEGS is a two-unit site with three dedicated Standby Diesel Generators (SDGs) per unit. The SDGs are identical units with a continuous rated output of 5500 kW and a 2000 hour rated output of 5935 kW at 4.16 kV. Each STPEGS unit is thus considered to have three dedicated Emergency AC (EAC) power supplies, one of which is utilized as the Alternate AC (AAC) source, normally available to the safe shutdown equipment of each unit. Thus, the total number of standby power supplies normally available to the safe shutdown equipment of one STPEGS unit, that are not being utilized as an AAC power source, equals two.

NUMARC Generic Response:

b) **ONE** emergency AC power supply is necessary to operate safe shutdown equipment following a loss of offsite power.

STPEGS Position:

The safe shutdown design basis for STPEGS is hot standby (Mode 3), as stated in Section 5.4.A of the STPEGS UFSAR. Upon loss of power to the reactor coolant pumps (RCPs), coolant flow necessary for core cooling and removal of decay heat is maintained by natural circulation of the reactor coolant loops. Any one of the three STPEGS Standby Diesel Generator (SDG) trains can maintain hot standby conditions for the postulated four-hour coping duration, based on the following:

- As discussed in Section C.2 of this submittal, the four Class 1E battery banks and associated instrumentation are considered AC-Independent (i.e., not requiring battery charging support) and will be operable for the postulated four hour coping duration with minimal DC load shedding. Thus, instrumentation channel availability is independent of the emergency AC power supply available.

- All three SDGs power an identical train of Steam Generator (SG) Power Operated Relief Valves (PORVs), an identical motor-driven Auxiliary Feedwater (AFW) pump and associated cubicle cooler for decay heat removal from the Reactor Coolant System (RCS).

- All three SDGs power an identical high head safety injection (HHSI) pump and associated area ventilation fan, for makeup of RCS inventory, if required.

- All three SDGs power an identical Essential Cooling Water (ECW) train, an identical Component Cooling Water (CCW) train and associated area ventilation fans or cubicle coolers for cooling of safety-related equipment and RCP seals.

- All three SDGs power an identical train of Electrical Auxiliary Building (EAB) and Control Room Envelope (CRE) HVAC, to ensure operability of safety-related equipment and habitability of the CRE.

- Analyses performed in support of the Fire Hazards Analyses - Cold Shutdown Report demonstrate that a single train of equipment can support achieving cold shutdown conditions. These studies also determined that cold shutdown could be achieved utilizing a single active SG. Reaching cold shutdown may require over 48 hours, which envelops the time limits of a postulated SBO event. The analysis results also justify the use of a single train of AFW feeding a single steam generator as an acceptable SBO coping mechanism.

- The quantity and category of instrumentation available to maintain safe shutdown conditions following a four hour SBO event has been reviewed. This review considered the minimum set of available instrumentation, which includes the inverters and DC loads powered by the "B" and "D" Train batteries. Numerous vital plant control and indication functions would be operable, including: Feedwater Flow Control and Indication, Pressurizer PORV Control, SG PORV Control, Pressurizer Level and Pressure Indication, Main Steam Line Pressure, SG Level Indication, RCS Hot Leg, Cold Leg and Tavg Temperature Indications, AFW Flow Indication, Residual Heat Removal Flow Indication, CCW Flow Indication, Containment Pressure Indication, and Refueling Water Storage Tank Level Indication. This instrumentation provides sufficient information to the plant operators to maintain the plant in a long-term safe shutdown condition following a postulated four hour SBO event.

A plant operating procedure has been developed which facilitates plant operator capabilities to cope with the loss of vital instrumentation. This procedure addresses the loss of vital plant inverters and associated instrumentation, as might occur during an extended loss of offsite power event. Compensatory operator actions required following loss of vital instrumentation are defined, and control and indication functions disabled as a result of loss of any Class 1E instrument inverter are detailed.

The systems and components summarized above represent those required to cope with a postulated four hour SBO event. Thus, the number of emergency AC power supplies (SDGs) necessary to operate safe shutdown equipment following a loss of offsite power is one.

NUMARC 87-00, Table 3-7 is utilized to determine the EAC Power Configuration Group applicable to STPEGS. Since STPEGS has two dedicated SDGs per unit not credited as an Alternate AC power source, with one SDG necessary for safe shutdown, the STPEGS EAC Power Configuration Group is C.

A.3. TARGET STANDBY DIESEL GENERATOR RELIABILITY

NUMARC Generic Response:

A target SDG reliability of **0.975**, was selected based on:

i. Having a nuclear unit average SDG reliability for the last 20 demands greater than 0.90;
ii. Having a nuclear unit average SDG reliability for the last 50 demands greater than 0.94;
iii. Having a nuclear unit average SDG reliability for the last 100 demands greater than 0.95;

consistent with NUMARC 87-00, Section 3.2.4.

STPEGS Position:

The following is a STPEGS-specific summary of the number of failures, the calculated reliability values, and the nuclear unit average reliability values for the last 20, 50 and 100 demands on a per Standby Diesel Generator (SDG) basis, utilizing test data through December 31, 1994. Reliability values are computed based on a conservative methodology which exceeds the guidelines of NUMARC 87-00 Appendix B.13, NSAC-108 and RG 1.155 Positions C.1.1 and C.1.2.

STPEGS SDG Failures and Reliability Values Through December 31, 1994								
	Unit 1				Unit 2			
	SDG 11	SDG 12	SDG 13	Unit 1 Average	SDG 21	SDG 22	SDG 23	Unit 2 Average
Failures in Last 20 Demands	1	0	0		0	0	0	
20 Demand Reliability	0.950	1.000	1.000	0.983	1.000	1.000	1.000	1.000
Failures in Last 50 Demands	2	1	1		0	0	0	
50 Demand Reliability	0.960	0.980	0.980	0.973	1.000	1.000	1.000	1.000
Failures in Last 100 Demands	3	3	2		0	1	2	
100 Demand Reliability	0.970	0.970	0.980	0.973	1.000	0.990	0.980	0.990

A.4. ALTERNATE AC POWER SOURCE

NUMARC Generic Response:

An Alternate AC (AAC) power source will be utilized at STPEGS which meets the criteria specified in Appendix B to NUMARC 87-00. The AAC source is an Emergency AC (EAC) power source which meets the assumptions in Section 2.3.1 of NUMARC 87-00.

The AAC power source is available within ten minutes of the onset of the station blackout event and has sufficient capacity and capability to operate systems necessary for coping with a station blackout for the required duration of four hours to bring and maintain the plant in safe shutdown. Class 1E battery capacity, compressed air, and containment isolation are addressed in Sections C.2, C.3 and C.5 of this submittal, respectively.

STPEGS Position:

The STPEGS is a two-unit site with three dedicated Standby Diesel Generators (SDGs) per unit. The SDGs are identical units with a rated output of 5500 kW (continuous)/5935 kW (2000 hour) at 4.16 kV. The design and continuous rating selected is consistent with the requirements of NRC Regulatory Guide 1.9 and IEEE Standard 387-1977.

Each STPEGS unit thus has three dedicated emergency AC power supplies (SDGs), any one of which may be utilized as the Alternate AC (AAC) source, normally available to each unit's safe shutdown equipment. Justification for use of any SDG as the AAC source is presented in Section A.2.b of this submittal. A functional diagram of a typical SDG and associated Class 1E loads required for SBO coping is provided as Figure 2.

Appendix B to NUMARC 87-00 describes the thirteen criteria that must be met by a power supply in order to be classified as an AAC power source. STPEGS will designate any one of the three SDGs per unit as an AAC power source which meets the criteria specified in NUMARC 87-00 Appendix B. A brief description of how STPEGS complies with each of the NUMARC 87-00 Appendix B criteria is provided below.

A.4.a. AAC Power Source Criteria

B.1. Any one of the three STPEGS SDGs dedicated to each unit may serve as the AAC source. The SDG and supporting systems are designated as safety-related systems. The SDGs are designed to be connected to the Class 1E 4.16 kV ESF buses, which are also designated as safety-related systems. These systems serve as the plant Class 1E systems for normal operating and other postulated accident conditions, and will continue to meet the applicable safety-related design criteria during a postulated SBO event.

B.2. Each SDG and supporting subsystems are housed in a separate cubicle in the Diesel Generator Building (DGB). The cubicle is intended to protect the SDGs from common cause failures due to (i) fire, (ii) pipe whip, (iii) jet impingement, (iv) waterspray, (v) flooding from a pipe break, (vi) radiation, pressurization, elevated temperature, or humidity caused by a high or medium energy pipe break, and (vii) missiles resulting from failure of rotating equipment or high energy systems. The SDG and supporting systems are designated as Seismic Category I, and the DGB is designed as a Seismic Category I structure.

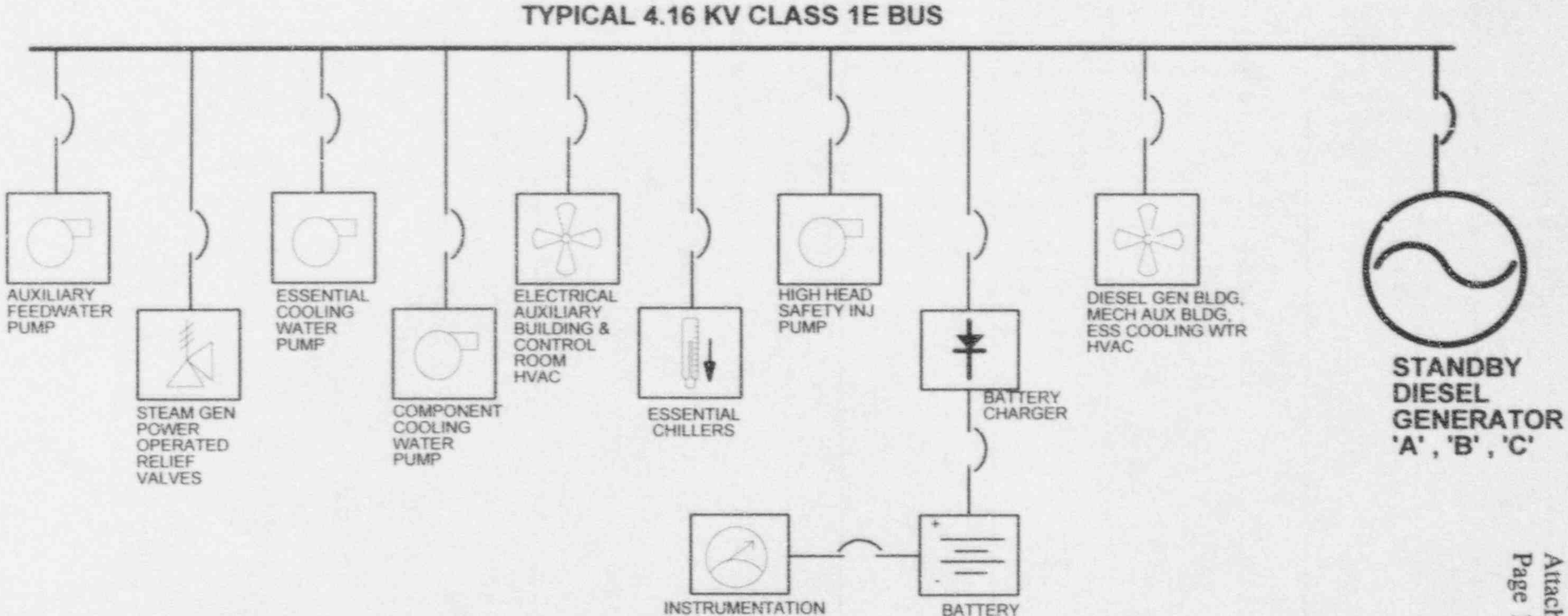
B.3. Each SDG and supporting subsystems are housed inside Seismic Category I structures with exterior walls and roof designed to withstand likely weather-related events. This environmental protection is described in detail in STPEGS UFSAR Section 3.8.4.

B.4. Physical separation of AAC components from other trains of safety-related components and equipment meets the original plant design basis for safety-related equipment separation, as described in Items 1 and 2 above.

A.4.b. Connectability to AC Power Systems

B.5. Failure of AAC components will not adversely affect Class 1E AC power systems. These components were also originally designed to conform with the applicable criteria for physical separation between safety-related component trains. The SDG utilized as the AAC source is not normally connected to the Class 1E AC power system. Thus, the original plant design for this equipment will ensure that a failure will not adversely impact other plant Class 1E power systems.

STPEGS STATION BLACKOUT SUBMITTAL
FIGURE 2: TYPICAL ONSITE CLASS 1E BUS



B.6. Electrical isolation of AAC power is provided through an appropriate isolation device. A normally-open Class 1E circuit breaker is provided between the SDG utilized as the AAC source and the associated 4.16 kV Class 1E switchgear bus.

B.7. The SDG utilized as the AAC source is normally inactive, and is isolated from its associated Class 1E 4.16 kV bus by the normally open Class 1E diesel generator output breaker. The SDG was also originally designed and licensed to be automatically started and to automatically load the safety-related loads associated with the applicable initiating accident signal.

A.4.c. Minimal Potential for Common Cause Failure

B.8. The following features of the SDG and supporting subsystems provide assurance that a minimal potential for common cause failure exists:

(a) The SDG utilized as the AAC source is connected to a Class 1E DC battery bank, battery charging and DC distribution system that is physically and electrically independent from the other trains of the blacked-out unit's preferred and Class 1E power system.

(b) The SDG utilized as the AAC source is equipped with two compressed air starting systems, either of which is capable of starting the engine without outside power, and is physically independent of the preferred and the blacked-out unit's preferred and Class 1E power supply.

(c) The SDG utilized as the AAC source is provided with a physically separate fuel oil supply and transfer system. Each SDG has a physically separate fuel oil storage tank with a capacity to support seven (7) continuous days of SDG operation. Each SDG fuel oil system is provided with an auxiliary fuel oil filtration skid including an automatic sampler, which facilitates collection of a composite sample for testing per STPEGS Technical Specification surveillance requirements.

(d) The SDG utilized as the AAC source and the associated electrical distribution and control systems were subjected to active failure analysis during the original plant design. The AAC power system is thus considered to have been adequately analyzed for active failures, and the appropriate actions already implemented. As described in the addendum to this submittal, each SDG is included in the Class 1E Diesel Generator Reliability Program described in RG 1.155 and NUMARC 87-00 Appendix D. Active failures of the SDGs are evaluated per the STPEGS Condition Reporting process to determine the root cause of such failures. Corrective actions are implemented for recurrence control.

(e) As described in Items 3, 4, and 5 above, the SDG utilized as the AAC source is housed inside Seismic Category I structures with exterior walls and roof designed to withstand likely weather-related events. The SDGs are also designed to be physically and electrically isolated from other safety-related trains and non-safety-related equipment. No single point vulnerability exists whereby a likely weather-related event or single active failure could disable any portion of the onsite emergency AC power sources or the preferred power sources, and simultaneously fail the AAC power source(s).

(f) The SDG utilized as the AAC source also serves the plant Class 1E systems for normal operating and other postulated accident conditions. The equipment was designed to meet the applicable criteria for physical and electrical separation and isolation between safety related components. Any of the three SDGs is fully capable of providing all train-related AC power for the SBO event. The AAC power system is thus capable of operating during and after a station blackout without any support systems powered from the preferred power supply, or the blacked-out unit's Class 1E power sources affected by the event.

(g) The conduct of maintenance and surveillance activities for the SDG utilized as the AAC source and associated distribution system is discussed in Section A.3 of this submittal. A standard requirement of the applicable procedures is return-to-service testing, which ensures the operability of the equipment following maintenance activities. Thus, the portions of the AAC power system subjected to maintenance activities are tested prior to returning the AAC power system to service.

A.4.d. Availability After Onset of Station Blackout

B.9. The SDG utilized as the AAC source is capable of meeting the voltage and frequency criteria specified for Class 1E standby power sources, and is designed to carry the safety-related loads attached to the ESF buses of the associated safety train. Each SDG has an independent fuel oil storage tank capable of powering the associated safety-related equipment for a seven day period. The AAC power system is thus sized to carry the required shutdown loads for the required coping duration and is capable of maintaining voltage and frequency within limits consistent with established industry standards that will not degrade the performance of any shutdown system or component.

A.4.e. <u>Capacity and Reliability</u>

B.10. As discussed in the Addendum to this submittal, each SDG utilized as the AAC source is demonstrated operable by test at intervals no greater than once per 31 days. This operability testing is performed to satisfy the requirements of STPEGS Technical Specification 3/4.8.1.

As discussed in the Addendum to this submittal, each SDG utilized as the AAC source is demonstrated operable once every refueling outage in accordance with STPEGS Technical Specification 3/4.8.1.

B.11. As discussed in the Addendum to this submittal and Item 10 above, the SDG used as the AAC source utilizes surveillance and testing procedures are governed by the STPEGS Technical Specifications. Thus, the surveillance and maintenance procedures for the AAC system are considered to be implemented in accordance with plant-developed procedures or manufacturer's recommendations.

B.12. As discussed in Item 7 above, the SDG utilized as the AAC source was originally designed and licensed to automatically start and sequence the safety-related loads associated with the applicable initiating accident signal. The SDG is designed to reach rated voltage and frequency within 10 seconds of receipt of a start signal, and will complete automatic sequencing of required safety-related loads 270 seconds after closure of the diesel generator output breaker.

As discussed in the Addendum to this submittal and Items 10 and 11 above, the SDG utilized as the AAC source is governed by the plant Technical Specification surveillance testing requirements. These requirements demonstrate the AAC source to be capable of powering required shutdown equipment within ten minutes of occurrence of a station blackout event.

B.13. AAC power is provided by any of the three dedicated Class 1E SDGs for each STPEGS unit. SDG/AAC source reliability is addressed in the addendum to this submittal.

B. PROCEDURES

Plant procedures have been developed for implementation in the event of a station blackout event at STPEGS. NUMARC 87-00, Section 4.2, provides guidelines for development of operating procedures for response to a station blackout event.

B.1. AC POWER RESTORATION (NUMARC 87-00 SECTION 4.2.2)

4.2.2(1) NUMARC Guidance:

Load dispatchers should give the highest possible priority to restoring power to nuclear units. Procedures and training should consider several potential methods of transmitting power from blackstart capable units to the nuclear plant.

STPEGS Position:

The STPEGS is jointly owned by City Public Service Board of San Antonio, Central Power and Light Company, City of Austin, and Houston Lighting & Power (the Project Manager). The STPEGS 345 kV switchyard incorporates a total of eight incoming lines which link the four utility grids together.

The four STPEGS owners are members of the Electric Reliability Council of Texas (ERCOT), which provides Operating Guides for electric utilities engaged in generation, transmission, or distribution within the State of Texas. These guides outline mutually acceptable practices to be followed in operation of the interconnected system. The Operating Guides are consistent with, and are used in conjunction with, the North American Electric Reliability Council (NERC) Operating Manual. These guides are distributed to personnel immediately responsible for hour-by-hour operation, planning, and engineering of the system facilities.

The ERCOT Black Start Guide defines the actions necessary for restoration of generation and transmission capabilities following a blackout. This guide also defines the priorities for systematic restoration of ERCOT load, with consideration for balancing load and generating capability while maintaining acceptable system frequency. The priorities for an ERCOT system restart are listed below, with the excerpts applicable to this NUMARC criterion shown in bolded text:

a. Secure and/or stabilize generating units where necessary.
b. Assess Control Area condition, ERCOT system condition, and available communication facilities.
c. Restore and maintain communication facilities to the extent possible.
d. Bring units with black start capability on-line.

e. **Provide service to critical facilities:**
   - **Provide station service for nuclear generating facilities.**
   - Provide critical power to as many power plants as possible to prevent equipment damage.
   - Secure or provide startup power for generating plants which do not have black start capability.
   - Supply station service to critical substations where necessary.

f. Connect islands, taking care to avoid recurrence of a partial or complete system collapse.

g. Restore service to critical loads such as:
   - Military facilities.
   - Facilities necessary to restore the electric utility system.
   - Law enforcement organizations and facilities affecting public health.
   - Public communication facilities.

h. Restore service to the remaining customers.

<u>4.2.2(2)</u> <u>NUMARC Guidance:</u>

Should incoming transmission lines to a nuclear power plant be damaged, high priority should be assigned to repair and restoration activities to at least one line capable of feeding shutdown equipment.

<u>STPEGS Position:</u>

The ERCOT Black Start Guide defines the actions necessary for restoration of generation and transmission capabilities following a blackout. This guide also prioritizes the restoration of a transmission circuit for nuclear power generation facilities. The following is the applicable section from the Black Start Guide, with the excerpts applicable to this NUMARC criterion shown in bolded text:

Ties between nearby power plants should be established as soon as possible. **Priority should be given in restoring at least one circuit to nuclear power plants to provide offsite power for safe shutdown.**

<u>4.2.2(3)</u> <u>NUMARC Guidance:</u>

Repair crews engaging in power restoration activities for nuclear units should be given high priority for manpower, equipment, and materials.

<u>STPEGS Position:</u>

The HL&P Energy Control Emergency Operating Plan addresses preparation for and response to potential emergency conditions requiring intense system restoration efforts. The Energy Control Emergency Operating Plan includes a set of preparation steps which are triggered by key events which can lead to a major emergency. These key events are:

Preparation Step A - Potential Damaging High Winds and Flooding
Preparation Step B - Potential Generation/Transmission Shortfall
Preparation Step C - Probable Generation/Transmission Shortfall
Preparation Step D - Imminent Generation/Transmission Shortfall
Preparation Step E - Probable Damaging High Winds and Flooding
Preparation Step F - Imminent Damaging High Winds and Flooding

The majority of transmission grid emergencies are the result of gradually degrading conditions, such as an approaching hurricane, which provide adequate time for event preparation. This allows the Energy Control Department to equip for and minimize the effect of emergencies on company facilities and equipment, including the STPEGS site. Category V of the HL&P Emergency Operation Plan, "South Texas Project Site Emergency," specifically prioritizes the manpower, equipment, and materials required for STPEGS power restoration activities.

4.2.2(4) NUMARC Guidance:

Portable AC generators should be designated as backup sources, if available, and directed to nuclear power plant sites. Procedures should address preplanned actions and identify required equipment.

STPEGS Position:

The Standby Diesel Generator (SDG) utilized as the Alternate AC source during a postulated station blackout event has the capacity and capability to power all loads required for the required SBO event duration. Each SDG has a dedicated seven day fuel supply to ensure long term operability. On this basis, the use of portable AC generators is not considered a practical option and has not been pursued.

4.2.2(5) NUMARC Guidance:

Once preferred and/or standby (Class 1E) AC power becomes available, station procedures should specify the sequence of circuit breaker operations required to restore AC power to shutdown equipment. Any additional actions such as pulling or replacing fuses should also be identified.

STPEGS Position:

Procedure 0POP05-EO-EC00, "Loss of All AC Power," provides the recovery actions for the plant to be taken when power is restored to any Class 1E AC ESF bus.

Procedure 0POP04-AE-0001, "Loss of Any 13.8 kV or 4.16 kV Bus," provides the recovery actions necessary to re-energize the 13.8 kV and 4.16 kV busses and directs the operators to the appropriate procedures for further recovery steps.

B.2. SEVERE WEATHER PROCEDURES (NUMARC 87-00 SECTION 4.2.3)

4.2.3(1) NUMARC Guidance - Actions for Hurricane

The plant procedures should identify site-specific actions necessary to prepare for the onset of a hurricane. These actions should be initiated when a hurricane warning is issued for the plant site area.

STPEGS Position:

The STPEGS severe weather guidelines are incorporated in two procedures:

- 0PGP03-ZV-0001, "Severe Weather Plan," which serves as the guiding document for STPEGS severe weather preparedness and response.
- 0POP04-ZO-0002, "Severe Weather Guidelines," which provides specific guidelines for plant personnel in the event a Tornado Watch/Warning or Hurricane Watch/Warning is issued for the STPEGS site area.

STPEGS complies with the guidelines of NUMARC 87-00, Revision 0, Sections 4.2.3 and 4.3.3. The STPEGS position for each paragraph of NUMARC 87-00 Section 4.2.3 and 4.3.3 follows.

4.2.3.1(a) NUMARC Guidance:

These actions should .... include inspecting the site for potential missiles and reducing this potential.

STPEGS Position:

0PGP03-ZV-0001 requires the removal of loose trash and materials, and tie down of temporary and portable structures within the Owner Controlled Area and Protected Area. 0PGP03-ZV-0001 also requires tie down of outdoor mobile cranes within the Protected Area. These actions occur when a hurricane has entered the Gulf of Mexico or a tropical storm watch has been posted for the Texas coast between Corpus Christi and Galveston Island.

4.2.3.1(b) NUMARC Guidance:

These actions should .... include reviewing the adequacy of site staff to support operations and repair.

STPEGS Position:

0PGP03-ZV-0001 requires Department Storm Crew Rosters, with the Storm Crew assignment, telephone numbers, and home address to be prepared for plant personnel. This information is provided for all affected departments when a hurricane enters the Gulf of Mexico. This information is provided for rotating shift schedule positions when a tropical storm watch is posted for the Texas coast between Corpus Christi and Galveston Island.

0POP04-ZO-0002 requires Shift Supervisors to ensure additional operations and maintenance support personnel are available for the anticipated duration of the storm. This action is implemented when an issued hurricane warning for the Texas coast includes the STPEGS site.

4.2.3.1(c) NUMARC Guidance:

These actions should .... include expediting the restoration of important plant systems and components to service.

STPEGS Position:

Procedure 0POP04-ZO-0002 states that the Shift Supervisors shall perform the following actions in preparation for the onset of a hurricane:

- Secure any Standby Diesel Generator Fuel Oil Storage Tank recirculation activities.
- Fill all fuel oil storage, chemical storage and gaseous storage tanks, if necessary.
- Ensure all Standby Diesel Generators are operable.
- Test the turbine generator lube oil pumps.
- Conduct a communications check on all Emergency Communications Systems.

These steps are implemented when a hurricane watch for the Texas coast and the STPEGS site is issued.

4.2.3.1(d) NUMARC Guidance:

These actions should .... include warming and lubricating standby (Class 1E) AC power sources.

STPEGS Position:

The STPEGS Standby Diesel Generators (SDGs) utilize standby lubricating oil and jacket water heaters, a lubricating oil circulating system, and a jacket water circulating system to maintain the SDGs in a pre-warmed condition when the engine is not running. No specific preparatory warming or lubrication is required.

4.2.3.1(e) NUMARC Guidance:

These actions should .... include determining the status of Alternate AC sources (if available) and taking necessary actions to ensure their availability.

STPEGS Position:

0POP04-ZO-0002 requires the Shift Supervisors to ensure all Standby Diesel Generators (SDGs) are operable prior to projected hurricane arrival. This action is performed twice: (1) when a hurricane watch for the Texas coast and the STPEGS site is issued; and (2) when a hurricane warning for the Texas coast and the STPEGS site is issued.

0POP04-ZO-0002 requires the following steps be performed at least 2 hours prior to the projected arrival of a hurricane (i.e., sustained winds › 73 mph):

1) Start and load **either** Standby Diesel Generator "A" **or** Standby Diesel Generator "C" and disconnect the respective ESF bus (and associated SDG) from the offsite power source.

2) Continue to operate the standby diesel generator until the hurricane has passed.

The preferred SDG selection is the unit connected to the bus powering the currently operating Centrifugal Charging Pump.

4.2.3.1(f) NUMARC Guidance:

These actions should .... include increasing CST inventory.

STPEGS Position:

0POP04-ZO-0002 requires the filling of the following water storage tanks, if necessary: Secondary Makeup tanks, Auxiliary Feedwater Storage tanks (the primary condensate storage tanks), Reactor Makeup Water storage tanks, and the Demineralized Water storage tank. This action is implemented when a hurricane watch for the Texas coast and the STPEGS site is issued.

4.2.3.1(g) NUMARC Guidance:

These actions should .... include placing battery chargers in service (if applicable).

STPEGS Position:

The STPEGS Class 1E Battery Chargers are normally in service, as governed by Technical Specification 3.8.2, to maintain the operability of the battery banks. No specific preparatory charging is needed.

4.2.3.1(h) NUMARC Guidance:

These actions should .... include start and load test EDGs.

STPEGS Position:

0POP04-ZO-0002 requires, at least two hours prior to projected hurricane arrival (i.e., sustained winds › 73 mph), the Shift Supervisors to start and load either the Train A or Train C Standby Diesel Generator (SDG), and disconnect the respective ESF Bus (and associated SDG) from offsite power. The preferred SDG selection is the unit connected to the bus powering the currently operating Centrifugal Charging Pump.

4.2.3(2) NUMARC Guidance - Actions for Hurricane:

Utility procedures should identify additional plant support staff and the method of contacting them once a hurricane notice has been issued by the National Weather Service.

STPEGS Position:

0PGP03-ZV-0001 requires Department Storm Crew Rosters, with the Storm Crew assignment, telephone numbers, and home address to be prepared for plant personnel. The rosters are provided for all affected departments when a hurricane enters the Gulf of Mexico. This information is provided for rotating shift schedule position when a tropical storm watch is posted for the Texas coast between Corpus Christi and Galveston Island.

0PGP03-ZV-0001 requires a developed severe weather plan, which includes means of communication with the storm crews (e.g., telephones, radio station broadcasts) and determination of staffing requirements.

0POP04-ZO-0002 requires Shift Supervisors to ensure additional operations and maintenance support personnel is available for the anticipated duration of the storm. This action is implemented when an issued hurricane warning for the Texas coast includes the STPEGS site.

4.2.3(3) NUMARC Guidance - Actions for Hurricane:

Plant procedures should specify actions necessary to ensure equipment required for station blackout response is available.

STPEGS Position:

0PGP03-ZV-0001 requires plant personnel to:

- Perform a periodic inventory check of emergency tools and equipment under their control as specified in their respective Departmental Severe Weather Plan.
- Designate storage locations for initial repair parts identified for plant restoration.
- Coordinate with the STPEGS owners to obtain emergency equipment available at their utilities that would be available for use at the STPEGS during severe weather.
- Move pre-designated emergency equipment inside the Protected Area.

This action is implemented when a hurricane watch for the Texas coast and the STPEGS site is issued.

4.2.3.4(a) NUMARC Guidance - Actions for Hurricane:

Plant procedures should address the following items prior to a hurricane arrival at a site: the site-specific indicator should ensure that the plant would be in a safe shutdown two hours before the anticipated hurricane arrival at the site (i.e., sustained wind speeds in excess of 73 mph).

STPEGS Position:

0POP04-ZO-0002 will be revised to require the following actions:

IF a Hurricane Warning is in effect AND the National Weather Service has predicted Hurricane landfall for the Texas coastal bend between Port Lavaca and Galveston, THEN PERFORM the following:

- As directed by the Plant Manager or his designee, ENSURE the Plant is in Mode 3 or lower at least 2 hours prior to the anticipated arrival of sustained wind speeds in excess of 73 mph at the site.

4.2.3.4(b) NUMARC Guidance - Actions for Hurricane:

Plant procedures should address the following items prior to a hurricane arrival at a site: operator review of station blackout procedures.

STPEGS Position:

0POP04-ZO-0002 requires all licensed operators on shift or coming on-shift during the Hurricane Warning to review the following procedures at least 12 hours prior to projected hurricane arrival: (1) 0POP05-EO-EC00, "Loss of All AC Power;" (2) 0POP05-EO-EC01; "Loss of All AC Power Recovery Without SI Required;" (3) 0POP05-EO-EC02; "Loss of All AC Power Recovery With SI Required;" and (4) 0POP04-AE-0001, "Loss of Any 13.8 kV or 4.16 kV Bus."

4.2.3.4(c) NUMARC Guidance - Actions for Hurricane:

Plant procedures should address the following items prior to a hurricane arrival at a site: operator review of procedures to line up and operate the switchyard spraydown system (if installed).

STPEGS Position:

The STPEGS site is located approximately 15 miles inland from the Gulf of Mexico. This criterion is not applicable to STPEGS, which does not have nor require a switchyard spraydown system for the removal of salt spray accumulation from the switchyard equipment insulators.

4.2.3(a) NUMARC Guidance - Actions for Tornado:

Plant procedures should identify site-specific actions necessary to prepare for the onset of a tornado. These actions should include inspecting the site for potential missiles and reducing this potential.

STPEGS Position:

STPEGS procedures recognize that tornadoes are often rapidly developing phenomena with limited warning. Normal operating practices thus attempt to minimize the need for specific actions, such as crane tie-downs, prior to severe weather.

0PGP03-ZV-0001 requires the removal of loose trash and materials, and tie down of temporary and portable structures within the Owner Controlled Area and the Protected Area. These actions are required when a Tornado Watch is issued for the STPEGS site area.

0POP04-ZO-0002 requires operators to inspect the Protected Area for potential missiles and secure loose items, when a Tornado Watch is issued for the STPEGS site area.

4.2.3(b) NUMARC Guidance - Actions for Tornado:

Plant procedures should identify site-specific actions necessary to prepare for the onset of a tornado. These actions should include expediting the restoration of important plant systems and components to service.

STPEGS Position:

0PGP03-ZV-0001 requires prioritization of Storm Crew assignments and announcement of re-mobilization efforts immediately after National Weather Service or National Oceanic and Atmospheric Administration data indicates the severe weather has passed, and site conditions allow for the return to work.

0PGP03-ZV-0001 provides requirements for restoration of tornado dampers to the open position, should they be actuated by an actual tornado strike.

Procedure 0POP04-AE-0001, "Loss of Any 13.8 kV or 4.16 kV Bus," describes AC power restoration actions to any 13.8 kV or 4.16 kV bus during all plant operating modes.

Procedure 0POP05-EO-EC00, "Loss of All AC Power," provides requirements to maintain the plant primary and secondary systems in a safe condition, should all AC ESF buses be de-energized.

B.3. STATION BLACKOUT RESPONSE GUIDELINES

4.2.1(1) NUMARC Guidance:

Plant procedures should identify site-specific action necessary to restore offsite or standby (Class 1E) AC power sources. If an AAC power source is available, it should be started as soon as possible. Plants relying on AAC power sources should start the AAC power source and commence loading shutdown equipment within the first hour of a station blackout.

STPEGS Position:

The following procedures are available in the event of an SBO event at STPEGS:

0POP05-EO-EC00, "Loss of All AC Power." This procedure provides actions to respond to a loss of all AC power. This procedure is entered on the indication that all 4.16 kV Class 1E ESF Buses are de-energized.

0POP05-EO-EC01, "Loss of All AC Power Recovery Without SI Required." This procedure provides actions to use normal operational systems to stabilize plant conditions following restoration of Standby AC power. This procedure is entered from 0POP05-EO-EC00 when Standby AC power is restored and Safety Injection (SI) is not required.

0POP05-EO-EC02, "Loss of All AC Power Recovery With SI Required." This procedure provides actions to use Engineered Safety Feature Systems to stabilize plant conditions following restoration of Standby AC power. This procedure is entered from 0POP05-EO-EC00 or 0POP05-EO-EC01 when Standby AC power is restored and SI is required.

0POP04-AE-0001 "Loss of Any 13.8 kV or 4.16 kV Bus" is the primary guidance for restoring power to any de-energized bus. This procedure contains a systematic method which places the major loads in Pull to Lock and then re-energizes the bus from the most desirable source or alternates, should the preferred sources not be available. Appropriate notes and cautions for each bus are included.

0POP04-AE-0001 is to be used in conjunction with the following procedures, as appropriate:

0POP05-EO-EC00, "Loss of All AC Power"
0POP05-EO-EC01, "Loss of All AC Power Recovery Without SI Required"
0POP05-EO-EC02, "Loss of AC Power Recovery With SI Required"
0POP05-EO-EO01, "Reactor Trip or Safety Injection"
0POP05-EO-ES01, "Reactor Trip Response"
0POP05-EO-EO10, "Loss of Reactor or Secondary Coolant"
0POP05-EO-ES12, "Post-LOCA Cooldown and Depressurization"

The Alternate AC (AAC) source is designed to start and reach rated speed and voltage within 10 seconds. However, the previously mentioned procedures have steps which attempt manual starts of the Standby Diesel Generators (SDGs). Loading of the AAC source would be automatic via the associated ESF Load Sequencer.

In addition, 0POP04-ZO-0002 requires, at least two hours prior to projected hurricane arrival, the Shift Supervisors to start and load either the Train A or Train C SDG, and disconnect the respective ESF Bus from offsite power. The preferred SDG selection is the unit connected to the bus powering the currently operating Centrifugal Charging Pump.

4.2.1(2) NUMARC Guidance:

Plant procedures should specify actions necessary to assure the shutdown equipment (including support systems) necessary in a station blackout can operate without AC power.

STPEGS Position:

In addition to the procedures described previously, 0POP05-EO-EO00, "Reactor Trip or Safety Injection," 0POP05-EO-EO10, "Loss of Reactor or Secondary Coolant," and 0POP05-ES12, "Post-LOCA Cooldown and Depressurization" provide guidance when the AAC source is available. 0POP05-EO-EO00 provides manual containment isolation actions, upon receipt of a Safety Injection signal, for any containment isolation valves which do not reach the fail safe position.

Procedure 0POP04-AE-0001, Loss of Any 13.8 kV or 4.16 kV Bus" allows the operator to manually control the Steam Generator (SG) Power Operated Relief Valves (PORVs) as required following a loss of AC power.

Procedure 0POP05-EO-EC00 places the SG PORV controllers in manual and provides local operation guidance for SG PORVs.

Procedures 0POP05-EO-EC00 and 0POP05-EO-EO00 both provide for manual control of Auxiliary Feedwater (AFW) valves to control proper AFW flow, if necessary.

4.2.1(3) NUMARC Guidance:

Plant procedures should recognize the importance of AFWS during the early stages of the event, and direct the operators to invest appropriate attention to assuring their continued, reliable operation through the transient since this ensures decay heat removal.

STPEGS Position:

STPEGS operating procedures recognize the importance of the Auxiliary Feedwater (AFW) system, regardless of the procedural path utilized, as documented below:

Procedure 0POP05-EO-EC00 addresses verification of AFW system flow and AFW storage tank level. Subsequent steps address monitoring of Steam Generator pressures and water levels, as well as the performance of the AFW system.

Procedure 0POP05-EO-EO00 also addresses verification of AFW system flow.

Procedures 0POP05-EO-ES01 and 0POP05-EO-EO10 address verification of AFW Storage Tank (AFST) levels and actions to fill the AFST from the alternate condensate storage source (Fire

Water Storage Tanks), if required.

4.2.1(4) NUMARC Guidance:

Plant procedures should identify the sources of potential reactor inventory loss and specify actions to prevent or limit significant loss.

STPEGS Position:

The STPEGS design has been reviewed to determine potential sources of Reactor Coolant System (RCS) inventory loss during a postulated SBO event. The Chemical and Volume Control System letdown line was identified as a potential source of RCS inventory loss.

The motor operated letdown isolation valve is not normally utilized. STPEGS has installed an air-operated fail-closed valve (C1CVFV0011) upstream of the three letdown orifice isolation valves. This valve will isolate letdown on a loss of instrument air or electrical power, thus removing any requirements on the operation of the motor operated valve and ensuring the RCS inventory loss is minimized. Operating procedures 0POP05-EO-EC00, "Loss of All AC Power" and 0POP05-EO-EO00, "Reactor Trip or Safety Injection" also contain specific procedural steps to manually isolate RCS letdown, if required.

All instrumentation in the above procedural steps are powered from Class 1E battery-backed DC power. The letdown orifice header isolation valve (C1CVFV0011) is controlled from the main control room. However, it would also receive an automatic isolation signal, based on pressurizer low level, and close on a loss of supply air.

Further discussion of RCS inventory control is discussed under Section C.6 of this report.

4.2.1(5) NUMARC Guidance:

Plant procedures should ensure that a flowpath is promptly established for makeup flow from the CST to the steam generator/nuclear boiler and identify backup water sources to the CST in order of intended use. Additionally, plant procedures should specify clear criteria for transferring to the next preferred source of water.

STPEGS Position:

The alternate Auxiliary Feedwater (AFW) supply is from two 300,000 gallon fire water storage tanks (FWST), with the motive force for fire water transfer being any one of three diesel-driven fire pumps. The flow path consists of manually operated valves and pre-staged fire hose. Procedure 0POP05-EO-EC00, "Loss of All AC Power" provides the required guidance for establishing makeup flow to the Auxiliary Feedwater Storage tank (AFST).

The motor-operated discharge valves associated with each motor-driven AFW pump train are powered from the same Class 1E electrical train as the associated AFW pump motor. Thus, providing AFW to its associated Steam Generator (SG) during a SBO is accomplished automatically during load sequencing of the Alternate AC Source, or can be controlled remotely from the Control Room. If AFW flow to other SGs be desired, procedural steps exist for local manual alignment of the AFW pump discharge cross-connect valves.

The following procedures provide specific actions to establish a flow path for makeup flow from the AFST, including transfer to the alternate source of makeup water from the FWST, if required.

0POP05-EO-EC00, "Loss of All AC Power"
0POP05-EO-EO01, "Reactor Trip or Safety Injection"
0POP05-EO-EC02, "Loss of All AC Power Recovery With SI Required"
0POP05-EO-EO10, "Loss of Reactor or Secondary Coolant"
0POP05-EO-ES12, "Post-LOCA Cooldown and Depressurization"

4.2.1(6) NUMARC Guidance:

Plant procedures should identify individual loads that need to be stripped from the plant DC buses (both Class 1E and Non-Class 1E) for the purpose of conserving DC power.

STPEGS Position:

For purposes of the Class 1E battery banks, the revised STPEGS SBO position considers operation of the Channel I, Channel III and Channel IV battery banks as AC-Independent (i.e., not requiring battery charging support) for a period of four hours; and the operation of the Channel II battery bank as AC-Independent for a period of eight hours. The Class 1E battery banks are considered to have no battery charging support during a postulated four hour SBO event, other than the specific train powered by the Alternate AC source.

The Class 1E DC load shedding requirements for a SBO event will be documented in two plant operations procedures: Emergency Operating Procedure 0POP05-EO-EC00, "Loss Of All AC Power," and Plant Operating Procedure 0POP04-AE-0001, "Loss of Any 13.8 KV or 4.16 KV Bus." The procedural steps which ensure shedding of the "A" Train ESF Load Sequencer, commencing 30 minutes after the SBO event initiation, will be incorporated into these two procedures.

There are no load shedding requirements for non-Class 1E DC systems credited for SBO coping. Additional information is provided in Section C.2 of this report.

4.2.1(7) NUMARC Guidance:

Plant procedures should specify actions to permit appropriate containment isolation and safe shutdown valve operations while AC power is unavailable. These actions may include:

(a) providing additional bottled air or nitrogen at the valves;

(b) specifying manual valve operation to maintain shutdown (e.g., manual valve seating to reduce system losses);

(c) ensuring appropriate containment integrity.

STPEGS Position:

No local manual actions to operate any containment isolation valves, during the postulated four hour SBO event, are required. Containment isolation can be achieved without manual operator action. Although not required for coping with a postulated four hour SBO event, containment isolation may be locally verified utilizing procedure 0POP05-EO-EC00. This procedure provides instructions to operating personnel in the event that local manual valve closure and local position verification is required. Additional details regarding containment integrity and containment isolation valves are provided in Section C.5 of this attachment.

4.2.1(8) NUMARC Guidance:

Plant procedures should identify the portable lighting necessary for ingress and egress to plant areas containing shutdown or AAC equipment requiring manual operation.

STPEGS Position:

The Emergency DC Lighting System provides lighting powered from batteries, in the event of loss of the Normal and Essential AC Lighting Systems. The Emergency DC Lighting System provides illumination of safe shutdown areas and associated ingress/egress paths by utilizing sealed beam lighting with self-contained 8-hour battery packs. These self-contained units are installed in safe shutdown areas such as the Main Control Room, Auxiliary Shutdown Panel Room, Transfer Switch Panel Rooms, and SDG Local Control Panel Areas.

STPEGS plant procedure 0POP01-ZA-0001, "Plant Operations Department Administrative Guidelines" requires the maintenance and control of emergency response lockers at strategic locations within the plant. These lockers contain flashlights and portable lanterns to facilitate local manual operations required during a station blackout event. Plant operators are also required to carry personal flashlights to augment the emergency lighting provisions discussed above.

4.2.1(9) NUMARC Guidance:

Plant procedures should consider the effects of AC power loss on area access, as well as the need to gain entry to other locked areas where remote equipment operation is necessary.

STPEGS Position:

STPEGS plant procedures 0POP01-ZQ-0022, "Plant Operations Shift Routines" and 0POP01-ZA-0019, "Locked Component Key Control" address compensatory manual actions required for access to locked areas and equipment in the event of a loss of offsite power. Security guards with keys would be posted at vital access doors to control access. In addition, there are seven vital door keys per unit carried by the operators. These keys are formally transferred during each shift turnover, inventoried once per month by Security, and utilized only during an emergency. This ensures operator accessibility during all operating modes or emergency conditions. Personnel inside a vital area may exit the area, since the doors will open from the inside, but not from the outside, on a loss of power.

4.2.1(10) NUMARC Guidance:

Plant procedures should consider loss of ventilation effects on specific energized equipment necessary for shutdown (e.g., those containing internal electrical power supplies or other local heat sources that may be energized or present in a station blackout). These procedures should address:

(a) specific room or cabinet temperatures or symptoms (e.g., alarms or indications of loss of cooling) readily identifiable by the operator, and the response thereto;

(b) methods for providing necessary ventilation and/or supplemental cooling within 30 minutes;

(c) the potential need for operator action to override HPCIS/RCICS steam line isolation on high temperature;

(d) opening cabinet doors containing instrumentation in control rooms necessary for safe shutdown in a station blackout within 30 minutes; and

(e) effects of actuation of fire protection features due to elevated temperature.

STPEGS Position:

As discussed in Section C.4 of this submittal, the temperatures in those areas where the equipment credited for SBO coping is located will be maintained within design limits. The Alternate AC source powers ventilation and cooling equipment which assure the operability of the credited equipment.

STPEGS procedures ensure cooling of the relay room cabinets by opening the cabinet doors, as described below:

Procedure 0POP04-AE-0001, "Loss of Any 13.8 kV or 4.16 kV Bus," requires all the relay room cabinet doors to be opened if less than two (2) 4.16 kV ESF buses are energized.

Procedure 0POP04-HE-0001, "Loss of EAB or Control Room HVAC," requires all the relay room cabinet doors to be opened, and temporary ventilation to be established, should a postulated loss of HVAC result in relay room temperatures approaching 98°F.

The fire protection system actuation setpoints were reviewed to ensure there will be no system actuation due to ambient temperature extremes. The minimum fire protection actuation setpoint in STPEGS safety-related areas is 165°F, which is in excess of the maximum ambient temperatures expected during the postulated four hour SBO event.

4.2.1(11) NUMARC Guidance:

Plant procedures should consider habitability requirements at locations where operators will be required to perform manual operations.

STPEGS Position:

The STPEGS design was reviewed for loss of ventilation during an SBO event. The need for local STPEGS operator actions which assure the SBO coping capability has also been reviewed. The only such action identified is shedding of the "A" Train ESF Load Sequencer commencing 30 minutes after the SBO event initiation. The noted manual action is an activity of short duration. The environmental conditions in the areas to be accessed in performing this task will remain habitable for the four hour SBO event duration.

As discussed in Section C.4 of this attachment, the temperatures in those areas where the safety related SBO response equipment are located will be maintained within acceptable limits. The Alternate AC source can power ventilation and/or cooling equipment to assure the operability of the energized equipment.

The discussion in Section A.2.b concludes that a single train of auxiliary feedwater (AFW) supplying a single Steam Generator (SG) provides acceptable decay heat removal capability for a four hour SBO event. On this basis, local manual actions are not required for cross-feeding AFW to more than one SG during a four hour SBO event. Therefore, habitability considerations in this area are not applicable to this SBO submittal.

4.2.1(12) NUMARC Guidance:

Non-Class 1E equipment relied upon to cope for the required station blackout coping duration should be addressed in a maintenance program.

STPEGS Position:

There are no non-safety-related components or equipment which are required to cope with a postulated four hour SBO event at STPEGS. Thus, there are no associated non-Class 1E equipment maintenance requirements specifically required for SBO coping.

An assessment of the revised STPEGS SBO position, relative to exclusion of equipment from the Maintenance Rule, has been performed. There are numerous criteria utilized to determine inclusion of equipment in the Maintenance Rule scope; one being whether the equipment is credited for SBO coping. Conversely, there are numerous criteria utilized to determine exclusion of equipment from the Maintenance Rule scope. Thus, plant equipment will not be excluded from the Maintenance Rule exclusively because of not being credited for SBO event coping. The final determination of equipment to be integrated into the Maintenance Rule scope is still in the preparatory assessment and development phase, and will be finalized by the July 10, 1996 implementation date of the Maintenance Rule.

4.2.1(13) NUMARC Guidance:

Plant procedures should consider loss of heat tracing effects for equipment necessary to cope with a station blackout. Alternate steps, if needed, should be identified to supplement planned action.

STPEGS Position:

Safety-related equipment heat tracing is required only for equipment and components containing significant boron concentrations which can potentially precipitate at low temperatures. The only borated water which may be required for a postulated SBO event is that utilized for makeup water to the Reactor Coolant System (RCS). The High Head Safety Injection (HHSI) pumps are utilized as the means of RCS inventory makeup. The normal source of suction for these pumps is the Refueling Water Storage Tank (RWST). Per STPEGS Technical Specification 3.5.5, the RWST boron concentration is maintained in the range of 2800 to 3000 PPM. The RWST and associated piping is located in the Mechanical Auxiliary Building, the Fuel Handling Building and the Reactor Containment Building. Thus, the affected systems do not have piping which will be exposed to outdoor ambient temperature extremes. None of this equipment is heat traced. On this basis, there are no applicable heat tracing considerations for equipment necessary to cope with a station blackout.

B.4. COLD STARTS

NUMARC Generic Response:

A cold start is considered to be an attempt to start an emergency diesel generator from ambient conditions without the presence of pre-warmed circulating water or pre-lubrication. A continuously pre-warmed and pre-lubed machine would not be considered to have cold starts.

STPEGS Position:

The STPEGS Standby Diesel Generators (SDGs) utilize standby lubricating oil and jacket water heaters, a lubricating oil circulating system, and a jacket water circulating system to maintain the SDGs in a pre-warmed condition when the engines are not running. These components are provided to minimize the effect of thermal stresses due to cold starts. STPEGS Technical Specifications 3/4.8 Bases states that, for the purposes of surveillance testing, ambient conditions are considered to be the hot pre-lube condition. Thus, the STPEGS SDGs are not considered to have cold starts.

B.5. EMERGENCY AC POWER AVAILABILITY

NUMARC Generic Response:

As stated in NUMARC 87-00, each utility is to monitor emergency AC power unavailability, utilizing data provided to INPO on a regular basis.

STPEGS Position:

Houston Lighting & Power participates in the INPO operating experience reporting system. Plant procedures ensure that INPO operating experience reports, as well as those issued by the NRC, are reviewed for applicability against the STPEGS and that corrective action, as appropriate, is taken in a timely manner. Houston Lighting & Power provides data to the INPO Performance Indicators program, and monitors Standby Diesel Generator (SDG) system performance through the STPEGS Performance Indicator Status program.

In addition, STPEGS participates actively in the Cooper-Bessemer Owners Group (CBOG). Thus, STPEGS personnel are cognizant of SDG reliability values of other utilities with diesel generators similar to the STPEGS design. Also, the CBOG provides a forum for review of generic technical issues and concerns, and a means for discussion and development of SDG performance improvement suggestions.

B.6. SUMMARY OF REQUIRED PROCEDURE CHANGES

The plant procedure review presented in this section has identified three (3) plant operating procedures which require revision as a result of implementation of the revised SBO position for STPEGS. These procedures are:

1) Submittal Section B.2, Paragraph 4.2.3.4(a)

Plant Operating Procedure 0POP04-ZO-0002 will be revised to clarify implementation of the site-specific indicator to ensure that the plant would be in safe shutdown two hours before the anticipated hurricane arrival at the site (i.e., sustained wind speeds in excess of 73 mph).

2) Submittal Section B.3, Paragraph 4.2.1(6)

The Class 1E DC load shedding requirements for a SBO event will be documented in two plant operating procedures.

- Emergency Operating Procedure 0POP05-EO-EC00, "Loss Of All AC Power," will be revised to ensure shedding of the "A" Train ESF Load Sequencer, commencing 30 minutes after initiation of the SBO event.
- Plant Operating Procedure 0POP04-AE-0001, "Loss of Any 13.8 KV or 4.16 KV Bus," will be revised to ensure shedding of the "A" Train ESF Load Sequencer, commencing 30 minutes after initiation of the SBO event.

STPEGS will perform the appropriate training required as a result of these procedural changes, in accordance with applicable regulatory guidance and specific plant program requirements.

C. COPING STUDY

The Station Blackout (SBO) position presented in this submittal does not require any modifications to plant systems or equipment.

NUMARC Generic Response:

The AAC source has the capacity and capability to power the equipment necessary to cope with a station blackout in accordance with NUMARC 87-00, Section 7, for the required coping duration of four hours, as determined in accordance with NUMARC 87-00, Section 3.2.5. The alternate AC power source will be available within ten minutes of the onset of the station blackout conditions.

STPEGS Position:

The ability of STPEGS to cope with an SBO was assessed using NUMARC 87-00, Section 7 with the following results.

C.1 CONDENSATE INVENTORY FOR DECAY HEAT REMOVAL (SECTION 7.2.1)

NUMARC Generic Response:

It has been determined from Section 7.2.1 of NUMARC 87-00 that 84,000 gallons of water are required for decay heat removal for a four hour coping duration category. The minimum permissible Auxiliary Feedwater Storage Tank (AFST) level per Technical Specifications provides 485,000 gallons of water, which exceeds the required quantity for coping with a four hour station blackout. No plant modifications or procedure changes are needed to utilize this water source.

STPEGS Position:

The STPEGS design has been reviewed to confirm that adequate condensate inventory is available for decay heat removal during an SBO of four hours. By the criteria of NUMARC 87-00, the amount of water required for decay heat removal is 84,000 gallons. This volume approximates a plant-specific analysis performed to study safety grade cold shutdown requirements. The plant-specific analysis predicted that 85,600 gallons would be utilized during a four hour hot standby period. This figure assumes that a cooldown to minimize leakage during the SBO event is not required.

The minimum permissible amount of water in the AFST, as required by Technical Specification 3.7.1.3, is 485,000 gallons. This volume is based on supporting a cooldown over a 14 to 21 hour period after 4 hours at hot standby. Thus, the minimum available quantity of water exceeds that required for coping with a four hour station blackout.

C.2. ASSESSING THE CLASS 1E BATTERY CAPACITY (SECTION 7.2.2)

NUMARC Generic Response:

A battery capacity calculation has been performed pursuant to NUMARC 87-00, Section 7.2.2 to verify that all four channels of the Class 1E batteries have sufficient capacity to meet station blackout loads for the four hour coping duration. A single "A" Train DC load, not needed to cope with an SBO, is stripped. This load will be identified by revision of two existing plant procedures, as described below.

STPEGS Position:

This battery sizing calculation utilizes the actual inverter loads and DC panel loads operating in a LOOP condition. This calculation utilizes design inputs for minimum cell electrolyte temperature of 65°F and cell aging factor of 1.25, consistent with the STPEGS plant design basis and the requirements of this NUMARC 87-00 criterion.

The SBO battery sizing calculation considers Standby Diesel Generator (SDG) field flashing, Reactor Trip Switchgear breaker trip and spring charging motor inrush loads, 4.16 kV Switchgear breaker trip loads, and 480V Load Center Switchgear breaker trip and spring charging motor inrush loads in the first minute of the battery loading profiles. SDG field flashing, 4.16 kV Switchgear breaker close and spring charging motor inrush loads, and 480V Load Center Switchgear breaker close loads are considered in the last minute of the battery loading profiles.

The results of this calculation shows that all four Class 1E DC battery banks will remain in an operable condition for a minimum of four hours, with shedding of only a single DC load (the ESF Load Sequencer) on the "A" Train battery bank. The battery terminal voltages exceed the following values at the end of the duty cycle:

Channel I (A Train):	› 106 VDC after 4 hours (ESF Load Sequencer shed at 30 min)
Channel II (D Train):	› 112 VDC after 8 hours
Channel III (B Train):	› 109 VDC after 4 hours
Channel IV (C Train):	› 108 VDC after 4 hours

The minimum acceptable battery terminal voltage is 106 VDC at the end of the duty cycle, based on the minimum allowable inverter input voltage, plus allowance for cable voltage drop.

Based on this data, STPEGS considers operation of the Channel I, Channel III and Channel IV battery banks to be AC-Independent (i.e., not requiring battery charging support) for a period of four hours and the operation of the Channel II battery bank to be AC-Independent for a period of eight hours. The Class 1E battery banks are considered to have no battery charging support during a postulated four hour SBO event, other than the specific train powered by the Alternate AC source. Thus, the Class 1E battery banks and instrumentation satisfy this NUMARC 87-00 criterion.

The Class 1E DC load shedding requirements for a SBO event will be documented in two plant operations procedures: Emergency Operating Procedure 0POP05-EO-EC00, "Loss Of All AC Power," and Plant Operating Procedure 0POP04-AE-0001, "Loss of Any 13.8 KV or 4.16 KV Bus." The procedural steps which ensure shedding of the "A" Train ESF Load Sequencer, commencing 30 minutes after initiation of the SBO event, will be incorporated into these two procedures.

C.3. COMPRESSED AIR (SECTION 7.2.3)

NUMARC Generic Response:

No air-operated valves or dampers are relied upon to cope with an SBO for the four hour coping duration.

STPEGS Position:

As noted in the STPEGS UFSAR, Section 9.3.1.3, neither the Instrument Air System nor the Service Air System are required to perform any safety-related function at STPEGS. All safety related air-operated valves are designed to be fail-safe, and thus assure that a loss of air will not result in the loss of any of the Engineered Safety Features of the plant. For the purposes of this assessment, the use of the air-operated valves in those systems critical to SBO coping (including the Containment Isolation, Component Cooling Water, Essential Cooling Water, Auxiliary Feedwater, and Safety Injection Systems) was reviewed and the UFSAR statements confirmed.

Each EAC power source (Standby Diesel Generator) at STPEGS is provided with two compressed air subsystems, either of which is capable of starting the engine without power. These subsystems, which are independent of the plant instrument and service air systems, are provided with non-safety related compressors and dryers. These components maintain the pressure of a safety-related receiver tank in each subsystem with sufficient capacity to provide air for up to five start attempts. Thus, a loss of AC power will not result in a loss of instrument air situation which would prevent the Standby Diesel Generators from starting and performing their function.

C.4. EFFECTS OF LOSS OF VENTILATION (SECTION 7.2.4)

NUMARC Generic Response:

The AAC power source provides power to HVAC systems serving dominant areas of concern. Reasonable assurance of the operability of station blackout response equipment in the applicable areas has been assessed. The effects of the loss of ventilation are assessed below. No modifications or procedure changes are required to provide reasonable assurance of equipment operability.

STPEGS Position:

The conditions in areas of the plant critical to the station blackout scenario are maintained by HVAC equipment powered from the same train as the energized equipment. For example, the Train A Standby Diesel Generator (SDG), Component Cooling Water (CCW) pump, Essential Cooling Water (ECW) pump, and Auxiliary Feedwater (AFW) pump are each provided with area ventilation fans which are powered from and receive cooling water (for cooled equipment) from Train A systems.

An assessment has been performed of the temperatures of several areas containing equipment important to the SBO response. A summary of the temperature assessment is provided by area below.

a. AFW Pump Rooms

NUMARC Generic Response:

The calculated steady state ambient air temperature for the steam driven AFW pump room (the dominant area of concern for a PWR) during a station blackout induced loss of ventilation is 130°F.

STPEGS Position:

For a PWR, the turbine-driven AFW pump room is generally a dominant area of concern. STPEGS does not rely on the availability of the turbine-driven AFW pump for SBO coping, due to the Alternate AC (AAC) power source coping methodology selected. One of the motor-driven AFW pumps will be utilized to provide the secondary makeup and decay heat removal function. The ventilation of the motor-driven pump rooms is provided by fans powered from the same train as the affected AFW pump. Thus, the conditions in these pump rooms during the SBO are expected to be no worse than those during other design basis scenarios which involve AFW pump operation.

While not credited for SBO coping, the turbine-driven AFW pump could be utilized for decay heat removal. The room for this pump is typically considered to be a dominant area of concern, due to large heat loads from the steam piping and AFW pump turbine. Room temperatures for this area have been calculated using the NUMARC 87-00 methodology. Temperatures due to piping and equipment heat loads would not exceed 130°F. Temperatures considering the additional potential heat loads due to steam leakage (e.g., valve packing leakage) would not exceed 160°F, assuming operator action to open the door to the AFW pump room. This temperature is below the 170°F qualification temperature for the safety-related components in the room.

b. Control Room Complex

NUMARC Generic Response:

The assumption in NUMARC 87-00, Section 2.7.1, that the Control Room will not exceed 120°F during the four hour station blackout coping period, has been assessed. The control room at STPEGS does not exceed 120°F during a station blackout. Therefore, the control room is not a dominant area of concern.

STPEGS Position:

The environmental conditions in the Electrical Auxiliary Building (EAB) and Control Room Envelope (CRE) are maintained by a three train HVAC system, each powered from an independent electrical train. The capability to maintain design temperatures in these areas has been demonstrated by analysis, testing, and by operating experience.

While the original sizing of the HVAC equipment in the EAB and CRE was based on 2 of 3 trains in operation, analysis, operating experience, and testing have demonstrated that one train of HVAC is adequate to maintain acceptable temperatures in these areas during normal operation. Since the SBO scenario reduces the cooling requirements in these areas, the HVAC train powered by the AAC source is adequate to maintain reasonable temperatures in these areas during an SBO of four hours duration.

Analysis indicates all rooms in the EAB and CRE which contain safety-related equipment (except the battery room, see item c. below) remain less than design temperature, assuming steady-state conditions (transient effects would reduce room temperatures). The conditions assumed in the analysis are conservative for the SBO scenario.

A test was conducted during normal power operation in which both the EAB and CRE HVAC systems were operated in the single train mode. Supply and return air temperatures were recorded following a four hour equilibration. The return air temperature for all rooms containing safety-related equipment remained less than design temperature. With any single train of EAB and CRE HVAC available and powered from the AAC power source, temperatures in the CRE have been calculated not to exceed 80°F. Therefore, the CRE is not considered to be a dominant area of concern.

Electrical equipment installed in Control Room cabinets are designed for 120°F. The Relay Room cabinets are installed in the CRE, and are also designed for this maximum temperature. The cabinet contents are designed to be cooled by convective air flow through vents at the top and bottom of the cabinets. Based on this calculated temperature, the opening of cabinet doors for relay panels in the CRE is not necessary to cope with an SBO in order to assure the operability of the equipment. Even considering a temperature increase due to the cabinet heat loads, there is adequate margin to the design temperature of the cabinets.

Although not required for coping with a postulated SBO event, STPEGS has implemented plant procedures to open the Relay Room cabinet doors, as discussed in paragraph 4.2.1(10) of submittal Section B.3.

c. Other Areas Important to Station Blackout Response

<u>NUMARC Generic Response:</u>

HVAC systems, serving the plant areas discussed below, will be available. Reasonable assurance of the operability of station blackout response equipment in the above areas. There are no dominant areas of concern at STPEGS. All areas have been found to remain within their qualified design temperatures. No modifications or associated procedures are required to provide this reasonable assurance of equipment operability.

<u>STPEGS Position:</u>

The following is a summary of HVAC system operation and predicted temperatures during a SBO event, in other plant areas containing essential equipment. Based on the results noted below, these areas are not considered dominant areas of concern.

- Battery Rooms

  These rooms are located in the EAB. The peak temperatures calculated for these areas is 82°F. While this is slightly above the normal design temperature for these rooms (77°F), this increase in temperature is considered to be acceptable for the four hour SBO coping duration.

- Relay Rooms

  These rooms are located in the CRE complex. The peak temperatures calculated for these areas is 80°F. Thus, these rooms remain within their normal design temperature (80°F). As noted above for the CRE, the opening of the relay cabinet doors will not be required to assure the operability of the equipment.

- Standby Diesel Generator Rooms

  These rooms are in the Diesel Generator Building. They are ventilated by fans powered from the same train as that fed by its associated SDG. The conditions during the SBO are no more severe than those when the SDGs are running in response to other events. The ventilation system is designed to maintain these rooms at less than 120°F.

- Reactor Containment Building (RCB)

  The temperature resulting from loss of ventilation in the RCB due to SBO is enveloped by the design basis LOCA and HELBA profiles, which predict a maximum temperature within the RCB of over 320°F.

  The operability of equipment inside the RCB during the SBO event scenario is bounded by an existing analysis which determines the heatup of the RCB following a fire and a loss of offsite power. The results demonstrate the RCB temperature will remain below 160°F for 72 hours, which is conservative for the four hour SBO scenario.

- Rooms Containing Safety-Related Equipment

  The safety related equipment, including the CCW pumps, ECW pumps, HHSI pumps, Chilled Water pumps and the Essential Chiller, credited for the four hour SBO coping duration, are cooled by HVAC equipment which is powered from the same train as the pump. Thus, the conditions during the SBO are enveloped by the normal design conditions for the equipment.

C.5. CONTAINMENT ISOLATION (SECTION 7.2.5)

NUMARC Generic Response:

The plant list of containment isolation valves has been reviewed to verify that valves which must be capable of being closed or that must be operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's Class 1E power supplies. No plant modifications and/or associated procedure changes were determined to be required to ensure that appropriate containment integrity can be provided under Station Blackout conditions.

STPEGS Position:

An assessment has been performed to ensure that appropriate containment isolation can be provided during the four hour SBO event. The assessment considered the exclusion criteria provided in Section C3.2.7 of Regulatory Guide 1.155 and in NUMARC 87-00. The guidance documents permitted the exclusion of the following valves:

1. Valves normally locked closed during operation,
2. Valves that fail closed on a loss of power,
3. Check valves,
4. Valves in non-radioactive, closed loop systems not expected to be breached in an SBO (except lines which communicate directly with the containment atmosphere, and
5. Valves of less than 3-inch nominal diameter.

Based on the exclusion criteria provided above, there are sixteen (16) penetrations for which both the inside and the outside isolation valves could not be excluded. The valves which could not be excluded are categorized as "valves of concern" by the NUMARC 87-00 methodology. Fifteen (15) of these penetrations included valves installed on one side of the penetration which satisfied one of the five exclusion criteria noted previously. The excluded valves would provide the isolation function for these penetrations.

Containment isolation is assured by the operability of either the inside or the outside isolation valve for the one remaining penetration. Thus, there is only one valve of concern identified which may require operator action to effect containment integrity during an SBO. That valve is XCV0024, which is associated with penetration 46. This penetration relies on two motor operated valves larger than 3" for isolation and is normally open during power operation to permit Reactor Coolant System (RCS) letdown.

As an alternative to manually closing XCV0024, STPEGS has installed a Safety Class 2 valve (C1CVFV0011) and designed it to close on receipt of a Phase A containment isolation signal. This valve is an air operated valve, fails closed on loss of either instrument air or electrical power, and is provided with position indication in the Control Room. Penetration 46 is thus effectively isolated by valve C1CVFV0011. On this basis, there are no valves at STPEGS requiring local manual actions to effect containment integrity.

Indication of containment isolation valve positions is available on the STPEGS Emergency Response Facility Data Acquisition and Display System (ERFDADS). ERFDADS is supported by a non-Class 1E battery supply system with a two hour capacity. This system will provide the initial indication of the proper alignment. Procedure 0POP05-EO-EC00, "Loss of All AC Power," includes the requirements to verify the containment isolation valves are closed. Valves which are operable from the Control Room during the SBO (i.e., those powered by the AAC source), are provided with Control Room position indication also powered by the AAC source. No local manual actions to operate any containment isolation valves, during the postulated four hour SBO duration, are required.

C.6. REACTOR COOLANT INVENTORY (SECTION 2.5)

NUMARC Generic Response:

The Alternate AC source powers the necessary make-up systems to maintain adequate reactor coolant system inventory to ensure that the core is cooled for the required coping duration of four hours.

STPEGS Position:

As noted in NUMARC 87-00, the expected sources of reactor coolant system (RCS) inventory loss include letdown flow, normal system leakage, and leakage from the reactor coolant pump (RCP) seals. The plant procedure 0POP05-EO-EC00, "Loss of All AC Power," directs the operator to confirm the RCS is isolated early in the scenario. The three main flow paths out of the RCS (letdown, seal return and pressurizer power operated relief valves) are isolated. While the remaining sources of leakage cannot be isolated, they have been quantified. The Technical Specification limit of 10 gpm has been assumed for the normal RCS leakage, and a rate of 25 gpm per RCP has been considered for leakage from the RCP seals.

The expected RCP seal leakage during normal operation is expected to be less than 3 gpm per pump. Approximately 8 gpm per pump is provided from the charging system for seal injection. Of this injection flow, about five gpm enters the RCS through the labyrinth seals and the thermal barrier. The seal leakage rate recommended in NUMARC 87-00 is 25 gpm per RCP. The STPEGS Technical Specification limit on miscellaneous leakage is 10 gpm. Thus, the total expected RCS inventory losses during the SBO are not expected to exceed 110 gpm. No other makeup systems, other than the High Head Safety Injection (HHSI) pumps, are required to maintain RCS inventory during the four hour SBO event. Thus, adequate core cooling can be maintained without any plant modifications or procedure changes.

An HHSI pump can be powered from any of the Standby Diesel Generators (SDGs) used as the Alternate AC (AAC) power source. The capacity of this pump is approximately 800 gpm, which envelops the assumed rate of inventory loss during the SBO event. The RCS would normally be maintained at hot standby conditions for the four-hour coping duration. Should the operator choose to utilize the HHSI pump for RCS makeup,the RCS would have to be depressurized to below the 1600 psi shutoff head of the HHSI pump. The required operator actions are proceduralized in procedures 0POP05-EO-EC00, 0POP05-EO-EC01, and 0POP05-EO-EC02. The rate of depressurization is dependent on both the leakage rate from the RCS as well as manual actions to effect cooldown, such as opening a steam generator (SG) power operated relief valve. The manual actions to permit steaming from the SGs can result in operation within one to two hours.

HHSI pump status indication and discharge valve position are provided by Class 1E instrumentation. These instruments give the operator an indication that the system is operational. The HHSI Class 1E indications include unique "HHSI Pump Stopped/Running" lamps and "HHSI Pump Injection MOV Open/Closed" lamps, dedicated to each High Head Safety Injection train, installed in the main control room. Verification of system operation is provided by indication that the HHSI pump is operating and the motor-operated injection valve is open. The Class 1E indication will be available during an SBO event. The HHSI flow indicator is a non-Class 1E indicator which conforms to the requirements of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," and is not credited for a SBO event.

The assumption of a 25 gpm per RCP leakage rate is supported by a generic study performed by Westinghouse (WCAP-10541, Revision 2, dated November, 1986). This study analyzed the effects of a complete loss of AC power which resulted in a loss of both RCP seal injection and seal cooling. The study determined that with no seal injection or cooling, the maximum expected leakage rate would be approximately 21.1 gpm per RCP. Westinghouse also reviewed the RCS inventory effects of the postulated maximum RCP seal leakage, and concluded that approximately 16 hours of leakage could be tolerated, without RCS inventory makeup, before core uncovery. This envelops the required four hour SBO coping duration, and demonstrates the conservatism of the STPEGS position, given the capacity and connectability of RCS makeup sources available.

There is an available source of RCP seal cooling which can be utilized, but is not credited, considering the availability of the AAC power source. The Component Cooling Water pump can be operated to provide RCP seal cooling. This cooling flow will maintain lower RCP seal temperatures and may limit RCS inventory losses due to seal leakage at a lower rate than that prescribed by NUMARC 87-00.

ADDENDUM - ADDITIONAL REGULATORY GUIDE 1.155 ISSUES

1. QUALITY ASSURANCE PROGRAM

The revised STPEGS position on Station Blackout (SBO) utilizes any one of the three Standby Diesel Generators as the Alternate AC (AAC) source. The loads powered by the AAC source, which are required for coping with the postulated SBO event, are loads normally aligned to the plant ESF buses and classified as either safety-related or Class 1E. These components are already covered by a quality assurance program which meets or exceeds the Regulatory Guide (RG) 1.155 guidelines. Verification of the QA requirements is documented and maintained at STPEGS in support of this SBO submittal.

There are no other non-safety-related components and equipment which are credited for the revised STPEGS SBO position. Therefore, the RG 1.155 quality assurance program guidance is not applicable to the revised STPEGS SBO position.

2. DIESEL GENERATOR RELIABILITY PROGRAM

A reliability program has been implemented at STPEGS to ensure than the desired reliability of the Standby Diesel Generators (SDGs) is met or exceeded. The STPEGS SDG reliability program is incorporated in three procedures:

- 0PEP07-DG-0001, "Performance Monitoring of ESF Standby Diesel Generators," which serves as the guiding document for STPEGS SDG reliability program.
- 0PSP03-ZQ-0025, "Diesel Generator Starting Classification," which provides specific criteria to determine the validity of all SDG start and load attempts.
- 0PGP03-ZE-0038, "System Performance Monitoring Program," which provides the general monitoring program guidance for equipment, components and systems critical to plant reliability and availability.

The reliability program meets the guidance of Regulatory Guide 1.155 Section C.1.2 Positions 1-5. The following is a summary of how the STPEGS program complies with each of the five regulatory positions.

Position 1: Section A.1 of this submittal shows the STPEGS SBO offsite power design characteristic group to be "P3*." Section A.2 of this submittal shows the EAC Power Configuration for STPEGS to be Group "C." Previous discussions in this submittal section shows the selected SDG target reliability to be 0.975. Section A of this submittal shows a required coping duration category of 4 hours. A review of NUMARC Table 3-8 shows the 0.975 SDG reliability target level to be consistent with the selected plant category and coping duration.

STPEGS has established a reliability target of 0.975 per demand per SDG. Thus, the STPEGS commitment complies with RG 1.155 position C.1.2(1).

Position 2: STPEGS Technical Specification 3/4.8.1 implements the surveillance testing requirements for the STPEGS SDGs. The tests require the SDGs to be started and loaded to full capacity for 1 hour, on a staggered test basis, at intervals no greater than once every 31 days. SDG operability is also demonstrated once every refueling outage, per Technical Specification surveillance testing requirements which include, for example:

- Starting and loading to full capacity
- Subjecting to partial load and full load rejection tests
- Subjecting to a simulated loss-of-offsite power test
- Verifying for proper auto-start and load sequencing functions
- Operating at rated capacity for 24 hours

STPEGS has implemented reliability monitoring programs which support SDG monitoring activities. These programs monitor and trend the condition of diesel engine fuel oil, lubricating oil, and jacket water. Vibration monitoring and trending of the diesel engine, generator, major mechanical auxiliary components is conducted. Quarterly engine analyses are performed to provide diagnostic information for possible subsequent corrective action.

STPEGS has established diesel generator operational data trending and analysis programs which identify opportunities for SDG performance improvements, and also calculate and monitor the individual SDG reliability values. Thus, the STPEGS commitment complies with RG 1.155 position C.1.2(2).

Position 3: Maintenance of the STPEGS SDGs and associated equipment is typically conducted in accordance with manufacturer's recommendations. These maintenance activities, which help ensure the SDG target reliability values are met, are implemented by a defined maintenance program utilizing specific maintenance procedures and preventative maintenance actions.

STPEGS Technical Specification 3/4.8.1 implements the reporting guidelines for all valid and non-valid failures of the STPEGS SDGs. STPEGS has selected a reliability target of 0.975 per demand per SDG, and has implemented the 50 demand and 100 demand failure rate trigger values for determining when the SDGs do not meet the target reliability. Root cause investigation and failure analysis actions are initiated when one or both demand trigger values are exceeded. STPEGS Technical Specification 3/4.8.1 also dictates the test frequency for the SDGs, based on the number of failures in the last 20 valid tests and 100 valid tests. Thus, the STPEGS commitment is considered to comply with RG 1.155 position C.1.2(3).

Position 4: The STPEGS data for each attempted start of the SDG, and the calculations for SDG reliability are categorized and documented. The SDG start and load attempts are recorded as either a "No Test," a "Valid Test," a "Non-Valid Failure," or a "Valid Failure."
The "Valid Test" and "Valid Failure" data is utilized to calculate the STPEGS SDG reliability values. The latter procedure also implements the program which monitors the SDG reliability values against the target values. Thus, the STPEGS commitment complies with RG 1.155 position C.1.2(4).

Position 5: STPEGS has established a system performance monitoring program for equipment, components and systems critical to plant reliability and availability. The SDGs and supporting systems and components are included in the scope of this monitoring program. The program includes annual review of the program status and review of recommendations by cognizant plant technical and managerial personnel.

The STPEGS SDG reliability data is calculated and trended. Any recommendations or performance improvement suggestions resulting from the SDG trending analyses are presented to plant management.

The Condition Reporting process may also be utilized to document any adverse conditions noted from SDG trending and reliability analyses. A quarterly report summarizing individual and nuclear unit SDG reliability is also prepared for presentation to plant management. Thus, the STPEGS commitment complies with RG 1.155 position C.1.2(5).

The STPEGS Standby Diesel Generator reliability program described above will be integrated into the requirements of the Maintenance Rule, scheduled for implementation at STPEGS by July 10, 1996. The specific structure and format of the STPEGS SDG reliability program under the Maintenance Rule guidelines is still in the preparatory assessment and development phase. The individual facets of the STPEGS SDG reliability program, including equipment monitoring, trending, testing, reliability determination, incident reporting and incident investigation activities are considered to envelop the requirements of the Maintenance Rule.

ATTACHMENT 2

South Texas Project Electric Generating Station
Listing of Superseded HL&P-to-NRC Correspondence

The following is a listing of HL&P-to-NRC correspondence related to Station Blackout which is superseded by this submittal:

1) M. A. McBurnett, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "Response to 10CFR50.63, Loss of All Alternating Current Power"; ST-HL-AE-3045; April 17, 1989.

2) M. A. McBurnett, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "Station Blackout Implementation: Request for Supplemental SBO Submittal to NRC"; ST-HL-AE-3416; March 30, 1990.

3) A. W. Harrison, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "10CFR50.63, Loss of All Alternating Current Power - Responses to NRC Questions"; ST-HL-AE-3509; January 10, 1991.

4) W. J. Jump, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "10CFR50.63, Loss of All Alternating Current Power - Responses to NRC Questions"; ST-HL-AE-3729; April 12, 1991.

5) W. J. Jump, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "Implementation of the Station Blackout Rule - Responses to SER Confirmatory Items"; ST-HL-AE-3847; August 22, 1991.

6) W. J. Jump, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "Update on Implementation of the Station Blackout Rule (10CFR50.63)"; ST-HL-AE-4157; August 04, 1992.

7) T. H. Cloninger, HL&P to Document Control Desk, U.S. Nuclear Regulatory Commission; "Response to August 23, 1994 Request for Additional Information - Compliance With Station Blackout Requirements"; ST-HL-AE-4917; October 31, 1994.

ATTACHMENT 3

Mark-Up of Current South Texas Project
Station Blackout Safety Evaluation Report
To Reflect Changes Necessary To Address Revised Submittal

NOTE: Deletion of original SER text is noted by utilizing ~~strikeout~~.
Addition of proposed SER text is noted by utilizing double underline.

MISC-95\95-052.001

1.0 INTRODUCTION

On July 21, 1988, the Code of Federal Regulations, 10 CFR Part 50, was amended to include a new Section 50.63, entitled "Loss of All Alternating Current Power," (Station Blackout). The station blackout (SBO) rule requires that each light-water-cooled nuclear power plant be able to withstand and recover from an SBO of specified duration, requires licensees to submit information as defined in 10 CFR Part 50.63, and requires licensees to provide a plan and schedule for conformance to the SBO rule. The SBO rule further requires that the baseline assumptions, analysis, and related information be available for NRC review.

Guidance for conformance to the rule is provided by (1) Regulatory Guide (RG) 1.155, "Station Blackout"; (2) Nuclear Management and Resources Council (NUMARC) 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors"; and (3) NUMARC 87-00 "Supplemental Questions/Answers and Major Assumptions" dated December 27, 1989, (issued to the industry by NUMARC on January 4, 1990).

To facilitate the NRC staff's (hereafter referred to as staff) review of licensee responses to the SBO rule, the staff endorsed two generic response formats. One response format is for use by plant proposing to use an Alternate AC (AAC) power source and the other format is for use by plants proposing an AC independent response. The generic response formats provide the staff with a summary of the results from the licensee's analysis of the plant's SBO coping capability. The licensees are expected to verify the accuracy of the results and maintain documentation that supports the stated results. Compliance to the SBO rule is verified by a review of the licensee's submittal, an audit review of the supporting documentation as deemed necessary, and possible follow-up NRC inspections to ensure that the licensee has implemented the appropriate hardware and/or procedure modifications that will be required to comply with the SBO rule.

The licensee has proposed using ~~an~~ any one of three existing Class 1E standby diesel ~~generator~~ generators as an AAC power source. The AAC source would be available within ten minutes after the onset of an SBO and would have the capacity and capability to power the equipment necessary to cope with an SBO for a required ~~8-hour~~ 4-hour coping duration.

The licensee's original response was provided by a letter from M. A. McBurnett, HL&P, to the Document Control Desk, U. S. Nuclear Regulatory Commission, dated April 17, 1989. In addition, the licensee provided a response to the NUMARC 87-00, Supplemental Questions/Answers, by a letter from M. A. McBurnett to the Document Control Desk, U. S. Nuclear Regulatory Commission, dated March 30, 1990. Subsequent submittals pertaining to staff questions were provided by letters dated April 5, 1990, and January 10, 1991. The licensee's original responses were reviewed by Science Applications, International Corporation (SAIC) under contract to the NRC The results of the review are documented by the SAIC

Technical Evaluation Report (TER), SAIC-91/6652, titled "Technical Evaluation Report, South Texas Project Electrical Generating Station, Station Blackout Evaluation," dated January 31, 1991, (Attachment 1).

On August 04, 1994, the licensee voluntarily reported issues related to the docketed SBO position described above. The identified issue described a single point failure vulnerability of Auxiliary ESF Transformers, credited for SBO coping, which were installed outdoors. The licensee prepared a Justification for Continued Operation (JCO) on August 01, 1994, which implemented the 73 mph hurricane shutdown criterion consistent with NUMARC 87-00, reduced the coping duration from 8 hours to 4 hours, and eliminated crediting the Auxiliary ESF Transformers for SBO coping. The NRC staff transmitted eight questions to the licensee on August 23, 1994 requesting additional information regarding compliance of JCO 94-004 with 10CFR50.63. The licensee responded to this request on October 31, 1994 (transmittal ST-HL-AE-4917).

Licensee Event Report 94-013, submitted on September 01, 1994 (transmittal ST-HL-AE-4882), documented the voluntarily reported STP SBO issue, along with three additional issues: (1) demonstration testing of the SBO power distribution configuration; (2) consideration of High Head Safety Injection pump operation in engineering analyses of SBO; and (3) implementation of quality assurance requirements for non-safety-related components credited for SBO. This submittal committed to present a revised SBO position by March 01, 1995. Revision 1 to Licensee Event Report 94-013, submitted on October 05, 1994 (transmittal ST-HL-AE-4901), provided the root cause of the noted event. The results of the NRC staff review of the licensee's revised SBO submittal are documented in this safety evaluation.

2.0 EVALUATION

After reviewing the licensee's initial SBO submittals and the SAIC TER, the staff concurred with the conclusions as identified in the SAIC TER ~~(refer to Attachment No. 1 for details of the review)~~. Subsequently, by letter dated April 12, 1991, the licensee responded to the concerns identified in the TER. ~~This~~ The initial safety evaluation ~~considers~~ considered also the licensee's April 12, 1991, response, which was not available at the time the TER was prepared. The licensee has since revised their position by their letter dated March 01, 1995. This supplemental safety evaluation considers the latest position, which has addressed all applicable questions and issues regarding the previous STPEGS position. Based on this review, the staff findings ~~and recommendations~~ are summarized as follows.

2.1 Station Blackout Duration

The licensee has calculated a minimum acceptable station blackout duration of ~~8-hours~~ 4-hours based on an offsite AC power design characteristic group of ~~"P3,"~~ "P3*," an Emergency AC (EAC) configuration group of "C," and an emergency diesel generator (EDG) reliability target of 0.975. The Group "C" EAC classification is based on two EDGs not credited as AAC power sources, with one of the two EDGs required to operate safe shutdown equipment following loss of offsite power. The target reliability was based on the South Texas plant EAC power sources having a unit average reliability greater than 0.90 over the last 20 demands, greater than 0.94 over the last 50 demands, and greater than ~~0.94~~ 0.95 over the last ~~50~~ 100 demands. The ~~"P3,"~~ "P3*," grouping is based on an independence of offsite power classification of Group "I 1/2," a severe weather (SW) classification of Group "1," ~~and~~ an extreme severe weather (ESW) classification of Group ~~"5."~~ "5," and a commitment to implement a site-specific indicator to ensure safe shutdown two hours prior to a hurricane arrival (i.e., sustained 73 mph winds) at the site.

The staff agrees with the licensee's determinations above except initially it was not clear to the staff that Trains A and C (for each unit) was redundant to each other and that each could provide one full division of safe shutdown equipment and related instrumentation and controls to maintain the plant in a safe shutdown condition for an extended period. The licensee verified and confirmed in the April 12, 1991, submittal to the NRC that the trains A and C are functionally redundant for long-term shutdown. The licensee further clarified in the March 01, 1995 submittal that Trains A, B and C are each capable of providing one full division of safe shutdown equipment for the required Station Blackout coping duration.

2.2 Alternate AC (AAC) Power Source

The licensee has proposed the use of ~~an~~ any one of three existing Class 1E ~~EDG (EDG B)~~ EDGs as the AAC power source to operate systems necessary for the required SBO coping duration of ~~8-hours~~ 4-hours and recovery therefrom.

2.2.1 General Staff Position on AAC Power Sources

The definition in 10 CFR 50.2, RG 1.155, and NUMARC 87-00 define the AAC power source in terms of four attributes: (1) connections to the offsite or the onsite AC power systems, (2) minimun. potential for common cause failure with offsite power or the onsite emergency AC power sources, (3) timely availability, and (4) required capacity and reliability. More specifically, in regard to the fourth attribute, the SBO rule reads as follows:

"(4) Has sufficient capacity and reliability for operation of all systems required for coping with station blackout and for the time required to bring and maintain the plant in safe shutdown (non-design basis accident)."

In view of the variety of types, capacities, and capabilities of power sources proposed as AAC sources by various licensees, the staff has characterized proposed AAC power sources as being either optimum, fully capable, or partially capable. This characterization, which relates only to the capacity attribute cited above, was necessary in order to facilitate the staff review of licensee responses to the SBO rule. It does not invalidate or revoke any of the requirements or guidance applicable to AAC power sources.

An optimum AAC power source design is one that is capable of powering simultaneously both safety trains of normal safe shutdown systems and equipment. Such a design, following actuation of the AAC source, would provide completely redundant normal safe shutdown capability during an SBO and recovery therefrom from the main control room.

A fully capable AAC power source design is one that is capable of powering at least one complete safety train of normal safe shutdown systems and equipment. This includes decay heat removal, battery charging, HVAC (heating, ventilation, and air conditioning), emergency lighting, and the associated controls and instrumentation. Thus, although redundant capability is not available, a fully capable AAC source would enable attainment of safe shutdown during an SBO and recovery therefrom from the main control room.

A minimally capable AAC power source design is one than is not capable of powering all (or any) normal safety train related safe shutdown equipment; but it is capable of powering specific equipment that, in conjunction with extensive manual operator actions both inside and outside of the control room, is critical for attaining safe shutdown during an SBO. Appendix R diesels proposed as an AAC source are examples of minimally capable AAC sources. With this design, operability of the main control room could not be assured unless the batteries were sized to operate for the SBO duration, or battery charging capability was provided by the AAC source.

2.2.1.2 Connectability of AAC Power Sources

The basic criteria governing the connectability of an AAC power source are contained in 10 CFR 50.2 (the AAC source should be connectable to but normally not connected to the offsite or onsite emergency AC power systems) and 10 CFR 50.63 (SBO should not assume a concurrent single failure or design basis accident). Therefore, in a one unit site as a minimum, an AAC source need only be connectable to one set of safe shutdown equipment, regardless of whether that equipment is part of a safety train or not.

2.2.2 Proposed AAC Power Source

The South Texas Project is a two unit plant with three EAC sources dedicated to each unit. The licensee proposes to designate <u>any</u> one of the three EAC sources ~~(EDG B for each unit)~~ as the AAC source. <u>The licensee's severe weather procedure require starting and loading either the Train A or the Train C EDG, and disconnecting from offsite power, two hours prior to projected arrival of a hurricane. Thus, either the Train A or the Train C EDG is expected to be the AAC source should a hurricane-induced SBO event actually occur.</u>

The proposed AAC source is a Class 1E EDG that meets or exceeds all the required criteria specified in Appendix B of NUMARC 87-00. The staff assessment of the capacity and connectability of the proposed AAC source indicates that it falls into the fully capable category as discussed in Section 2.2.1 above and meets the connectability requirements of Section 2.2.1.2 above. ~~Although it lacks the connectability to support the control room emergency lighting, the centrifugal charging pump, and the boric acid transfer pump, the licensee has determined that there are alternative means to support the needed functions during an 8-hour SBO (see attached TER for details).~~ <u>Each of the three dedicated EDG units can energize an independent train of Auxiliary Feedwater, Essential Cooling Water, Component Cooling Water, Steam Generator Power Operated Relief Valves, High Head Safety Injection, Electrical Auxiliary Building HVAC, and Control Room Envelope HVAC.</u> Therefore, the staff agrees that there is reasonable assurance that the proposed AAC source has sufficient capacity and connectability to support the SBO loads.

The licensee stated that the AAC system has been demonstrated to be capable of powering the required shutdown equipment within ten minutes of a station blackout event.

2.3 Station Blackout Coping Capability

The characteristics of the following plant systems and components were reviewed to assure that the systems have the availability, adequacy, and capability to achieve and maintain a safe shutdown and recover from the SBO for the required coping duration.

2.3.1 Condensate Inventory for Decay Heat Removal

The licensee stated that the minimum permissible volume of water in the Auxiliary Feedwater Storage Tank (AFST) is sized to support cooldown for 14 to 21 hours depending on the initiating event and the single failure that is considered. The staff has determined that approximately ~~138,000~~ 84,000 gallons of condensate water would be required to remove decay heat for the ~~8-hour~~ 4-hour SBO event. The licensee stated ~~that if the positive displacement pump is not adequate~~ that, if required to maintain the RCS inventory, the reactor will be cooled down and depressurized to below 1600 psig where the high head safety injection (HHSI) pump can be used to replenish the RCS inventory losses. The plant Technical Specifications require a minimum condensate level of ~~525,000~~ 485,000 gallons in the AFST. Therefore, we agree that adequate condensate inventory is available, including that necessary to effect that plant cooldown, to achieve and maintain the plant in a safe shutdown condition during an SBO event.

2.3.2 Class 1E Battery Capacity

Each unit has four Class 1E batteries, which are designated as A, B, C, and D. ~~Battery B will be charged by the AAC power source and therefore is not a concern.~~ Batteries B and C have sufficient capacity to serve their respective loads for 4 hours without charging and are therefore adequate for the 4-hour coping duration. Battery D has sufficient capacity to serve its loads for 8 hours without charging and is therefore adequate for the ~~8-hour~~ 4-hour coping duration. The licensee has stated that ~~Batteries A and C~~ Battery A can last for 4 hours without charging if the ~~Nuclear Steam Supply System (NSSS) inverters, which are not needed for an SBO, are~~ ESF Load Sequencer, which is not needed for an SBO (following initial automatic load sequencing), is shed ~~within~~ commencing 30 minutes after initiation of the SBO event..

~~Either Battery A or Battery C (but not both at the same time) is needed to support the safe shutdown instrumentation. In the initial submittal to the NRC, the licensee proposed to de-energize the load on the A or C battery within 30 minutes. After 4 hours, the battery that was de-energized (A or C) would be reconnected and the battery that supplied the load for the first 4 hours would be disconnected from its loads for the remaining 4 hours of the required 8 hour coping duration. However, in the April 12, 1991, submittal, the licensee proposed instead a procedure modification that would create a crosstie during an SBO from the bus that is powered by the AAC source to the battery charger which powers the division A or division C battery. This would eliminate the need to alternate between the division A and division C batteries, since the division A or division C battery will be adequate for the entire 8 hour SBO coping period.~~ The licensee stated that all four channels of the Class 1E batteries have sufficient capacity to meet station blackout loads for the four hour coping duration. The licensee has demonstrated that all four divisions of instrumentation will be available for the required 4-hour coping duration, with shedding of only one Battery A load, (the ESF Load Sequencer), commencing 30 minutes after initiation of the SBO event. The licensee has committed to revise the relevant operating procedures to document the required load shedding actions discussed above.

Recommendation: The licensee should confirm that the relevant procedures [crosstie from the bus that is powered by the AAC source to the battery charger which powers the division A or division C battery] have been modified and are included in the documentation to be maintained by the licensee in support of the SBO submittals.

2.3.3 Compressed Air

The licensee stated that no air-operated valves are required to cope with an SBO. The South Texas Plant Updated Final Safety Analysis Report (UFSAR), Section 9.3.1.3.2, states that following a loss-of-offsite power (LOOP), air-operated valves are designed to fail in the safe position upon loss-of-air. Based on this and upon review of the SAIC TER, the staff concurs with the licensee that no air-operated valves are required to cope with an SBO for the required duration.

2.3.4 Effects of Loss of Ventilation

The licensee stated that, except for the turbine-driven auxiliary feedwater (AFW) pump room, the AAC source provides power to the HVAC systems serving dominant areas of concern those areas containing equipment credited for SBO coping, and that no modifications or procedures are required to provide reasonable assurance for equipment operability. The licensee calculated the steady-state ambient air temperature for the turbine-driven AFW pump room at 132°F using the NUMARC 87-00 methodology, or 124°F after an 8-hour SBO using an alternative transient heat-up calculation. Reasonable assurance of the operability of SBO equipment under these conditions has been assessed and found to be operable using Appendix F of NUMARC 87-00.

The licensee calculated that the control room would reach a temperature of 107°F after 8 hours. 80°F after 4 hours. This calculation was also based on a transient heat-up calculation.

The licensee added that testing has demonstrated the capability to maintain acceptable control room and relay room temperatures with only one train of HVAC in service. However, the licensee did not initially state what the temperature would rise to under this condition or under what temperature conditions The licensee stated that the control room and relay room temperatures would remain within design limits, and it would not be necessary to open cabinet doors in the control or relay rooms. In the April 12, 1991, submittal to the NRC, the licensee stated that the 107°F temperature in the control room assumed no HVAC available. However, the licensee has implemented procedures for opening the cabinet doors inside the control room and relay room. One procedure requires all the relay room cabinet doors to be opened if less than two (2) 4.16 kV ESF buses are energized, and the second procedure requires all the relay room cabinet doors to be opened, and temporary ventilation to be established, should a postulated loss of HVAC result in relay room temperatures approaching 98°F. With the EDG B (the AAC source) Alternate AC source available, temperature would be maintained in the normal range by the HVAC system. The staff interprets this statement to also apply to the relay room. If not, the following recommendation applies.

Recommendation: The licensee's procedures should include a provision to open the cabinet doors in the relay room within 30 minutes of the onset of the SBO in the temperature exceeds 105°F (or at a lower temperature if necessary to ensure equipment operability). This is necessary to provide adequate air mixing to maintain cabinet temperatures in equilibrium with the steady state temperatures inside the rooms in accordance with the revised guidance of NUMARC 87-00.

2.3.5 Containment Isolation

The licensee stated that the plant list of containment isolation valves has been reviewed to verify that the valves, which must be capable of being closed or that must be operated (cycled) under SBO conditions, can be positioned (with indication) independent of the preferred and SBO unit's Class 1E power supplies. The attached TER indicates that some normally closed motor-operated valves that fail as is upon loss-of-power may not be powered from the AAC power source.

In the April 12, 1991, March 1, 1995 response to the NRC, the licensee stated there is only one penetration in which both isolation valves fail to meet the RG 1.155 exclusion criteria. An alternative fail-safe air-operated valve is installed inside containment, to assure containment integrity for this penetration. the The licensee confirmed that indication of containment isolation valve positions is available on the plant's Emergency Response Facility Data Acquisition and Display System (ERFDADS) and that ERFDADS is supported by a battery system with 2-hour capacity backed by the Technical Support Center (TSC) diesel. The valves are identified in procedures and should a valve require manual operation to close, closure will be verified.

2.3.6 Reactor Coolant Inventory

The licensee stated that the AAC source powers the necessary systems to maintain adequate reactor coolant system inventory for the required 8-hour 4-hour coping duration.

The charging system at South Texas that may be available during an SBO event consists of a positive displacement pump with a design flow capacity of 35 gpm. The power supply for this pump is the non-Class 1E Technical Service center (TSC) diesel generator rather than the AAC source. The licensee performed an analysis with an assumed leakage of 110 gpm gpm. and with this charging pump operating (net loss of 75 gpm). The analysis disclosed that the operators will have at least 178 minutes before natural circulation ends to activate a high-head safety injection (HHSI) pump. Additional reactor coolant inventory would then be available through the use of an HHSI pump powered by the AAC source and drawing from the reactor water storage tank. Since the HHSI pump has a discharge pressure of 1750 psig, the operators would effect a plant cooldown to maintain the required sub-cooled margin while reducing RCS pressure to 1600 psig. These actions are governed by procedures ~~1POP05-EO-CC00/01/02~~ 0POP05-EO-EC00; EC01; EC02. Since the shutdown procedure depends on the HHSI pump, flow indication is needed during use of the pump.

In the ~~April 12, 1991, response~~ March 01, 1995 submittal to the NRC, the licensee stated that the HHSI flow indicator is a non-Class 1E indicator which conforms to the requirements of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident." Class 1E instrumentation verifies system operation by indication that the pump is operating and the valve is open. The Class 1E indication is available during an SBO. The staff finds this acceptable.

The reactor coolant inventory evaluation as discussed above was based on the guidance provided in NUMARC 87-00 of 25 gpm per reactor coolant pump (RCP) seal leakage for pressurized water reactors. The 25 gpm valve was agreed to between NUMARC and the staff pending resolution of Generic Issue (GI) 23, "Reactor Coolant Pump Seal Failures." If the final resolution of GI-23 defines higher RCP leakage rates than assumed for this evaluation, the licensee should be aware of the potential impact of this resolution on their analysis and actions addressing conformance to the SBO rule.

2.4 Procedures and Training

The licensee has stated that the SBO response guidelines, ac power restoration, and severe weather procedures have been reviewed and will be revised as necessary to meet the NUMARC 87-00 guidelines. We find this to be an acceptable commitment.

2.5 Proposed Modifications

The licensee did not propose any modifications to plant equipment.

2.6 Quality Assurance (QA) and Technical Specifications (TS)

The ~~licensee did not provide in its initial response any information regarding QA programs and TS for the SBO equipment. However, in the April 12, 1991, response, the~~ licensee stated that ~~with exception of some of the equipment used to cross-connect the AAC source to the division A or division C safety buses,~~ all of the equipment ~~used~~ credited during an SBO is classified as safety related or Class 1E; such that the level of QA complies with RG 1.155, Appendix A. ~~Such equipment not so classified is under review to establish the level of QA commensurate wit' the importance of the equipment to safe operation of the plant during an SBO. Revised Q. requirements are expected to be implemented by September 6, 1991.~~ Verification of the QA requirements is documented and maintained with the other documentation developed by the licensee in support of the SBO submittals.

Technical Specifications (TS) for the SBO equipment are currently being considered generically by the NRC in the context of the Technical Specification Improvement Program and remains an open item at this time. However, the staff would expect that the plant procedures will reflect the appropriate testing and surveillance requirements to ensure the operability of the necessary SBO equipment. If the staff later determines that a TS regarding the SBO equipment is warranted, the licensee will be notified of the implementation requirements.

~~Recommendation: The licensee should verify that the SBO equipment is covered by an appropriate QA program consistent with the guidance of RG 1.155. Further, this verification should be documented and maintained with the other documentation to be maintained by the licensee in support of the SBO submittals.~~

2.7 EDG Reliability Program

The licensee confirmed that a diesel reliability of 0.975 is to be maintained for the EDGs. ~~No information was provided in the licensee's initial response on how this target reliability will be maintained. However, in the April 12, 1991, response to the NRC, the licensee stated that the EDG program will meet the NUMARC 87-00 guidelines.~~ The licensee provided information which confirmed that an EDG reliability program, developed in accordance with the guidance of RG 1.155, Section 1.2, has been implemented. Confirmation that such a program is in place is included in the documentation maintained by the licensee in support of the SBO submittals.

~~Recommendations: It is the staff's position that a reliability program should be developed in accordance with the guidance of RG 1.155, Section 1.2. Confirmation that such a program is in place or will be implemented, should be included in the documentation to be maintained by the licensee in support of the SBO submittals.~~

2.8 Scope of Staff Review

The station blackout rule (10 CFR 50.63) requires licensees to submit a response containing specifically defined information. It also requires utilities "... to have baseline assumptions, analyses, and related information used in their coping evaluations available for NRC review." The staff and its contractor (SAIC) did not perform a detailed review of the proposed hardware and procedural modifications which are scheduled for later implementation. However, based on our review of the licensee's supporting documentation, we have identified the following areas for focus in any follow-up inspection or assessment that may be undertaken by the NRC to verify conformance with the SBO rule:

a. hardware and procedural modifications;

b. SBO procedures in accordance with R.G. 1.155, Position 3.4, and NUMARC 87-00, Section 4;

c. operator staffing and training to follow the identified actions in the SBO procedures;

d. EDG reliability program meets, as a minimum, the guidelines of RG 1.155; and

e. equipment and components required to cope with an SBO are incorporated in a QA program that meets the guidance of RG 1.155, Appendix A; and.

f. actions taken pertaining to the specific recommendations noted in the SE.

Additional items may be added as a result of the staff's review of the licensee's response to this SE.

3.0 SUMMARY AND CONCLUSIONS

The staff has reviewed the licensee's responses to the SBO rule and the Technical Evaluation Report prepared by the staff's consultant, SAIC.

Based on our review of the submittals, we find the licensee's response and proposed method of dealing with an SBO to be in conformance with the SBO rule., contingent upon receipt of confirmation from the licensee within 30 days that the recommendations documented in this SER will be implemented. The schedule for implementation should also be provided in accordance with 10 CFR 50.63(c)(4). The licensee has committed to implement the required procedure changes within 30 days of the notification date of NRC staff acceptance of the licensee's response.

ATTACHMENT 4

**Mark-Up of Current South Texas Project
Station Blackout Contractor Technical Evaluation Report
To Reflect Changes Necessary To Address Revised Submittal**

NOTE: Deletion of original TER text is noted by utilizing ~~strikeout~~.
Addition of proposed TER text is noted by utilizing double underline.

1.0 BACKGROUND

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR Part 50 by adding a new section, 50.63, "Loss of All Alternating Current Power" (1). The objective of this requirement is to assure that all nuclear power plants are capable of withstanding a station blackout (SBO) and maintaining adequate reactor core cooling and appropriate containment integrity for a required duration. This requirement is based on information developed under the Commission study of Unresolved Safety Issue A-44, "Station Blackout" (2-6).

The staff issued Regulatory Guide (RG) 1.155, "Station Blackout," to provide guidance for meeting the requirements of 10 CFR 50.63 (7). Concurrent with the development of this regulatory guide, the Nuclear Utility Management and Resource Council (NUMARC) developed a document entitled, "Guidelines and Technical Basis for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," NUMARC 87-00 (8). This document provides detailed guidelines and procedures on how to assess each plant's capabilities to comply with the SBO rule. The NRC staff reviewed the guidelines and analysis methodology in NUMARC 87-00 and concluded that the NUMARC document provides an acceptable guidance for addressing the 10 CFR 50.63 requirements. The application of this method results in selecting a minimum acceptable SBO duration capability from two to sixteen hours depending on the plant's characteristics and vulnerabilities to the risk from station blackout. The plant's characteristics affecting the required coping capability are: the redundancy of the on-site emergency AC power sources, the reliability of on-site emergency power sources, the frequency of loss of off-site power (LOOP), and the probable time to restore off-site power.

In order to achieve a consistent systematic response from licensees to the SBO rule and to expedite the staff review process, NUMARC developed two generic response documents. These documents were reviewed and endorsed by the NRC staff (13) for the purposes of plant-specific submittals. The documents are titled:

1. "Generic Response to Station Blackout Rule for Plants Using Alternate AC Power," and

2. "Generic Response to Station Blackout Rule for Plants Using AC Independent Station Blackout Response Power."

A plant-specific submittal, using one of the above generic formats, provides only a summary of results of the analysis of the plant's station blackout coping capability. Licensees are expected to ensure that the baseline assumptions used in NUMARC 87-00 are applicable to their plants and to verify the accuracy of the stated results. Compliance with the SBO rule requirements is verified by review and evaluation of the licensee's submittal and audit review of the supporting documents as necessary. Follow up NRC inspections assure that the licensee has implemented the necessary changes as required to meet the SBO rule.

In 1989, a joint NRC/SAIC team headed by an NRC staff member performed audit reviews of the methodology and documentation that support the licensees' submittals for several plants. These audits revealed several deficiencies which were not apparent from the review of the licensees' submittals using the agreed upon generic response format. These deficiencies raised a generic question regarding the degree of the licensees' conformance to the requirements of the SBO rule. To resolve this question, on January 4, 1990, NUMARC issued additional guidance as NUMARC 87-00 Supplemental Questions/Answers (14) addressing the NRC's concerns regarding the deficiencies. NUMARC requested that the licensees send their supplemental responses to the NRC addressing these concerns by March 30, 1990.

2.0 REVIEW PROCESS

The review of the licensee's submittal is focused on the following areas consistent with the positions of RG 1.155:

A. Minimum acceptable SBO duration (Section 3.1),

B. SBO coping capability (Section 3.2),

C. Procedures and training for SBO (Section 3.4),

D. Proposed modifications (Section 3.3), and

E. Quality assurance and technical specifications for SBO equipment (Section 3.5)

For the determination of the proposed minimum acceptable SBO duration, the following factors in the licensee's submittal are reviewed: a) off-site power design characteristics, b) emergency AC power system configuration, c) determination of the emergency diesel generator (EDG) reliability consistent with NSAC-108 criteria (11), and d) determination of the accepted EDG target reliability. Once these factors are known, Table 3-8 of NUMARC 87-00 or Table 2 of RG 1.155 provides a matrix for determining the required coping duration.

For SBO coping capability, the licensee's submittal is reviewed to assess the availability, adequacy and capability of the plant systems and components needed to achieve and maintain a safe shutdown condition and recover from an SBO of acceptable duration which is determined above. The review process follows the guidelines given in RG 1.155, Section 3.2, to assure:

a. availability of sufficient condensate inventory for decay heat removal,

b. adequacy of the class 1E battery capacity to support safe shutdown,

c. availability of adequate compressed air for air-operated valves necessary for safe shutdown,

d. adequacy of the ventilation systems in the vital and/or dominant areas that include equipment necessary for safe shutdown of the plant,

e. ability to provide appropriate containment integrity, and

f. ability of the plant to maintain adequate reactor coolant system inventory to ensure core cooling for the required coping duration.

The licensee's submittal is reviewed to verify that required procedures (i.e., revised existing and new) for coping with SBO are identified and that appropriate operator training will be provided.

The licensee's submittal is reviewed for any proposed modifications to emergency AC sources, battery capacity, condensate capacity, compressed air capacity, appropriate containment integrity and primary coolant make-up capability. Technical specifications and quality assurance set forth by the licensee to ensure high reliability of the equipment, specifically added or assigned to meet the requirements of the SBO rule, are assessed for their adequacy.

The licensee's proposed use of an alternate AC power source is reviewed to determine whether it meets the criteria and guidelines of Section 3.3.5 of RG 1.155 and Appendix B of NUMARC 87-00.

This SBO evaluation is based on a review of the licensee's submittals dated April 17, 1989 (10) and March 30, 1990 (12), telephone conversations between NRC/SAIC and the licensee's staff on August 9 and 15, 1990, the licensee's response (17) to the questions raised during the telephone conversation, a follow-up telephone call to the licensee on December 13, 1990, and the information available in the plant Updated Final Safety Analysis Report (UFSAR) (11); it does not include a concurrent site audit review of the supporting documentation. Such an audit may be warranted as an additional confirmatory action. This determination would be made and the audit would be scheduled and performed by the NRC staff at some later date.

On August 04, 1994, the licensee voluntarily reported issues related to the docketed SBO position described above. The identified issue described a single point failure vulnerability of Auxiliary ESF Transformers, credited for SBO coping, which were installed outdoors. The licensee prepared a Justification for Continued Operation (JCO) on August 01, 1994, which implemented the 73 mph hurricane shutdown criterion consistent with NUMARC 87-00, reduced the coping duration from 8 hours to 4 hours, and eliminated crediting the Auxiliary ESF Transformers for SBO coping. The NRC staff transmitted eight questions to the licensee on August 23, 1994 requesting additional information regarding compliance of JCO 94-004 with 10CFR50.63. The licensee responded to this request on October 31, 1994 (transmittal ST-HL-AE-4917).

Licensee Event Report 94-013, submitted on September 01, 1994 (transmittal ST-HL-AE-4882), documented the voluntarily reported STP SBO issue, along with three additional issues: (1) demonstration testing of the SBO power distribution configuration; (2) consideration of High Head Safety Injection pump operation in engineering analyses of SBO; and (3) implementation of quality assurance requirements for non-safety-related components credited for SBO. This submittal committed to present a revised SBO position by March 01, 1995. Revision 1 to Licensee Event Report 94-013, submitted on October 05, 1994 (transmittal ST-HL-AE-4901), provided the root cause of the noted event. The results of the NRC staff review of the licensee's revised SBO submittal are documented in this technical evaluation.

3.0 EVALUATION

3.1 Proposed Station Blackout Duration

Licensee's Submittal

The licensee, Houston Lighting and Power (HL&P), initially calculated (10 and 12) a minimum acceptable SBO duration of four hours for the South Texas Project Electric Generating Station (STPEGS). This determination was based on an implementation of a pre-hurricane procedure which calls for shutting down the plant if the hurricane windspeed exceeds 120 miles per hour (mph). Since the selection of the 120 mph hurricane windspeed was greater than the NUMARC 87-00 recommended windspeed of 73 mph, the staff informed the licensee during the telephone conversation on August 9, 1990, that it cannot take credit for pre-hurricane shutdown to reduce the coping duration. In its subsequent submittal (17), the licensee revised the offsite power characteristic to "P3" with a required coping duration of eight hours. The licensee has since revised their position by their letter dated March 01, 1995. This revised position implemented the NUMARC 87-00 recommendation for pre-hurricane shutdown at a 73 mph windspeed, thus revising the offsite power characteristic to "P3*" with a required coping duration of four hours. The licensee stated that no modifications are required to attain this coping duration.

The plant factors used to estimate the proposed SBO duration are:

1. Offsite Power Design Characteristics

The plant AC power design characteristic group is ~~"P3"~~ "P3*" based on:

a. Independence of the plant offsite power system characteristics of "I1/2,"

b. Expected frequency of grid-related LOOPs of less than one per 20 years,

c. Estimated frequency of LOOPs due to extremely severe weather (ESW) which places the plant in ESW group "5," ~~and~~

d. Estimated frequency of LOOPs due to severe weather (SW) which places the plant in SW ~~group "1."~~ Group "1," and

e. Implementation of the pre-hurricane shutdown at 73 mph sustained windspeeds, in accordance with the guideline of NUMARC 87-00 Section 4.2.3.

2. Emergency AC (EAC) Power Configuration Group

The EAC power configuration of the plant is "C." Each unit at STPEGS is equipped with three emergency diesel generators (EDGs). ~~Two EDGs, (EDG A and EDG C), are~~ Any two EDGs may be assigned to EAC power configuration. ~~The third EDG, (EDG B), is~~ Any one EDG may be assigned as an Alternate AC (AAC) power source. Only one EDG is required to operate safe shutdown equipment following a LOOP.

3. Target Emergency Diesel Generator (EDG) Reliability

The licensee has selected a target EDG reliability of 0.975. The selection of this target reliability is based on having a unit average EDG reliability of greater than 0.90 over the last 20 demands, greater than 0.94 for the last 50 demands, and greater than 0.95 over the last 100 demands, consistent with NUMARC 87-00, Section 3.2.4.

Review of Licensee's Submittal

Factors which affect the estimation of the SBO coping duration are: The independence of the offsite power system grouping, the estimated frequency of LOOPs due to ESW and SW conditions, the expected frequency of grid-related LOOPs, the classification of EAC, and the selection of EDG target reliability. The licensee's estimate of the expected frequency of LOOPs due to ESW conditions, which places the STPEGS site in ESW group "5," is consistent with the data provided in Table 3-2 of NUMARC 87-00. Using the data provided in Table 3-3 of NUMARC 87-00, the expected frequency of LOOPs at STPEGS due to SW conditions are estimated to be 0.0037 or 0.0018 depending on the site having offsite power transmission lines on one, multiple rights-of way, placing the site in SW group "2" or "1," respectively. A review of the STPEGS UFSAR indicates the site has transmission lines on three rights-of-way, therefore, we concur with the licensee's selection of SW group "1."

The licensee stated that the independence of the plant offsite power system grouping is "I1/2." A review of STPEGS UFSAR indicates that:

1. All offsite power sources are connected to the plant through a single switchyard;

2. During normal operation the Class 1E electrical buses in each unit are powered from two independent sources of offsite power: two buses are powered from an offsite power source through the standby transformer and one bus from the main generator through the unit auxiliary transformer;

3. Upon loss of power from main generator, the connected emergency bus will be powered from the unit standby transformer through an automatic transfer; and

4. Upon loss of power from the unit standby transformer the connected buses are powered from the other unit standby transformer, or emergency transformer through manual transfer.

Based on the above and the criteria stated in Table 5 of RG 1.155, the plant independence of offsite power system group is "I2."

With regard to the expected frequency of grid-related LOOPs at the site, we can not confirm the stated results. The available information in NUREG/CR-3992 (3), which gives a compendium of information on the loss of offsite power at nuclear plants in the U.S., only covers these incidents through the calendar year 1984. The STPEGS did not begin its commercial operation until June of 1989. In the absence of any contradictory information, we agree with the licensee's statement.

Based on an independence of offsite power system grouping of "I2," grid-related LOOPs of less than one per 20 years, ESW group "5," ~~and~~ SW group "1,"and implementation of the NUMARC 87-00 Section 4.2.3 pre-hurricane shutdown criterion at 73 mph, STPEGS has an offsite power design characteristic of group ~~"P3."~~ "P3*."

The licensee stated that the EAC classification of STPEGS is "C." This is based on the determination that one EDG is required to support the safe shutdown loads following a LOOP and two-out-of-three existing EDGs ~~(EDG A and C)~~ are available and designated as EAC power sources. Review of the plant UFSAR, Section 8.3.1.1.4, indicates that each unit is equipped with three independent, physically separated, EDGs supplying power to three associated load groups designated as Train A, Train B, and Train C. Each EDG and load group of a particular unit is also physically separated and electrically independent from the other two EDGs and their load groups. Each train (i.e., load group) is not totally redundant, however. Two trains are necessary to mitigate the consequences of a design basis accident.

The guidance provided in NUMARC 87-00 Supplemental Questions/Answers (14), under Question 3.4, states that when determining the number of EAC power sources necessary to operate safe shutdown equipment the shutdown loads powered must be capable of maintaining the plant in a safe shutdown condition for an extended period. ~~The licensee stated (17) that limited manual actions are needed to maintain long term cooling. Based on the information provided in Reference (17) and the plant UFSAR, it is not clear whether Train A and Train C are fully redundant and each can provide one full division of safe shutdown equipment and related instrumentation and controls to maintain the plant~~

~~in a safe shutdown condition for an extended period. On the surface, it appears that only Train A can be considered to provide a quasi-division; whereas, Train C does not appear to provide one. Even if each train meets the full division requirement, the licensee's statement that only one EDG train is sufficient to operate the safe shutdown equipment following a LOOP appears to be justified for a limited time period; it is bounded by insufficient battery capability to provide the required instrumentation and controls support.~~

The licensee stated in their March 1, 1995 submittal that, considering a loss of offsite power with no other accidents, all three trains are functionally capable of maintaining safe shutdown conditions for an extended period of time. STPEGS therefore qualifies for an EAC classification of "C."

~~If Train A or Train C cannot provide a full division of ESF equipment and instrumentation and controls, then the licensee needs to consider that two-out of three EDGs are required for supporting LOOP loads and EDG B cannot be assigned as an AAC power source. If this is the case, (i.e., two-out of three EDGs are needed), then the EAC classification of the plant is "D." The licensee needs to provide information supporting the conformance of the EAC classification to the guidance stated above.~~

The licensee stated that the 0.975 target EDG reliability is based on the demonstrated start and run reliability of EDGs for the last ~~20 and 50~~ 20, 50 and 100 demands. ~~At the time of initial submittal (10), the EDGs had not accumulated 100 start demands each.~~ The licensee provided the statistics for the ~~20 and 50~~ latest 20, 50 and 100 start demands. Based on this information, the EDGs at STPEGS experience an average 100 start demand reliability of ~~0.998~~ 0.981 per diesel generator. Using this data, it appears that the target EDG reliability (0.975) selected by the licensee (10) to be appropriate. ~~The licensee stated (10) that a reliability program has been implemented at STPEGS to ensure that the target EDG reliability is met. However, the information supporting the statistics of the EDG reliability is only available on site for review. An audit may be required to ensure compliance and to identify whether the STPEGS formal EDG reliability program is consistent with the guidance of the RG 1.155, Section 1.2, and NUMARC 87-00, Appendix D.~~ The licensee stated that all of the equipment credited during an SBO is classified such that the level of QA complies with RG 1.155, Appendix A. Verification of the QA requirements is documented and maintained with the other documentation maintained by the licensee in support of the SBO submittals.

Based on the above, ~~and pending the licensee's confirmation that Train A or Train C provides a full division of instrumentation and controls and ESF equipment,~~ the offsite power design characteristic of the STPEGS site is ~~"P3"~~ "P3*" with a minimum required SBO coping duration of ~~eight~~ four hours.

3.2 Alternate AC (AAC) Power Source

Licensee's Submittal

The licensee stated that ~~one EDG per unit, (EDG B)~~ any one of the three EDGs per unit, will be designated as the AAC power source. The AAC power source will be available within 10 minutes of the onset of an SBO event. This power source will have sufficient capacity and capability to operate systems necessary for coping with an SBO for the required duration of ~~eight~~ four hours.

Review of Licensee's Submittal

The licensee's AAC power source is a Class 1E EDG that meets or exceeds all the required criteria specified in Appendix B to NUMARC 87-00. The AAC power source has sufficient capacity to support the required loads~~. However, it lacks the connectability to support the control room emergency lighting, the centrifugal charging pump, and the boric acid transfer pump. The licensee stated that a positive displacement charging pump which is powered by a non-Class 1E diesel generator will be used to provide reactor coolant system (RCS) make-up.~~, including auxiliary feedwater, steam generator power operated relief valves, essential cooling water, component cooling water, high head safety injection, and electrical auxiliary building /control room envelope HVAC.

During the telephone conversation on August 9, 1990, the licensee stated that the control room lighting is provided by several battery packed self contained unit during an SBO event. The adequacy of these units have been evaluated during the control room design review evaluation process. The licensee added that neither the boric acid transfer pump nor a centrifugal or positive displacement charging pump will ~~not~~ be needed during ~~an eight~~ a four hour coping duration.

3.3 Station Blackout Coping Capability

Based on the above explanations/justifications, we concur with the licensee that the proposed AAC power source has sufficient capacity to support the SBO loads.

The plant coping capability with an SBO event for the required duration of ~~eight~~ four hours is assessed based on the following results:

1. Condensate Inventory for Decay Heat Removal

Licensee's Submittal

The licensee stated (17) that the minimum permissible volume of water in the Auxiliary Feedwater Storage Tank (AFST) is sized to support cooldown for 14 to 21 hours including 4 hours at hot standby until residual heat removal (RHR) is initiated. The duration varies with the initiating event and single failure considered. Therefore, STPEGS has adequate condensate available for decay heat removal during an SBO of ~~eight~~ four hours with AAC power available.

Using the expression given in NUMARC 87-00, Section 7.2.1, each unit would need approximately ~~138,000~~ 84,000 gallons of condensate water to remove decay heat during ~~an 8-hour~~ a 4-hour SBO event. This estimate is based on a maximum licensed core thermal rating of 3876 MWt, or 102% of 3800 MWt (Table 4.1-1 of the plant UFSAR). The licensee stated ~~that if the positive displacement pump was not able~~ that, if required to maintain the RCS inventory, the reactor will be depressurized/cooled down below 1600 psig where the high head safety injection (HHSI) pump can be used to replenish the RCS losses. If the licensee were to cool down the RCS below 1600 psig additional condensate would be needed. However, plant Technical Specifications requires a minimum condensate level of ~~525,000~~ 485,000 gallons be available in the AFST. Therefore, we concur with the licensee that adequate condensate inventory is available to maintain the plant in a safe shutdown condition during an SBO event.

2. Class 1E Battery Capacity

Licensee's Submittal

The licensee stated that the STPEGS design has been reviewed to ensure that adequate battery capacity is available to support decay heat removal during the 4-hour SBO. At STPEGS each of the four Class 1E vital 120 V AC channels is backed by its own Class 1E battery. Calculations determined that Channel II (Train D) is adequate for an eight hour duration and ~~Channel III (Train B) is~~ Channels III and IV (Trains B and C) are adequate as sized for a 4-hour duration, with no load shedding. ~~Channels I (Train A) and IV (Train C) are each~~ Channel I (Train A) is adequate for a four hour duration provided that the ~~NSSS inverter on each channel~~ ESF Load Sequencer is switched off ~~within~~ commencing 30 minutes ~~of~~ after the start of an SBO event.

The licensee stated that ~~either channel I (Train A) or Channel IV (Train C) must be maintained to support control room display of safe shutdown plant parameters.~~ all four channels of the Class 1E batteries have sufficient capacity to meet station blackout loads for the four hour coping duration. ~~These channels will be alternated to cover the eight-hour duration. One channel will be maintained energized during the first four hours. The other channel will be de-energized within the first 30 minutes of the blackout and re-energized less than its NSSS inverter, at approximately four hours into the event. This~~ The Channel I load shedding requirements will be incorporated into the plant procedures.

Review of Licensee's Submittal

A review of the plant UFSAR indicates that the Class 1E batteries are sized to carry their connected ESF loads, plus design margin, for two hours without power flow from the chargers in the event of loss of AC power. The plant has four Class 1E batteries. The licensee stated that Battery A ~~and Battery C~~ can last for four hours if the ~~NSSS inverters on these batteries are~~ ESF Load Sequencer on this battery is shed ~~within~~ commencing 30 minutes after initiation of the SBO event. Battery B ~~will be charged from the AAC power source (EDG B)~~ and Battery C have sufficient capacity for four hours, and Battery D has sufficient capacity for eight hours. ~~Since neither Battery A nor Battery C can be charged from the AAC power source and one of them is needed to support the required safe shutdown instrumentation in the control room, the licensee has proposed to alternate use of these batteries to cover the eight-hour duration. The licensee stated that switching off one NSSS inverter would not cause any undesirable ESF actuation. However, if two NSSS inverters are switched off it would generate ESF actuation signals.~~ The licensee's proposed action requires that ~~two of the NSSS inverters to~~ the ESF Load Sequencer on Battery A be switched off ~~within~~ commencing 30 minutes after initiation of an SBO.

~~Therefore, operator actions are required to prevent ESF actuation. In addition, alternating the use of Battery A and C during an SBO also adds additional operator actions which are outside of the normal and emergency training procedures. These actions make operator tasks more difficult and would exacerbate the already difficult situation. Therefore it does not appear to be~~ This action is consistent with the staff's position (15 and 16) ~~that~~ not to burden the operators excessively. ~~Based on the discussion with the staff, the licensee needs to provide charging capability for either Battery A or C during an SBO event. Without this capability, the plant does not~~ The plant is thus considered to conform to the SBO guidance.

3. Compressed Air

Licensee's Submittal

The licensee stated that no air operated valves are required to cope with an SBO, and no further action is required.

Review of Licensee's Submittal

A review of the plant UFSAR indicates that the compressed air system is not required to perform any safety function. An air compressor and associated instrument air emergency cooling water pump may be put in service by using a non-Class 1E balance-of-plant diesel. However, for the purposes of this review, no air is assumed to be available during an ~~eight-hour~~ four-hour SBO event. Following a LOOP, air-operated valves throughout the plant are designed to fail in the safe position upon loss of air. Our review concurs with the licensee's statement.

4. Effects of Loss of Ventilation

Licensee's Submittal

The licensee stated that an assessment has been performed to determine the steady-state temperature in dominant areas containing equipment necessary to achieve and maintain safe shutdown during an SBO event. The licensee added that~~, except for the turbine-driven auxiliary feedwater (AFW) pump room,~~ ventilation to all areas of concern is provided by the AAC power source. ~~The calculated steady state ambient air temperature for the turbine-driven AFW pump room during an SBO using the NUMARC 87-00 method is 132°F. The result of a transient heat-up calculation for this room after eight hours is 124°F~~. During ~~an 8-hour~~ a 4-hour SBO, the control room temperature at STPEGS would reach ~~107°F~~80°F. This is ~~also~~ based on the result of a ~~transient~~steady state heat-up calculation. Therefore, the control room is not a dominant area of concern.

The licensee added that testing has demonstrated the capability to maintain acceptable control room and relay room temperatures with only one train of HVAC in service. ~~The test was conducted with two trains of control room HVAC fans in service in the make-up and clean-up recirculation mode (for maximum heat load) but with only one cooler train in service. The control room temperature was found to not increase during operation of only one train of HVAC.~~ Supply and return air temperatures were recorded following a four hour equilibration. The return air temperature for all rooms containing safety-related equipment remained less than design temperature.

~~Reasonable assurance of the operability of SBO equipment in the turbine driven AFW pump room, (the only dominant area of concern), has been assessed using Appendix F of NUMARC 87-00.~~ No modifications or associated procedures are required to provide reasonable assurance for equipment operability.

Review of Licensee's Submittal

Based on the licensee's statement that the AAC power source ~~(EDG B)~~ and its associated ESF train will support the required HVAC for the equipment operating on that train, we conclude that the plant conforms to the SBO guidance. ~~However,~~ In addition, the licensee ~~needs to have a procedure~~ has implemented procedures for opening the cabinet doors inside the control room and relay room ~~within 30 minutes~~. ~~This is needed to maintain the temperature inside the cabinet below 120°F. The control room temperate is calculated to be 107°F, and according to the licensee, the equipment in the control room cabinet are designed for conditions up to 120°F. If we were to assume a 15° temperature rise inside the cabinet compared to the average bulk room temperature, the equipment inside these cabinets will experience a temperature above 120°F.~~

One procedure requires all the relay room cabinet doors to be opened if less than two (2) 4.16 kV ESF buses are energized, and the second procedure requires all the relay room cabinet doors to be opened, and temporary ventilation to be established, should a postulated loss of HVAC result in relay room temperatures approaching 98°F. Opening the cabinet doors to reduce the hot spots and potential equipment operability problems is a recommended guidance in the NUMARC 87-00 Supplemental Questions and Answers.

5. Containment Isolation

Licensee's Submittal

The licensee stated that an assessment has been performed to ensure that appropriate containment isolation can be provided during a station blackout event. The plant list of containment isolation valves has been reviewed to verify that valves which must be capable of being closed or that must be operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's Class 1E power supplies. No plant modifications and/or procedure changes were determined to be required to ensure that appropriate containment integrity can be provided under an SBO conditions.

Review of Licensee's Submittal

Upon review of the plant containment isolation valves given in Figure 6.2.4-1 of the UFSAR, we found several valves than can not be excluded using the criteria stated in RG 1.155. ~~These valves are normally closed motor-operated valves that fail as is upon loss of power. Since only one train of ESF buses can be powered from the AAC power source, the licensee needs to ensure that these valves are closed during an SBO event. The assurance needs to be provided by listing these CIVs in an appropriate procedure and identifying the actions required to ensure these valves are fully closed by providing position indications (local, remote, mechanical, process information, etc.) independent of preferred and EAC power sources.~~ The licensee stated there is only one penetration in which both isolation valves fail to meet the RG 1.155 exclusion criteria. An alternative fail-safe air-operated valve has been provided to assure containment integrity for this penetration.

6. Reactor Coolant Inventory

Licensee's Submittal

~~In its recent submittal (17), the~~ The licensee stated that the AAC power source supplies power to the make-up systems necessary to maintain adequate RCS inventory to ensure that the core is cooled for the required coping duration of ~~eight~~ four hours.

The licensee stated ~~(17) that the maximum expected reactor coolant pump (RCP) seal leakage during an SBO would be 3 gpm per pump, based on the seal leakoff rates during normal seal injection. Charging flow directed to the reactor coolant pumps for seal water is nominally 8 gpm. Nominally 5 gpm enters the labyrinth seals and thermal barrier. The remainder of the flow, 3 gpm, is directed up the pump shaft to the number one seal leakoff and then discharged either to the suction side of the charging pumps or to the volume control tanks. During an SBO, when both centrifugal charging pumps are unavailable, RCP seal injection flow and reactor coolant boration capability can be maintained by a 35 gpm positive displacement pump powered by the non-Class 1E Technical Support Center diesel generator.~~ that their RCS inventory analyses assume 25 gpm per reactor coolant pump seal leakage, which is consistent with NUMARC 87-00 guidelines.

Assuming a seal leakage rate of 25 gpm per pump, plus the miscellaneous technical specification leakage of 10 gpm, results in a total leakage rate of 110 gpm. ~~With only the positive displacement pump, the plant must contend with a net outflow of 75 gpm.~~ This case has been analyzed assuming availability of one standby diesel generator as the AAC source, so that there is continued capacity for HHSI system. In this scenario the RCS must be depressurized below 1600 psig for the HHSI pump to inject.

~~Assuming a net RCS leakage rate of 75 gpm, the operators have a minimum of 178 minutes before natural circulation ends.~~ Plant procedures describe actions to be taken in the event of loss of all AC power. Activation of safety injection as described in Emergency Operating Procedures will ensure that ~~at the end of natural circulation~~ the reactor core will remain covered for a station blackout duration of ~~eight~~ four hours.

Review of Licensee's Submittal

Reactor coolant make-up is necessary to replenish the RCS inventory losses due to the RCP seal leakage (25 gpm per pump), and the technical specifications maximum allowable leakage (10 gpm ~~according to reference 17~~). The make-up, or the charging, system at STPEGS during an SBO is a ~~positive displacement~~ high head safety injection pump with a design flow capacity of ~~35~~ 800 gpm. ~~With an assumed 110 gpm RCS leak rate, and the positive displacement pump running, a net loss of 75 gpm would result. The licensee's analysis determined that with this leak rate the operators have a minimum of 178 minutes before natural circulation ends. Before this occurs, the~~ The operator will activate the Safety Injection system, per emergency operating procedures ~~1~~0POP05-EO-EC02, which will ensure core coverage. One HHSI pump can deliver 800 gpm of borated water at 1750 psig from the Reactor Water Storage Tank (RWST). The RWST has a minimum volume of 383,500 gallons of water to be used for safety injection. With this system core coverage is assured even with cooldown and/or depressurization.

~~However, the~~ The licensee ~~needs to verify that the HHSI flow indication, which is powered from a non-Class 1E power source,~~ stated that the injection function is verified by Class 1E indication of HHSI pump operating status and HHSI discharge valve position, which will be available during an SBO event.

Note:

"The 25 gpm RCP seal leak rate was agreed to between NUMARC and NRC staff pending resolution of Generic Issue (GI) 23. If the final resolution of GI-23 defines higher RCP seal leak rates than assumed for the RCS inventory evaluation, the licensee needs to be aware of the potential impact of this resolution on its analyses and actions addressing conformance to the SBO rule."

3.4 Proposed Procedures and Training

Licensee's Submittal

The licensee stated that the following plant procedures have been reviewed per guidelines in NUMARC 87-00, Section 4:

1. Station Blackout response guidelines,
2. AC power restoration, and
3. Severe weather.

The licensee listed the name(s) of the plant procedures, which fall in each of above categories, in the plant SBO submittal. The licensee stated that these procedures will be revised, if necessary, to meet NUMARC 87-00 guidelines.

Review of Licensee's Submittal

~~We neither received nor reviewed the affected SBO procedures.~~ We view these procedures as plant-specific actions concerning the required activities to cope with an SBO. It is the licensee's responsibility to revise and implement these procedures, as needed, to mitigate an SBO event and to assure that these procedures are complete and correct, and that the associated training needs are carried out accordingly.

3.5 Proposed Modifications

Licensee's Submittal

The licensee did not propose any modifications.

Review of Licensee's Submittal

Our review indicates that the licensee ~~needs to provide charging support for either Battery A or C to prevent alternating their use during an SBO event. This modification is necessary to conform to the staff's guidance. In addition, if Train A or Train C cannot be considered to provide a full division of instrumentation and controls the licensee may need to perform other modifications for EDG B to be classified as an AAC power source.~~ <u>did not propose and does not require any plant modifications.</u>

3.6 Quality Assurance and Technical Specifications

The licensee did not provide any provided information on how the plant complies with the requirements of RG 1.155, Appendices A and B. The components credited for SBO coping are already covered by a quality assurance program which meets or exceeds the Regulatory Guide (RG) 1.155 guidelines. Verification of the QA requirements is documented and maintained by the licensee in support of the SBO submittals. There are no other non-safety-related components and equipment which are credited; therefore, the RG 1.155 quality assurance program guidance is not applicable.

4.0 CONCLUSIONS

Based on our review of the licensee's submittals and the information available in the UFSAR for South Texas Project Electrical Generating Station, we find that the submittal ~~does not conform~~ conforms to the requirements of SBO rules for the following reasons:

1. Emergency AC (EAC) Power Configuration Group

The licensee classified the plant as an EAC group "C." This is based on the determination that one EDG is required to support the safe shutdown loads following a LOOP and two-out-of-three existing EDGs ~~(EDG A and C)~~ are available and designated as EAC power sources. The guidance provided in NUMARC 87-00 Supplemental Questions/Answers (14), under Question 3.4, states that when determining the number of EAC power sources necessary to operate safe shutdown equipment the shutdown loads powered must be capable of maintaining the plant in a safe shutdown condition for an extended period. ~~It is not clear whether Train A and Train C are fully redundant and each can provide one full division of safe shutdown equipment and related instrumentation and controls to maintain the plant in a safe shutdown condition for an extended period. On the surface, it appears that only Train A can be considered to provide a quasi-division; whereas, Train C does not appear to provide one. If Train A or Train C cannot provide a full division of safe shutdown equipment and Instrumentation and controls, then the licensee needs to consider that two-out-of-three EDGs are required for supporting LOOP loads and EDG B cannot be assigned as an AAC power source. If this is the case, then the EAC classification of the plant is "D."~~ The licensee ~~needs to provide~~ has provided sufficient information supporting the conformance of the EAC classification to the guidance stated above.

2. Class 1E Battery Capacity

The licensee stated that ~~either Battery A or Battery C is needed to support control room display of safe shutdown plant parameters.~~ all four channels of the Class 1E batteries have sufficient capacity to meet station blackout loads for the four hour coping duration. However, ~~these batteries~~ Battery A can only last for four hours provided that the ~~NSSS inverter loads on these batteries are~~ ESF Load Sequencer on this battery is shed ~~within~~ commencing 30 minutes after initiation of the SBO event.. ~~Since neither Battery C nor Battery A can be charged from the AAC power source, the licensee has proposed to alternate use of these batteries to cover the eight-hour duration. There are two problems with the proposed action:~~ Batteries B and C are capable of four hour operation, and Battery D is capable of eight hour operation, and support of control room display of safe shutdown parameters, without battery charging support.

~~1. The operator actions required to timely switch off both the NSSS inverter loads and one train of DC loads without causing ESF actuation would burden the operators excessively and exacerbate the already difficult situation. This does not conform to the staff's guidance that not to burden the operators excessively.~~

~~2. The switching off and on and alternating the use of a set of Instrumentation and Controls for meeting the SBO rule does not appear to be a sound practice. The problem becomes more pronounced if a set of instrumentation is out of service before the accident occurs.~~

Therefore, the licensee ~~needs to provide~~ does not require charging capability for ~~either Battery A or C~~ any of the four battery banks during an SBO event~~. Without this capability,~~ , and the plant ~~does not conform~~ conforms to the SBO guidance.

3. Effects of Loss of Ventilation

The licensee stated that the control room temperature is calculated to be ~~107°F~~ 80°F during an SBO event. ~~However,~~ In addition, the licensee ~~needs to have a procedure~~ has implemented procedures for opening the cabinet doors inside the control room and relay room ~~within 30 minutes~~. ~~This is needed to maintain the temperature inside the cabinet below 120°F. If we were to assume a 15° temperature rise inside the cabinet compared to the average bulk room temperature, the equipment inside these cabinets will experience a temperature above 120°F.~~ One procedure requires all the relay room cabinet doors to be opened if less than two (2) 4.16 kV ESF buses are energized, and the second procedure requires all the relay room cabinet doors to be opened, and temporary ventilation to be established, should a postulated loss of HVAC result in relay room temperatures approaching 98°F. Opening the cabinet doors to reduce the hot spots and potential equipment operability problems is a recommended guidance in the NUMARC 87-00 Supplemental Questions and Answers.

4. Containment Isolation

Our review of the plant CIVs indicates that there are several motor operated valves that are not locked closed and will fail as is upon loss of power and, therefore, can not be excluded by the criteria given in RG 1.155. ~~The licensee needs to add these valves in an appropriate procedure to ensure that they are fully closed, if needed, by providing position indication (local, remote, mechanical, process information, etc.) independent of preferred and EAC power sources.~~ The licensee stated there is only one penetration in which both isolation valves fail to meet the RG 1.155 exclusion criteria. An alternative fail-safe air-operated valve has been provided to assure containment integrity for this penetration.

5. Proposed Modifications

The licensee did not propose any modifications. ~~However, our review indicates that the licensee needs to provide charging support for either Battery A or C to prevent alternating their use during an SBO event. This modification is necessary to conform to the staff's guidance. In addition, if it cannot be justified that Train A and C each represents a full division, the licensee may need to perform other modifications for EDG B to be classified as an AAC power source.~~

6. Quality Assurance and Technical Specifications

~~The licensee's submittal does not document the conformance of the plant's SBO equipment with the guidance of RG 1.155, Appendices A and B.~~ The licensee stated that all of the equipment credited during an SBO is classified such that the level of QA complies with RG 1.155, Appendix A. Verification of the QA requirements is documented and maintained by the licensee in support of the SBO submittals.