Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609

MAY 28 1992

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - PROPOSED CHANGE IN STATION BLACKOUT (SBO) COPING STRATEGY AND EMERGENCY AC (EAC) GROUP CLASSIFICATION

In a letter dated March 27, 1992, TVA committed to provide justification for a desired change in the BFN coping strategy for multi-unit operation. The revised strategy involves selective augmentation of the AC independent coping capabilities, using limited amounts of power from the existing Class 1E Emergency Diesel Generators. The strategy includes a corresponding revision to the EAC Group classification, and the selection of a target reliability of 0.95 in conjunction with a four hour coping duration.

Enclosure 1 provides the revised SBO coping strategy. Enclosure 2 provides supporting information and supersedes portions of the original response that no longer apply to the revised strategy. TVA plans to implement the revised coping strategy for use during single unit operation prior to restart from the Unit 2, Cycle 6 outage. TVA currently complies with the SBO rule for single unit operation using an AC independent coping strategy. Modifications required for SBO rule compliance during multi-unit operation will be completed prior to Unit 3 restart. Accordingly, TVA requests that a supplemental Safety Evaluation that addresses SBO compliance for multi-unit operation be issued by December 31, 1992.

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U.S. Nuclear Regulatory Commission

MAY 28 1992

A summary list of commitments contained in this letter is provided in Enclosure 3. If there are any questions, please telephone me at (205) 729-7566.

Sincerely,

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT (BFN)

REVISED COPING STRATEGY FOR MULTI-UNIT OPERATION

I. INTRODUCTION

By letters dated April 18, 1989, April 5, 1990, and May 4, 1990, TVA submitted its response to the Station Blackout (SBO) rule (10 CFR 50.63) for the Browns Ferry Nuclear (BFN) Plant. In addition, on October 25, 1990, TVA responded to a number of questions raised during a telecon with the NRC. The NRC Staff evaluated this information and issued a Safety Evaluation (SE) by letter to TVA dated July 11, 1991.

In its SE, the NRC concluded that Unit 2 conforms with the SBO rule contingent on the satisfactory resolution of several Staff "recommendations." The Staff also concluded that Units 1 and 3 were not in conformance with the rule. The principal concern was the adequacy of batteries to support the AC independent coping strategy, which involved safe shutdown of all units for the required coping duration of four hours.

By letter dated August 13, 1991, TVA responded to the SE recommendations and provided an implementation date of May 30, 1992, for Unit 2 (single unit operation) compliance with the SBO rule. TVA provided a revised response for BFN Units 1 and 3 by letter dated December 2, 1991. That response addressed NRC concerns regarding battery capacity. TVA responded verbally to NRC questions related to these responses during a telecon with the NRC on January 8, 1992. By letter dated March 5, 1992, NRC issued a Request for Additional Information (RAI) related to these responses and the January 8, 1992, teleconference. TVA responded to the RAI and documented the January 8 teleconference responses by letter dated March 27, 1992. In that letter, TVA advised the NRC of its intent to implement a more realistic coping strategy for SBO during multi-unit operation that involved providing heating, ventilating and air conditioning (HVAC) powered from a non-blacked out unit's Emergency Diesel Generator (EDG) to provide cooling in some areas. TVA originally proposed a coping strategy for BFN that was <u>independent</u> of an Alternate AC (AAC) power source. The revised approach, including TVA's intent to request a corresponding change in Emergency AC (EAC) group classification, was discussed in a March 19, 1992, teleconference with NRC staff.

As noted in the March 27 letter, TVA has been examining the possibility of a more realistic coping strategy than originally proposed for BFN. The strategy addresses multi-unit operation, and involves augmenting the station's AC independent coping capabilities on an as needed basis. TVA interest in such strategy has arisen primarily because of the need to provide cooling during an SBO in certain areas via normal HVAC equipment. In the March 27 letter, TVA introduced a revised coping strategy for powering HVAC loads by using the station's extensive EDG capabilities. TVA also noted related plans for revising the EAC Group classification per NUMARC 87-00 (and Regulatory Guide 1.155), and committed to provide additional information on these proposed changes by May 29, 1992.

This enclosure presents the revised SBO coping strategy. This submittal supersedes previous submittals in certain limited respects (e.g., AAC coping capabilities, EAC Group classification). Enclosure 2 provides necessary changes to support the revised coping strategy. Most of the previous information remain applicable to the revised coping strategy, since TVA will continue to rely primarily on multi-unit AC independent coping for the required four hour duration.

II. REVISED COPING STRATEGY

A. Overview

TVA proposes to revise its coping strategy by relying on limited use of AAC power. In accordance with the SBO rule and approved guidance, the level of redundancy of the EDGs in the BFN emergency AC power system allows for AAC "assistance."

B. Description of Emergency AC System

A detailed description of the Auxiliary Power System and the Standby Auxiliary Power System can be found in BFN Final Safety Analysis Report (FSAR) Sections 8.4 and 8.5 respectively. BFN has an EAC system that is partly common, and partly unitized. Some equipment that is normally aligned to a specific unit can be aligned to another unit from the Control Room.

As shown in the attached sketch, one EDG is normally aligned to each 4kV Shutdown Board. Six of the eight 4kV Shutdown Boards are normally aligned (as depicted by the bold lines in the sketch) to power the divisional safety equipment (two divisions per unit). This results in one

EDG powering one division of one unit. However, through the use of 4kV Shutdown Bus 1 and 2, and the 4kV Bus Tie Board, any EDG can supply any 4kV Shutdown Board. The above actions, with the exception of the bus tie board, can be performed from the Control Room. The bus tie board is controlled locally.

4kV Shutdown Boards A, B, C, and D each directly power Emergency Core Cooling System (ECCS) equipment for both Units 1 and 2 [e.g., 4kV Shutdown Board A contains one Residual Heat Removal (RHR) pump for Unit 1 and one RHR pump for Unit 2]. 4kV Shutdown Boards 3EA, 3EB, 3EC and 3ED each power Unit 3 ECCS equipment, and safety related equipment common to all three units (RHR Service Water Pumps or Emergency Equipment Cooling Water pumps). Each 4kV Shutdown Board is directly tied to one other 4kV Shutdown Board with double breaker protection, and to either the 4kV Bus Tie Board or the Shutdown Buses. (The 4kV Shutdown Board to Board tie is Unit 3 to Units 1 and 2 only.)

Most of the loads on the 480V Shutdown Boards are unitized, although some common loads such as battery chargers and ventilation equipment are located on some of these boards. Each 480V Shutdown Board can be supplied by two 4kV Shutdown Boards. The alternate 4kV Shutdown Board can be aligned manually from the Control Room.

The 480V Reactor Motor Operated Valve (RMOV) boards contain loads specific to a single unit. Each of these boards can be supplied by the two 480V Shutdown Boards for that unit. Thus, one EDG is capable of providing power to both divisions of RMOV Boards for one unit. Using the alternate 480V Shutdown Board to power the RMOV Boards is a manual action performed locally at the board.

C. <u>Proposed Coping Duration</u>

In the July 11, 1991, SE, the NRC staff noted its acceptance of TVA's calculated minimum acceptable SBO duration of four hours based on a plant AC power design characteristic Group "P1," and EAC power configuration Group "D," and a target EDG reliability of 0.975. The "P1" grouping was based on an independence of offsite power classification of Group "I 1/2," a severe weather (SW) classification of Group "2," and an extremely severe weather (ESW) classification of Group "1."

The EAC classification Group "D" was based on having eight EDGs at the site of which six EDGs are required for safe shutdown loads following a Loss of Offsite Power (LOOP). The

six EDG requirement was based on an existing LOOP/LOCA design basis analysis (DBA)[1] and was therefore conservative.

The approved guidance (NUMARC 87-00 and Regulatory Guide 1.155) does not explicitly address the BFN configuration, which includes eight EDGs. In view of a specific calculation performed to demonstrate that fewer EDGs are necessary to achieve safe shutdown under loss of offsite power conditions, i.e., three out of eight EDGs, the EAC Group should be revised. The EAC Group has been enhanced because of the reduction from six (conservative) to three (realistic) EDGs required for safe shutdown.

In selecting the EAC Group that corresponds to the revised strategy, TVA considered various possibilities including the view that all units share the eight EDGs, and the view that Units 1 and 2 share four EDGs and four EDGs are dedicated to Unit 3. In addition, TVA reviewed the SEs issued by NRC for other plants with similar large numbers of EDGs, some of which are designated as AAC power sources (e.g., South Texas station - six EDGs/2 units, Limerick station - eight EDGs/2 units, and Palo Verde station - six EDGs/3 units).

NUMARC 87-00 provides that the EAC Group can be inferred from the site's design basis for operating Class 1E AC equipment without offsite AC power. Accordingly, EAC Group "B" (two EDGs necessary out of four or five available) is the appropriate classification for BFN. TVA calculations demonstrate that three EDGs are adequate to provide power to sustain safe shutdown (TVA conservatively based the calculations on a cold shutdown endpoint) for an extended duration following loss of offsite power. From an SBO coping capability standpoint, two EDGs are necessary for use in providing relatively modest amounts of AAC assistance during an SBO. Note that EDGs used to provide AC assistance are not credited as EAC Group EDGs. Thus, a total of six EDGs are available of which three are necessary for safe shutdown as noted above. Therefore, a

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[1] For the long-term (greater than 10 minutes), three of the Unit 1 and 2 EDGs, with three of the Unit 3 EDGs are adequate to supply all required loads for the safe shutdown and cooldown of all three Units in the event of a loss of offsite power and a design bases event.

reclassification to EAC Group "B" is proper[2]. The target EDG reliability for the revised coping strategy is 0.95, and the requisite coping duration is four hours.

D. Proposed Use of AC Assistance

TVA proposes to rely on limited use of AC power for coping purposes. This AC assistance can be provided, as necessary, to augment the existing AC independent coping capabilities. As a minimum, TVA plans to provide control room cooling for the blacked-out unit(s). Moreover, additional EDGs (not designated for use as AC assist sources) would be available, as necessary, for coping with the loss of offsite power event at the non-blacked out unit(s). The EDGs used as AC assist power sources meet the criteria for AAC sources set forth in NUMARC 87-00, Appendix B, and through existing cross-ties can be made available to power necessary loads such as HVAC loads within 1 hour. As a result of the common arrangement at BFN, the HVAC system (as well as other systems needed for coping) will be available to provide for safe shutdown at both the blacked-out and non-blacked out units.

E. Station Response to SBO at BFN

An SBO event at BFN would be defined by the loss of the EDGs that normally feed the respective unit's 480 volt AC shutdown boards [e.g., for Unit 1 that would be loss of EDG A (Division I) and EDG C (Division II)]. TVA's battery calculation demonstrates that the 250V DC system is able to cope AC independent for the four hour coping duration for a three unit SBO. BFN's revised coping strategy is to shut down the blacked out unit using the 250V DC system and shut down the non-blacked out units using two of the remaining EDGs. Response scenarios for an SBO at each unit are provided below.

SBO in Unit 1 - An SBO for Unit 1 would be caused by the loss of EDGs A and C. There will be four EDGs available (one assigned to Unit 2 and three assigned to Unit 3). This is based on the loss of two EDGs from the blacked out unit (Unit 1), and a failure of one EDG in each of the remaining non-

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[2] EAC Group D (3/4, 3/5, 2/3, or 1/2 shared) is clearly not applicable to BFN. EAC Group C does not appear applicable, i.e., it is not accurate to characterize the EAC configuration as 1/2 dedicated or 1/3 shared. (See NUMARC 87-00, Table 3-7.) To illustrate, consider the example of 4 EDGs shared by Units 1 and 2 and 4 EDGs dedicated to Unit 3, for which the number of available EDGs exceeds the "supplies available" corresponding to EAC Group C. EAC Group B is therefore appropriate.

blacked out units (Units 2 and 3). By using available cross-ties, an EDG from Unit 3 can be connected to 4kV Shutdown Board A to energize HVAC loads on the Unit 1 side. Units 2 and 3 can be shut down by using two of the remaining three EDGs and Unit 1 can be shut down using the 250V DC batteries.

SBO in Unit 2 - An SBO in Unit 2 would be caused by the loss of EDGs B and D. As in the scenario described for Unit 1 above, four EDGs will be available to shut down the Units (one assigned to Unit 1 and three assigned to Unit 3). Two of the four EDGs are required to provide power to the two non-blacked out Units and the common HVAC load. Units 1 and 3 can be shut down by using two of the available EDGs and Unit 2 can be shut down using the 250V DC batteries.

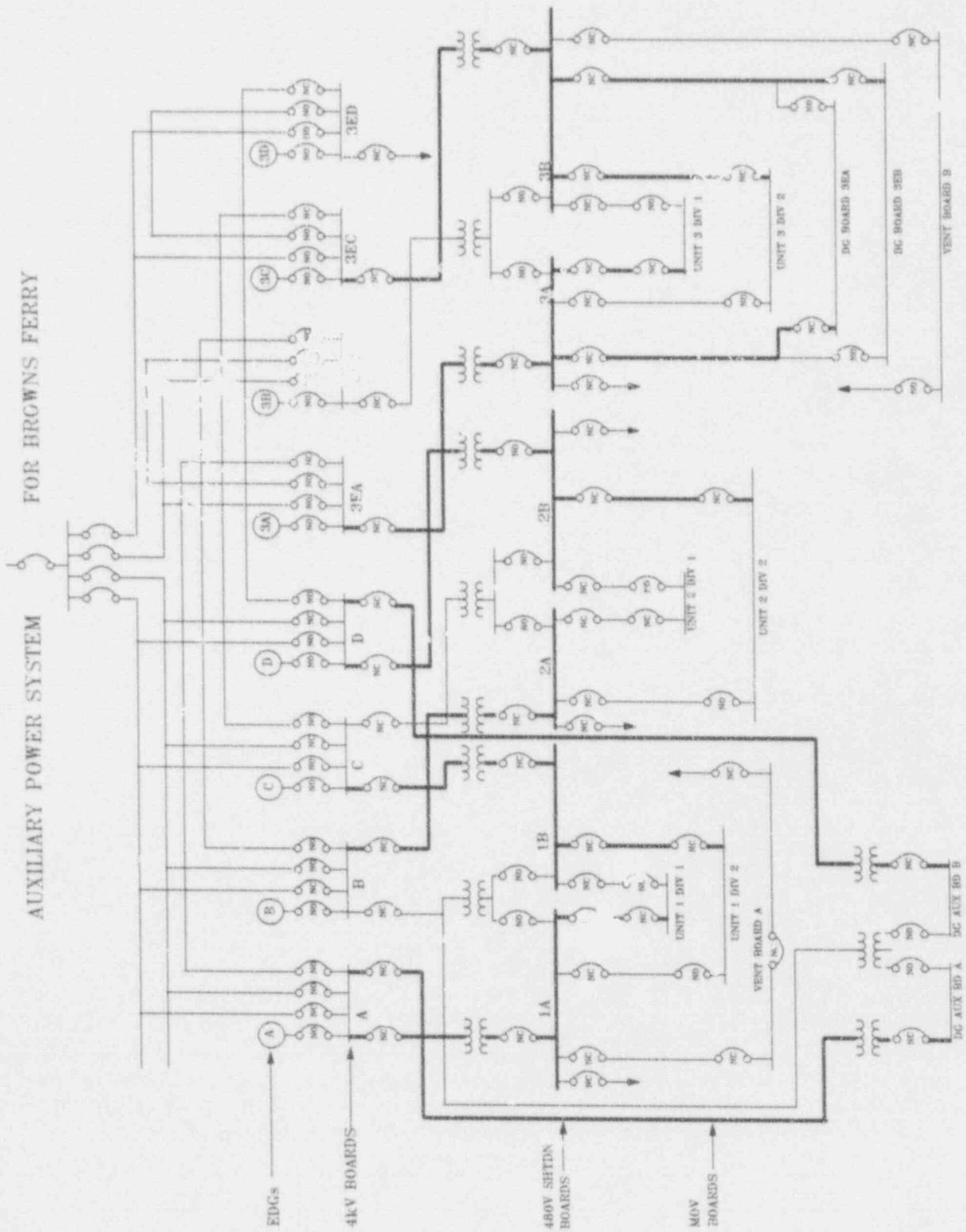
SBO in Unit 3 - An SBO in Unit 3 would be caused by the loss of EDGs 3A and 3C. As for an SBO in Unit 1 or 2, four EDGs will be available to shut down the Units (two EDGs from those assigned to Unit 1 and 2 and two EDGs from those assigned to Unit 3). Two of the four EDGs are required to provide power for the shut down of the two non-blacked out units and the common HVAC load. Unit 1 and 2 can be shut down by using two of the available EDGs and Unit 3 can be shutdown using the 250V DC batteries.

III. SUMMARY

The preceding information, along with the supporting information provided in Enclosure 2, provides adequate justification to support the revised coping strategy and corresponding revision to EAC Group classification. TVA intends to implement the revised coping strategy for single unit operation prior to restart from the Unit 3, Cycle 6 outage. TVA is currently in compliance with the SBO rule for single unit operation using an AC independent coping strategy. Modifications required for SBO rule compliance during multi-unit operation will be completed prior to Unit 3 restart.

ENCLOSURE 1

ATTACHMENT



ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT (BFN)

SUPPORTING INFORMATION FOR REVISED SBO COPING STRATEGY

I. INTRODUCTION

TVA reviewed its previous submittals and has concluded that the information provided applies to the revised multi-unit coping strategy except as noted below and in Enclosure 1.

II. REVISION TO INITIAL RESPONSE MADE PER NUMARC RESPONSE GUIDELINES

The numbering for the following items corresponds with TVA's initial response per NUMARC response guidelines (April 18, 1989 letter). Only items with revised responses are listed.

A. Proposed Station Blackout Duration

1. [NO CHANGE]

2. The emergency AC power configuration group is B[3] based on:

   a. There are six emergency AC power supplies not credited as Alternate AC power sources.

   b. Three emergency AC power supplies are necessary to operate safe shutdown equipment following a loss of offsite power (LOOP).

3. The target emergency diesel generator (EDG) reliability is 0.95.

   a. A target EDG reliability of 0.95 was selected based on having a nuclear unit average EDG reliability for the last 100 demands greater than 0.95 consistent with NUMARC 87-00, Rev. 1, Section 3.2.4.

   b. The emergency AC power configuration B allows an EDG target reliability of 0.95.

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[3] A detailed discussion is provided in Enclosure 1.

B. Procedure Description

Procedure review and revisions identified in the initial response remain applicable to the multi-unit coping strategy. BFN's Station Blackout procedure, AOI-57-2, which provides instructions for response to Station Blackout, will be revised to require, as a minimum, the limited use of Alternate AC (AAC) to power HVAC.

C. Proposed Modifications and Schedule

1. [NO CHANGE]

2. [NO CHANGE]

3. Class 1E Battery(ies) Capacity

TVA identified modifications to the DC Power Supply System and DC connected loads for Units 1, 2, and 3 necessary to assure adequate battery capacity for a 4-hour SBO event during multi-unit operation in its December 2, 1991 response to the NRC's Safety Evaluation. That response still applies. Note that the battery capacity is conservatively based on all three units being under AC independent conditions.

4. Effects of Loss of Ventilation

The steady state ambient air temperature has been calculated for the following dominant areas of concern considering multi-unit operation:

AREA	TEMPERATURE
HPCI Room	< 130 degrees F
RCIC Room	< 125 degrees F
Main Steam Tunnel	< 155 degrees F

Reasonable assurance of the operability of SBO response equipment in the above dominant areas of concern has been assessed using Appendix F and G to NUMARC 87-00, Revision 1.

HVAC powered by the non-blacked out portion of the station will be restored to the main control rooms and electrical equipment areas within one hour of an SBO event. TVA will either confirm that temperatures in these areas remain below 120°F or

will assess equipment operability in accordance with NUMARC 87-00, Appendix J, Question & Answer 2.2 by August 31, 1992.

No modifications are required for equipment operability.

Procedure changes needed for the revised coping strategy will be implemented prior to restart from the Unit 2, Cycle 6 outage (currently scheduled to begin in January 1993). Modifications, identified in Part C above, required for SBO rule compliance during multi-unit operation will be completed before restart of Unit 3.

ENCLOSURE 3

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT (BFN)

SUMMARY OF COMMITMENTS

1. Procedure changes needed for the revised coping strategy will be implemented prior to restart from the Unit 2, Cycle 6 outage.

2. Modifications required for SBO rule compliance during multi-unit operation will be completed before restart of Unit 3.

3. TVA will either confirm that temperatures in these areas remain below 120°F or will assess equipment operability in accordance with NUMARC 87-00, Appendix J, Question & Answer 2.2 by August 31, 1992.