TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

January 5, 1983

Director of Licensing
Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Vassallo:

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

In response to your letter to H. G. Parris dated October 26, 1982, subject "10 CFR 50 Appendix R, Section III.G," we have prepared the enclosed information. This information addresses the seven questions contained in your letter and incorporates supplemental information as a result of subsequent conference calls with your staff.

If you have any questions, please call Jim Domer of my staff at FTS 858-2725.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 5th day of January 1983
Paulette D. White
Notary Public
My Commission Expires 9-5-84

Enclosure
cc: See page 2

A006

cc (Enclosure):
U.S. Nuclear Regulatory Commission
Region II
ATTN: James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Mr. R. J. Clark
Browns Ferry Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

ENCLOSURE

Request for Additional Information
Post-Fire Safe Shutdown Capability
Browns Ferry Nuclear Plant Units 1, 2, and 3
Docket Nos. 50-259, 50-260, and 50-296

Question 1

In your proposed method of alternate safe shutdown,

A. How much of the core will be uncovered and for how long? How does this compare with the extent of core uncovery using normal shutdown facilities?

B. What is the predicted peak torus water temperature?

Response 1

A. In a telecon between NRC and TVA on November 15, 1982, TVA agreed to provide additional information for the case of manual blowdown after ten minutes using four SRVs from the backup control panel with low pressure makeup consisting of one LPCI pump only. The results presented in attachment 1, which were obtained from NEDO-24708 entitled, "Additional Information Required for NRC Staff Generic Report on Boiling Water Reactors," are indicative of this case. The water level inside the shroud is shown to approach the TAF with recovery provided with low pressure makeup using one LPCI and two core spray pumps. The only difference between the subject case and the case presented in attachment 1 is the rate at which the water level is recovered. Due to the comparatively large contribution to level recovery by the LPCI pump, the water level inside the shroud is expected to stay near or above the TAF. If any core uncovery is experienced, it would be minimal, and sufficient reflood capability is easily provided by one LPCI pump to recover and maintain the water level above the core before any core damage occurs. These results are similar to several events which require emergency depressurization using the relief valves in manual or automatic mode.

B. What is the predicted peak torus water temperature? This question refers to the case analyzed for time greater than one hour.

The peak calculated bulk torus water temperature is 197.5 F which occurs at approximately 10.5 hours into the transient. The associated subcooling (difference between local pool temperature and saturation temperature at the T-quencher submergence) will be in excess of 30 F. Comparison with NUREG-0783 indicates that smooth and stable steam condensation would be expected to exist under these conditions. Thus, we believe that we are in compliance with NRC requirements.

Question 2

Will the proposed addition of manual safety relief valve controls to the new backup control panel preclude spurious SRV operation as a result of a fire in the A1, C1, and E1 shutdown board rooms?

Response 2

No. The fire scenario for board rooms A1, C1, and E1 is given on sheet 2-4, paragraph 2 of the TVA appendix R submittal dated June 30, 1982. It says that, ". . . it is possible that some S/R valves can spuriously operate."

Question 3

Have the following systems been considered in the alternate safe shutdown analysis? If not, provide justification for not including them.

A. HPCI or RCIC,

B. Emergency Diesel Generator.

Response 3

A. Yes. HPCI and RCIC were considered as an alternate means of safe shutdown as shown on the shutdown logic diagram (figure I.a); however, because a low pressure system (RHR) is needed for torus cooling, it was decided to also use low pressure systems in conjunction with ADS for core cooling to minimize equipment required. Therefore, detailed studies regarding HPCI or RCIC availability were not performed and no credit is taken for these systems in the analysis.

B. Yes. The emergency diesel generators (DGs) were considered, and it was shown that a minimum of four DGs would be available regardless of the fire area. The physical separation of the eight DGs (i.e., four at one side of the reactor building and four at the other side) precludes any power and control cables for one set of DGs being involved in a common fire with the cables of the other four DGs. The automatic logic and support systems were evaluated in attachment 2, "BFN Diesel Generator Automatic Start and Diesel Fuel Supply System Evaluation for Appendix R."

Question 4

Are the following process instrumentation parameters available at the backup control station?

A. Torus temperature and level,

B. Condensate storage tank level.

Response 4

A. Yes. These instrumentation parameters are available at the backup control panel. The torus water level was not initially required since the connections to the torus were analyzed to ensure there was no possibility of inadvertently draining the torus. However, consideration was not given to the possibility of overfilling the torus. After examination, there is only one major source of water that could possibly increase the torus water level. The condensate storage tank (CST) could drain into the torus if the HPCI and RCIC miniflow valves were inadvertently opened. This would be a very small leak and would take a considerable amount of time to affect the torus water level. Therefore, the following instrumentation will be available in the main control room (MCR) and backup control panel (BCP) for the given fire areas.

Fire Area	Instrumentation	Location
RB/DGB	CST Water Level	MCR
SBR	CST Water Level	MCR
BBR	Torus Water Level	MCR
TB/IPS	Torus Water Level	MCR
CB	Torus Water Level	BCP

B. No. CST level is not required at the BCP because it is not a source of makeup water to the vessel for the appendix R analysis.

Question 5

For the mechanical shutdown systems, have you considered the possibility of one pump in any system being out of service for maintenance at the outset of the fire? If not, provide justification for your basis.

Response 5

No. The possibility of one pump in any system being out of service for maintenance is governed by the limiting conditions for operation specified in the technical specifications. Therefore, no considerations were given to equipment being out of service at the outset of the fire. Note that this is consistent with the way other events are handled. A fire occurring while one train of mitigating equipment is out of service is unlikely, and a fire in a particular area that takes out all mitigative equipment except one train in conjunction with the remaining train being out for maintenance is extremely unlikely.

Question 6

In your submittal, sheet 4-84 is not consistent with sheets 4-85 and 4-86. It appears that information is missing.

Response 6

There is a sheet that was inadvertently omitted following sheet 4-86. Attachment 3 is the missing corrective action sheet.

Question 7

On pages 4-111 and 4-112, you stated that new alternate power supply breakers may be required for the 480-volt reactor MOV board B and I&C power for shutdown and battery boards. What is the status of this potential change?

Response 7

The pages referenced in your request were 4-111 and 4-112. These page numbers were revised during our telecon on November 9, 1982 to 4-108 and 4-109. You requested the status of the new alternate power supplies to 480-V RMOV board B and I&C power. The corrective actions are referring to manual transfers to alternate supplies which were already present. No modification was required.

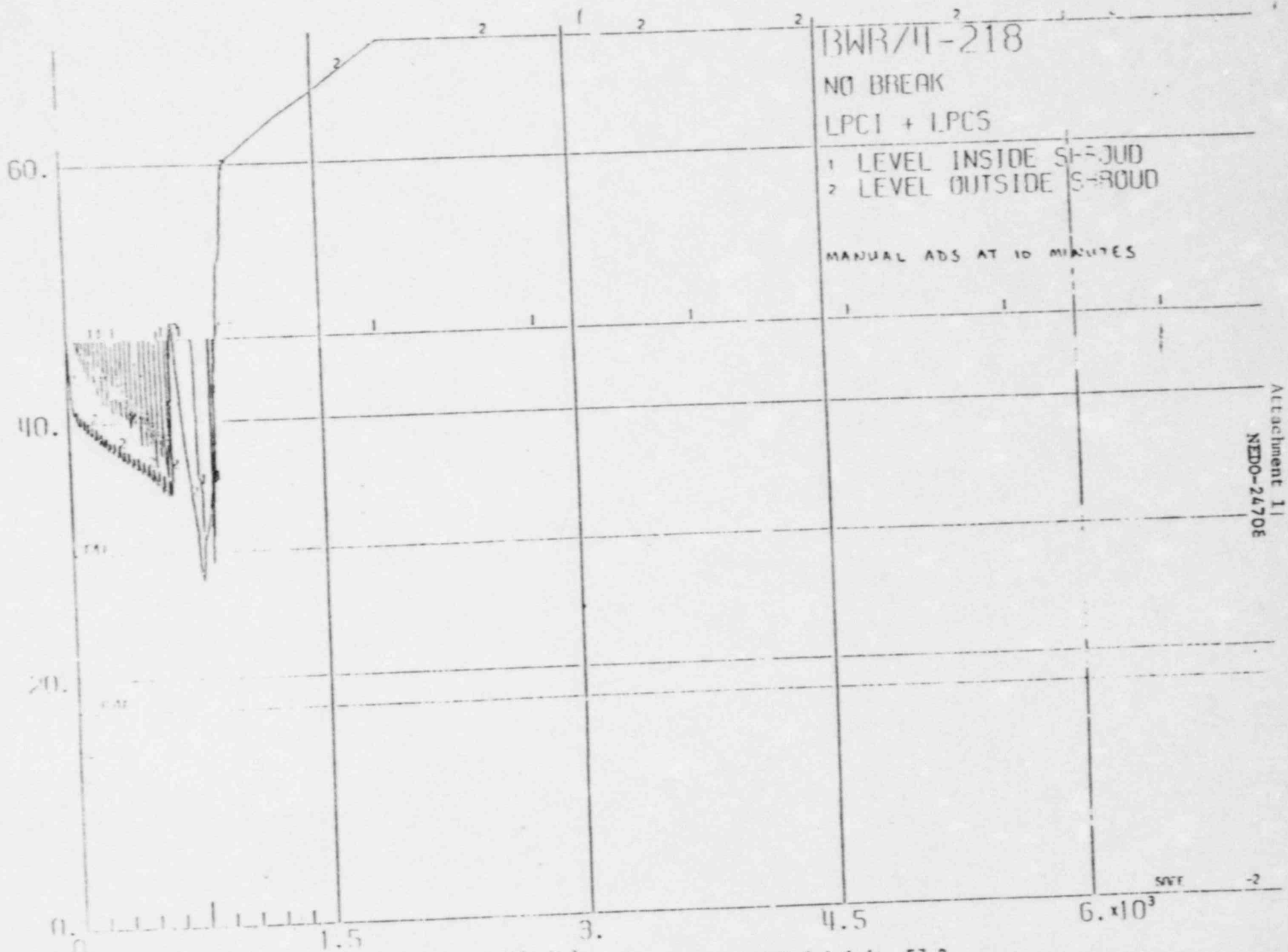


FIGURE 3.1.1.1 - 57.2

Attachment 2

TITLE: DIESEL GENERATOR AUTOMATIC START AND DIESEL FUEL SUPPLY SYSTEM EVALUATION FOR APPENDIX "R"	UNID SYSTEM(S)	PLANT/UNIT: BFN SAR SECTION(S):

ORIGINATING ORGANIZATION: EB-ELG-APS	REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
	R0	---	EEB 820615 909
	R1		
	R2		
	R3		

APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS

KEY NOUNS

REV	R0	R1	R2	R3
DATE				
PREPARED				
CHECKED				
SUBMITTED	6-15-82			
APPROVED	6-15-82			
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
LIST ALL PAGES* DELETED BY THIS REV:				
LIST ALL PAGES* CHANGED BY THIS REV:				

STATEMENT OF PROBLEM:

TO DETERMINE IF A 20-FOOT DIAMETER FIRE CAN DEGRADE EITHER THE DIESEL GENERATOR AUTOMATIC START SYSTEM OR THE ELECTRICAL PORTION OF THE DIESEL FUEL SUPPLY SYSTEM TO PREVENT AT LEAST THE UNITS 1&2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING ONTO THEIR RESPECTIVE SHUTDOWN BOARDS DURING THE 72 HOURS FOLLOWING LOSS OF ALL OFFSITE POWER

ABSTRACT

THE DIESEL GENERATOR AUTOMATIC START SYSTEM AND THE ELECTRICAL PORTION OF THE DIESEL FUEL SUPPLY SYSTEM WERE ANALYZED AGAINST THE EFFECTS OF A 20-FOOT FIRE. THE ONLY PART OF THESE SYSTEMS WHICH COULD PREVENT BOTH UNITS 1&2 AND UNIT 3 DIESEL GENERATORS FROM STARTING IS THE AUTOMATIC START CIRCUIT WHEN INITIATED BY A LOCA SIGNAL.

THE RESULTS OF THE ANALYSIS IS THAT NO SINGLE 20-FOOT FIRE, FOR THE SYSTEMS ANALYZED, WILL PREVENT AT LEAST UNITS 1&2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING ONTO THEIR RESPECTIVE SHUTDOWN BOARDS DURING THE 72 HOURS FOLLOWING THE LOSS OF OFFSITE POWER

PLEASE RETURN ORIGINALS TO G.R. REED, W2B92C-K

TENNESSEE VALLEY AUTHORITY SHEET 1 of 5

SUBJECT: DIESEL APPENDIX "R" ANALYSIS PROJECT: BROWNS FERRY

COMPUTED BY: [signature] DATE 6-14-82 CHECKED BY: [signature] DATE 6-14-82

PURPOSE

TO DETERMINE IF A 20 FOOT DIAMETER FIRE CAN DEGRADE EITHER THE DIESEL GENERATOR AUTOMATIC START SYSTEM OR THE ELECTRICAL PORTION OF THE DIESEL FUEL SUPPLY SYSTEM TO PREVENT AT LEAST THE UNITS 1+2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING ONTO THEIR RESPECTIVE SHUTDOWN BOARDS DURING THE 72 HOURS FOLLOWING LOSS OF OFFSITE POWER. (THE LOSS OF ALL OFFSITE POWER WILL CAUSE A THREE (3) UNIT TRIP)

SYSTEMS EXCLUDED

THE FOLLOWING DIESEL RELATED SYSTEMS ARE OUTSIDE THE SCOPE OF THIS STUDY

1) DIESEL COOLING WATER (EMERGENCY EQUIPMENT COOLING WATER SYSTEM)

2) 4KV SHUTDOWN BOARD CONTROL POWER

ASSUMPTIONS

1) PLANT IS IN NORMAL OPERATING CONFIGURATION WHEN OFFSITE POWER IS LOST

2) NO PLANT PERSONNEL ACTION IS TAKEN TO CONNECT THE DIESEL GENERATORS TO THEIR RESPECTIVE SHUTDOWN BOARDS.

DIESEL GENERATOR SYSTEM DESCRIPTION

THE 4KV DIESEL GENERATOR POWER DISTRIBUTION SYSTEM IS SHOWN IN FIGURE I (SHEET 2)

THE SYSTEM IS CONTAINED IN THREE (3) BUILDINGS

1) UNIT 1+2 DIESEL BUILDING

2) UNIT 3 DIESEL BUILDING

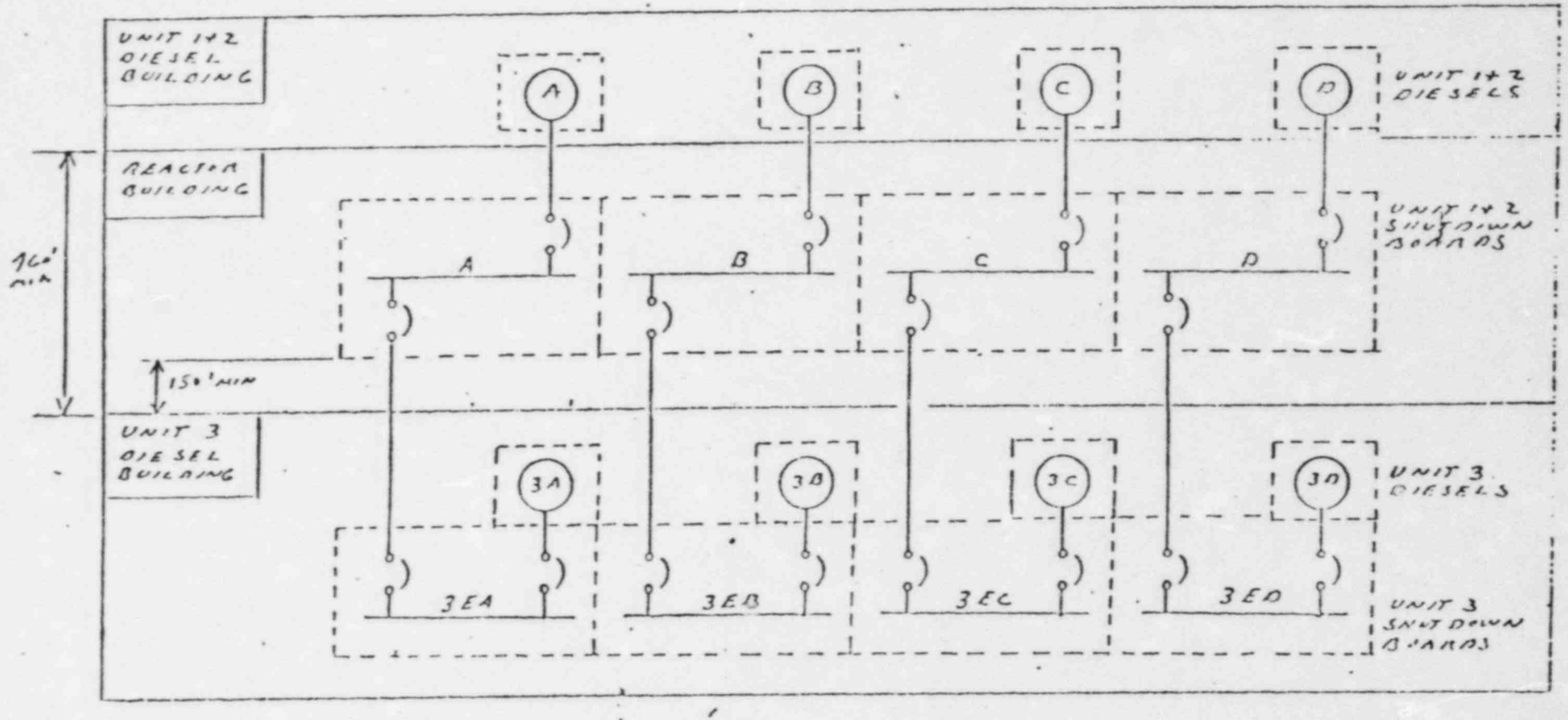
3) REACTOR BUILDING (UNIT 1+2 SECTIONS)

THE UNIT 1+2 DIESEL BUILDING CONTAINS DIESEL GENERATORS A, B, C, + D ALONG WITH 480V DIESEL AUXILIARY BOARDS A+B (NOT SHOWN)

TENNESSEE VALLEY AUTHORITY SHEET 2 OF 5

SUBJECT DIESEL GENERATORS PROJECT BROWNS FERRY

COMPUTED BY [signature] DATE 6/14/82 CHECKED BY T. Howard DATE 6-14-82



---- INDICATES FIRE BARRIER

FIGURE I

DIESEL FEED SYSTEM

SUBJECT DIESEL APPENDIX "R" PROJECT BROWNS FERRY
ANALYSIS

COMPUTED BY F. Fuller DATE 6-14-82 CHECKED BY T. Harrell DATE 6-14-82

THE UNIT 3 DIESEL BUILDING CONTAINS DIESEL GENERATORS 3A, 3B, 3C, 3D; 4KV SHUTDOWN BOARDS 3EA, 3EB, 3EC, + 3ED ALONG WITH 480V DIESEL AUXILIARY BOARDS 3EA + 3EB (NOT SHOWN IN FIGURE I).

THE REACTOR BUILDING CONTAINS THE UNITS 1+2 4KV SHUTDOWN BOARDS (A, B, C, + D); EACH IS SEPARATED FROM THE OTHER BY A THREE(3) HOUR FIRE BARRIER

EACH OF THE EIGHT(8) DIESELS IS CONTAINED IN AN INDIVIDUAL THREE (3) HOUR FIRE RATED COMPARTMENT ALONG WITH THE FOLLOWING:

1) AIR STARTING SYSTEM

2) 120VDC BATTERY, DISTRIBUTION CABINET, AND BATTERY CHARGER

3) CONTROL + RELAY CABINET

4) FUEL SYSTEM

METHOD

FOR A FIRE TO PREVENT AT LEAST THE UNITS 1+2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING ONTO THEIR RESPECTIVE SHUTDOWN BOARDS THE FIRE:

1) MUST OCCUR IN A COMMON SYSTEM TO THE UNIT 1, 2 + 3 DIESELS +

2) MUST HAVE THE CAPABILITY OF DEGRADING DIESEL GENERATOR SYSTEM CAPABILITY.

THIS STUDY INVESTIGATES THE DIESEL GENERATOR AUTOMATIC START SYSTEM AND THE DIESEL GENERATOR FUEL SUPPLY SYSTEM TO DEFINE COMMON SYSTEMS TO THE UNIT 1, 2, + 3 DIESELS DURING THE 72 HOURS FOLLOWING LOSS OF OFFSITE POWER. COMMON SYSTEMS WILL THEN BE EVALUATED TO DETERMINE IF A FIRE IN THOSE SYSTEMS COULD DEGRADE THE DIESEL GENERATORS' ABILITY TO START AND LOAD ON THEIR RESPECTIVE 4KV SHUTDOWN BOARDS.

SUBJECT DIESEL APPENDIX "R" PROJECT BROWNS FERRY

ANALYSIS

COMPUTED BY [illegible] DATE 6-14-82 CHECKED BY [illegible] DATE 6-16-82

ANALYSIS

DIESEL FUEL SUPPLY ELECTRICAL SYSTEM

EACH DIESEL GENERATOR HAS ITS OWN SELF CONTAINED INDEPENDENT FUEL SUPPLY SYSTEM CONSISTING OF A "DAY TANK" MOUNTED ON THE DIESEL FRAME AND AN INDIVIDUAL "7 DAY TANK" ENCASED DIRECTLY BELOW EACH DIESEL GENERATOR.

BEFORE DIESEL GENERATOR STARTUP, FUEL IS DRAWN FROM THE DAY TANK BY A 120VAC MOTOR. AFTER THE DIESEL COMES UP TO SPEED, AN ENGINE DRIVEN PUMP BECOMES AVAILABLE AND THE FIRST FUEL PUMP BECOMES A 100% BACKUP TO THE ENGINE DRIVEN PUMP. THE 120VAC FUEL SUPPLY MOTOR IS FED FROM THE DIESEL GENERATORS INDIVIDUAL CONTROL ROOM BATTERY

FUEL IS REPLACED IN THE "DAY TANK" BY TWO (2) 240VAC MOTORS WHICH RECEIVE THEIR POWER SUPPLY FROM THE DIESEL GENERATOR OUTPUT.

THE FUEL AVAILABLE IN BOTH TANKS IS SUFFICIENT TO SUPPLY THE INDIVIDUAL DIESEL GENERATOR FOR 72 HOURS WITHOUT RELYING ON OTHER FUEL SOURCES

NO PART OF THE UNIT 1+2 AND UNIT 3 FUEL SYSTEMS IS COMMON

DIESEL AUTOMATIC START SYSTEM

THE DIESEL GENERATOR AUTOMATIC START SYSTEM IS ACTIVATED BY:

1) DEGRADED OR LOSS OF 4KV SHUTDOWN BOARD VOLTAGE OR

2) GENERATING UNIT ACCIDENT SIGNAL (LOW WATER LEVEL OR HIGH DRYWELL PRESSURE)

CONCERNING THE DEGRADED OR LOSS OF VOLTAGE START:

EACH 4KV SHUTDOWN BOARD IS EQUIPPED WITH A LOSS OF VOLTAGE AND DEGRADED VOLTAGE SENSING SYSTEM INDEPENDENT OF ANY OTHER SHUT DOWN BOARD. EACH SYSTEM WILL AUTOMATICALLY START + LOAD THE BOARDS DIESEL WHEN THE SHUTDOWN BOARD VOLTAGE DROPS BELOW AN ACCEPTABLE LEVEL FOR A GIVEN TIME. THE LOSS OF OFFSITE POWER WILL TRIGGER BOTH OF THESE SYSTEMS TO FUNCTION INDEPENDENTLY OF THE REST OF THE PLANT.

SUBJECT DIESEL APPENDIX "R" PROJECT BROWNS FERRY

ANALYSIS

COMPUTED BY [signature] DATE 6-18-82 CHECKED BY T. [signature] DATE 6-18-82

ALL DIESELS HAVE TWO (2) INDEPENDENT AIR STARTING SYSTEMS CONTAINED WITHIN EACH DIESEL COMPARTMENT. EACH STARTING SYSTEM'S PRESSURE IS MAINTAINED TO ALLOW FOR ITS INDEPENDENT STARTING OF THE DIESEL GENERATOR WITHOUT RELYING ON THE START SYSTEM AIR COMPRESSORS.

DIESEL CONTROL POWER IS SUPPLIED BY EACH DIESEL'S INDIVIDUAL BATTERY. HOWEVER 4KV SHUTDOWN "BOARD CONTROL POWER IS NEEDED TO "LOAD" EACH DIESEL ON TO ITS SHUTDOWN BOARD.

NO PART OF THE UNIT 1+2 AND UNIT 3 DEGRADE OR LOSS OF 4 KV SHUTDOWN BOARD VOLTAGE DIESEL GENERATOR AUTOMATIC START SYSTEM IS COMMON

AVAILABILITY OF THE GENERATING UNIT ACCIDENT SIGNAL FOR DIESEL GENERATOR AUTOMATIC START

WHEN ANY GENERATING UNIT EXPERIENCES AN ACCIDENT SIGNAL FROM EITHER ALOW REACTOR WATER LEVEL OR A HIGH DRYWELL PRESSURE, ALL EIGHT (8) DIESEL GENERATING UNITS ARE AUTOMATICALLY STARTED.

THIS SYSTEM IS COMMON TO ALL EIGHT (8) DIESEL GENERATORS.

THIS START SYSTEM IS SEEN BY THE INDIVIDUAL DIESEL GENERATOR START CIRCUITAS A NORMALLY OPEN CONTACT WHICH CLOSES ON UNIT LOCA TO SIGNAL THE DIESEL TO START.

THE OPERATION OR NON-OPERATION OF THE AUTOMATIC DIESEL GENERATOR START SYSTEM WHEN ACTUATED BY A LOCA SIGNAL, DOES NOT DEGRADE THE OPERATION OF THE DEGRADED OR LOSS OF VOLTAGE AUTOMATIC START SYSTEM. THEREFORE, A FIRE IN THE ACCIDENT SIGNAL AUTOMATIC START SYSTEM CAN NOT PREVENT AT LEAST THE UNIT 1+2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING.

CONCLUSION

NO SINGLE 20 FOOT DIAMETER FIRE CAN DEGRADE EITHER THE DIESEL GENERATOR AUTOMATIC START SYSTEM OR THE ELECTRICAL PORTION OF THE DIESEL GENERATOR FUEL SUPPLY SYSTEM TO PREVENT AT LEAS THE UNITS 1+2 OR UNIT 3 DIESEL GENERATORS FROM STARTING AND LOADING ONTO THEIR RESPECTIVE SHUTDOWN BOARDS DURING THE 72 HOURS FOLLOWING LOSS OF OFFSITE POWER

This modification involves wrapping the division I conduits (listed below) containing cables shown on BFN-1T-TB-RHRSW-0, sheet 1, for RHRSW pumps A1, A2, C1, and C2 with a one hour fire rated barrier in the intake pumping station, where 20-foot separation or a three-hour fire-rated barrier does not exist between redundant division II cable trays for RHRSW pumps B1, B2, D1, and D2.

Conduits: ES75-I
ES88-I
ES100-I
ES113-I

Attachment 3

APPENDIX R

CORRECTIVE ACTION

PREPARED: [illegible]

REVIEWED: Tom Barlow

DATE: [illegible]