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SUBJECT: Forwards revised pages to 840327 10CFR20,App R,submittal due to decision to withdraw request for exemption for offsite power.Final rev addressing engineering solution & addl exemption requests will be submitted by 841031.

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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

June 12, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

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

Please refer to my letter to you dated March 27, 1984, which contained our revised Appendix R submittal for Browns Ferry Nuclear Plant. We have concluded our consideration of the offsite power exemption. While we continue to believe that our position regarding loss of offsite power has excellent technical merit, we have decided not to pursue the exemption request. However, as a result of that decision, our March 27 submittal will have to be revised to reflect our final engineering solution. Enclosed are those pages of the March 27 submittal which are affected by this decision. We have informally identified these changes to the NRC staff previously. These changes will affect only a small portion of our submittal (approximately five percent).

From recent conversations with the NRC staff, it is our understanding the NRC will not be in a position to review our March 27 submittal until October 1984. By October 31, 1984, we will forward to you a final revision to the submittal. This revision will address our engineering solution, additional exemption requests necessitated by NRC clarifications provided in Information Notice 84-09 and in the regional Appendix R workshops, and specific details for all required modifications.

We met with the NRC staff on May 23, 1984 regarding our integrated schedule which contains the Appendix R implementation schedule. The schedule discussed in that meeting is the same schedule previously submitted in our July 18, 1983 letter regarding the integrated schedule. In both cases, the scheduled completion date for the Appendix R modifications is the unit 3, cycle 7, outage in 1987. As discussed in the May 23 meeting, we anticipate submitting the integrated schedule as a license amendment request as soon as possible. The justification for our Appendix R schedule exemption will be included in that package. Based on the above date, we believe our schedule exemption request warrants further consideration by the NRC.

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Mr. Harold R. Denton June 12, 1984

We are proceeding with design changes to the plant on the basis of the March 27 submittal and in support of the integrated work schedule. As previously discussed with your staff, we would appreciate your review and preliminary indication of agreement on our intervening combustibles exemption as outlined in the March 27 submittal. That exemption request includes a generic technical position, tabulation of specific intervening combustible situations, and drawings showing the location of these situations. If a working meeting on this subject would be beneficial, please notify us of a date that would be convenient.

If you have any questions, please get in touch with us through the Browns Ferry Project Manager.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Subscribed and sworn to before
me this 12th day of June 1984.

Bryant M. Lowery
Notary Public
My Commission Expires 4/8/86

Enclosure
cc (Enclosure):
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ATTN: James P. O'Reilly, Regional Administrator
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Mr. R. J. Clark
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7920 Norfolk Avenue
Bethesda, Maryland 20814

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30 minutes to prevent any unnecessary loss of vessel inventory. Table 3 lists the valves required with remote control being from the MCR.

(3) Condensate system

The condensate system is required to be operable only in the fire affected unit (i.e., unit 1 condensate system is only required for a unit 1 RB fire, etc.). The system will be used in two different modes of operation. During initial RPV depressurization, the system will be aligned in the same mode as the normal power operation mode to reflood the vessel. Once reflood is accomplished, the valves can be repositioned to provide water level control. Table 4 lists the equipment required for the two modes with note 4 describing the reflood mode.

The water source for the pumps will be the condenser hotwell and condensate storage tank (CST). The hotwell will contain sufficient makeup during the reflood mode (120,000 gallons) while the CST can supply water to the hotwell in excess of the required makeup rate to the vessel for water level control. The CST will have sufficient water to supply the condensate system in excess of the required 3 hours.

The condensate system is justified for use in conjunction with rapid RPV depressurization by comparing its flow versus pressure characteristics to that of the RHR system discussed in section III.A.1.b(6). The condensate system will be considered acceptable if it can provide at least the same amount of flow at a given pressure as the RHR system. One condensate/condensate booster pump combination can produce a maximum of 10,000 gal/min against 378 lb/in^2a while an RHR pump can produce a maximum 10,000 gal/min at 267 lb/in^2a. Therefore, the condensate system can be used in conjunction with rapid RPV depressurization provided the RHR system can be used (see section III.A.1.b(6)) in the same manner. The condensate system must be aligned in the reflood mode when depressurization begins. Based upon initiating rapid RPV depressurization at RPV water level one after water makeup has been lost and the RCS has been isolated, the condensate system must be aligned in the reflood mode within approximately 20 minutes based upon figure III.A.1.b(6).

(4) Raw cooling water (RCW) system

The RCW system is a common system providing equipment cooling water for the condensate and control air systems. Normal operation of the system requires nine to ten pumps operating with all three units operating. By isolating all possible nonessential loads remotely from the MCR, four pumps will be required to operate during any RB fire to support the one condensate system operating. If sufficient cooling is not available for the pumps to last 3 hours, two more condensate/condensate booster pump combinations are available. This combination of the RCW and condensate systems should provide sufficient RPV makeup for the required 3 hours. See table 5 for a list of required equipment.

(5) Plant control air (PCA) system

The PCA system is required to support the condensate and RCW systems. All equipment in table 6 must be available for any RB fire.

(6) Residual heat removal (RHR) system

The RHR system is required to be operable in the low-pressure coolant injection (LPCI) mode for the two units not physically affected by the fire (i.e., units 2 and 3 RHR systems are required for a unit 1 RB fire, etc.). The RHR systems in these unaffected units will be used in conjunction with rapid RPV depressurization as in the previous description of the condensate system. Tables 7, 8, and 9 list the requirements of the RHR systems for the three RB fire areas.

As stated before, one RHR pump is capable of providing 10,000 gal/min at 267 lb/in^2a. Figure III.A.1.b(6) (taken from GE NEDO 24708, figure 3.1.1.1-58.2, page 4-503) illustrates a manual initiation of ADS at RPV water level one with one RHR pump (10,000 gal/min) and two core spray pumps providing water makeup to the RPV. The figure illustrates that sufficient makeup is available to restore and maintain RPV water level. Based upon the minimum required logic inputs to automatically initiate ADS (i.e., ADS will automatically initiate with a confirmatory signal that ony one RHR pump is running), one RHR pump is sufficient to provide RPV reflood following a rapid depressurization without any aid from the core spray system to prevent any core damage. Using this fact in conjunction with figure III.A.1.b(6), it is concluded that one RHR pump (or one condensate/condensate booster pump, section III.A.1.b(3)) will cause an increase in RPV water level at the same point shown in the figure if a rapid depressurization of the RPV is initiated when vessel water level reaches level one. The time constraint of 20 minutes will also apply to the RHR system as described in the condensate system description.

(7) Emergency equipment cooling water (EECW) system

The EECW system will be required to supply cooling water to the RHR systems being used and the operating diesel generators. Two pumps in one header will be sufficient to supply the required heat load. This is based on normal shutdown requirements (section 10.10 of BFNP FSAR) of 9800 gal/min with 4400 gal/min being dedicated to reactor building closed cooling water (RBCCW) system. Two pumps are capable of supplying 9000 gal/min with the supply to RBCCW being automatically isolated if EECW header pressure drops below a specified setpoint by hydraulically operated valves. In addition, the system is designed in such a manner that closure of one valve in one header will not prevent proper operation of the system. Table 13 lists the equipment required to ensure proper EECW system operation.

(8) High pressure coolant injection (HPCI) system

There are no requirements for the HPCI system to supply RPV water inventory control for any RB fire area. However, if the system is operable, it can be used to maintain and satisfy RPV inventory requirements.

Isolation of the HPCI system may be required from the MCR if the RCS has been isolated (section III.A.1.a), RPV pressure is decreasing, no SRVs are being manually operated, and there is no makeup of water to the RPV. Operator discretion is required for this action.

(9) Reactor core isolation cooling (RCIC) system

There are no requirements for the RCIC system to supply RPV water inventory control for any RB fire area. However, if the system is operable, it can be used to maintain and satisfy RPV inventory requirements.

Isolation of the RCIC system may be required from the MCR if the RCS has been isolated (section III.A.1.a), RPV pressure is decreasing, no SRVs are being manually operated, and there is no makeup of water to the RPV. Operator discretion is required for this action.

c. Reactivity Control

(1) Reactor protection system (RPS)

the 250-V dc battery system must provide power to their respective loads.

Each board supplying power to a required component will be evaluated to ensure power is available when the component requires it.

2. Time Between 1 Hour and 3 Hours

Only new or changed requirements will be addressed in the remaining time frames. If the function is not mentioned, the previous time frame requirements for the systems are still applicable.

a. Reactor Pressure Vessel (RPV) Water Inventory Control

(1) DCA system

Sufficient air must be available to control a minimum of one SRV during this time frame to maintain the RPV depressurized.

(2) SRV system

Only one valve should be used to maintain the RPV at a low enough pressure for RHR or condensate system to supply the RPV with makeup.

b. Reactivity Control

Once insertion of the control rods has been accomplished, no further action is required to maintain them in the required position.

c. Shutdown Control Area Environmental Control

Fresh air must be supplied to the operators during the time frame of 1 hour and 72 hours. Table 18 lists the equipment necessary to meet this requirement for the MCR. Other areas will only be inhabited for short time frames and will not require any special equipment.

d. Decay Heat Removal (DHR)

(1) RHR system

The RHR system will perform two functions for each RB fire area. As stated in section III.A.1.b(6), the RHR system will be providing RPV water inventory control for the two units not physically affected by the fire. In addition, the RHR systems must be placed in the torus cooling mode within 1 hour on these two units. However, one RHR pump is sufficient to perform both functions. This case has been analyzed for adequate torus cooling and found to have a maximum

bulk pool temperature of 197.5°F (see figure
III.A.2.d). This case was previously addressed in the response to questions on TVA's submittal on 10CFR50, Appendix R. This response was submitted by letter to D. B. Vassalo dated January 5, 1983 (NEB 830110 617). This case has been documented by TI-ANL-74R1 issued August 17, 1983 (NEB 830817 237). Tables 22, 23, and 24 list the valve and pump requirements for the RHR system associated with the units not affected by fire.

(2) RHR service water (RHRSW) system

The RHRSW system will provide cooling water to the RHR system to support the torus cooling mode. The RHRSW pumps associated with the RHR pumps being used above (section III.A.2.d(1)) must be started and the heat exchanger discharge valve opened when the system is placed in service to support to the RHR system. Table 25 lists the pumps and valves required for the RHRSW system.

3. Time Between 3 Hours and 72 Hours

a. Reactor Coolant System (RCS) Integrity

Once RPV temperature is reduced below 212°F (i.e., cold shutdown), some valves above normal RPV water level may be opened. This includes the head vent and main steam line drain valves. In addition, if the normal shutdown cooling mode of RHR is used, table 26, the RHR suction valves (FCV-74-47 and -48) will also be opened. However, these valves are required to remain closed until RPV decreases to 75 lb/in^2g.

b. Reactor Pressure Vessel (RPV) Water Inventory Control

(1) Condensate system

The condensate system will no longer be required beginning at 3 hours. Its function will be replaced by the RHR system as described below.

(2) RCW system

The RCW system will no longer be required beginning at 3 hours based upon the reason given in (1) above.

(3) PCA system

The PCA system will no longer be required beginning at 3 hours based upon the reason given in (1) above.

(4) RHR system

The RHR system will continue to provide RPV water inventory control for the two units not physically affected by the fire. In the fire-affected unit, the RHR system is required to be placed in the LPCI mode no later than 3 hours to replace the condensate system. Tables 7, 8, and 9 in conjunction with tables 22, 23, and 24 should be used to align the RHR system for this time frame.

In addition to the above, the RHR sytem will be used during cold shutdown as shown in table 26 or in the alternate shutdown cooling mode. The alternate method includes opening of the SRV(s) and filling the RPV to where it overflows through the SRV(s) back into the torus. The RHR system will be aligned in the LPCI mode to provide a closed recirculation path of the primary coolant.

c. Decay Heat Removal (DHR)

(1) RHR system

The RHR system will continue to provide DHR for the two units not physically affected by the fire. In the fire-affected unit, the RHR system is required to be placed in the torus cooling mode no later than 3 hours. This requires two pumps to be operating to provide sufficient torus cooling. These two pumps may be the same ones being used for RPV water inventory control desribed in III.A.3.b(4) above. The maximum bulk pool temperature is less for this case than that discussed previously (section III.A.2.d(1)) and is documented in the same analysis (TI-ANL-74R1). Tables 22, 23, and 24 list the valve and pump requirements for the RHR system.

(2) RHRSW system

The RHRSW is required to support the RHR system in the torus and shutdown cooling modes of operation. One RHRSW pump must be operable for each RHR pump being used. Table 25 lists the equipment that can be used.

B. Shutdown Board Rooms (SBRs) Fire Areas

The SBR fire areas are located on elevations 593 and 621.25 in each RB for a total of six shutdown board rooms. There are two additional areas located in unit 3 DGB that includes SBRs 3EA and 3EB and SBRs 3EC and 3ED. The 4-kV bus tie board is also located in unit 3 DGB. However, the entire board may be lost without any affect on safe shutdown. Therefore, there are no requirements for the 4-kV bus tie board.

Valves FCV-74-60 and 74 were deleted since their opening would not defeat the function of decay heat removal (i.e., any leakage would eventually return to the torus).

Valves FCV-68-3 and 79 are deleted from Table 26 since they are not required to be closed for shutdown cooling.

2. Modifications

The RHR pump backup control logic will be modified to bypass the drain valve position interlock as shown on drawing 45N765-4 (see Volume 2, Tab 3).

The valve control logic for the valves previously mentioned will be modified as shown in drawing 45N779-10. One switch will be used to disable all of the System I valves, and another switch will be used for System II valves.

Backup control will be added to FCV-74-58 and 59 for unit 1 and FCV-74-72 and 73 for units 2 and 3.

All System I RHR cables still required will be separated from all System II RHR cables to meet Appendix R criteria.

APS Corrective Action

The APS is described in chapter 8 of the BFNP FSAR. Any configuration of the power system is considered to be acceptable provided sufficient time and manpower is available to align the system. Specific arrangements of the power system were only determined for the RB fire areas during the short term (less than 3 hours). All other arrangements will depend upon the area of the fire and the routing of all required cables for other systems. Therefore, two descriptions of corrective actions are provided.

1. General Alignments

   This will involve alignments required for all fire areas to ensure equipment required will have sufficient power when required. Cables will be rerouted as necessary to ensure distribution boards will have power available when their respective loads are required.

2. Specific Alignments

   The only specific alignment identified was to backfeed the diesel generators to the start buses 1A and 1B to provide onsite power to the condensate system during an RB fire. This involved specific alignment of breakers and specific manual actions to accomplish the alignment with the design of the present APS. However, due to the limited manpower available and the time frame required to accomplish the alignment, some modifications were required to accomplish this function.

   One portion of the backfeed alignment was to provide ac power for the two nonfire affected units to support the RHR system being used for RPV water inventory control. This portion will be eliminated by taking credit for HPCI in these two units thus eliminating the need for this backfeed arrangement (i.e. HPCI is dependent upon dc power only).

   In addition, a new backfeed switch will be added in each unit to reduce the number of breaker manipulations (i.e. the new switch will position a number of breakers for each unit) required of the unit operator. The new backfeed switch will necessitate adding two breakers in series to provide cross-connect capability of the start buses as shown on drawing 15W500-1. A description of the present backfeed switch (already installed) and the new backfeed switch are provided below. Drawings 15W500-1, 2, and 3 (see Volume 2, Tab 5) show the location of breakers identified below.

   The present backfeed switches (one per unit) trip and lock out the normal and alternate feeder breakers to the respective units A and B unit boards (breakers 1112, 1424, 1114, and 1524 for unit 1, etc.). This prevents any possibility of the diesel generators providing power to other 4-kV boards in the turbine building and the offsite power system. The new backfeed switches (one per unit) will perform the functions for the associated breakers listed in Table 1 to allow the opposite unit's diesel generators (i.e. unit 3 DGs for unit 1 unit boards) to provide power to the necessary loads required for

Appendix R. All new cables associated with the backfeed switches and the start buses cross-connect breakers will be routed outside the RBs.

The above modifications are required to reduce the manual actions required to accomplish the backfeed alignment. Table 2 provides a list of cables that were identified as being routed inside the fire area for the backfeed alignment required in that specific unit. One of the following four options will be utilized for each cable to ensure the backfeed alignment will remain available.

a. Rely on alternate cables located outside the fire area.

The cables in the above category, marked with a "+" in Table 2, are not required to be rerouted based upon having another cable available outside the fire area that can be isolated from the cable listed and can perform the same function. Most of these cables involve supplying central power to the 4-kV and 480-V shutdown boards.

b. Rely on HPCI availability.

The cables in the above category, marked with a "*" in Table 2, were required to support the backfeed alignment for RHR in the two nonfire affected units. By ensuring HPCI availability for these two units, these cables are no longer required and will not be rerouted.

c. Rely upon separation between redundant alignments.

The cables in this category, marked with a number and letter in Table 2, are required to be separated as necessary to comply with 10CFR50, Appendix R, section III.G.2 to ensure the availability of one backfeed alignment.

d. Justification not to reroute cable.

There are seven cables in this category. One cable (PP285-B) will be addressed separately while the remaining cables will be addressed as a group.

The function of control cable PP285-B which is shown in drawing 45N763-2 (see Volume 2, Tab 5) is to energize an annunciation relay for an overload condition. A fault on this cable could blow the trip circuit fuse <u>only</u> if an actual overload condition (51 contacts closed) exists on the feeder cable being monitored. This breaker is required to be tripped before any load is placed onto the cable, thus preventing any overload condition. The breaker is to remain in the tripped condition throughout the postulated event. Therefore, the control circuit cable will not prevent tripping the breaker as required for the postulated event.

The remaining cables in this category are associated with the control circuit of the 4-kV shutdown board unit crosstie breakers shown in drawing 45N765-11 (see Volume 2, Tab 5). The breakers are required to be tripped for the given fire area which is their normal position. Therefore, only the spurious closing of the breaker will be addressed. The battery systems supplying power to the control circuit is not grounded. Therefore, to get a closure signal, a cable with the same power supply would be required to supply a hot short to the cable in the closure circuit. This hot short is not considered to be credible and, therefore, no cables will be rerouted to ensure these breakers will remain tripped.

Table 1

New Backfeed Switch Functions

Unit 1	Unit 2	Unit 3
1424, B	1428, B	1432, B
1524, B	1526, B	1528, B
1116, T&L	1216, T&L	1316, T&L
1412, T&L	1412, T&L	1424, B
1414, T&L	1414, T&L	1428, B
1518, T&L	1518, T&L	1412, T&L
1516, T&L	1516, T&L	1414, T&L
1118, T&L	1118, T&L	1518, T&L
1522, T&L	1522, T&L	1516, T&L
1422, I	1422, I	1118, T&L
1432, B	1528, B	1522, T&L
1532, I	1426, I	1422, I
		1434, I

Key: B - Bypass the present backfeed switch trip and lock out contacts allowing manual closure of the breaker from the MCR.

T&L - Trip and lock out the breaker.

I - Prevent automatic closure of the breaker. Will require closing from the MCR.

Table 2

Unit 1	Unit 2	Unit 3
	3B89-IE,*	
3B180-IE,+	PP285-B,%	PP698-IB,%
3B93-IE,+	3B189-IE,+	3B98-IE,+
3B189-IE,+	3B193-IE,+	PP713-IIC,%
PP661-IID,*	3B181-IE,1A	PP663-IID,%
3B88-IE,+	3B88-IE,*	3B98-IE,+
	3B180-IE,1B	PP679-IA,%
	FS1942-IB,*	B76,2A
	PP276-B,*	B77,2B
	3B93-IE,+	PP472-IIC,%
	PP979-B,*	PP471-IIC,%
	FS1975-IA,*	1B93-IE,+
	FS1934-IA,*	PP481 thru 486,3A
	1B89-IE,*	PP964,3A
	PP698-IB,*	PP213,3A
	FS1796-IB,*	PP246,3A
	PP694-IB,*	3PP740,3A
	B514-IE,*	3PP742,3A
	2B96-IE,+	PP475 thru PP480,3B
	PP459-IA,*	PP979,3B
	PP460-IA,*	PP219,3B
	PP679-IA,*	PP984,3B
	PP677-IA,*	3PP751,3B
	2B95-IE,+	3PP753,3B
	1B88-IE,*	
	FS1985-IB,*	

Key: + - Alternate cables outside fire areas
* - HPCI availability and its effects
number, letter - The cables with the numbers must be separated from each other as designated by their letters (i.e., cable with 1A suffix must be separated from cable with 1B suffix).
% - Justification is provided (See Item D, Page 5-14)