Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

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10 CFR 50.90

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

Gentlemen:

In the Matter of) Docket No.50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - LICENSE AMENDMENT REQUEST - WBN-TS-00-014 - DIESEL GENERATOR ACTION COMPLETION TIME - REQUEST FOR ADDITIONAL INFORMATION (TAC NO. MB0352)

The purpose of this letter is to provide responses to NRC's questions discussed in a teleconference call with NRC Reviewer I. Jung, on November 9, 2000. The enclosure provides the responses to these questions.

On November 21, 2000, a teleconference call was held between TVA and the above NRC Reviewer in which TVA was requested to provide a statement which ensures that no hot work (e.g., welding, cutting, or open flame work) is conducted in the vicinity of or on safety related equipment during the outage for the 1B-B diesel's generator replacement. An action item has been placed in the schedule to verify that no hot work is scheduled in the vicinity of or on safety related equipment for the duration of the diesel outage.

TVA has evaluated the No Significant Hazards Determination provided in the October 30, 2000 letter and has determined that the responses to the request for additional information in the November 15, 2000 letter, and this letter have not affected that determination.

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No regulatory commitments are identified in this letter. If you have any questions about this change, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Subscribed and sworn to before me
on this 22nd day of November, 2000

E. Jeannette Long
Notary Public

My Commission Expires June 27, 2001

Enclosure
cc (Enclosure):
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DIESEL GENERATOR ACTION COMPLETION TIME
REQUEST FOR ADDITIONAL INFORMATION

The following request for additional information was discussed in a teleconference with NRC on November 9, 2000, concerning WBN's one-time diesel generator action completion time extension from 72 hours to 10 days. Below are the responses to NRC's questions:

QUESTION 1a

Describe the capabilities of the Unit 2 diesel generators credited in your PRA to mitigate a loss of offsite power at Unit 1. Are they a significant contributor to risk? For example, your original Individual Plant Examination (IPE) indicated that the availability of the diesel generators on the opposite unit provided the power to SG level instrumentation and TDAFW control. Are there any other such capabilities?

RESPONSE

The table below shows the equipment credited in the Probabilistic Safety Assessment (PSA) that is supplied from Unit 2 on-site power.

Equipment	Diesel Generator 2A-A	Diesel Generator 2B-B
125V Battery Board III	X	
125V Battery Board IV		X
Component Cooling Water (CCS) Pump 2A-A	X	
Component Cooling Water Pump 2B-B		X
Component Cooling Water Pump C-S		X*
Essential Raw Cooling Water (ERCW) pump C-A	X	
ERCW pump D-A	X	
ERCW pump G-B		X
ERCW pump H-B		X
0-67-152 - CCS Heat Exchanger C Outlet Valve		X
DC Battery room cooling fan to turbine driven auxiliary feedwater (TDAFW) Pump 1A-S **	X	
LCV-3-172 - TDAFW pump LCV**	X	

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Equipment	Diesel Generator 2A-A	Diesel Generator 2B-B
LCV-3-173 - TDAFW pump LCV**		X
LCV-3-175 - TDAFW pump LCV**	X	
LCV-3-174 - TDAFW pump LCV**		X
Relay BA which swaps TDAFW pump steam supply valve**	X	
Relay BA1 which supplies open/close signals to TDAFW pump ERCW supply valve 3-136A and B**	X	
Relay BB which supplies open/close signals to TDAFW pump ERCW supply valve 3-179A and B **	X	
PCV-1-5 - SG-power-operated-relief-valve (PORV) Loop #1** ***	X	
May also be opened via nitrogen bottles		
PCV-1-30 - SG-PORV Loop #4** ****		X
May also be opened via nitrogen bottles		
FCV-1-51 -TDAFW Pump Trip and Throttle Valve	NOR	ALT
Auxiliary Control Air Compressor A	X	
Auxiliary Control Air Compressor B		X
Shutdown Board Room Ventilation A	X	
Shutdown Board Room Ventilation B		X
480V Board Room 2B Ventilation		X
480V Transformer Room 2A Ventilation	X	
480V Transformer Room 2B Ventilation		X

* This pump is a swing pump and can also be powered from Unit 1 Train A.
** Supplied by Vital Battery Bd. III
*** Also supplied by Battery Bd. II
**** Also supplied by Battery Bd. I

As shown in the table above, the primary support to WBN Unit 1 from the Unit 2 diesel generators is to provide power to the Unit 2 and swing pump CCS pumps, the auxiliary air compressors, and Unit 2 shutdown board and Transformer Room ventilation. It should be noted that two of the station air compressors are also powered from the Unit 1 shutdown boards. The Unit 2 diesel generators loaded as described above, are not significant contributors to risk.

The 125V Vital Battery Boards III and IV are supplied power through their respective diesel generators. If the diesel is unavailable, power to the boards is supplied by battery. The instrumentation listed above is supplied through the battery boards and it should be noted that the steam generator PORVs can be opened from two separate power supplies. The steam generator PORVs also have nitrogen bottles available so that the bottles may be manipulated during station blackout (SBO) events.

QUESTION 1b

Did you take credit for the recovery of diesel generators after they failed on a loss of offsite power event?

RESPONSE

Recovery of diesel generator 1A-A was credited in this analysis. Recovery of diesel generator 1B-B was credited in this analysis and as stated in TVA's previous response, this makes the results slightly optimistic.

The electric power recovery analysis is discussed in detail in Section 3.3.3.4 of the WBN Individual Plant Examination (IPE), Revision 0. The Monte Carlo simulation STADIC is used in the recovery analysis at WBN. This recovery analysis for the WBN PSA model is an integrated, time dependent model that looks at several parameters and conditions. These parameters include the recovery of offsite power, the recovery of one or two diesels, and the availability of auxiliary feedwater for heat removal. The result of the recovery analysis is a recovery factor that is the ratio of two conditional frequencies, given a loss-of-offsite power (LOOP) initiating event: the conditional frequency of the

loss of onsite power in a mission time of 24 hours and the failure to restore onsite or offsite power before core damage occurs, and the conditional frequency of onsite power failure in a 24-hour period without recovery.

It should be noted that in the recovery analysis the diesels are assumed to be unrecoverable after depletion of the dc batteries because the 125 V batteries are required for breaker control on key individual loads.

QUESTION 1c

In Attachment 4, provide the values of the cutsets for the top LOSP sequence.

RESPONSE

As discussed in our telephone conversation, WBN uses the RISKMAN large event tree methodology which results in sequences, not cutsets. The following split fractions are involved in failure of the top sequence:

LOSP - 3.64 E-2
OGR11 - Operator fails to recover Grid in 1 hour - 5.82 E-2
DG1A - Diesel Generator 1A-A fails - 1.02E-1
REC1 - Power recovery with two diesels failed - 3.76 E-2

While in some cases, sequences can be turned into cutsets easily. In this particular case, the sequence cannot be easily turned into cutsets because of the two recovery terms in the sequence. As stated in the answer to the previous question power recovery is the ratio of two conditional frequencies, given LOOP initiating event: the conditional frequency of the loss of onsite power in a mission time of 24 hours and the failure to restore onsite or offsite power before core damage occurs, and the conditional frequency of onsite power failure in a 24-hour period without recovery. The probability of offsite power recovery in an hour is also included in the analysis of the REC top event. This ratio does not allow the probabilities for OGR11 and REC1 to be multiplied together like the probabilities forming a cutset.

QUESTION 2

With a 0.18g or greater earthquake, would offsite power be lost? If so, what is the conditional core damage probability given an

earthquake greater than or equal to 0.18g when diesel generator 1B-B is removed from service?

RESPONSE

In the WBN design bases, the switchyard is assumed to fail during a design basis earthquake. The conditional core damage frequency (CCDF) of an earthquake was assumed to be equal to that of a guaranteed LOOP. The WBN PSA model was quantified for all initiators with the LOOP frequency set equal to 1.0, diesel generator 1B-B failed and the possibility of recovering offsite power during the first hour failed. The results of the quantification show the CCDF to be 6.0 E-3.

As stated in our last response the probability of an earthquake during the 10-day period the diesel generator is out of service is 6.07 E-6.

The core damage frequency (CDF) due to a design basis or greater earthquake during the 10-day period the diesel is out of service may be calculated as:

$$(6.07\ E\text{-}6)(6.0\ E\text{-}3) = 3.64\ E\text{-}8$$

If an earthquake were to be considered one of the initiating events, the CDF with diesel generator 1B-B failed would increase from 5.3059 E-5 to 5.3095 E-5. This is an increase of less than one tenth of one percent.

QUESTION 2b

Your response to the question on fire did not address the potential fires in areas other than the EDG rooms. Fires that could cause loss of offsite power should be addressed. For example, a fire in cable spreading room may cause loss of offsite power and, at the same time, other safety equipment could be lost. The following specific questions should be addressed:

- What are the rooms or areas that fires within could cause a loss of offsite power?
- Given the fires, what other equipment or safety functions could fail?
- With the 1B-B diesel generator removed from service, estimate the conditional core damage probability (CCDP) for each room and the total fire CCDP.

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RESPONSE

A review of the WBN Fire Protection Report identified three fire areas, where if a fire started in that area diesel generator 1B-B is the only protected train of power available to achieve safe shutdown. These areas are:

	FIRE AREA	COMPARTMENT	LOCATION
1.	Fire Area 14 - AV-036	737.0-A1A	Auxiliary Building, Column Lines Q-U1/A1-A6
		737.0-A1AN	Auxiliary Building, Column Lines Q-U1/A6-A8
		737.0-A2	Hot Instrument Shop
		737.0-A4	Air Lock
		757.0-A13	Refueling Room
2.	Fire Area 17 - AV-042	757.0-A2	6.9kV and 480-V Shutdown Board Room
		757.0-A9	Personnel and Equipment Access
	- Fire Area 17 - AV-042D	757.0-A2	6.9kV and 480-V Shutdown Board Room
		757.0-A9	Personnel and Equipment Access
	- Fire Area 17 - AV-042E	757.0-A2	6.9kV and 480-V Shutdown Board Room
		757.0-A9	Personnel and Equipment Access
	- Fire Area 17 - AV-042F	757.0-A2	6.9kV and 480-V Shutdown Board Room
		757.0-A9	Personnel and Equipment Access
	- Fire Area 17 - AV-042G	757.0-A2	6.9kV and 480-V Shutdown Board Room
		757.0-A9	Personnel and Equipment Access
3.	Fire Area 24 - AV-049	757.0-A28	Auxiliary Control Instrument Room 2B

WBN used the Fire Induced Vulnerability Evaluation (FIVE) methodology in its Individual Plant Examination of External Events (IPEEE) analysis. In Fire Area 14, area AV-036, compartments 737.0-A2 and 737.0-A4 screened out during Phase 1 using the FIVE methodology. Compartment 737.0-A2 is the Hot Instrument Shop. The Hot Instrument Shop does not contain any equipment required for safe shutdown or plant trip initiators and is separated from adjacent rooms in the Auxiliary Building by 2-hour rated reinforced concrete barriers with the door and penetrations also fire rated. The room is provided with a

detection system and the combustible loading is low, < 16,000 BTU/ft^2. Compartment 737.0-A4 is the Air Lock between the Air Intake Room and Elevation 737.0-A1. This room is separated from the Air Intake Room by 2-hour fire rated reinforced concrete and from Compartment 737.0-A1 by non-fire rated reinforced concrete. The doors and penetrations are fire rated. The combustible loading in Room 737.0-A4, is insignificant. Compartments 737.0-A2 and 737.0-A4 will not be discussed further. The other compartments in Fire Area 14 contain the equipment which would affect safe shutdown of the unit.

Fire Compartment 737.0-A1A and 737.0-A1AN (20 ft. buffer zone around compartment A1A) were evaluated together in the IPEEE. These compartments were screened in Phase II.3 using the FIVE methodology. A Fire in Compartment 737.0-A could affect systems and components powered from the A-train 6.9-kV and 480V shutdown boards, including diesel generator 1A and normal power fed from common station service transformer (CSST) A. If the Train B diesel is taken out of service for maintenance, a safe shutdown path is still provided through CSST B to shutdown boards 1B and 2A. The IPE analysis did note that there were cables for 6.9k-V shutdown bus 2A in the area; however, the cables were away from any significant fire sources in the area.

Also, it was noted during the review that the alternate offsite feeds for these buses are routed at Elevation 772.0, such that each bus has at least one offsite power supply available, even during an engulfing fire on Elevation 737.0. The boards transfer to the alternate offsite feeds automatically on a containment spray system (CSS) transformer fault.

The evaluation of this fire compartment in the IPEEE was performed using three case scenarios ranging from a minor fire in the compartment to a severe fire assumed to result in extensive damage. The IPEEE assumes diesel generator 1B-B is available. The results of this evaluation from the IPEEE are presented below.

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IPEEE Evaluation of Fire Area 737.0-A1A (Corridor West)				
Case	Description	Case Frequency (F1)	Probability of Core Damage (P2) CCDP	Core Damage Frequency F2 = (F1 x P2) FCCDP
Case 1	Minor fire, suppressed	2.65E-03	2.16E-06	5.72E-09
Case 2	Significant fire with manual suppression	2.82E-05	1.29E-04	3.64E-09
Case 3	Severe fire, assumed to result in extensive damage, similar to screening evaluation	3.14E-06	7.49E-02	2.35E-07
Total		2.68E-03		2.44E-07

As can be seen in the table above, approximately 95% of the fire conditional core damage probability (FCCDP) comes from Case 3. This case was requantified with diesel generator 1B-B failed in addition to what was already failed for this case. The CCDP for Case 3 increased to 7.58E-2 and F2 would equal 2.38E-7. Because offsite power is still available, the increase in fire CDF still allows this case to remain below the IPEEE screening criteria.

Fire Compartment 757.0-A13 was evaluated in the IPEEE and screened in Phase II.3 using the FIVE methodology. The value for F2 was calculated as:

$$F2 = 2.00E\text{-}03 \times 1.22E\text{-}05 = 2.44E\text{-}08$$

This case was requantified with diesel generator 1B-B failed in addition to what was already failed for this case. The CCDP for this case increased to 1.36E-5 and F2 would equal 2.72E-8. Because offsite power is available and bleed and feed are still available the increase in fire CDF still allows this case to remain below the IPEEE screening criteria.

Fire Area 17 - AV-042 is a fire volume that contains cables and/or equipment associated with the fifth Vital Battery. The fifth Vital Battery is an installed spare battery that can be used if one of the existing batteries is out of service for maintenance or testing. This fire area was originally analyzed as a spare battery and then four additional analyses (042D-G) were performed with the fifth Vital Battery in place of each of the four normally credited batteries. The results of the initial screening were similar so further analysis as in Phase II.3, was performed as just one fire area.

The evaluation of this fire compartment in the IPEEE was performed using three case scenarios ranging from a minor fire in the compartment to a severe fire assumed to result in extensive damage. The results of this evaluation from the IPEEE are presented below.

IPEEE Evaluation of Area 757.0-A2 (6.9kV and 480V Shutdown Board Room A)				
Case	Description	Case Frequency (F1)	Probability of Core Damage (P2) CCDP	Core Damage Frequency F2 = (F1 x P2) FCCDP
Case 1	Minor fire, suppressed	1.43E-03	5.98E-05	8.55E-08
Case 2	Significant fire with manual suppression	9.72E-06	7.34E-03	7.13E-08
Case 3	Severe fire, assumed to result in extensive damage, similar to screening evaluation	1.08E-06	0.338	3.65E-07
Total		1.44E-03		5.22E-07

In this case there is the potential for a fire-related loss of offsite power. When diesel generator 1B-B is also failed, the CCDP for Case 3 approaches 1.0. While a safe-shutdown path would not be available for this area should a fire occur with diesel generator 1B-B out of service, it should be noted that the actual probability for a severe fire is very low. The FCCDP for Case 3 would then approach 1.08 E-06. This is also an area that is well traveled and contains the personnel and equipment access into the Auxiliary Building. A fire in this area has a high probability of being noticed.

Fire Area 24 - AV-049 is a fire volume that contains systems and/or components necessary to maintain long term decay heat removal. Safe shutdown was achieved through the use of the residual heat removal (RHR) Train B, CSS and the centrifugal charging pumps.

The evaluation of this fire compartment in the IPEEE was performed using three case scenarios ranging from a minor fire in the compartment to a severe fire which is assumed to result in extensive damage. The results of this evaluation from the IPEEE are presented below.

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IPEEE Evaluation of Room 757.0-A28 (Auxiliary Control instrument Room 2B)				
Case	Description	Case Frequency (F1)	Probability of Core Damage (P2) CCDP	Core Damage Frequency F2 = (F1 x P2) FCCDP
Case 1	Minor fire, suppressed	6.12E-05	5.98E-05	3.66E-09
Case 2	Significant fire with manual suppression	4.16E-07	7.34E-03	3.06E-09
Case 3	Severe fire, assumed to result in extensive damage, similar to screening evaluation	4.63E-08	0.338	1.56E-08
Total		6.17E-05		2.24E-08

Like the previous scenario with diesel generator 1B-B out of service the safe shutdown path credited is unavailable and the CCDP for Case 3 approaches 1.0. As with the previous scenario, while a safe-shutdown path would not be available for this area should a fire occur with diesel generator 1B-B out of service, it should be noted that the actual probability for a severe fire is very low and the FCCDP for Case 3 would approach 4.63 E-08.