



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

WBN-TS-01-04

10 CFR 50.90

DEC 14 2001

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

In the Matter of the  
Tennessee Valley Authority

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Docket No. 50-390

**WATTS BAR NUCLEAR PLANT (WBN) - TECHNICAL SPECIFICATION CHANGE  
TS-01-04, DIESEL GENERATOR (DG) RISK INFORMED ALLOWED OUTAGE TIME  
(AOT) EXTENSION - REQUEST FOR ADDITIONAL INFORMATION AND  
SUPPLEMENT TO AMENDMENT REQUEST**

TVA's letter dated August 7, 2001, submitted Technical Specification (TS) change TS-01-04. TVA held teleconferences with the NRC staff on November 5, 2001, and November 15, 2001, to discuss the TS change. The additional information requested by the staff during these teleconferences is itemized in the Enclosure 1 to this submittal along with TVA's response to each request.

The staff presented an additional question to TVA in a teleconference held on November 28, 2001. The principal concern of this question was the impact of Westinghouse Owners Group (WOG) Peer Review on the electrical portion of the WBN Probabilistic Safety Analysis (PSA). Prior to receipt of this question, TVA had planned to submit a supplement to the August 7<sup>th</sup> amendment request addressing the WOG review. Therefore, the information provided in Enclosure 2 addresses the question received on November 28<sup>th</sup> and supplements TVA's August 7, 2001, amendment request.

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As indicated in TVA's August 7, 2001, letter, the requested amendment has the potential to impact the scope of the upcoming spring refueling outage. Therefore, TVA requests NRC action on this amendment by early February 2002.

No regulatory commitments are identified in this letter. If you have any questions regarding this letter, 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 14th day of December 2001

E. Jeannette Long  
Notary Public

My Commission Expires May 21, 2005

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cc (Enclosure):

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**Enclosure 1**  
**NRC Request for Additional Information**  
**From the Review of TVA's Letter Dated August 7, 2001**  
**Technical Specification Change TS-01-04**  
**Diesel Generator (DG) Risk Informed Allowed Outage Time (AOT) Extension**

1. Information Requested:

Provide a version of Table 10, "Top Event Importance by Risk Achievement Worth (RAW) to Core Damage Frequency (CDF)," and Table 12, "Top Event Importance by RAW to Large Early Release Frequency (LERF)," which reflects the Rhodes Reactor Coolant Pump (RCP) Seal Loss of Coolant Accident (LOCA) Model.

TVA Response:

An updated version of the two tables reflecting the Rhodes model are included in Attachment 1 to this enclosure. The updated tables are designated as Table 10R and Table 12R to signify the use of the Rhodes model.

2. Information Requested:

Verify that the calculation for the seismic event probability documented on Page E1-26 of the August 7<sup>th</sup> submittal is for the requested 14 day AOT and if so, revise the calculation to reflect 14 days.

TVA Response:

TVA verified that the calculation was for a 14 day period and not for the 10 days specified in the August 7, 2001, amendment request. An updated version of Page E1-26 reflecting 14 days is included in Attachment 2 to this enclosure.

3. Information Requested:

Beginning on Page E1-19 there is a listing of equipment that should not be removed from service concurrent with a diesel generator. Verify that the listing for the Steam Generator (SG) Power Operated Relief Valves (PORVs) is correct.

TVA Response:

As described in TVA's letter dated August 7, 2001, the listing on Page E1-19 is equipment which is controlled in accordance with the guidelines established by TI-124, "Equipment to Plant Risk Matrix." TI-124 was reviewed and the listing for the SG PORVs was verified to be correct.

4. Information Requested:

Is there a means available where one of the two diesel generators (DGs) in a train can be substituted for the other DG in the train? As an example, if the 1A DG is out-of-service, can the 2A DG be connected to service the loads of the 1A DG?

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TVA Response:

Currently there are no provisions for the direct connection of one DG to the loads normally powered by another DG.

5. Information Requested:

The staff requested information regarding the impact of external events as discussed in the WBN Individual Plant Examination of External Events (IPEEE) on TVA's amendment request.

TVA Response:

NRC's safety evaluation of the WBN IPEEE is documented in a letter dated March 19, 2000. In addition, TVA's letter dated November 15, 2000, addressed questions raised by NRC during the review of a Technical Specification amendment for a one-time extension of the allowed outage time (AOT) for the 1B DG. One of the questions, Question 2, addressed the impact of external events, primarily seismic and fire considerations. The basis used for justification of the one-time amendment request is very similar to that used for TVA's amendment request dated August 7, 2001.

TVA's August 7, 2001, amendment request addresses seismic impact in Section B4-1k, "Seismic Considerations." The impact from a fire is discussed in Section B4-1l, "Fire Considerations."

6. Information Requested:

The staff requested information which clarifies the terminology TVA uses for the Steam Generator Power Operated Relief Valves (PORVs, i.e., atmospheric dump valves) and the Condenser Steam Dump Valves.

TVA Response:

The terms Steam Generator PORVs and Atmospheric Dump Valves (ADV) refer to the same set of valves. A good description of the PORVs/ADV can be found in the Technical Specification Bases for Limiting Condition for Operation (LCO) 3.7.4, "Atmospheric Dump Valves." The Condenser Steam Dump Valves are a series of nonsafety related valves that allow steam to discharge directly to the condenser. These valves are the preferred means of heat removal during periods when the main turbine is not in operation, but the main steam isolation valves are open. Additional information regarding both the PORVs/ADV and the Steam Dump Valves can be found in Section 10.3, "Main Steam Supply System," of the WBN Updated Final Safety Analysis Report.

**Attachment 1 to Enclosure 1**

**Table 10R - Top Event Importance by Risk Achievement  
Worth (RAW) to Core Damage Frequency (CDF)  
and  
Table 12R - Top Event Importance by RAW  
to Large Early Release Frequency (LERF)**

**Table 10R**  
**Top Event Importance By RAW to CDF Assuming**  
**Rhodes RCP Seal LOCA Model**

<b>RAW Ranking</b>	<b>Base Case 3-Day AOT</b>	<b>Proposed 14-Day AOT</b>	<b>DG 1A-A in Planned Maintenance</b>	<b>DG 1A-A in Corrective Maintenance</b>
1	VT1A (480V Transformer Room Ventilation)	VT1A	VT1A	VT1A
2	RT (Reactor Trip Breakers)	RT	RT	OG (Loss of 161-kV Grid)
3	AE(ERCW Train A pumps)	AE	AE	RT
4	AB(6.9kV Shutdown Bd. 2A)	AB	AB	AE
5	RW (RWST)	RW	RW	AB
6	AA(6.9kV Shutdown Bd. 1A)	AA	OG	RW
7	A1(480V Shutdown Bd. 1A1)	A1	AA	AA
8	DB (125V DC Bus II)	DB	A1	A1
9	B1(480V Shutdown Bd. 1A1)	B1	DB	DB
10	CE (ERCW Train A header)	CE	B1	B1

**Table 12R**  
**Top Event Importance By RAW to LERF Assuming**  
**Rhodes RCP Seal LOCA Model**

<b>RAW Ranking</b>	<b>Base Case 3-Day AOT</b>	<b>Proposed 14-Day AOT</b>	<b>DG 1A-A in Planned Maintenance</b>	<b>DG 1A-A in Corrective Maintenance</b>
1	VT1A	VT1A	VT1A	VT1A
2	AE	AE	OG	OG
3	RT	RT	AE	AE
4	OS (Operator action to start AFW given ESFAS fails)	OS	RT	RT
5	AB	AB	OS	DC (125V DC Bus III)
6	OG	OG	AB	AF
7	DC	DC	DC	DCAC (120V AC Vital Bus III)
8	CE	CE	CE	VNV2R (Recovery of Unit 2 480V Bd. Room Vent)
9	A1	A1	A1	LER (LERF Binning Top)
10	DE	DE	DCAC	CP (Containment Purge Isolation)

**Attachment 2 to Enclosure 1**

**Updated Version of  
Page E1-26 of TVA's Letter Dated August 7, 2001**

extremely low. Potential vulnerabilities of WBN to both seismic and fire issues were evaluated in the WBN Individual Plant Examination of External Events (IPEEE). These issues were discussed previously in WBN submittals to NRC for Technical Specification (TS) Change WBN-TS-00-014 - DG Action Completion Time Extension, which requested a one time change in the DG completion time to 10 days.

#### **B4-1k Seismic Considerations**

The seismic calculations have been revised to discuss a 14-day completion time and the updated model. The WBN design basis safe shutdown earthquake (SSE) is 0.18g. The mean annual frequency of exceedance for a SSE at WBN is 2.25E-4. The probability of a SSE occurring during the 14-day (0.038 years) period the DG is out of service maybe taken from the equation:

$$P = 1 - e^{-\lambda\tau}$$

Therefore,  $P(\text{SSE in 14 days}) = 1 - e^{(-2.25\text{E-}4)(0.038)} = 8.55 \times 10^{-6}$  which is a small probability.

The evaluation of seismic events performed as part of the IPEEE used the Electrical Power Research Institution (EPRI) Seismic Margins Assessment methodology and the review level earthquake was 0.3g. Both trains of WBN DGs were included in the list of components analyzed for safe shutdown of the unit following an earthquake. The DG Building was also analyzed. This evaluation provided adequate evidence of the ability of WBN to resist a seismic event up to the review level earthquake (RLE) and initiate a safe shutdown of the unit. The IPEEE program did not identify any adverse spatial interactions or any components with seismic capacity below the RLE level.

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. For this assessment, the WBN PSA model was modified with the LOOP frequency set equal to 1.0, DG 1A-A failed, the possibility of recovering offsite power during the first hour failed and the possibility of recovering diesel generator 1A-A during the next 24 hours failed. The possibility of recovering diesel generator 1A and any other diesel that failed during the 24 hour mission time was

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**Response to NRC's November 28, 2001,**  
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**Supplemental Response to TVA's Letter Dated August 7, 2001**

The following discussion relates to TVA's August 7, 2001, amendment request and the model used as a basis for the amendment request. WBN has reviewed the diesel generator allowed outage time (AOT) model with respect to Revision 3 of the Watts Bar Probabilistic Safety Assessment (PSA) and with respect to the Westinghouse Owners Group (WOG) Peer Review of Revision 3. Provided as follows is a summary of the areas reviewed and the pertinent comments from the Peer Review. Note that the Peer Review has not been finalized and the following information is based on the draft report.

The WOG Peer Review used the methodologies described in WCAP-15135, "PSA Peer Review Certification: PSA Self Assessment Process" and was performed between April 23-27, 2001 on Revision 3 of the WBN PSA. Revision 3 of the PSA extends the electric power system model updates used as a basis for TVA's amendment request dated August 7, 2001, (extension of the diesel generator AOT) to include other general updates and specific updates to the mechanical system models. The Peer Review of the Revision 3 model included the 11 general areas listed below:

PSA Element	Assigned Grade (Draft)
1. Initiating Events	3(C) <sup>1</sup>
2. Accident Sequence Evaluation	2
3. Thermal Hydraulic Analysis	3(C)
4. Systems Analysis	3
5. Data Analysis	3
6. Human Reliability Analysis	3(C)
7. Dependency Analysis	3
8. Structural Response	3
9. Quantification and Results Interpretation	3(C)
10. Containment Performance Analysis	3
11. Maintenance and Update Process	2

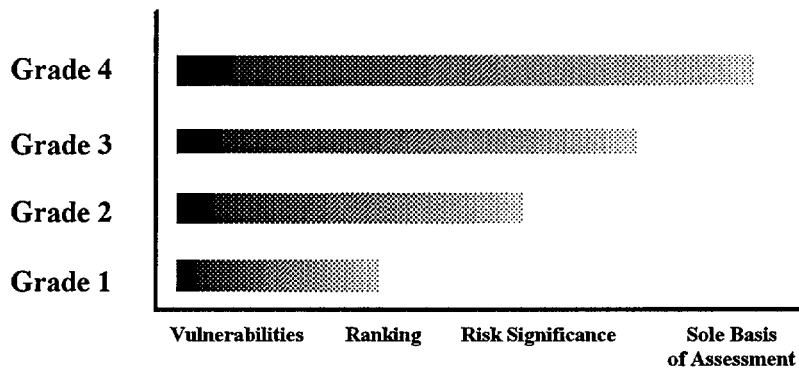
WBN received a grade 3 for systems analysis and the Electric Power System notebook was one of the notebooks reviewed by the WOG Peer team. With the exception of the one finding discussed below regarding diesel generator and 125V DC dependence, the team concluded that component level failures (both active and passive), common cause, and dependencies were appropriately treated. The team determined that the system notebooks provide reasonable documentation for the system analyses performed at WBN and are comparable to the system notebooks at other plants.

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<sup>1</sup> The "(C)" designation indicates that the grade is contingent upon implementation of improvements suggested by the WOG Peer Review.

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It should be noted that each of the PSA elements listed above were graded by the review team using the following scale. The assigned grades are reflected in the above table and indicate that the WBN PSA is basically adequate for risk informed applications once the specific review observations are addressed. The information provided in this enclosure discusses the relevant observations and TVA's initial disposition of the observations:



**Spectrum of Application Effectively  
Supported by the PSA**

Results of the review were categorized into significance levels, including "A" level facts and observations which are extremely important, "B" level facts and observations which are important but are not likely to affect the results and conclusions and may be deferred to the next update, "C/D" lesser facts and observations, and "S" superior treatment. For Revision 3, the Peer Review report which is currently in draft format, assessed seven A level facts and observations, forty one B level facts and observations and six superior findings. Since the A level observations are extremely important, these are discussed below with respect to TVA's August 7<sup>th</sup> amendment request:

**I. Accident Sequence Evaluation:**

- a. Successful bleed and feed when operators align to bleed and feed; does not query hardware availability.

**WBN Initial Disposition:**

This is a rule error in Revision 3; sensitivities performed during the Peer Review indicate low impact from correction of this error on model results. The model on which the August 7<sup>th</sup> amendment request was based did not question the hardware availability for bleed and feed explicitly. Because the success of bleed and feed is dominated by the operator action, success of bleed and feed was determined by the success of the operator action and the availability of all support systems for successful hardware operation. In Revision 3, a top event was added to the model for the hardware and the error was introduced at this time.

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- b. RISKMAN rules are coded in a way difficult for a reviewer to determine how the rules function.

WBN Initial Disposition:

The lack of experience with RISKMAN and/or Westinghouse Owners Group procedures along with the lack of comments or rules documentation made it difficult for the reviewers to follow the split fraction rules coded in the model. WBN is working on revising the model quantification notebook and adding additional comments to the split fraction rules to provide further clarification. WBN has used two nationally recognized PSA contractors to perform major model updates. Each contractor has a quality assurance process and the use of two independent contractors for different updates provides cross checking of modeling and assumptions in addition to WBN's internal reviews. This observation does not indicate any specific errors, just a matter of style of writing split fraction rules and ease of understanding.

II. Thermal Hydraulic Analysis:

- a. Successful bleed and feed with one Charging or one Safety Injection (SI) pump.

WBN Initial Disposition:

This is an inconsistency in prior revisions of the model between the success criteria analyses and the RISKMAN rules. This could have some impact on sequences where power was available in conjunction with loss of secondary side cooling. Preliminary sensitivity studies performed at the time of the Peer Review indicated the success was dominated by operator action.

III. Human Reliability Analysis:

- a. Sensitivity study is needed to identify sequences that, but for a low human error rate, would have been dominant contributors to core damage frequency.

WBN Initial Disposition:

A study is included in Revision 3, but had not been performed at the time of the Peer Review.

- b. Human Error Probabilities quantified independently, need to look at interdependence of actions in individual sequences.

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WBN Initial Disposition:

This action was planned and conducted for Revision 3, but was not complete at the time of the Peer Review. The lack of these sensitivity studies was identified to the Peer Review team by WBN at the entrance meeting for the team.

IV. Dependency Analysis:

- a. Common cause failure of eight check valves in thermal barrier system is used to represent all contribution from loss of seal injection.

WBN Initial Disposition:

This is a documentation error in the description of the model, the actual rule correctly models failure of any of the check valves as impacting the thermal barrier.

V. Quantification and Results Interpretation:

- a. Successful operation of Power Operated Relief Valve (PORV) block valves incorrectly recovers both PORV and Safety Valve stuck open failures.

WBN Initial Disposition:

This was a model simplification to gain recovery credit for stuck open PORVs which was non conservative for stuck open safety valves. While this could impact sequences that challenge the safety valves such as Anticipated Transient Without Scram (ATWS), it would not be significant for failures of the electric power systems or the diesel generators.

A review of the Level B findings and observations identified five observations that discussed the electric power system. The following presents a summary of these five Level B observations and the current WBN disposition of these issues along with and a statement of the impact on TVA's August 7, 2001, amendment request:

I. Systems Analysis:

- a. There is no documentation of a plant specific analysis for the EDG repair analysis or for AFW turbine-driven pump repair.

WBN Initial Disposition:

At the time the WBN Individual Plant Examination (IPE) was performed, WBN had not received an operating license and the diesel generator repair time was taken from a PLG (PSA contractor) study performed for the Zion nuclear station. During the revision 3 update to the WBN PSA diesel generator failure rates and

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maintenance frequency and durations were updated with plant specific data. This update included separating the maintenance terms into planned and forced maintenance terms. At the time of the update, WBN had experienced two diesel generators failures and so had limited plant specific data to update the earlier study with. The data for these forced maintenance durations were reviewed to verify it was bounded by the earlier Zion study. WBN does not intend to modify its electric power recovery analysis as a result of this observation and therefore, there is no impact to the conclusions defined in TVA's August 7, 2001, amendment request.

**II. Initiating Event:**

- a. The frequency for Loss of Offsite Power is updated with a Bayesian process. The plant specific data is listed as 0 failures in 20 years. A claim is made, but not substantiated, that the switchyard experience since 1980 is applicable to the current switchyard operation, thus allowing 20 years accumulated experience.

**WBN Initial Disposition:**

This item is similar to an RAI question that resulted from NRC's review of the TVA's amendment request dated October 30, 2000, for a one-time extension of the diesel generator AOT. The RAI was addressed in TVA's letter dated November 15, 2000, and indicated that the 161KV lines providing offsite power to the WBN switchyard come from the switchyard at TVA's Watts Bar Hydroelectric Station at the Watts Bar Dam. TVA's transmission division maintains these lines and associated records. WBN considers that this data is applicable even while the plant was under construction because the probability of an event that could cause a loss of offsite power was greater during the construction phase than it is during power generation. The reasons for this are that access to the switchyard is now controlled while during the construction phase, access to the switchyard was not as controlled and large pieces of heavy equipment were frequently moved about the site including in the switchyard area.

**III. Accident Sequence Evaluation:**

- a. The loss of multiple 120VAC panels can cause spurious actuation of key plant safety equipment. The failure of multiple 120VAC buses has occurred in the industry-especially due to the failure of the automatic transfer feature. This is not modeled as an initiator and is not in the current set of rules for the failure of multiple inverters, post trip.

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WBN Initial Disposition:

WBN is currently reviewing the issue of the loss of multiple AC boards. This review will include the consideration of both site specific and industry experience. However, WBN does not consider that any changes which may result from the review will significantly impact the loss of offsite power or diesel generator models used as a basis for TVA's August 7<sup>th</sup> amendment request.

IV. Quantification and Results Interpretation:

- a. The DG top events are noted as having a dependency on the 125V DC Battery Board (top event DA & DB). The 125V DC dependency should be modeled in the event tree.

WBN Initial Disposition:

During the WOG review, TVA discussed this issue with one of the PSA contractors and established that the dependency between the diesel generator and the 125V vital batteries is modeled in the electric power recovery analysis.

V. Human Reliability Analysis:

- a. Repair is modeled for some components. However, no operator action is used to start the repaired component (Turbine Driven Auxiliary Feedwater Pump). It is unclear as to whether this action is included in the data for the fraction of start failures that are recoverable. Clarify the treatment of the operator action for the repair. Ensure that it is consistent with the scenarios for which it is credited.

WBN Initial Disposition:

This modification was made to the model subsequent to the completion of the August 7<sup>th</sup> amendment request. If it is determined that this change is appropriate to include as a part of Revision 3, the CDF will be further reduced when compared to the model used for the August 7<sup>th</sup> amendment request.

Based on the review of the WOG Peer comments for impact on the August 7, 2001, amendment request, TVA has concluded that the WOG facts and observations are important to the overall WBN model but should not have significance with respect to the diesel generator AOT extension submittal. This application would be dominated by the modeling of such events as turbine driven feedwater, loss of offsite power, Reactor Coolant Pump (RCP) seal loss of coolant accident (LOCA) model, operator actions for offsite power recovery. Therefore, it is concluded that implementation of the Revision 3 model, once all internal reviews are complete, will not alter the conclusions presented in TVA August 7<sup>th</sup> letter. One additional factor which supports this conclusion is that the contribution to core damage frequency for the loss of offsite power event was calculated to be slightly more conservative for the diesel generator AOT amendment request than what was used in the model for Revision 3.