

July 1, 2002

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 — ISSUANCE OF AMENDMENT
REGARDING INCREASE IN ALLOWED OUTAGE TIMES FOR EMERGENCY
DIESEL GENERATORS (TAC NO. MB2720)

Dear Mr. Scalice:

The Commission has issued the enclosed Amendment No. 39 to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant, Unit 1. This amendment responds to your application of August 7, 2001, supplemented by letters of December 14, 2001, and April 1, 2002. The amendment changes Technical Specification LCO 3.8.1, "AC Sources Operating," action allowed outage time to restore an inoperable emergency diesel generator to operable status from 72 hours to 14 days.

A copy of the Safety Evaluation is also enclosed. Notice of issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

L. Mark Padovan, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures: 1. Amendment No. 39 to NPF-90
2. Safety Evaluation

cc w/enclosures: See next page

July 1, 2002

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 — ISSUANCE OF AMENDMENT
REGARDING INCREASE IN ALLOWED OUTAGE TIMES FOR EMERGENCY
DIESEL GENERATORS (TAC NO. MB2720)

Dear Mr. Scalice:

The Commission has issued the enclosed Amendment No. 39 to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant, Unit 1. This amendment responds to your application of August 7, 2001, supplemented by letters of December 14, 2001, and April 1, 2002. The amendment changes Technical Specification LCO 3.8.1, "AC Sources Operating," action allowed outage time to restore an inoperable emergency diesel generator to operable status from 72 hours to 14 days.

A copy of the Safety Evaluation is also enclosed. Notice of issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

L. Mark Padovan, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures: 1. Amendment No. 39 to NPF-90
2. Safety Evaluation

cc w/enclosures: See next page

Distribution:

PUBLIC	MPadovan	PGill (e-mail)
PDII-2 Reading	BClayton (Hard Copy)	MWohl
HBerkow	OGC	GHill (2 Hard Copies)
KJabbour, Acting SC	ACRS	RDennig
		PFredrickson, RII

Tech Spec Pages: ML021860188

ADAMS Accession No. ML021840589 & Package: ML021840595 *NLO with comments

OFFICE	PDII-2/PM	PDII-2/LA	DE/EEIB	OGC	PDII-2/(A)SC
NAME	MPadovan	BClayton	SE dated	RWeisman*	KJabbour
DATE	6/28/02	6/28/02	5/21/02	6/28/02	7/1/02

OFFICIAL RECORD COPY

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 39
License No. NPF-90

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (the licensee) of August 7, 2001, supplemented by letters of December 14, 2001, and April 1, 2002, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-90 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 39, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented no later than 60 days from the date of its issuance. Implementation of this amendment shall include updating appropriate site procedures to incorporate a cross-train alignment of diesel generators for contingency purposes during an extended diesel generator allowed outage time, as described in the licensee's letter dated April 1, 2002, and the NRC staff's safety evaluation for Amendment No. 39, dated July 1, 2002.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Kathan N. Jabbour, Acting Chief, Section 2
Project Directorate II
Division of Project Licensing Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: July 1, 2002

ATTACHMENT TO AMENDMENT NO. 39

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

Replace the following pages of the Appendix A Technical Specifications and associated Bases with the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

Remove Pages

3.8-2
—
3.8-3
3.8-4
3.8-5
B 3.8-8
B 3.8-9
B 3.8-10
B 3.8-11
—
B 3.8-12
B 3.8-13
B 3.8-14
B 3.8-15
B 3.8-19
B 3.8-36
B 3.8-36a

Insert Pages

3.8-2
3.8-2a
3.8-3
3.8-4
3.8-5
B 3.8-8
B 3.8-9
B 3.8-10
B 3.8-11
B 3.8-11a
B 3.8-12
B 3.8-13
B 3.8-14
B 3.8-15
B 3.8-29
B 3.8-36
B 3.8-36a

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 39 TO FACILITY OPERATING LICENSE NO. NPF-90

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

1.0 Introduction

Tennessee Valley Authority's (TVA's, the licensee's) letter of August 7, 2001, as supplemented by letters on December 14, 2001, and April 1, 2002, requested changes to the Watts Bar Nuclear Plant, Unit 1, Technical Specifications (TS). The requested changes to emergency diesel generator (DG) Limiting Conditions for Operation (LCO) Action Statements would revise the current 72-hour action completion time/allowed outage time (AOT) specified in the TS for LCO 3.8.1, "AC [alternating current] Sources Operating." Specifically, the revised TS would allow 14 days to restore an inoperable DG to operable status. The purpose of the proposed change is to give TVA needed flexibility to perform DG maintenance, particularly 6-year and 12-year maintenance, during power operation. The supplemental letters provided clarifying information and did not change the scope of the proposed action or the initial proposed no significant hazards consideration determination.

The requested amendment would add a new condition and associated actions to LCO 3.8.1 to allow one DG to be out of service for 14 days. The amendment request includes changes to the TS bases for the affected actions. The proposed change would provide margin for TVA to perform corrective maintenance that may be needed to resolve DG deficiencies that TVA discovers during equipment surveillances or scheduled preventive maintenance activities. This could potentially avert an unplanned shutdown. In addition, the proposed 14-day AOT for a single inoperable DG will allow TVA to perform on-line, preventive maintenance work that currently can only be performed during shutdown, or by entering the LCO multiple times. TVA indicates that performing DG maintenance at power using the proposed extended AOT would result in increasing DG availability during a refueling outage and a net decrease in risk. For reasons set forth below, the licensee's risk analysis indicates that increasing the AOT from the current 3 days to 14 days is not risk significant.

TVA's amendment request also proposes including a new Condition B, for one DG being inoperable, and changing the existing Conditions B through H to Conditions C through I. The "AND" portion of the completion time for the new Action B.4 would be 17 days from discovery of failure to meet the LCO. The Completion Time for determining if a common cause failure (CCF) is present would be reduced from 24 to 12 hours. The Completion Time for performing Surveillance Requirement (SR) 3.8.1.2 for the operable DGs would be reduced from 24 to 12 hours.

ENCLOSURE

The proposed AOT is based on the findings of both deterministic and probabilistic safety assessments. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the proposed changes to LCO 3.8.1, and the associated changes to the corresponding Bases, and finds them acceptable as discussed below.

2.0 Regulatory Evaluation

General Design Criterion (GDC) 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 requires, in part, that offsite electric power be supplied by two physically independent circuits designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. GDC 17 also requires that onsite electric power supplies have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure. In addition, this criterion requires provisions to minimize the probability of losing electric power from the remaining electric power supplies as the result of loss of power from the unit, the offsite transmission network, or the onsite power supplies. GDC 18, "Inspection and Testing of Electric Power Systems," requires that electric power systems that are important to safety be designed to permit appropriate periodic inspection and testing. Section 50.36 of 10 CFR, "Technical Specifications," requires the TS in a license to include LCOs, which include AOTs for equipment required for safe operation of the facility. Section 50.65 of 10 CFR, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," identifies the objective of minimizing unavailability of systems, structures and components, due to monitoring or preventive maintenance. Regulatory Guide (RG) 1.93, "Availability of Electric Power Sources," gives guidance about operating restrictions (i.e., AOTs) if the number of available ac sources is less than the TS LCO requires.

The offsite and onsite, standby ac power systems at Watts Bar are designed to comply with the following:

- GDC 17
- GDC 18
- RG 1.6, Rev 0
- RG 1.9, Rev 3
- Institute of Electrical and Electronic Engineers Standard 308-1971

TVA is requesting the proposed changes in accordance with 10 CFR 50.90 to assure continued compliance with GDC 17 and GDC 18.

As described in Watts Bar's Final Safety Analysis Report and TVA's letter of August 7, 2001, Watts Bar has four Class 1E, DG sets to provide onsite emergency ac power to essential safety systems in the event of a loss of offsite power (LOOP), degraded voltage on the 6.9 kV shutdown boards, and/or a safety injection signal. The DG power system is divided into two redundant load groups. Each load group has two power trains (train 1A and 2A; train 1B and 2B) and supplies power to all safety-related plant loads. There are four 6.9 kV shutdown boards that are arranged into four electrical power trains (two per unit) with two boards associated with each load group and each unit. Load group A is located in Unit 1, and load group B is in Unit 2. Two DGs in the same train are needed to mitigate a design-basis event.

Separate DGs are provided for each shutdown board to provide power when offsite power is not available. Each DG set is complete with its own air starting system, fuel supply system, and automatic control circuitry. The DGs are designed, installed, and tested to requirements that ensure their availability. The DGs are also designed to operate in parallel with the normal electrical power source for test and exercise purposes. Each DG set consists of two diesel engines directly connected to a common 6.9 kV, 60 hertz, 3-phase, ac generator. Each DG has a continuous rating of 4400 kilowatts (kW) (5500 kVA) and short-time rating of 4840 kW (6050 kVA). The four DGs were originally sized to supply the loads of both Units 1 and 2. Since Unit 2 was not completed, the four DGs have ample capacity to supply the Unit 1 loads.

For normal offsite-power operation, 6.9 kV common station service transformers C and D supply each 6.9 kV shutdown board through common station service switchgear C and D circuits and shutdown supply breakers. Also, circuits and normally-open breakers are provided from common station service switchgear C and D to supply alternate offsite power to the shutdown boards. Further, circuits and breakers (maintenance circuits) from 6.9 kV startup buses A and B can be manually aligned to supply offsite power to the 6.9 kV shutdown boards. The 6.9 kV startup buses A and B are supplied from the common station service transformer A. The common station service transformers A, B and C are supplied from the 161 kV offsite power system.

3.0 Deterministic Evaluation

The current Watts Bar, Unit 1 TS LCO 3.8.1 requires two separate and independent DGs to be operable in Modes 1, 2, 3, and 4. This redundancy ensures that at least one of the onsite ac power sources will be operable during accident conditions, coincident with an assumed LOOP and single failure of the other onsite ac power (DG) source. If one or more DGs in one train become(s) inoperable for any reason, Action B.4 of the LCO requires, in part, that the inoperable DG be restored to operable status within 72 hours AND 6 days from discovery of failure to meet the LCO. Otherwise, the plant must transition to hot standby within the next 6 hours and to cold shutdown within the following 36 hours. If only a single DG is inoperable, TVA proposes to restore it to operable status within 14 days in lieu of the current 72 hours. TVA also proposes to revise the associated TS bases. TVA proposes the following changes to TS 3.8.1, "AC Sources - Operating."

- The current TS LCO Action items B through H of the "Condition," column would be revised to Action items C through I and a new condition "B" would be included for one DG being inoperable.
- The Completion Time for restoring a single DG in new Action B.4 would be set at 14 days and 17 days from discovery of failure to meet the LCO.
- Action C (current Action B) would be revised to apply to two (instead of one or more) inoperable DGs in a single train.
- The Completion Time for determining that DGs are not inoperable due to a CCF (new Action B.3.1 and revised Action C.3.1) would be reduced from 24 to 12 hours.
- The Completion Time for performing SR 3.8.1.2 for the operable DGs (new Action B.3.2 and revised Action C.3.2) would also be reduced from 24 to 12 hours.

The main purpose of the proposed change to LCO 3.8.1 is to extend the AOT for a single DG from the current 72 hours to 14 days to allow TVA to perform major 6-year and 12-year DG overhauls while on line. TVA has demonstrated, based on a probabilistic safety assessment (PSA) basis (see Evaluation of PSA in Section 3.2), that performing on-line maintenance at power using the proposed extended DG AOT would not result in a significant increase in risk. Nevertheless, the staff also reviewed the amendment using a deterministic approach.

3.0.1 Risk of Station Blackout

In evaluating TVA's request to extend the allowed AOT for a single DG, the staff considered whether the extension would erode the decrease in severe accident risk achieved with the Station Blackout (SBO) Rule (10 CFR 50.63). TVA's submittal discussed the impact of the AOT on SBO, and stated that extending the AOT would not change the assumptions and results of the SBO analysis, and will maintain compliance with 10 CFR 50.63. TVA said that the reliability of Watts Bar's DGs will be maintained at or above the selected SBO target level, and the effectiveness of maintenance on the DGs and support systems will be monitored pursuant to the Maintenance Rule (10 CFR 50.65).

In the event that a DG is inoperable in Modes 1-4, the existing LCO 3.8.1 requires that all required systems, subsystems, trains, components, and devices that depend on the remaining operable DG as a source of emergency power must be verified operable within 4 hours. For planned outages of a DG, TVA would verify this before removing it from service. This required action assures that a LOOP will not result in a complete loss of safety function of critical systems during the period one of the DGs is inoperable.

3.0.2 DG Availability Due to Online Maintenance

The staff evaluated TVA's request for the AOT extension to ensure that the 14-day AOT would also be consistent with the objective and intent of 10 CFR 50.65. In this regard, the staff sought assurance that increased on-line preventive maintenance activities would not significantly reduce the overall availability of the DGs. TVA provided DG availability data in its submittal in support of the requested AOT extension. TVA stated that unavailability is calculated separately for each DG set based on the time spent in LCOs 3.8.1 or 3.8.2. TVA reviews updated unavailability and unreliability data periodically. TVA said that the actual unavailability of the four DGs for the 24 months ending on April 30, 2001, was less than 1 percent for DGs 1A-A, 2A-A, and 2B-B, and was 1.64 percent for DG 1B-B. The higher unavailability for the 1B-B DG was attributed to a maintenance activity involving replacement of the electrical generator. The unavailability performance criterion for the DGs at Watts Bar is less than 2 percent. Additionally, TVA stated that it schedules work only if the work is anticipated to take 50 to 60 percent of the current 3-day AOT. The licensee states that in order to perform major DG maintenance, this requires splitting the maintenance into several parts. TVA states further that this practice requires multiple LCO entries, multiple post-maintenance tests, and additional resources and materials management. TVA estimates that the proposed 14-day completion time would reduce DG unavailability by approximately 50 percent for the upcoming 6-year and 12-year DG maintenance.

Further, 10 CFR 50.65(a)(4) requires licensees to assess and manage the increase in risk that may result from proposed maintenance activities before performing such activities. Before

performing maintenance activities on a DG during the requested extended AOT, TVA must, pursuant to 10 CFR 50.65(a)(4), assess and manage any increase in risk that may result from such activities. TVA performs this assessment in accordance with the Configuration Risk Management Program (CRMP), as described in the Administrative Procedure that implements 10 CFR 50.65. This ensures that PSA-informed processes are in place to assess the overall impact of maintenance activities on plant risk before entering the LCO action statement for planned activities.

3.0.3 Offsite Power Availability and Reliability

The staff reviewed the offsite power system design and historical losses of offsite power at Watts Bar to ensure that a reliable offsite power system is available for use during an extended DG AOT. TVA provided an extensive discussion concerning the offsite transmission network at Watts Bar to show that it has a very strong offsite power system. TVA records dating back to 1977 show that Watts Bar has not had a LOOP. Watts Bar is connected to two 161-KV transmission lines and five 500 kV lines. The two 161 kV lines provide preferred power to the safety buses. The 161 kV lines are connected to a hydro plant located about 1.5 miles from the Watts Bar nuclear power plant. The 161 kV lines are routed to minimize the likelihood of simultaneous failure. TVA concluded that the expected frequency of grid-related losses of offsite power for Watts Bar will not exceed once per 20 years. TVA indicated that it has improved the preferred power supply system and the plant/grid interfaces to enhance reliability and voltage regulation to the safety boards during all modes of plant operation. Additionally, TVA performs comprehensive transmission system studies on a 3-year cycle to ensure that Watts Bar can withstand a loss-of-coolant accident (LOCA) and a simultaneous transmission contingency.

3.0.4 DG Alignment and Interconnections

As a part of its review of the proposed amendment, the staff asked TVA, during the teleconference on February 19, 2002, whether DGs from one train could be interconnected to the opposite train, if required, to power safe-shutdown loads. The staff wanted to evaluate the capability and cross-train alignment of the remaining DGs in the event of a LOOP and failure of an additional DG during the extended maintenance outage. TVA provided information regarding the capabilities of the DGs and onsite electrical system in its letter of April 1, 2002, indicating that a means exists to interconnect the DGs to provide one train of safe shutdown power. TVA's submittal of April 1, 2002, provided a schematic that showed various breaker alignments for cross-connecting DGs of one train to the opposite train. The various breaker alignments documented in the schematic show that TVA can cross-connect DGs 1A-A and 2A-A to power safe shutdown boards 1B-B and 2B-B. Similarly, TVA can cross-connect DGs 1B-B and 2B-B to power safe shutdown boards 1A-A and 2A-A. Aligning breakers for cross-connecting DGs of one train to the opposite train requires manual actions locally that could be accomplished in less than an hour. In its letter of April 1, 2002, TVA said it would update appropriate site procedures to incorporate a cross-train alignment of DGs for contingency purposes during the extended AOT. TVA also said it would have the procedures formally approved and released for use when incorporating the proposed amendment into the TS. The cross-train interconnection capability of DGs ensures that two DGs are available for contingency purposes to power one train of safe shutdown loads for a design basis event during the extended maintenance outage.

3.0.5 Additional Operational Restrictions

The staff's evaluation of the proposed DG AOT amendment is based on the findings of both deterministic and PSAs, as previously mentioned. TVA stated that procedures are in place at Watts Bar for work control risk evaluation processes. TVA performs a risk assessment before beginning online maintenance. TVA's risk-assessment guidelines use the results of the Watts Bar probabilistic safety analysis, along with other safety considerations such as the TS to determine which systems, components and equipment groups may be maintained online. The licensee assesses scheduled activities before starting work to maximize safety (reduce risk) when performing on-line work. Also, in support of this amendment, TVA identified additional operational restrictions that would be invoked during the extended DG AOT. Therefore, TVA will incorporate into the TS Bases for LCO 3.8.1 the following additional compensatory measures:

- Verify that the offsite power system is stable. This action will establish that the offsite power system is within single-contingency limits and will remain stable upon the loss of any single component supporting the system. If a grid stability problem exists, the planned DG outage will not be scheduled.
- Verify that no adverse weather conditions are expected during the outage period. The planned DG outage will be postponed if inclement weather (such as severe thunderstorms or heavy snowfall) is projected.
- Do not remove from service the ventilation systems for the 6.9 kV shutdown board room, the elevation 772 transformer room; or the Unit 2 480-volt shutdown board room, concurrently with the DG, or implement appropriate compensatory measures.
- Do not remove the reactor trip breakers from service concurrently during planned DG outage maintenance.
- Do not remove the turbine-driven auxiliary feedwater (AFW) pump from service concurrently with a Unit 1 DG outage.
- Do not remove the AFW level control valves to the steam generators from service concurrently with a Unit 1 DG outage.
- Do not remove the opposite train residual heat removal (RHR) pump from service concurrently with a Unit 1 DG outage.

The procedures governing these measures are described in the Updated Final Safety Analysis Report, and the licensee may change them only upon evaluating the changes under the provisions of 10 CFR 50.59. This regulation provides adequate control over these measures.

Based on the above, the staff finds the proposed increase in the AOT from 3 days to 14 days given in new Action B.4 and the increase in completion time from 6 to 17 days for restoring a single DG from discovery of failure to meet the LCO acceptable from a deterministic point of view.

3.0.6 Additional TS Changes

In its submittal of August 7, 2001, TVA proposed the following additional changes to LCO 3.8.1:

- The current LCO Action items B through H of the “Condition” column have been re-lettered as Action items C through I, and a new Condition B was added for one DG being inoperable in either Train A or Train B. The original Condition B addressed the case of one or more DGs being inoperable in either train, and has been re-lettered as Condition C to address the case of two DGs being inoperable in either train. No changes are made in the AOT for the condition in which two DGs are inoperable in one train. The new Conditions B and C specify action statements for one and two DGs respectively and, therefore, improve the specifications. This change is administrative in nature and therefore acceptable.
- A Completion Time for determining that DGs were not inoperable due to a CCF (new Action B.3.1 and revised Action C 3.1) is reduced from 24 to 12 hours. The Completion Time for performing SR 3.8.1.2 for the operable DGs (new Action B.3.2 and revised Action C.3.2) is also reduced from 24 to 12 hours. The failure of a DG increases the conditional probability for CCFs between the DG known to have failed and the remaining DGs. The reduction in the time needed to perform the CCF determination will allow plant risk of entering into an LCO for corrective maintenance to meet the incremental conditional core damage probability (ICCDP). The staff finds that reducing the time for determining CCFs from the current TS-specified 24 hours to 12 hours is more conservative and, therefore, is acceptable.
- TVA proposes to delete the footnote to current Action B.4 which applied until the beginning of the Cycle 4 refueling outage. The footnote was implemented as Amendment 30 to allow a one-time TS change to current Action B.4 to extend the DG 1B-B AOT from 3 days to 10 days to replace an electrical generator. Since the Cycle 4 refueling outage was completed in April 2002, the staff finds deleting the footnote to be acceptable.

3.1 Deterministic Conclusion

The staff concludes that although the extension of an AOT for a single inoperable DG from the current 72 hours to 14 days is contrary to the recommendations of RG 1.93, the proposed change is acceptable. The staff’s conclusion is based on the following factors:

- The longer AOT would reduce the number of entries into the LCO, as well as the number of DG starts for major DG maintenance activities.
- The extension will not erode the decrease in severe accident risk that was achieved with implementing the SBO Rule (10 CFR 50.63).
- The 14-day AOT is consistent with the objective and intent of the Maintenance Rule (Appendix A to 10 CFR 50.65).

- TVA will update the appropriate site procedures to incorporate a cross-train alignment of DGs for contingency purposes during the extended AOT to have one train of power available during the extended outage.
- TVA will perform risk assessments in accordance with the CRMP before entering into the extended DG maintenance outage.
- Watts Bar has not experienced a LOOP since 1977.

Furthermore, the staff believes that TVA's commitments to implement other restrictions and compensatory measures during the extended DG AOT enhances the availability of the remaining sources of power and minimizes the occurrence of an SBO. The staff also concludes that the proposed changes do not affect Watts Bar's compliance with the requirements of GDC 17 and 18, and that the associated changes to the Bases are consistent with the requested DG AOT extension.

3.2 Evaluation of Probabilistic Safety Assessment

TVA used the following RGs to evaluate the risk associated with the proposed amendment:

- RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk Informed Decisions on Plant Specific Changes to the Licensing Bases"
- RG1.177, "An Approach for Plant-Specific Risk Informed Decision Making: Technical Specifications"

TVA's evaluation for extending the AOT from 3 to 14 days for a single DG was based on a three-tiered approach to assess the risk associated with the proposed amendment. The first tier evaluated the PSA model and the impact of the change on plant operational risk. The second tier addressed the need to prevent potentially high-risk configurations if additional equipment will be taken out of service simultaneously, or other risk-significant operational factors such as concurrent system or equipment testing are involved. The third tier evaluated TVA's configuration risk management program to ensure that equipment removed from service prior to, or during, the proposed AOT will be appropriately assessed from a risk perspective. Each tier and associated PSA insights are discussed below.

3.2.1 Tier 1

Using the Rhodes Reactor Coolant Pump (RCP) Seal Leakage Model, TVA computed the change in Core Damage Frequency (CDF) to be $3 \text{ E-7}/\text{reactor-yr}$. The change in Large Early Release Frequency (LERF) was computed to be $3 \text{ E-8}/\text{reactor-yr}$. Both of these values are very small as compared to the guidelines of RG 1.174. The licensee computed the incremental conditional core damage probability (ICCDP) to be 7.05 E-7 for preventive maintenance, and 7.16 E-7 for corrective maintenance. Both of these values are close to the recommended guideline value (5E-7) of RG 1.177. The TVA-computed values of Incremental Conditional Large Early Release Probability (ICLERP) are 3.51 E-8 for preventive maintenance (within the 5 E-8 RG 1.177 guideline), and 5.59 E-8 for corrective maintenance (close to the 5 E-8 RG 1.177 guideline). All of the above computed values of delta CDF, delta LERF, ICCDP, and ICLERP are reasonable and acceptable to the staff.

3.2.2 Tier 2

In planned maintenance, TVA removes equipment from service using a 12-week schedule and according to the guidelines established by Technical Instruction 124, "Equipment to Plant Risk Matrix." The matrix provides that TVA will not remove the following equipment from service concurrent with removing a DG from service:

- reactor protection system
- essential raw cooling water headers and pumps
- refueling water storage tank
- containment sump and equipment affecting high-pressure recirculation
- an offsite power line or switchyard equipment
- 6.9-KV shutdown circuit boards
- 480-volt shutdown circuit boards
- 120-volt ac power
- component cooling water header 1A or 1B
- steam generator atmospheric steam dumps
- pressurizer safety-relief valves

Additionally, TVA specified compensatory measures involving operational restrictions it would take when performing extended-scheduled maintenance on a DG as shown in Section 3.0.5 "Additional Operational Restrictions" above.

3.2.3 Tier 3

The Maintenance Rule (in particular, (a)(4) of 10 CFR 50.65) became effective in November 2000. The requirements of Section 50.65(a)(4) and TS incorporating CRMP provisions which are identified in RG 1.177, contain substantial overlap, as acknowledged by the staff in the "Statement of Considerations," for 10 CFR 50.65 (see 64 *Federal Register*, 38551, 38552-53, July 19, 1999). The staff indicated therein that after the revision to 10 CFR 50.65 is effective, it would expeditiously support licensee requests to remove CRMP requirements from plant TS. Thus, the licensee did not address the CRMP in its submittal, which is acceptable.

3.2.4 PSA Quality

TVA submitted the Watts Bar Individual Plant Examination (IPE) to the NRC on September 1, 1992. Dr. Ian Wall, an outside TVA consultant, independently reviewed the IPE. TVA submitted Revision 1 to the IPE on May 2, 1994, and the staff issued a safety evaluation on October 5, 1994. Since that time, the PSA has undergone one additional revision. ERIN

Engineering, Inc. prepared Revision 2 to the Watts Bar PSA for the licensee, and this is the basis for the present submittal. TVA states that the use of ERIN Engineering, Inc., for Revision 2 also served as an independent check of the original model created by Pickard, Lowe, and Garrick, Inc. (PLG). Revision 2 of the PSA was used by the staff during its review of TVA's implementation of Maintenance Rule requirements.

The licensee updates its PSA model periodically, as needed. The general guidance for this activity is contained in the licensee's administrative procedures. Watts Bar is in the process of completing an update, and the Revision 3 model has just undergone a Westinghouse Owners Group (WOG) peer review. The draft peer review report was recently issued. TVA anticipates that its independent review and resolution of pertinent WOG peer review comments will be completed later this year.

With respect to Revision 3, it should be noted that the electric power portion of the model, including the electric power event trees, electric power systems analysis, and electric power recovery model, were revised to create the PSA version used in this amendment request. TVA does not anticipate any risk-increasing changes to the evaluation performed for this submittal when the evaluation is confirmed using Revision 3. In reviewing Revision 3, the WOG Peer Review Group used the methodologies described in WCAP-15135, "PSA Peer Review Certification: PSA Self Assessment Process." The assessment was performed during the period April 23 — 27, 2001, on Revision 3 of the Watts Bar PSA. Revision 3 of the PSA extends the electrical power system model updates used as a basis for the licensee's amendment request of August 7, 2001. The extended updates include other general and specific updates, not impacting this submittal, to the mechanical system models. The WOG peer review of the Revision 3 model included the following 11 general areas:

- initiating events
- accident sequence evaluation
- thermal hydraulic analysis
- systems analysis
- data analysis
- human reliability analysis
- dependency analysis
- structural response
- quantification and results interpretation
- containment performance analysis
- maintenance and update process

The WOG judged TVA's PSA to be of adequate quality, along with deterministic engineering considerations, to form a basis for TS changes, such as the AOT extension requested in the present submittal. The WOG team concluded that component-level failures (both active and passive), common cause failures, and dependencies were appropriately treated. The team determined that the system notebooks provide reasonable documentation for the systems analyses performed at Watts Bar and are comparable to the system notebooks at other plants.

The licensee has performed a self-assessment of the current Revision 2 to the Watts Bar PSA. Items identified in the self-assessment as affecting the electric power systems and recovery are in the model which forms the basis for the present submittal. EQE and PLG performed this model update for TVA. As a result of the self-assessment, the licensee:

- changed the definition of LOOP to show that it includes the loss of both the 161 kV and 500 kV grids
- modified the model to include the loss of just one switchyard
- changed the electric power recovery model to (1) credit recovering just the Unit 1 DGs, and (2) consider the effect of a DG out of service for maintenance
- combined electric power event trees to allow basic event importance measures to be calculated
- created an intermediate, top event to model loss of the 480-volt transformer room ventilation system

The licensee made other key changes to the model, in addition to those identified during the licensee's self-assessment. The licensee:

- Incorporated plant-specific equipment performance data for the DGs, the fuel oil system, ventilation equipment, and turbine-driven AFW pump. This update reflects plant equipment performance through the end of Cycle 2. The effect of this update on the model was a decrease in CDF for the DGs, fuel oil system, and turbine-driven AFW pump, and an increase in CDF for the fans and chillers. In particular, the zero failures for the turbine-driven AFW pump lowered the CDF contribution from SBO sequences.
- Added several CCF components, such as dampers, which resulted in an increase to the CDF.
- Introduced the Rhodes RCP Seal Leakage LOCA accident model, upon which the present staff evaluation depends, along with a parallel Brookhaven National Laboratory model.
- Took credit for the operators' use of the pressurizer power operated relief valves to depressurize the reactor coolant system during an SBO. Earlier model revisions gave no credit for this action. This change to the model reduces the reactor coolant system pressure for many sequences in which RCP seal LOCAs occur and, therefore, lowers the leak rates. The lower leak rates give more time for recovery, and thus reduce the overall frequency of core damage from SBO sequences.

In the staff's experience, the changes TVA is incorporating into the Watts Bar PSA, Revision 3, represent reasonable refinements to the model. Based on the staff's judgment, as set forth above, the staff finds them to be adequate and acceptable.

3.2.5 External Events

a. Seismic Concerns

The licensee's design basis safe shutdown earthquake (SSE) is 0.18g. The mean annual frequency for exceeding an SSE at Watts Bar is 2.25 E-4/yr . The probability of an SSE occurring during the 14-day (.038 yr.) period during which the DG is out of service is $1 - \exp(-2.25 \text{ E-4})(.038) = 8.55 \text{ E-6}$; a very small number.

The evaluation of seismic events performed as part of the Individual Plant Examination for External Events (IPEEE) used the Electric Power Research Institute Seismic Margins Assessment methodology, with a review level earthquake (RLE) of .3g. Both trains of Watts Bar DGs were included in the list of components evaluated for safe shutdown of the unit following an earthquake. The DG building was also evaluated. The evaluation of seismic events provided adequate evidence of the ability of Watts Bar to resist a seismic event up to the RLE and initiate a safe shutdown of the plant. The IPEEE program did not identify any adverse spatial interactions or any components with seismic capacity below the RLE level.

In the Watts Bar design bases, the switchyard is assumed to fail during a design-basis earthquake. The conditional core damage frequency of an earthquake was assumed to be that of an assured LOOP. For this assessment, the licensee's 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 DG 1A-A during the next 24 hours failed. The possibility of recovering DG 1A-A and any other DG that failed during the 24-hour mission time was also failed. This is a conservative assumption since recovery of a failed DG or a DG in maintenance is possible and the results of the licensee's quantification show the conditional core damage frequency to be 1.61 E-1/yr .

The CDF due to a design basis or larger earthquake during the 14-day DG outage is $(8.55 \text{ E-6})(1.61 \text{ E-1/yr}) = 1.38 \text{ E-6/yr}$. If an earthquake were to be considered one of the initiating events, DG1A-A failed, and there was no recovery of offsite power or any DG that failed, the licensee estimates that the CDF would increase approximately 3 percent.

Additionally, when performing a Seismic Margins Assessment with an RLE of .3g compared with the SSE of .18 g, TVA's IPEEE indicated that both trains of DGs could withstand a seismic event up to the RLE and initiate a safe shutdown. These conclusions in accordance with the guidance of RG 1.177, p. 16, which states that "External Events and Level 2 issues are treated qualitatively or quantitatively, or both."

In conclusion, the probability of an SSE occurring during the 14-day DG outage is low, and the opposite train of DGs would be available to provide safe shutdown of the unit.

b. Fire Concerns

Based on information provided in NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," TVA concluded that the site was reasonably clear of combustible materials and, therefore, external fires were not considered in the Watts Bar IPEEE. The effects from an internal fire were examined in the IPEEE using the Fire Induced Vulnerabilities methodology. The licensee did not identify any fire-induced vulnerabilities during the evaluation.

Each DG set is housed in its own room. Physical separation requirements are provided for each room as well as fire suppression from a carbon dioxide system. In the IPEEE report, DG Rooms 1A, 2A, 1B, and 2B are Fire Areas 49, 50, 51, and 52 respectively. TVA determined the fire-related CDF for the 1B-B DG room was 1.52 E-7/yr. This probability may increase during repair work on DG1B-B due to the potential for introducing additional transient combustibles. These transient combustibles, if present, will be controlled, and TVA will post any necessary fire protection and impairment permits according to plant procedures. Additionally, train A equipment will be protected to ensure safe shutdown of the unit.

c. Additional Concern — Protection of Opening in Auxiliary Building

An opening originally existed in the concrete canopy on the Unit 2 side of the auxiliary building. This introduced a potential vulnerability due to high wind and tornado missiles. Subsequently, TVA installed a protective steel shield structure over this opening to remove this potential vulnerability.

The staff concludes from its IPEEE safety evaluation report that the results were adequately complete and reasonable considering the design and operation of the plant. The staff concludes that the aspects of seismic events, fires, and high winds were adequately addressed, and other external events were not of substantial consequence.

3.3 PSA Conclusion

The staff concludes that the impact on plant risk of relaxing the Watts Bar DG AOT from 3 to 14 days for a single DG is very small for both internal and external events. The staff, thus, finds the proposed change to be acceptable.

4.0 State Consultation

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 Environmental Consideration

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding

that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (66 FR 48292). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 Conclusion

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: Paul S. Gill, NRR
Millard L. Wohl, NRR

Date: July 1, 2002

Mr. J. A. Scalice
Tennessee Valley Authority

WATTS BAR NUCLEAR PLANT

cc:

Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Paul L. Pace, Manager
Licensing and Industry Affairs
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Mr. Jack A. Bailey, Vice President
Engineering & Technical
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Larry S. Bryant Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Mr. William R. Lagergren
Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Senior Resident Inspector
Watts Bar Nuclear Plant
U.S. Nuclear Regulatory Commission
1260 Nuclear Plant Road
Spring City, TN 37381

General Counsel
Tennessee Valley Authority
ET 11A
400 West Summit Hill Drive
Knoxville, TN 37902

Rhea County Executive
375 Church Street
Suite 215
Dayton, TN 37321

Mr. Robert J. Adney, General Manager
Nuclear Assurance
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

County Executive
Meigs County Courthouse
Decatur, TN 37322

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

Ms. Ann P. Harris
341 Swing Loop Road
Rockwood, Tennessee 37854