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

FEB 28 1996

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) - PROPOSED LICENSE AMENDMENT, SLAVE RELAY TEST FREQUENCY (TAC NO. 94425)

In accordance with 10 CFR 50.90, the Tennessee Valley Authority (TVA) requests that Appendix A of Facility Operating License NPF-90, Watts Bar Unit 1 Technical Specifications, be amended to revise the surveillance frequency for Westinghouse type AR relays, used as solid state protection system slave relays or auxiliary relays, from quarterly to a refueling outage frequency.

Watts Bar is the lead plant for the Westinghouse Owners Group for relaxation of the slave relay test frequency for Westinghouse type AR relays. The relaxation of the surveillance frequency for Westinghouse type AR relays is based on information contained in Westinghouse Electric Company (Westinghouse) reports WCAP-13877 (proprietary), "Reliability Assessment of Westinghouse Type AR Relays Used as SSPS Slave Relays," and WCAP-14129 (non-proprietary), "Reliability Assessment of Westinghouse Type AR Relays Used as SSPS Slave Relays." WCAP-13877 and WCAP-14129 are included as Enclosures 4 and 5. Diablo Canyon is the lead plant for the Westinghouse Owners Group for relaxation of the slave relay test frequency for Potter & Brumfield MDR Series relays. The Diablo Canyon license amendment request is currently being reviewed by the NRC staff.

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A description of the proposed amendment, and the bases for it, is included in Enclosure 1. TVA's analysis of the issue of no significant hazards consideration, as required by 10 CFR 50.91(a), is included in Enclosure 2. Proposed revised technical specification pages are included in Enclosure 3.

The proposed amendment has been reviewed by the Watts Bar Plant Operations Review Committee and the TVA Nuclear Safety Review Board.

WCAP-13877 contains information proprietary to Westinghouse. Accordingly, Enclosure 6 includes a Westinghouse Application for Withholding Proprietary Information from Public Disclosure, and an accompanying Affidavit CAW-95-816 signed by Westinghouse, the owner of the information. Also included are a Proprietary Information Notice and a Copyright Notice. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission, and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR 2.790 of the Commission's regulations. TVA requests that the Westinghouse proprietary information be withheld from public disclosure in accordance with 10 CFR 2.790.

Correspondence regarding the proprietary aspects of the Westinghouse report listed above, the Copyright Notice, or the supporting affidavit, should reference Westinghouse letter CAW-95-816 and be addressed to N. J. Liparulo, Manager, Nuclear Safety Regulatory and Licensing Activities, Westinghouse Electric Corporation, P. O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Although the proposed changes are not required to address an immediate safety concern, TVA would like to implement them as soon as possible to reduce the risk of inadvertent actuation of engineered safety features equipment and reactor trips by reducing the number of surveillance tests performed at power. Additionally, the reduction in surveillance testing will save TVA more than $100,000 over the life of the plant and, therefore, would be considered a cost beneficial licensing action. TVA requests that review and approval of this request be given a high priority.

In accordance with 10 CFR 50.91(b)(1), a copy of this proposed license amendment is being forwarded to the State Designee for the State of Tennessee.

FEB 28 1996

If you should have any questions, please contact John Vorees at (423) 365-8819.

Sincerely,

D. V. Kehoe
Nuclear Assurance
and Licensing Manager

Sworn to and subscribed before me
this 28th day of February 1996

E. Jeannette Long
Notary Public
My Commission Expires July 1, 1997

Enclosures
cc: See page 4

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BSS:JV:TCG
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ENCLOSURE

ENCLOSURE 1

PROPOSED LICENSE AMENDMENT - SLAVE RELAY TEST FREQUENCY

Description of Proposed License Amendment

The proposed amendment would revise the Watts Bar Unit 1 Technical Specifications to change the surveillance frequency for Westinghouse type AR relays, used as solid state protection system slave relays or auxiliary relays, from quarterly to a refueling outage frequency.

Specifically, Surveillance Requirements (SR) 3.3.2.5 and 3.3.6.5 would be revised to change the frequency from "92 days" to "92 days OR 18 months for Westinghouse type AR relays".

To support these changes, the Watts Bar Unit 1 Technical Specification Bases would be revised as follows:

Technical Specification basis for B 3.3.2 would be revised by adding the following paragraph to the basis for SR 3.3.2.5: "For ESFAS slave relays which are Westinghouse type AR relays, the SLAVE RELAY TEST is performed every 18 months. The Frequency is based on the relay reliability assessment presented in Reference 13. This reliability assessment is relay specific and applies only to Westinghouse type AR relays. Note that, for normally energized applications, the relays may require periodic replacement in accordance with the guidance given in Reference 13."

The following reference would be added to B 3.3.2:
13. WCAP-13877, Rev. 0, "Reliability Assessment of Westinghouse Type AR Relays Used As SSPS Slave Relays," January 1994.

Technical Specification basis B 3.3.6 would be revised by adding the following paragraph to the basis for SR 3.3.6.5: "For ESFAS slave relays which are Westinghouse type AR relays, the SLAVE RELAY TEST is performed every 18 months. The Frequency is based on the relay reliability assessment presented in Reference 3. This reliability assessment is relay specific and applies only to Westinghouse type AR relays. Note that, for normally energized applications, the relays may require periodic replacement in accordance with the guidance given in Reference 3."

The following reference would be added to B 3.3.6:
3. WCAP-13877, Rev. 0, "Reliability Assessment of Westinghouse Type AR Relays Used As SSPS Slave Relays," January 1994.

Basis for Proposed License Amendment

I. BACKGROUND

Generic Letter (GL) 93-05, "Line Item Technical Specification Improvements to Reduce Surveillance Requirements for Testing During Power Operation," was approved in September 1993. This GL is the result of recommendations from a 1983 NRC task group formed to investigate problems with surveillance testing required

by TS. The objectives of the NRC task group were: 1) to review the basis for test frequencies; 2) to ensure that the tests promote safety and do not degrade equipment; and 3) to review surveillance tests for unnecessary burden on plant personnel. The studies found that while some testing at power is essential to verify equipment and system operability, safety can be improved, equipment degradation decreased, and unnecessary personnel burden relaxed by reducing the amount of testing at power. The relaxation of the slave relay test frequency is consistent with the objectives of the NRC task group. The results of the studies were documented in WCAP-13877 (proprietary) and WCAP-14129 (non-proprietary).

A. SSPS Overview

The solid state protection system (SSPS) is designed to actuate plant engineered safety feature (ESF) components when it receives the appropriate combination of input signals. The SSPS consists of two redundant, electrically independent trains. ESF components are arranged so that a failure of either SSPS train will not result in the loss of a required safety function.

ESF components are actuated by slave relays in the SSPS. The slave relays are actuated by master relays, which are actuated by the logic circuits of the SSPS. Each slave relay actuates multiple ESF components either directly or indirectly. Most slave relays actuate the ESF component directly. A number of slave relays actuate auxiliary (interposing) relays that actuate the ESF components.

A safeguards test cabinet (STC) is also provided to allow testing of the slave relays. The STC consists of test switches that apply voltage to a particular slave relay to determine operability of the relay. Each slave relay has a unique test switch.

Several tests are performed to verify the operability of all parts of the SSPS. An actuation logic test verifies the reactor trip and ESF logic signal output when simulated input signals are provided to the SSPS. A master relay test circuit energizes each master relay and verifies the continuity of the circuit through each slave relay coil associated with the particular master relay. Slave relay coil continuity is demonstrated by a reduced voltage test signal, which is sufficient to light a test lamp, but not sufficient to cause actuation of the slave relay. Finally, a slave relay test is performed that actuates each slave relay. Each slave relay is actuated via a test switch in the STC that applies normal voltage to the associated slave relay. The slave relay is then verified operable through a continuity check or actuation of the associated components.

B. Relay types and Construction

The SSPS slave relays used at Watts Bar are Westinghouse type AR relays.

The basic Westinghouse type AR relay consists of a coil assembly and a contact block assembly. The principal components of the contact block assembly are the cover, crossbar, and a set of contact cartridge assemblies. A contact assembly adder block provides four additional contact poles and is functionally identical to the four-pole contact block assembly. Type AR relays can be equipped with a latch assembly.

A detailed description of the Westinghouse type AR relay subcomponents, drawings, and photographs are included in WCAP-13877.

C. Relay Operation

Westinghouse type AR non-latching relays are either normally energized (NE) or normally de-energized (ND). A relay is considered to be NE if its coil is energized to maintain a desired contact position under normal plant operating conditions. A relay is considered to be ND if its coil is de-energized during normal plant operating conditions. Latching relays are ND. Typically, a latching relay is used to control functions where loss of power should not cause an inadvertent reset, or where deliberate action is required to reset or terminate a function, such as safety injection.

Type AR relays are designed to operate without the aid of gravity. The de-energized contact state is maintained or restored by a return spring. When the relay coil is energized, the upper-half armature is drawn into the coil block assembly, overcoming the resistance of the return spring. The crossbar is pulled along by the action of the relay coil assembly, causing the change of state of the relay contacts.

Type AR latching relays are equipped with an ARLA latch attachment which is engaged when the relay coil is energized and do not change position when the coil is de-energized. The latch is disengaged by momentarily energizing the latch (reset) coil, allowing the contacts to return to the de-energized state.

D. Interposing Relays

A number of the slave relays actuate interposing relays that actuate the ESF components. Interposing relays are typically tested during slave relay testing; however, some interposing relays are tested during performance of TS-required equipment testing other than slave relay testing. The reliability assessments performed in the referenced WCAPs encompass these interposing relays if they are Westinghouse type AR relays. Relays which are not Westinghouse type AR will continue to be tested every 92 days.

II. JUSTIFICATION

Some slave relay testing results in actuation of ESF equipment. These actuations have caused plant transients at other plants, such as inadvertent ESF actuations and reactor trips. Failures in the STC circuits, particularly for those ESF components which are not intended to be actuated during the test, can also contribute to an increase in inadvertent plant trips due to slave relay testing. Changing the frequency of slave relay testing from quarterly to a refueling frequency will minimize the risks associated with unnecessary ESF actuations or reactor trips.

Performance of some slave relay testing requires that the associated safety systems be removed from service. Examples of systems that must be removed from service for slave relay testing include the auxiliary feedwater system, the containment spray system, and portions of the safety injection system. Relaxing the surveillance interval reduces the frequency that safety systems will be removed from service and, therefore, increases their availability to perform their required safety functions. This results in a reduction in risk.

A reduction in slave relay testing frequency will also be cost beneficial by reducing the burden on the plant operations, maintenance, and engineering staff.

III. SAFETY EVALUATION

Slave relays are used to actuate ESF components upon receipt of the appropriate signals from the SSPS logic. If a slave relay fails to actuate, ESF equipment associated with the slave relay will not automatically actuate in response to an accident condition.

Similarly, if an interposing relay fails to actuate when actuated by a slave relay, the equipment associated with the interposing relay will not actuate. Reliability of interposing relays is addressed in a subsequent section of this safety evaluation.

Slave relay testing can identify slave relay failures before the slave relay is required to perform its intended function. However, slave relay testing can result in ESF actuations or reactor trips. Relaxing the slave relay test frequency reduces the number of tests performed on the relays and reduces the number of opportunities to identify problems with slave relays. Relaxation of the slave relay test frequency also reduces the risk of unnecessary ESF actuations or reactor trips.

Westinghouse performed an evaluation to determine the reliability of the Westinghouse AR relays used in the SSPS and auxiliary relay cabinets for actuation of ESF components. The evaluation documented in WCAP-13877 includes: 1) a generic review of industry information on relay problems; 2) a slave relay surveillance test failure study; 3) a failure modes and effects analysis; and 4) an aging assessment. A summary of the evaluation is presented below.

A. Generic Issues Review

A review of NRC documents, such as Information Notices, Circulars, and Bulletins, and Westinghouse technical bulletins associated with relays was performed to identify potential relay failure modes and mechanisms. The issues identified and considered in the analysis included performance of potting materials and lubricants, contact block assembly binding, excessive loading of relay contacts, insufficient contact travel, latch attachment seismic qualification, and material degradation. The results of this review and the documents reviewed are documented in Section 6 of WCAP-13877.

B. Slave Relay Surveillance Test Failure Study

To identify potential relay failure modes, data regarding the failure of slave relays were collected from the Nuclear Plant Reliability Database System and supplemented with survey information on slave relay failures from Westinghouse designed plants. The data collected included slave relay failures occurring after entry into commercial operation. The data were subdivided based on the surveillance interval (1-month, 2- or 3-month, and 18-month). The type AR relay survey data collected from Westinghouse plants indicated that after approximately 43,000 valid slave relay actuations and tests, 17 possible failures of the relay or latch attachment occurred in the ND relay population. Four of the 17 failures involved the ARLA latch attachment. Failure of the latch attachment will not prevent successful automatic actuation of the Engineered Safety Features Actuation System. Details of the failure experience review are provided in Section 9 of WCAP-13877.

Since a minimal number of failures were identified, no firm statistical conclusions could be drawn from the data. However, the data indicate a higher reliability than that assumed by IEEE 500, "Guide to the Collection and Presentation of Electrical, Sensing Component, and Mechanical Equipment Reliability Data for Nuclear Power Generating Stations." The data also indicated that even slave relays used in high-demand applications would be actuated significantly less than their design life limit when installed in the SSPS.

C. Failure Modes and Effects Analyses

Failure Modes and Effects Analyses (FMEA) were performed for the AR relays. The FMEAs considered the design and design history of the relays, failure modes and mechanisms based on failure history, materials performance data, and included input from design and manufacturing engineers. The FMEAs were performed based on guidance in IEEE 352-1987, "IEEE Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Safety Systems." Based on the results of the FMEAs, aging assessments were performed to determine the effects of thermal aging and out-gassing on slave relay reliability. The details of the FMEAs are included in Section 3 and 7 of WCAP-13877.

D. **Aging Assessment**

Continuously energized coils experience significant self-heating, resulting in accelerated age/temperature dependent degradation of components used in the relays. The temperature rise expected in normally energized type AR relays is between 10°C and 30°C. Actual temperature rises are dependent on relay sub-component location with respect to the coil and the ambient temperature. Since no actual failures of type AR AC relay coils were identified, the life expectancy determination was conservatively based on failure data for DC coil relays (type ARD).

To identify the type AR relay materials most susceptible to temperature accelerated aging and most likely to out-gas, available thermogravimetric analyses (TGA) applicable to temperature sensitive materials used in the construction of type AR relays were reviewed. The TGA is based on material performance data and considers the effect of temperature changes on the material. The materials identified as likely out-gassers and likely to degrade and cause relay degradation are neoprene rubber and Nylon Zytel 101. The other organic materials in the type AR relays are not susceptible to temperature accelerated aging. As such, there is little likelihood of significant out-gassing or evolution of corrosive compounds, such as hydrochloric acid, from the other materials. A detailed evaluation of the thermogravimetric analysis for the type AR relay components is included in Section 8 of WCAP-13877.

Conclusion of Aging Assessment

Westinghouse type AR relays used as ND SSPS slave relays will not experience temperature-induced, age-related degradation sufficient to result in failure within the 40-year plant life. Degradation of critical components requires substantial time and would result in no perceptible change in relay performance. Degradation of non-critical components, such as the neoprene armature sponge or magnet rubber, will result in perceptible changes to both appearance and material characteristics; however, no adverse impact to relay performance or reliability would occur.

Type AR relays used as NE SSPS slave relays will experience temperature-induced, age-related degradation sufficient to result in failure within the 40-year plant life and, therefore, should be replaced periodically dependent on temperature data specific to the location in the plant. Although no actual failures of type AR AC relay coils were identified, the life expectancy was conservatively determined based on failure data from type ARD DC coil relays. With replacement at a conservative interval, NE type AR relays will exhibit the same reliability as ND relays. WBN will implement a program to replace normally energized type AR slave relays at an appropriate interval as recommended in WCAP-13877.

Based on the results of the aging assessment, the probability of a relay malfunctioning or the reliability of slave relays

decreasing as a result of a refueling interval test frequency (i.e., 18 to 24 months) is low.

E. Interposing Relay Reliability

Since interposing relays can affect the ultimate function of the slave relay to start the required equipment, interposing relay reliability must be comparable to that of the associated slave relay. All of the slave relays and their actuated devices were evaluated for the presence of interposing relays. The majority of slave relays directly actuate ESF equipment, although some slave relays actuate a combination of equipment both directly and via interposing relays. Testing on a refueling frequency is adequate to confirm reliability and continuing operability of the type AR relays, subject to service life limitations of NE relays, based on the results of WCAP-13877. Interposing relays which are not type AR will continue to be tested every 92 days.

F. Safety Evaluation Conclusions

The slave relay reliability study verified that Westinghouse type AR relays are highly reliable. The aging assessment concludes that the degradation of ND and NE relays is sufficiently slow that a refueling frequency surveillance interval will adequately identify relay failures. The aging assessment also demonstrates that ND relays can be expected to operate reliably for a 40-year service life. NE relays will be replaced at an interval determined specifically for their location so as to maximize their reliability.

Testing on a refueling frequency is also adequate to confirm reliability and continuing operability of interposing relays which are Westinghouse type AR relays, subject to service life limitations of NE relays. Relays which are not Westinghouse type AR will continue to be tested every 92 days.

Based on the above evaluation, TVA concludes that there is reasonable assurance that the health and safety of the public will not be affected by the proposed changes.

Environmental Consideration

The proposed changes do not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed changes is not required.

ENCLOSURE 2

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Description of Proposed License Amendment

The proposed amendment would revise the Watts Bar Unit 1 Technical Specifications to change the surveillance frequency for Westinghouse type AR relays, used as solid state protection system slave relays or auxiliary relays, from quarterly to a refueling outage frequency.

Specifically, Surveillance Requirements (SR) 3.3.2.5 and 3.3.6.5 would be revised to change the frequency from "92 days" to "92 days OR 18 months for Westinghouse type AR relays".

To support these changes, the Watts Bar Unit 1 Technical Specification Bases would be revised as follows:

Technical Specification basis for B 3.3.2 would be revised by adding the following paragraph to the basis for SR 3.3.2.5: "For ESFAS slave relays which are Westinghouse type AR relays, the SLAVE RELAY TEST is performed every 18 months. The Frequency is based on the relay reliability assessment presented in Reference 13. This reliability assessment is relay specific and applies only to Westinghouse type AR relays. Note that, for normally energized applications, the relays may require periodic replacement in accordance with the guidance given in Reference 13."

The following reference would be added to B 3.3.2:
13. WCAP-13877, Rev. 0, "Reliability Assessment of Westinghouse Type AR Relays Used As SSPS Slave Relays," January 1994.

Technical Specification basis B 3.3.6 would be revised by adding the following paragraph to the basis for SR 3.3.6.5: "For ESFAS slave relays which are Westinghouse type AR relays, the SLAVE RELAY TEST is performed every 18 months. The Frequency is based on the relay reliability assessment presented in Reference 3. This reliability assessment is relay specific and applies only to Westinghouse type AR relays. Note that, for normally energized applications, the relays may require periodic replacement in accordance with the guidance given in Reference 3."

The following reference would be added to B 3.3.6:
3. WCAP-13877, Rev. 0, "Reliability Assessment of Westinghouse Type AR Relays Used As SSPS Slave Relays," January 1994.

Basis for No Significant Hazards Consideration Determination

The Nuclear Regulatory Commission has provided standards for determining whether a significant hazards consideration exists (10 CFR 50.92 (c)). A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a

new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. Each standard is discussed below for the proposed amendment.

(1) Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.

This change to the Technical Specifications does not result in a condition where the design, material, and construction standards that were applicable prior to the change are altered. The same ESFAS instrumentation is being used and the same ESFAS system reliability is expected. The proposed change will not modify any system interface or function and could not increase the likelihood of an accident since these events are independent of this change. The proposed activity will not change, degrade or prevent the performance of any accident mitigation systems or alter any assumptions previously made in evaluating the radiological consequences of an accident described in the safety analysis report. Therefore, the proposed amendment does not result in any increase in the probability or consequences of an accident previously evaluated.

(2) Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated.

This change does not alter the performance of the ESFAS mitigation systems assumed in the plant safety analysis. Changing the interval for periodically verifying ESFAS slave relays (assuring equipment operability) will not create any new accident initiators or scenarios. Implementation of the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety.

This change does not affect the total ESFAS system response assumed in the safety analysis. The periodic slave relay functional verification is relaxed because of the demonstrated high reliability of the relay and its insensitivity to any short term wear or aging effects. Implementation of the proposed amendment does not result in a reduction in a margin of safety.

Summary

Based on the above analysis, TVA has determined that operation of Watts Bar in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety;

therefore, operation of Watts Bar in accordance with the proposed amendment would not involve a significant hazards consideration as defined in 10 CFR 50.92.