8/13/91

Note to: Peter S. Tam

From: John Knox

Subject: Watts Bar, Summary of areas discussed during an August 7 & 8 meeting with TVA.

The enclosure provides a summary of areas discussed during an August 7 and 8, 1991 meeting between myself and representatives from TVA at the Watts Bar plant site. For each open issue identified in the NRC letter dated June 20, 1991, a description of the meeting discussions with a preliminary conclusion or status has been summarized.

It is recommended that the enclosed summary discussions and conclusions or status be considered for transmittal to TVA for use in their preparation of formal responses to the open issues identified in the NRC letter dated June 20, 1991.

John Knox

cc:
J. Knight

(List of Attendees)
August 7 & 8 meeting with TVA

L. Ackley	~~Electrical & Super Manager~~ Eng	Principal Elect. Eng.
M Brickey	Lead Electrical Engineer	
T. Holbert	Electrical Engineer	
G. Nicely	Senior Electrical Engineer	
R. Bradley	Tech Support	
S. Woods	System Eng	
W. Harris	Operations	
L. Dolan	Licensing Engineer	
D. Bryson	Electrical Engineer	
G. Peterson	Electrical Engineer	
T. Hughes	Cable Specialist	
J. Maddox	Syst. Eng.	

ENCLOSURE

SUMMARY OF AREAS DISCUSSED DURING A MEETING BETWEEN JOHN KNOX AND REPRESENTATIVES FROM TVA (SEE LIST OF ATTENDEES) AT THE WATTS BAR PLANT SITE ON AUGUST 7 AND 8, 1991.

8 ELECTRIC POWER SYSTEMS

8.2 Offsite Electric Power

8.2.1 Compliance with GDC 5

8.2.1.1 Grid Stability after Loss of Both Units

In section 8.2.1 of the SER, the staff concluded that the applicant has met the requirements of GDC 5, "Sharing of Structures, Systems, and Components," with respect to sharing of circuits of the preferred power system. This conclusion was based in part on the assumption that for a design basis event in one unit causing its trip and a single failure trip of the remaining unit, the offsite system would remain stable such that sufficient capacity would be available to accomplish safe shutdown in both units. In section 8.2.2 of the SER, the staff stated that the results of the applicant's grid stability analysis indicated that loss of both units themselves will not cause grid instability. However, subsequent review of the applicant's analysis results for grid stability (presented in section 8.2.2 (page 8.2.18) of Amendment 63 to the FSAR) indicate that the grid will remain stable for loss of one unit but not for both units. In order to complete our review, resolution is required for the above described inconsistency.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR as shown on a proposed draft mark up of the FSAR to indicate that offsite would remain stable when both units trip. Based on the proposed change, this item is considered acceptably resolved pending revision of the FSAR.

8.2.2 Compliance with GDC 17

8.2.2.1 Availability of Offsite Power Circuits

8.2.2.1.1 Design Basis for the Watts Bar Hydro Switchyard

In the SER, the staff concluded that the offsite power system circuits at the Watts Bar Hydro Plant Switchyard meet GDC 17 and are acceptable pending documentation in the FSAR of the additional information submitted by letter dated October 9, 1981. In SSER 2, the staff reported that the additional information was documented in Amendment 48 and that this item was closed. However, in section 8.1.4 of amendment 52 to the FSAR, the

applicant documented the design bases for the two offsite circuits but excluded the Watts Bar Hydro 161 kv yard from this design basis. Design basis information for the Watts Bar Hydro 161 kv yard has thus not been documented in the FSAR as originally concluded in SSER 2. In order to resolve this issue, additional information is required concerning the design basis for the Watts Bar Hydro switchyard.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR section 8.2.2.1.1 to indicate that two offsite power circuits do share the switchyard and eliminate the exclusion for meeting the requirements of GDC 17 for the circuits in the switchyard. Pending revision of the FSAR with the proposed change, this item is considered acceptable resolved.

8.2.2.2.3 Testing of the Automatic Transfer from the Normal to Preferred Offsite Circuit

Description of proposed testing for the automatic transfer from the offsite normal to the preferred source has not been included in the FSAR. In order to initiate our review in this area, additional information is required which describes the proposed testing for the automatic transfer that will be included in the plant technical specifications.

During an August 7 and 8, 1991 meeting, TVA indicated that the automatic transfer from the normal to the C and D transformers would be eliminated by a design change notice (M-12051-A). Pending the change of the FSAR for this proposed change, this item can be considered acceptably resolved.

8.2.2.2.4 The Use of the Second Alternate Offsite Circuit

Section 8.3.1.1 of Amendment 63 to the FSAR (page 8.3-4) indicates that the second alternate supply breaker is normally racked out but implies that this second supply breaker may be used during some modes of plant operation. In order to complete our review in this area, clarification is required for when this second supply may be used and the limiting conditions for plant operation and surveillance requirements when it is used.

During an August 7 and 8, 1991 meeting, TVA indicated that the second supply breaker would not be racked out due to the design change addressed in section 8.2.2.2.3 above. Pending the change to the FSAR this item can also be considered acceptably resolved.

8.2.2.2.5 Separation Between Offsite Power Transformers and Preferred Offsite Circuits

The physical separation and protection provided between any one of the main or common station transformers and the two preferred offsite circuits has not been clearly described or analyzed in the FSAR. In order to complete our review in this area, clarification and analysis is required to demonstrate that failure of any one transformer will not prevent at least one offsite circuit from being returned to service in time to prevent fuel damage in accordance with requirements of GDC 17.

During an August 7 and 8, 1991 meeting, TVA indicated that the offsite circuits from the C and D transformers are routed underground. Drawing 71N200-1 (Revision 13) shows the underground routing. TVA indicated that the FSAR would be revised to more clearly describe this routing. Based on review of drawing 71N200-1 this item can be considered resolved pending revision of the FSAR to clarify the routing.

8.2.2.2.6 Separation of Associated Circuits

As discussed in item (3) of section 8.2 of supplement No. 3 to the SER, the 125-V dc control power for the offsite power circuits is provided from the onsite Class 1E power system. The control power cables are treated as associated circuits and are routed in separate raceways. The staff found that this routing met the independence requirements of GDC 17 for offsite circuits and was acceptable.

By letter dated July 31, 1990, TVA provided an advance copy of the proposed updates to Sections 8.1.5.2, 8.1.5.3, 8.2.1.6, 8.3.1.4.1, and 8.3.1.4.3 so that current information concerning the Cable and Electrical Issues at Watts Bar would be available for NRC staff review. The proposed update to sections 8.2.1.6 (page 8.2-10a) and 8.3.1.4.3 (page 8.3-48) changes the allowable separation between the 125 v dc control power cables that are associated with the two independent offsite power circuits. The allowable separation has changed from routed in separate raceways to separated such that they do not touch.
In order to initiate a review of this proposed change, additional information is required to address the following items.

(1) Results of an analysis which demonstrates that the proposed separation for control power circuits associated with the two offsite preferred circuits meets the requirements of GDC 17 for independence of offsite circuits.

(2) Identification and analysis and/or justification for this proposed routing that is in violation of separation criteria presented in the FSAR for associated circuits. The subject 125 v dc control power circuits are considered associated because they serve non-Class 1E loads located in non-category 1 structures and receive power from redundant and

independent 125 v Class 1E vital battery buses. FSAR criteria for associated circuits requires them to meet the same separation criteria as Class 1E circuits and when routed in non category 1 structures they are further required to be electrically and physically separated from other circuits (ref: FSAR section 8.3.1.4.3, pages 8.3-47a and 8.3-47b).

(3) Results of a cable routing analysis which demonstrates that all associated non-Class 1E circuits have been installed in accordance with separation criteria presented in the FSAR and have sufficient physical and electrical separation to meet the independence requirement of GDC 17.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR to go back to routing cables in separate raceways. Acceptance criteria for the exception to this separation will be defined in the FSAR. TVA indicated that they would provide acceptance criteria at some future time for the exceptions. The acceptance criteria is to be equivalent to separate trays. Exceptions that have been found were located at junction points for raceways. These points will be analyzed to assure adequate separation. The criteria currently in the FSAR that the cables will not touch will changed. To what TVA would not commit. But will most likely be separation by barrier or some physical separation. This item remains open pending additional information.

8.2.2.2.7 Design Basis Requirements for Offsite Circuit Control Power

In section 8.2.1.8 (page 8.2-16) of amendment 63 to the FSAR, TVA indicated that the design of the control power feeders to switchgear associated with common transformers C and D and 6.9 kv shutdown boards A-A and B-B ensures compliance with GDC-17, i.e., a loss of control power will not result in a loss of offsite power. Based on the information presented in the FSAR, it is not clear how the design which used the Class 1E vital dc system for control power for offsite circuits meets the following requirement of GDC-17:

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

In order to clarify the design basis requirements for control power, additional analysis is required to demonstrate (1) that loss of any one source of dc control power (to the offsite from the onsite Class 1E system), which may degrade or cause a loss of operability to both onsite and offsite power supplies, will not cause degradation or loss of operability to the remaining immediate access offsite power supply to the remaining minimum required safety system loads and (2) that failure of one or both of the non-Class 1E dc control power circuits to the offsite system will not present a challenge to or cause loss of either of the onsite Class 1E power supplies.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR to indicate that A train of one division supplies C transformer control power while B train of the other division supplies the D transformer control power. Coordinated breakers installed as part of fire protection provides protection between onsite and offsite. The proposal appears to meet the requirements of GDC 17, and is therefore acceptable pending documentation of the proposed change.

8.2.2.3 Compliance with GDC 17 for the Duration of Offsite System Contingencies

In amendment 63 to the FSAR, TVA proposed a new design for the offsite power system to be enabled only during offsite system contingencies that preclude the supply of adequate power (i.e. loss of voltage on either 6.9 kv start bus A or B or for a 161 kv transmission system contingency). During system contingencies, an automatic load shedding scheme would be manually enabled and a number of alternate offsite supply breakers to BOP boards or panels would be tripped and locked out. For a trip of both units, the load shedding scheme would be initiated to trip off part of the BOP loads.

Based on information presented in amendment 63 to the FSAR, it appears that implementation of the proposed new design will reestablish the offsite power system's compliance with the requirements of GDC 17 following offsite system contingencies. This reestablishment of compliance will permit continued operation of the plant beyond the technical specification allowable limits (generally 24 hours for loss of capability of both offsite circuits).

In order to initiate a review of the proposed new offsite system design, additional descriptive information and analysis is required to demonstrate the new design's compliance with the requirements of GDC 17 and 18. The level of information and analysis required for the new design should be consistent with the level presented in the FSAR for the current design of the offsite power system.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR to describe the circuits that will be used for load shed. Redundant circuits are used which appear to meet criteria for independence of offsite circuits. Also drawing number 1-45W760-200-2 showing the circuits were provided for review. The proposal for the use of redundant circuits appeared to be acceptable. This item remains open pending analysis demonstrating that the proposed scheme meets GDC. Physical separation between redundant trip circuits and testing of the load shed circuits were not discussed as part of their proposed response.

8.2.2.4 Minimizing the Probability of a Two Unit Trip Following Unit Trip

In amendment 63 to the FSAR, TVA indicates that upon any single unit trip, power from the offsite system is transferred from the normal circuits (via the unit transformers) to the preferred circuits (via the common transformers). TVA also indicates that after transfer one train of each unit will be connected to the preferred circuits. The staff is concerned that on trip of one unit, the other unit will be vulnerable to trip because its source of offsite power is being changed from the normal circuit (which has not lost its capability as a source of offsite power) to its preferred source via the common transformers. In order to resolve this concern, additional analysis is required to demonstrate compliance with the requirement of GDC 17 that design provisions be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit.

During an August 7 and 8, 1991 meeting, TVA indicated that when the design is changed to eliminate automatic transfer between offsite circuits this item will no longer be applicable. Also the existing design will be clarified. This item appears to be resolved pending documentation of the proposed design change.

8.3.1.1 Non-safety Loads Powered from the Class 1E AC Distribution System

8.3.1.1.1 Diesel Generator Capacity

In section 8.3.1.1 of amendment 63 to the FSAR (page 8.3-16d), TVA indicates that the worst case loading for the diesel generators occurs for a simultaneous loss of offsite power and a loss of coolant accident on the associated diesel unit. Results of analysis which demonstrates that adequate margin exists, in all cases, between worst case loading and diesel capacity has not

been presented in the FSAR. In-order to complete our review, documentation is required of these analysis results.

During an August 7 and 8, 1991 meeting, TVA indicated that they would provide some margin but would not commit to the extent of the margin. Margin will be defined in the FSAR in a future amendment. Loading will not exceed the design rating of the machines. The same process used for Sequoyah and Browns Ferry will be used at Watts Bar for running an actual load test simulated loss of offsite power and LOCA with loads to within 3 percent of actual load.

The auto connected loads equal the 2 hour rating, during this time the transient load on the diesel is such that the load sequence is being changed to accommodate transients. After two hours loads that are not needed such as non safety loads will be shed manually and automatically. This item remains open pending analysis results.

8.3.1.2.1 Allowable Technical Specification Limits for the Inverse Time Delay Relay

In the SER and SSER No. 2, the staff indicated that the Watts Bar design is in conformance with position B-2 of BTP PSB-1 and was found acceptable. The staff, based on a review of the FSAR through amendment 63, reconfirmed this conclusion; however, with regard to technical specification requirements specified by position B-2 of BTP PSB-1, it is not clear that the proposed design which uses an inverse time delay type relay can reliably be shown to not trip above a maximum voltage of 4860 volts but will trip below some minimum voltage level which has not been specified in the FSAR. To clarify this issue, additional information is required for the following items.

(1) Reliability data which demonstrates that an inverse time type relay will not trip at voltages above the 70 percent voltage level of 4860 volts.

During an August 7 and 8, 1991 meeting, TVA indicated that only the load shed and diesel generator start relays are of the inverse time type. The degraded voltage and loss of voltage relays are solid-state type relays. The diesel generators are in full compliance with RG 1.9's position on frequency and voltage decreases, i.e., at no time during the loading sequence does the frequency or voltage decrease to less than 95 percent of nominal and 75 percent of nominal respectively. An accuracy calculation for the load shedding relays will be performed with 75 percent being the maximum upper limit. The results of the accuracy calculation will be used in the technical specification.

Pending documentation of the above information, the staff considers this item to be acceptably resolved.

(2) Technical specification limits for maximum and minimum limits that will be in the technical specifications.

During an August 7 and 8, 1991 meeting, TVA indicated that the present set point for the load shed relays is 4860 volts with a five second time delay to close contacts on complete loss of voltage. The NRC will include this as the minimum limit in the technical specifications for the load shed relays and similar minimum limits for the diesel start relays. Maximum limits for the load shed relays will be included in the technical specifications based on the results of TVA's analysis results. At 75 percent voltage the load shed relays should not actuate to strip loads. Thus, the technical specification should require as an example that the capability of the relays not to trip when subjected to a voltage of 75 percent for 30 seconds be periodically demonstrated. Pending inclusion of these items in the technical specifications this item can be considered acceptably resolved.

8.3.1.7 Possible Interconnection Between Redundant Divisions Through the Normal and Alternate Power to the Battery Charger

In the SER, the staff evaluated possible interconnections for components that can be transferred between redundant divisions. For each component that can be transferred, the applicant documented their commitment to keep the alternate feed breaker at the 480 volt shutdown boards open, to provide an alarm in the control room for when this alternate feed breaker is closed, and to provide an alarm in the control room when the manual transfer switch is in the alternate position. Based on this commitment, the staff concluded that the applicant's transfer design provided sufficient independence between redundant divisions, assured correct system alignments, met the requirements of GDC 17, and was acceptable.

However, by amendment 56 to the FSAR (section 8.3.1.1 page 8.3-6), the applicant indicates that the alternate feed breaker at the 480 volt shutdown boards will normally be kept open except for three identified cases where the power supply alignment is not important. Also, the applicant indicated that the alternate feed breakers would be verified open in accordance with the technical specifications i.e. no control room alarms will be provided on the alternate feed breakers or on the manual transfer switches.

To initiate our review of the proposed design for transferring

loads manually between redundant divisions, the following additional information is required for each load identified in Table 8.3-10 of the FSAR.

1. Results of analysis which demonstrates that the Watts Bar design will meet the requirements of GDC 17 when the load is being supplied from its alternate power source.

2. Proposed frequency for verifying the alternate supply breaker is open.

3. Proposed limiting conditions for operation with the load being supplied through the alternate supply breaker. Limiting conditions should be defined for operating modes 5 and 6 and for modes 1 through 4.

4. Basis and justification for the frequency for verification of alignment and limiting conditions for operation described in items 2 and 3 above.

5. Administrative provisions with justification for assuring correct or normal system alignments.

During an August 7 and 8, 1991 meeting, TVA indicated that the response has been included in section 8.3.1.7.1. For the battery charger and inverter loads, TVA indicated that the load transfer would not meet the requirements of GDC 17. The diesel generator does not have sufficient capacity to supply these additional loads. Limiting conditions for operation were provided in the TS for monitoring the position of these supply breakers. For the battery charger and inverter loads this item is considered acceptably resolved.

For the remaining loads, TVA indicated that they would provide an analysis or additional information which demonstrates that the remaining shared loads meet the requirements when supplied from the alternate source. This response is to be provided by January 1, 1993.

TVA also indicated that they would provide acceptance criteria for the future analysis to be provided by January 1, 1993. Appropriate acceptance criteria may allow this item to be resolved.

8.3.1.7.1 Transfer of Loads Between Power Supplies Associated with the Same Load Group but Different Units

In section 8.3.2.2 (page 8.3.63) of amendment 63 to the FSAR, TVA indicates that each essential load, that is supplied power from the Class 1E DC system's distribution system boards, has a redundant supply which is electrically separate from its first

supply. The supply cables are routed so as to provide complete physical separation from the two supplies to each load. The staff is concerned that, when the redundant supply is used, the system alignment may be such that the design basis requirements, which includes four independent power trains, will not be maintained. In order to resolve this concern, the following additional information is required for each load (AC or DC) that can be transferred between power trains of the same load group.

1. Results of analysis which demonstrates that the Watts Bar design will meet the independence requirements of GDC 17 when one or more of the loads are being supplied from its alternate power source.

2. Proposed frequency for verifying the alternate supply breaker is open.

3. Proposed limiting conditions for operation with the load being supplied through the alternate supply breaker.

4. Basis and justification for the frequency for verification of alignment and limiting conditions for operation described in items 2 and 3 above.

5. Administrative provisions with justification for assuring correct or normal system alignments.

During an August 7 and 8, 1991 meeting, TVA indicated that an alternate feeder analyses will be performed prior to the integrated tests of the safety systems. The analyses will identify the restrictions and limitations for each alternate feeder and the results will be incorporated into the technical specification. A response to this item will be provided by January 1, 1993.

TVA also indicated that they would provide acceptance criteria for the future analysis to be provided by January 1, 1993. Appropriate acceptance criteria may allow this item to be resolved.

8.3.1.10 No Load Operation of the Diesel Generator

Section 8.3.1.1 (page 8.3-11) of amendment 55 to the FSAR indicates that the manufacturer of the diesel generators recommends that diesel's not be run for extended periods of time at less than 50% of continuous rated load. The FSAR further indicates that diesel engines have been tested for no-load operation for four hours. After four hours of operation at less than 30% load, the diesel generator will be run at a minimum of 50% load for at least 30 minutes. And after an accident situation when the diesel generator has run for an extended period of time at low or no-load, the load is to be gradually increased until

the exhaust smoke is approximately twice as dense as normal. The increasing load is then stopped until the smoke clears. This procedure is repeated until full load can be carried with a clear exhaust. For all situations, TVA has loads continuously available to the operator that exceed 50% of the continuous rated load.

It is the staff concern that the diesel generator may not have sufficient capability to supply required power within the specified accident analysis time limits following an accident, prolonged operation of the diesel generators at no load, and a loss of offsite power. In order to resolve this concern, the following additional information is required.

(1) The manufacturer test results that verify the capability of the diesel generator to accept design basis loads within the specified accident analysis time limits following 4 hours of no load operation.

During an August 7 and 8, 1991 meeting, TVA indicated that the diesel generator ratings are not degraded as a result of no-load operation and if the condition warrants, the diesel generator may be loaded as if it had just been started. TVA does not have manufacturer test to demonstrate this capability of the diesel generator. Based on the information presented, we were unable to conclude that the machine would be capable of being loaded with accident loads if required after operation at no load.

In addition, TVA indicated that concurrent loss of offsite power with a LOCA is the design basis for the plant. Thus, the need for the diesel generator after its prolonged operation at no load due to an accident doesn't have to be postulated for a loss of offsite power. The NRC disagreed that concurrent loss of offsite power is the design basis for the Watts Bar plant.

(2) The accident analysis results which demonstrate that sufficient time is available to load the diesel generator slowly as described in the FSAR after four or greater hours of operation of the diesel generator at no load.

During an August 7 and 8, 1991 meeting, TVA did not respond to this item.

(3) A description of the administrative procedures for assuring that the diesel will never be expected to provide power to accident loads after the diesel has operated for greater than four hours under no load conditions.

During an August 7 and 8, 1991 meeting, TVA indicated that operating procedures have certain requirements to

prohibit operating the DG below 60 percent except for an emergency.

This response did not adequately respond to the concern. This item thus needs to be clarified further.

(4) During accident conditions it is a standard technical specification requirement that onsite and offsite power circuits not be paralleled. For this condition of operation (i.e. the offsite circuits are supplying loads required to safely shut the reactor down following an accident), describe how the available loads will be connected to the diesel generator so the diesel will not be operated at no load for prolonged periods of time. And describe the circuit design that automatically makes available the onsite power source in the event of a loss of offsite power.

During an August 7 and 8, 1991 meeting, TVA indicated that the circuit design that automatically makes available the onsite power source in the event of a loss of offsite power is described in Section 8.3.1.1, pages 8.3-4, 8.3-5, 8.3-6 and 8.3-10.

Description of how the diesel generator would be loaded was not described. This item thus needs to be further clarified.

8.3.1.11 Test and Inspection of the Vital Power System

In section 8.3.1.1, page 8.3-21 of amendment 63 of the FSAR, it has been indicated that the following items will be tested prior to placing the vital a.c. system in operation but will not be subsequently tested during plant operation. In order to complete our review, substantiating analysis is required which demonstrates that there will be reasonable assurance that each of these items will maintain their capability to perform their design basis safety function over the operational life of the plant without further testing.

(1) The output voltage and frequency of each invertor.

During an August 7 and 8, 1991 meeting, TVA indicated that they verify the voltage and frequency every 18 months during load testing.

(2) The capability of the invertor to deliver 100 percent of its output while operating on either the normal or emergency supplies.

During an August 7 and 8, 1991 meeting, TVA indicated that every 18 months the invertor is loaded to 20KW at

1.0 power factor and transfers to the emergency 125 VDC supply while maintaining voltage and frequency.

(3) Calibration of the panel and board mounted instruments.

During an August 7 and 8, 1991 meeting, TVA indicated that they perform the calibration once every 18 months.

(4) Proper trip operation of circuit breakers on each instrument power board.

During an August 7 and 8, 1991 meeting, TVA indicated that all of the breakers are not tested since 1E boards are not required to be tested. The NRC disagreed that Class 1E breaker did not have to be tested. TVA indicated that they would clarify the testing to be done on all Class 1E breakers. TVA clarification was that they test only those required for isolating of the non-safety and containment protection. Testing only includes the opening and closing of the breakers.

(5) Fuse verification with respect to size and type.

During an August 7 and 8, 1991 meeting, TVA indicated that plant administrative instruction 10.10 provides control of fuses along with the master fuse report drawing series 45B6000.

With the exception of item 4, this item has been acceptably resolved pending documentation of TVAs response to this item.

8.3.1.12 The Capability and Independence of Offsite and Onsite Sources When Paralleled During Testing

In amendment 63 to the FSAR (page 8.2-11), it is stated that for test and exercise purposes, a diesel generator may be manually paralleled with the normal or preferred power source. While offsite and onsite sources are paralleled, it is also indicated that both a loss of offsite power and a safety injection signal are required to automatically override the manual controls and establish the appropriate alignment.

When there is a safety injection signal alone without a loss of offsite power or when there is a loss of offsite power by its self without a safety injection signal, the staff is concerned that the capability and independence of offsite and onsite sources may be compromised when they are paralleled during testing. To complete our review, additional information is required to demonstrate in accordance with the requirements of GDC 17 that appropriate provisions have been included in the design to minimize the probability of losing both offsite and onsite power supplies given an accident or loss of offsite power

during testing with the offsite and onsite sources paralleled.

During an August 7 and 8, 1991 meeting, TVA indicated that loss of the offsite supply would cause the instantaneous over current relay to trip the standby circuit breaker, the loss of voltage relays to trip the supply breaker and loads, and subsequently the diesel generator load sequencer will load the shutdown board with the non-LOCA loads. If an accident signal is initiated during testing of the standby supply, the parallel connection is maintained unless loss of offsite power also occurs. Should a LOCA and a loss of offsite power occur when the diesel generator is parallel with the grid under test, the same sequence of events take place as loss of offsite power except the diesel generator sequencer will load the accident loads. Only one diesel generator will be in the test mode at any given time.

The position that the NRC has taken for recent NTOL application is to require trip of the diesel generator breaker on an accident signal when the diesel is in the test mode and paralleled with the offsite system. TVA indicated that they would reevaluate their design. If the design is not changed, additional information in support of their design my be required to support the current design for not tripping the diesel on accident signal.

8.3.1.13 The Use of an Idle Start Switch for Diesel Generators

In section 8.3.1.1 of amendment 57 to the FSAR (page 8.3-11), the licensee has indicated that a idle start switch is provided to start and run the diesel engine at idle speed for durations of unloaded operation. During this type of operation any emergency signal will cause the engine to go to full speed and complete the emergency start sequence.

Detailed design and testing information demonstrating that the idle start switch will not degrade below an acceptable level the capability of safety systems from performing their safety functions has not been presented in the FSAR. In order to initiate our review of the installed idle start switch, additional design and testing information is required.

During an August 7 and 8, 1991 meeting, TVA indicated that a local idle start switch is provided by the diesel manufacturer to start and run the engine at idle speed for extended durations of unloaded operation. Use of the local idle start switch is enabled by a permissive signal from the main control room. During idle operation, any emergency start signal will disable the idle start circuitry and will command the engine to go to full speed and complete the emergency start sequence.

This response did not answer the question. Design and testing

information is required for the idle speed switch. TVA indicated that they would provide the required information.

FSAR figure 8.3.25 provides the design details for the idle start switch. TVA to provide the testing information. TVA indicated that the circuitry for bypassing the idle start switch on an accident signal is not currently being tested.

8.3.2 Onsite DC System Compliance with GDC 17

8.3.2.2 DC System Monitoring and Annunciation

As discussed in Supplement No. 3, the staff determined that the following items had not been included in the design of the Watts Bar diesel generator dc monitoring and annunciation system.

(1) Battery circuit input current is not monitored.
(2) DC bus under voltage is not alarmed in the control room.

In order to complete our review, justification is required which demonstrates that each of these items has been included or adequately covered in the design for monitoring the diesel generator dc system.

In section 8.3.1.1 (page 8.3-16b) of amendment 63 to the FSAR, the main control room alarm for battery charger output breaker open was removed. In addition to the above two items, justification is required which demonstrates that the diesel generator dc system is adequately monitored without the battery charger output breaker being alarmed in the main control room.

During an August 7 and 8, 1991 meeting, TVA indicated that the battery circuit input current is monitored locally. The DC bus under voltage is monitored indirectly through the battery charger low output voltage alarm in conjunction with the battery discharge alarm. The battery charger output breaker open is alarmed by charger output current alarm or by the battery discharge alarm. Pending documentation of TVA's justification, this item is considered acceptably resolved.

8.3.2.4 Diesel Generator Battery System

In the SER and SSER 2, the staff based on information presented through amendment 48 to the FSAR found the diesel generator 125-V dc control power system to be acceptable. However, based on subsequent revisions to the FSAR documented by amendments 57, 63, and 65, it is no longer clear that the design continues to be in compliance with the applicable GDC's, Regulatory Guides, and IEEE standards. In order to clarify compliance, additional information is required for the following items.

(1) Justification for non-compliance with position C.1.c. of

Regulatory Guide 1.32 revision 2 or clarification of compliance.

(2) Description of and justification for areas of non-compliance with IEEE Standard 308-1971 or clarification of compliance.

(3) Capacity and capacity margin over required design loads to be maintained as a design basis requirement.

During an August 7 and 8, 1991 meeting, TVA indicated that compliance of the DG battery system with applicable GDCs, RGs, and IEEE standards is in FSAR section 8.3.1.1 of the FSAR. TVA indicated that they would revise the FSAR to provide a reference to these sections. This item is considered acceptably resolved.

8.3.2.5 Non-safety Loads Powered from the DC Distribution System and Vital Inverters

In the SER, the staff concluded based on information presented in the FSAR through amendment 48 that the powering of non-safety loads from the dc distribution system would not degrade the Class 1E systems below an acceptable level and was therefore acceptable. This conclusion was based in part on the applicant's statement documented in Section 8.3.2.1.1 of the FSAR that the batteries have the capacity to supply all connected loads (Class 1E and non-Class 1E) for a minimum of 2 hours and that the batteries will be tested periodically in accordance with the Technical Specifications to ensure this capacity.

Subsequent review of information presented in section 8.3.2.1.1 of the FSAR through amendment 65 indicates that batteries may not have sufficient capacity to supply all connected (or connectible) loads as originally concluded in the SER. In order to clarify or establish the minimum design basis requirements for battery capacity with margin and in order to determine required

administrative procedures to assure non-essential loads do not use any of this minimum required design basis capacity, additional information is required to address each of the following items.

(1) As a design basis requirement define the load currents each battery is expected to supply for specified time periods for all modes of plant operation (i.e. battery duty cycle as defined in IEEE Standard 485). Accident with loss of offsite power, loss of offsite power without accident, and loss of both offsite and onsite ac sources without accident (i.e. station blackout) should be included in the duty cycle.

During an August 7 and 8, 1991 meeting, TVA indicated that the batteries have been sized for loss of both offsite and onsite ac sources without accident for two hours; accident with loss of offsite power and chargers plus a single failure for 30 minutes; and full-load rejection with no accident or loss of power.

Battery sizing for the load profile for station blackout has not been completed. A station blackout submittal to the NRC is planned for the end of 1992.

(2) Define the design margin that will be maintained for the capacity of the battery and/or the size of loads included in the battery duty cycle.

During an August 7 and 8, 1991 meeting, TVA indicated that margin would be greater than or equal to zero. The current margin is 5 percent. The battery loading calculation assumes the vital inverters are fully loaded although the inverter loading calculation indicates actual loading to be 60 to 90 percent.

The zero percent margin with respect to the recommendations of IEEE 385 on battery sizing should be addressed or further clarified.

(3) Describe how the battery capacity with margin will be maintained and periodically verified over the life of the plant.

During an August 7 and 8, 1991 meeting, TVA provided a written response, based on this response this item appeared to be acceptably resolved.

(4) Describe the additional capacity that has been provided in each battery for non-essential loads.

(5) Describe the administrative procedures and/or other provisions that will be implemented to assure non-essential loads do not use any of the capacity required for essential loads for all modes of plant operation.

During an August 7 and 8, 1991 meeting, TVA indicated for items 4 and 5 that non-essential loads are not separated from safety loads in the sizing calculations. This item should be resolved based on information provided for item 1 above.

8.3.2.7 The Fifth Vital Battery System

By amendment 58 to the FSAR, TVA documented their proposed addition of a fifth vital battery system to be used as a

temporary replacement for any one of the four 125v dc vital batteries during their testing, maintenance, and outages with no loss of system reliability under any mode of operation.

In section 8.3.2.1.1 to the FSAR (page 8.3-54), TVA stated that the four channels of the vital dc power system are electrically and physically separated so that a single failure in one channel will not cause a failure in another channel.

When one of the four batteries of the electrically and physically separated vital dc power system described above has been temporarily replaced by the fifth battery, it is not clear, based on the information presented, that the four channels will remain electrically and physically separate so that a single failure in one channel will not cause a failure in another channel. In order to clarify the design's compliance with the single failure criterion when the fifth battery is being used, additional information is required to address each of the following items.

(1) Description of the support systems for each of the vital dc power systems.

(2) Description of system and support system alignments which assures that failure of any one channel of the vital dc power system will not cause a failure in another channel of the dc power systems.

(3) Description of the support systems for the fifth battery when it is being used as a temporary replacement for one of the four 125v dc system batteries.

(4) Results of analysis demonstrating that when the fifth battery is being used as a temporary replacement for one of the four 125v dc system batteries, failure of any one channel of the vital dc power system will not cause a failure in another channel of the dc power systems.

(5) Proposed limiting conditions for operation for when the fifth battery is being used as a temporary replacement for one of the four 125v dc system batteries.

During an August 7 and 8, 1991 meeting, TVA provided a written response which appeared acceptable when reviewed during the meeting.

8.3.2.8 Reenergizing the Battery Charger from the Onsite Power Sources Manually Versus Automatically Immediately Following a Loss of Offsite Power

Based on information presented in section 8.3.1 of the FSAR, it is implied that the battery chargers are a Class 1E load that are automatically reconnected to the onsite power supply following a

loss of offsite power with or without an accident signal. However, in section 8.3.2 of the FSAR, it is implied that the charger may be reconnected manually 30 minutes following a loss of offsite power. In order to complete our review of this item, clarification with justification of the design is required for supplying power to the battery charger following loss of offsite power.

During an August 7 and 8, 1991 meeting, TVA indicated that the chargers are automatically reconnected. this item is considered acceptably resolved.

8.3.3.1.1 Submerged Electrical Equipment as a Result of a Loss-of-Coolant Accident

In the SER, the staff indicated that the design for the automatic de-energizing of circuit loads as a result of a loss-of-coolant accident (LOCA) would be verified as part of the staff's site visit/drawing review. By letter dated January 16, 1985, the applicant submitted electric schematic drawings for each valve that has been identified to be automatically de-energized by a LOCA signal. On the basis of a review of drawing numbered 45W760-30-8 Revision 10, the staff concluded that the design for power removal is acceptable pending resolution of surveillance requirements that were to be reviewed with and included in the technical specifications.

In the SER, the staff similarly indicated that the design using power lockout or protective devices was acceptable pending resolution of surveillance requirements that were to be reviewed with and included in the technical specifications.

Subsequently, as part of a technical specification improvement program, the staff concluded that the above type of surveillance requirements were not appropriate for inclusion in the technical specifications but should be reviewed with and included in the FSAR as licensing commitments. In order to initiate our review of the required surveillance, additional information is required for the following items.

1. Description of the proposed surveillance for automatically de-energizing in the event of a LOCA, power lockout provisions, and proper operation of protective devices.

2. Results of analyses or other justification that demonstrates the proposed surveillance will demonstrate the operability of all components used in the designs for automatically de-energizing, power lockout, and protective devices.

3. The frequency for which the proposed surveillance will be performed with justification.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR to state that the components listed in Table 8.3-28 are automatically de-energized by the accident signal and the accident signal must be reset to remove the automatic trip signal from each component. Testing to ensure the operability of all of the components used in the design for automatic de-energization is performed in conjunction with the test which verifies ESFAS actuation circuitry. Acceptance criteria for this test is that all devices will assume their accident conditions and maintain those conditions after the accident signal is reset. This test is performed every 18 months. For equipment automatically de-energized in the event of a LOCA, the described surveillance resolves this item.

During an August 7 and 8, 1991 meeting, TVA indicated that they would provide additional response for power lockout provisions and proper operation of protective devices.

TVA indicated that power lockout provisions are not used for protection of Class 1E buses due to submergence. Pending revision of the FSAR, this item is resolved.

Proper operation of protective devices remains an open issue.

8.3.3.1.3 Failure Analysis of circuits Associated with Cables and Cable Splices Unqualified for Submergence

Amendment 63 removed the following phrase from the FSAR:

"Cables and cable splices are qualified for submergence".

With the removal of this phrase, the staff concludes that cables and splices used to supply Class 1E or non-Class 1E equipment that may or may not be submerged following a LOCA are not qualified for submergence. The staff is concerned that the circuits associated with these unqualified cables and cable splices were not included in the failure analysis to demonstrate the ability of the electric power system to withstand failure of submerged electrical components from the postulated LOCA flood levels inside containment. In order to resolve this concern, additional clarifying information is required which indicates that circuits associated with these unqualified cables and splices were included in the failure analysis.

During an August 7 and 8, 1991 meeting, TVA indicated that cables that are required to operate during and after a LOCA will not be routed below the flood level, and the electrical power system will be able to withstand the failure of submerged components (including cables) from the postulated LOCA flood levels.

A revision to the submergence calculation will be scheduled upon the completion of the analysis of the auxiliary power system with the new CSST C & D. The calculation revision will identify those cables that are routed below the flood level and receive power from a Class 1E board. The revision will add the loading effect on the Class 1E boards due to the cables that are submerged and energized. If any of the cables are required to be energized for component operation, they will be re-routed above the flood level. For any of the 1E boards determined to be overloaded as a result of the additional loading due to unqualified submerged cables, a corrective action will be initiated such as tripping the load for an accident or changing the protective device's rating.

Further clarification is needed for what is meant by loading effect on Class 1E boards when unqualified cables or splices fail due to submergence.

8.3.3.1.4 The Use of Waterproof Splices in Potentially Submersible Sections of Underground Duct Runs

Section 8.3.1.2.3 of amendment 63 to the FSAR indicates that Class 1E cables routed underground between the auxiliary building and the diesel generator building and the intake pumping station are provided with waterproof splices in the potentially submersible sections of the duct runs. Position 9 of Regulatory Guide 1.75 states that cable splices in raceways should be prohibited. The basis for position 9 further states that if cable splices exist, the resulting design should be justified by analysis and that the analyses should be submitted as part of the Safety Analysis Report. In order to evaluate the use of cable splices in raceways, additional justifying analyses is required which will demonstrate compliance with the requirements of GDC 2, 4, and 17.

During an August 7 and 8, 1991 meeting, TVA indicated that splices are included in manholes of the underground duct run. Splices are not permitted by the Watts Bar design basis to be installed in raceways. TVA indicated that the FSAR would be clarified to state that splices are not allowed to be installed in raceways. Pending revision of the FSAR, this item is considered to be resolved.

8.3.3.2.1 Sharing of DC Distribution Systems and Power Supplies Between Units 1 and 2

In the SER, the staff concluded (based on results of an analysis provided by letter dated January 7, 1982, imposition of appropriate Technical Specifications for shared dc systems, and other information documented in the FSAR) that there was reasonable assurance that the sharing would not significantly

impair the ability of the dc system from performing its safety function, meets the requirements of GDC 5, and was acceptable. However, after further review of the results of the analysis provided by letter dated January 7, 1982 and information documented in the FSAR, it is not clear that the sharing of raceways will not significantly impair the ability of the dc system from performing its safety function for any given single failure in accordance with the requirements of GDC 5 and 17. It is the staff concern that a single failure of the shared A train (or B train) raceway may cause failure of two dc vital battery systems. To resolve this concern, additional information is required for the following items:

1. Descriptive analysis or clarification of the separation design to demonstrate that failure of the A train (or B train) will not cause loss of more than one dc vital battery system.

   During an August 7 and 8, 1991 meeting, TVA indicated that the design is capable of the safe shutdown in one unit and the mitigation of an accident in the other unit for loss of battery combinations I and III or II and IV.

   TVA further indicated that failure of the A train can cause loss of battery systems I and III and that failure of the B train can cause loss of battery systems II and IV.

   Based on the above it appears that this item can be considered resolved pending clarification of the FSAR.

2. Documentation in the FSAR of the results of the analysis of the vital 125 volt dc system with respect to position C.2 of Regulatory Guide 1.81 that was provided by letter dated January 7, 1982.

   During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR to document compliance with the positions of RG 1.81. Operations indicated that some sharing at least at the system level may be required. TVA indicated that they would reconsider their response for compliance to RG 1.81.

8.3.3.2.2 Sharing of AC Distribution Systems and Standby Power Supplies Between Units 1 and 2

In the SER, the staff indicated (1) that sharing of onsite ac and dc systems had not been adequately described or analyzed in section 8.3 of the FSAR; (2) that the applicant, by letter dated January 7, 1982, had provided the required description and analyses; and (3) that the design met, on the basis of the information presented in this January 7, 1982 letter, the

guidelines of Regulatory Guide (RG) 1.81 and was acceptable pending revision of the FSAR that reflects requirements of the shared safety systems.

In SSER 3, the staff determined that information presented in Amendment 48 and a letter dated January 17, 1984 were consistent with information presented in the applicant's letter of January 7, 1982 and was acceptable pending confirmation that the information in the January 17, 1984 letter was incorporated into the FSAR.

Information presented in the FSAR through amendment 63 was reviewed with respect to the January 7, 1982 and January 17, 1984 letters. As a result of this review, a number of discrepancies were identified. In order to resolve these discrepancies additional information and justification is required to address each of the following items:

1. Due to the lack of physical separation provided between unit 1 and 2 distribution system cables at Watts Bar (e.g., unit 1 train A cables are routed in the same raceway with unit 2 train A cables), a single failure of A train cables can cause loss of the two diesel generator power supplies or two dc system power supplies that are associated with the A train. Likewise, single failure of B train cables can cause loss of the two diesel generator power supplies or two dc system power supplies that are associated with the B train. Provide the results of analysis which demonstrates that sufficient diesel generator and DC system power is available to attain a safe and orderly shutdown of both units following a design basis event in one unit and a single failure which causes the failure two diesel generators or two dc battery systems.

2. Technical Specification requirements for in operability of any part of a power train.

3. Test and maintenance restriction due to shared systems.

4. Extent of coordination required between units due to shared systems.

5. The availability of complete information for both control room operators regarding the status of systems such as the DC vital battery and the AC and DC distribution systems that are shared between units.

   During an August 7 and 8, 1991 meeting, TVA provided a written response. based on this response this item appears to be acceptably resolved. However, compliance with RG or clarification of compliance is being evaluated by TVA.

8.3.3.3(3) Separation Criteria Between Class 1E and Non Class 1E Circuits

In the SER, the staff indicated that surveillance requirements for protective devices will be reviewed with the Technical Specifications. Since issuance of the SER, the staff as part of their technical specification improvement program have established that surveillance requirements for the subject protective devices that are to be used to assure independence of circuits at Watts Barr should be included in and be evaluated as part of the FSAR. In order to initiate our review, additional information is required describing the surveillance requirements for the protective devices.

During an August 7 and 8, 1991 meeting, TVA indicated that the electrically operated circuit breaker and molded case circuit breakers actuated by a fault current and installed as an isolation device will have at least 10 percent of each type of breaker tested every 18 months and will have the recommended maintenance performed on 100 percent of the breakers within the past 60 months. For any breaker failure of breaker found inoperable, an additional 10 percent of that type breaker will be tested until no more failures are fund or all electrically operated circuit breakers of that type have been functionally tested.

The term within the past 60 months needs clarification.

During an August 7 and 8, 1991 meeting, TVA indicated that they would describe the surveillance requirements for the testing of circuit protective devices used to protect Class 1E circuit from failure of non-Class 1E circuits. Testing includes a 300 percent current test at initial installation on the thermal breakers. 15x rating or ?? for magnetic breakers at initial installation. DC breakers are not tested since testing is performed by manufacturer. After installation the breakers are tested to AB2 1990 which includes only opening and closing of the breaker. We indicated that this level of testing was not considered sufficient to assure the operability of the protective devices.

8.3.3.5 Compliance with GDC 18

8.3.3.5.1 Compliance with Regulatory Guide 1.118

In the SER, the staff indicated that the applicant by letter dated October 16, 1981 has documented that the FSAR will be revised to indicate full compliance to Regulatory Guide 1.118 ("Periodic Testing of Electric Power and Protection Systems"). The staff found this commitment to indicate full compliance acceptable. Subsequently in amendment 63 to the FSAR, the

applicant indicated that the Watts Bar design complies with all of the positions of Regulatory Guide 1.118, Rev. 2 except for position C.6(a).

Position C.6(a) allows (as an exception to section 6.4(5) of IEEE Std 338-1977) the use of temporary jumper wires when portable test equipment is used during testing. For the temporary jumper wires to be acceptable, the position requires that the safety system equipment under going test be provided with facilities specifically designed for connection of this portable test equipment and that these facilities must be considered part of the safety system under going test and must meet all the requirements of IEEE Std 338-1977.

In justification of this exception, the applicant documented in the FSAR that where feasible test switches or other necessary equipment will be installed permanently to minimize the use of temporary jumpers in testing.

In order for the staff to initiate its review of this exception, additional information and/or justification is required in the following areas.

(1) Identification of each safety system component where temporary jumpers are used that do not meet position C.6(a) of Regulatory Guide 1.118.

During an August 7 and 8, 1991 meeting, TVA indicated that they will identify each safety system component where temporary jumpers are utilized in testing by procedure.

(2) Justification which demonstrates that the use of each jumper identified in item (1) will not compromise the design basis safety function of the system component being tested.

During an August 7 and 8, 1991 meeting, TVA indicated that they will through the 10CFR50.59 type process analyze each identified jumper to assure that it will not compromise the design basis of the system component being tested.

The acceptability of the proposed resolution of items 1 and 2 described above will require further review by I and C as to its acceptability. This type of issue is primarily considered an I and C issue and should be transferred there for resolution.

(3) Design commitment which indicates that the test switches or other necessary permanent equipment will be installed to minimize the use of temporary jumpers in testing will meet

all the requirements of IEEE STD 338-1977.

During an August 7 and 8, 1991 meeting, TVA indicated that they would revise the FSAR as proposed in a draft mark up to indicate compliance with IEEE STD 338-1977. Pending revision of the FSAR, this item is considered acceptably resolved.

8.3.3.5.2 Compliance with Regulatory Guide 1.108

In the FSAR, the applicant identified an exception to position C.2.a(2) of Regulatory Guide 1.108. Position C.2.a(2) requires that the emergency loads be sequenced onto the diesel generator unit with each load operating at its full load rating (i.e. each pump operating at full flow). The applicant indicated that as part of preoperational testing, the loads would be operated at full flow while being sequenced on the diesel generator but that, during 18 month periodic testing, loads would be operated at mini flow while being sequenced on the diesel generator. Mini flow produces a loading of less than full load. In the SER, the staff found the use of mini flow loads during periodic testing to be acceptable.

Because testing at full load is not practical, the staff continues to find the use of mini flow loads during periodic testing to be acceptable; however, the staff is concerned that this acceptability for the use of mini flow loads may be misinterpreted to mean that a successful test at mini flow translates, without further analysis or evaluation, to a successful demonstration of the diesel generators capability to sequence loads at full flow. In order to resolve this concern, additional information is required with regard to modeling, trending, analysis, and/or other methodology performed on the miniflow test data to periodically demonstrate the capability of the diesel generator to sequence the full flow design basis loads.

During an August 7 and 8, 1991 meeting, TVA indicated that they would provide a written response with regard to modeling, trending, analysis, and/or other methodology performed on the miniflow test data to periodically demonstrate the capability of the diesel generator to sequence the full flow design basis loads. The verbal response appeared to be acceptable. Pending documentation of the verbal response, this item should be resolved.

8.3.3.5.3 Testing of One of Two Class 1E Power Systems Versus One of Four Systems

In the SER, the staff indicated that the applicant, by letter dated October 9, 1981, documented the commitment that only one of the four power trains of the plant (unit 1 and 2) would be tested

at one time. The staff concluded that this commitment was acceptable pending its documentation in the FSAR. In SSER 2, the staff indicated that the applicant had provided the required documentation by amendment 48 to the FSAR. The staff in its review of amendment 63 to the FSAR was however unable to locate the specific commitment which states that only one train would be tested at one time. In order to resolve this item, additional clarifying information is required as to the location of the specific commitment in the FSAR or to the new proposed testing restrictions with appropriate justification that have been documented in the FSAR.

During an August 7 and 8, 1991 meeting, TVA indicated that the FSAR commitment to test only one train at a time is stated on pages 8.3-9 and 8.3-12 of the FSAR. The operations engineers at the meeting pointed out that their procedures state that only one train should be tested at one time. Operations considered this should be tested at one time to be inconsistent with the FSAR statement that only one diesel will ever be in the test mode at any one time.

TVA indicated that they would either revise the FSAR or the operations procedure to be consistent with each other. If the FSAR is revised, TVA indicated that they would provide the necessary justification in the FSAR for when two diesels can be tested at one time.

8.3.3.6 Compliance With Position 1 of Regulatory Guide 1.63

In the SER, the staff required a reevaluation of the penetrations' capability to withstand, without seal failure, the total range of available time-current characteristics assuming a single failure of any over current protective device. In SSER 3, the staff found the results of the applicant's reevaluation acceptable pending confirmation that information presented in a January 17, 1984 letter was incorporated into the FSAR. Based on a review of information documented in the FSAR through amendment 63, the staff has reconfirmed that the applicant's reevaluation is acceptable. Therefore, the staff considers information presented in the January 17, 1984 letter to be incorporated into the FSAR and confirmatory issue 35 resolved.

In section 8.1.5.3 of the FSAR, the applicant indicated, as an exception to the testability requirements of RG 1.63, that, in lieu of the testing of fuses by resistance measurement, a fuse inspection and maintenance program would be established. Because justification was not presented in the FSAR for this exception, the staff, in Section 8.3.3.6 of the SER, indicated that periodic resistance measurement of fuses and their terminal connections would be required as part of its Technical Specification.

By letter dated September 15, 1982 and Amendment 55 to the FSAR,

the applicant provided information as to why periodic resistance measurement is not practical and provided justification for the adequacy of the proposed inspection and maintenance program in lieu of testing of fuses by resistance measurement. However, the applicant, by amendment 63 to the FSAR, removed the justification for demonstrating the adequacy of inspection and maintenance. Therefore, based on information presented in the FSAR, the staff is unable to find the applicants' proposed inspection and maintenance program acceptable.

In regard to the SER statement that periodic resistance measurement of fuses and their terminal connections would be required as part of its Technical Specifications, the staff has subsequently concluded as part of the Standard Technical Specification improvement program that this type of testing requirement should not be included in the plant's Technical Specification but should be included instead in the FSAR as a design basis requirement for the plant. Periodic resistance measurement of fuses and their terminal connections will therefore not be required as part of the technical specifications as indicated in the SER but will be addressed as part of the staff's review of the FSAR. In order for the staff to resolve this issue, justification is required which addresses the adequacy of the proposed inspection and maintenance program.

During an August 7 and 8, 1991 meeting, TVA indicated that they would add back the following justification that was removed.

> "Fuse manufacturers have also stated that fuses do not deteriorate with service life. Service temperatures above the rated temperature, current surges, and unusual cycling conditions all reduce the fuses service life, i.e., the fuse becomes more protective. Under no conditions will a fuse become less protective during its service life."

The inclusion of the above statement resolves this concern.

Failure of the fuse because of aging was discussed. TVA indicated that fuses would not age at the same rate and that their failure would not cause common mode failure of the redundant circuits. Fuse will trip randomly and will be identified by periodic monitoring of equipment or by loss of power due to their failure. This was not considered to be an issue.