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

JUL 01 1994

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

Gentlemen:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) - RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION RELATED TO WBN FIRE PROTECTION REPORT

The purpose of this letter is to respond to NRC's request for additional information relating to the fire protection program (TAC M63648) at WBN. This request was made in a letter dated April 6, 1994, from P. S. Tam (NRC) to O. D. Kingsley, Jr. (TVA).

Enclosure 1 to this letter provides a restatement of NRC's specific questions and TVA's response. Enclosure 2 to this letter provides Attachment 2 to the deviation request identified by NRC in Question 1 under Deviations. Enclosure 3 provides a list of commitments made in this letter.

If you should have any questions, contact P. L. Pace at (615)-365-1824.

Sincerely,

Dwight E. Nunn
Vice President
New Plant Completion
Watts Bar Nuclear Plant

Enclosures
cc: See page 2

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cc (Enclosures):
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50-390 TVA WATTS BAR 1

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION RELATED TO WBN FIRE PROTECTION REPORT

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

1. NRC REQUEST

"In reviewing Section 4.0, References, it was noted that the appropriate standards referenced by TVA's Watts Bar conduit and cable tray fire endurance were not included. These fire barriers are part of the fire protection features required to protect the plant's capability to achieve and maintain post-fire safe shutdown. Please identify the criteria and standards used and incorporate them into the fire protection report. In addition, the fire protection report should identify the appropriate fire barrier testing and design references along with specifying the performance objectives for these barriers".

TVA REPLY

The Fire Protection Report, Section II-4.2, is presently being revised to add the following references:

a. Mechanical Design Standard DS-M17.2.2, "Electrical Raceway Fire Barrier Systems." This design standard identifies the fire endurance acceptance criteria, applicable standards, fire endurance test summaries and how to apply those tests to WBN field configurations.

b. General Engineering Specification G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems." This general engineering specification defines the engineering requirements for installation, modification, and maintenance of electrical raceway fire barrier systems which are to be installed at TVA nuclear power plants.

In general, the WBN fire test program used the time-temperature profile as required by ASTM E-119 and the fire endurance criteria of UL Subject 1724 as enhanced by WBN. The test program is in agreement with the criteria published in NRC Generic Letter 86-10, Supplement 1.

2. NRC REQUEST

"Combustible control zones is defined in Section 5.0, Definitions. The definition indicates that these are designated locations which are provided in accordance with Appendix R, Section III.G.2 regulations. This term does not appear in Appendix R. Please describe, through an illustration, how these combustible control zones provide the required fire separation of redundant safe shutdown trains".

TVA REPLY

A combustible control zone is a defined area in the plant in which transient combustibles may not be stored unless adequate evaluation and/or compensatory measures are implemented. For example, a combustible control zone is located in the Diesel Generator Building corridor (Elevation 760.5) in the vicinity of the CO_2 system panels. This area is to be kept free of transient combustibles.

3. NRC REQUEST

"Continuous fire watch as defined in Section 5.0, Definitions, indicates that a trained individual should be in a specified area at all times and that the area should contain no impediment to restrict the movement of the watch. The patrol frequency for a continuous fire watch specified is 15 minutes with a 5 minute margin. In addition, this definition indicates that a specified area for a continuous fire watch is one or more fire zones within one or more fire areas. This definition does not meet the original intent of a continuous fire watch. Please provide your technical basis for using this type of fire watch patrol and identify how a roving watch provides the same level of fire safety to that of a fire watch that remains within the specified fire area on a continuous basis. In addition, information is needed regarding the training fire watches receive. In order to complete the review in this area an overview of the fire watch training program is needed".

TVA RESPONSE

The definition provided in the WBN Fire Protection Report (FPR) provides an interpretation for roving and continuous fire watch. The proposed definitions will aid in the reduction of fire watches not believed to be necessary for the prompt detection of fires and will clarify the requirements for meeting the time frequencies of the watches.

Continuous fire watch infers a separate, stationary, and continuous fire watch is needed for each compartment or area outside of visual range. The prompt detection of fires can be achieved by a continuous fire watch monitoring multiple impairments in a given fire area or areas, provided movement is not restricted by impediments and that the general area/locations where the impairments are located are checked no less than every 15 minutes with a 5-minute margin. This allows for movement and varied areas to be observed thus adding to the fire watch's alertness and attentiveness.

These definitions are considered to provide reasonable administrative flexibility and reduce the overall fire watch burden while maintaining an acceptable level of detection. These definitions are not considered to change the intent of regulatory requirements and are similar to wording contained in the D.C. Cook Nuclear Plant Technical Specification Bases. Additionally, NRC approved similar changes to the Sequoyah Nuclear Plant Technical Specification Bases in TAC No's. M83543 and M83544 (TS-9205), dated November 25, 1992.

Plant employees assigned to established fire watch tours or fire watch positions are given an initial fire watch course (Fire Protection Training [FPT]-313.001) prior to assuming fire watch duties and annually thereafter. The course is approximately 4 hours long and provides training in the basic chemistry of fire, fire detection, and procedures for reporting fires as well as hands-on training in the use of portable fire extinguishers. Annual retraining is also required to remain fire watch qualified.

This training requirement is found in Fire Protection Instruction (FPI)-0120, "Training," under Section 4.0, "Definitions" (FPI-0120 is on ADMINISTRATIVE HOLD at this time based on the current plant construction status), and the details for training are contained in the Fire Watch Lesson Plan (FPT-313-001).

4. NRC REQUEST

"Fire watch-roving as defined, requires that a trained individual be in the affected area at specified intervals with a margin of 25 percent. Please provide your technical basis for this 25% allowance and how you intend to assure that the fire watch patrol frequency is maintained to the original specified interval without excessive use of extensions".

TVA RESPONSE

It is desirable to quantify the limits associated with the hourly patrol requirements and provide tolerances. Defining a roving fire watch frequency as 60-minute intervals with a 15-minute margin provides reasonable administrative flexibility and is consistent with other Technical Specification related surveillance frequencies that allow margins of 25%.

The definition establishes the limit for which the roving fire watch interval may be extended. It permits an allowable extension of the normal frequency interval in consideration of plant operating conditions that may not be suitable for completing the fire watch round (e.g., transient conditions). It is not intended that this

provision be used repeatedly as a convenience to extend roving fire watch intervals beyond that specified but to allow for the fire watch to correct deficiencies in the field, which is the purpose of the fire watch. This provision is sufficient to ensure that the reliability ensured through roving fire watch activities is not significantly degraded beyond that obtained from the specified roving fire watch interval.

5. NRC REQUEST

"Frequency has been defined in Section 5.0. As part of this definition an extension to the frequency of 1.25 times, as measured from the previous performance, or as measured from the time a specified condition of the frequency is met. Please provide your technical basis for this 25% extension and how you intend to assure that the testing/inspection frequency is maintained to the original specified interval without successive extensions in the frequency".

TVA RESPONSE

WBN defined the extension time for test frequency as 125% of the stated frequency. This was to be consistent with the Technical Specifications (Tech Spec) test frequency. Again for consistency, the Fire Protection Program testing will be scheduled the same way as the Tech Spec testing as described in Site Standard Practice (SSP)-8.02, "Surveillance Test Program." SSP-8.02, Section 1.2, "Applicability," states in part "This SSP is applicable to procedures used to fulfill Surveillance Requirements of periodic test commitments identified in the following: Enhanced Technical Specification (Tech Specs), Technical Requirements Manual, Offsite Dose Calculation Manual, and Fire Protection Plan (FPP). These procedures include ... and Fire Operating Requirements (FORs)".

6. NRC REQUEST

"It is noted that noncombustible smoke and hot gas seals are utilized. Please provide your criteria for the use of these seals and a typical description of the materials used to construct these seals. In addition, please clarify if these seals are included in a surveillance and test program and provide a description of this program (e.g., frequency of inspection, type of inspections performed)".

TVA RESPONSE

Typically, conduits that are less than 2 inches in diameter are provided with a noncombustible smoke and hot gas seal when the conduit terminates from 1 to 5 feet from the barrier. The most prevalent smoke and hot gas seals have a minimum of 3 inches of RTV silicone foam and 1 inch of ceramic fiber damming at the back/bottom side of the foam. This criteria is presently documented on the 45W883 series drawings.

A 100% walkdown of the internal seals for electrical conduits is currently in progress. This walkdown will verify that the conduits are properly sealed in accordance with the details on the 45W883 series drawings. Following this walkdown, which will be a baseline, the systems covering all penetration fire barrier seals will be turned over to plant operations.

The smoke and hot gas seals will not be included in a surveillance and test program. Since these seals are internal and not subject to mechanical damage as is the case with mechanical seals, WBN plans to control configuration of these seals administratively. This will be accomplished by required reviews of work activities and design changes for fire protection program impact. Any breaches to these internal seals, caused by the work activity or design change, will be controlled by the plant configuration control system which will ensure that the seals are returned to normal following completion of the work.

7. NRC REQUEST

"Section 8.2, Modification Controls, indicates that the fire hazards analysis contains an area by area evaluation of the plant to determine the ability of the passive and active fire protection systems to protect against the hazards present in the area. In the fire hazards analysis, the fire resistive ratings of the barriers have been evaluated in order to delineate the necessary fire separation. In reviewing the fire hazards analysis, the safety factors used in the design of your fire barriers could not be identified. For the fire area boundary fire barriers, please provide a typical description of their design and design basis and the fire resistive safety factors used in determining the rating of these barriers".

TVA RESPONSE

In general, the fire barriers (walls, ceilings, floors) are of either reinforced concrete construction or reinforced concrete block construction. The concrete barriers are normally a minimum of 12 inches thick and the block barriers are normally 8 inches thick. The UL Fire Resistance Directory identifies similar concrete block barriers as Design No. U904, U905, U906 and U907 which are 2-hour to 4-hour fire rated designs. The Fire Protection Handbook (Seventeenth Edition), Section 6, Chapter 5, provides a correlation between the fire rating and the thickness of reinforced concrete. Figure 6-5G indicates that fire resistance rating of a reinforced concrete floor with a thickness of 6 inches should be approximately 4-hours. Based on this, the 12 inches thick reinforced concrete exceeds the maximum 3-hour rating assigned to these barriers at Watts Bar.

8. NRC REQUEST

"Section 9.1, Fire Brigade Staffing, please provide a description of the type of emergencies that the fire brigade would respond to on the plant site or owner controlled area, their responsibilities at these emergencies, and when involved in an emergency for a period exceeding 1-hour, what provisions are there to assure that manual fire fighting capabilities for the power block can be adequately supported".

TVA RESPONSE

The following is a list of the four types of emergencies that the fire brigade would respond to on the plant site and owner controlled areas and their responsibilities.

a. FIRES

The responsibilities are covered in FPI-0110, "Emergency Response" and are as follows:

Emergency Coordinator/Shift Operations Supervisor (SOS)

- Oversees the emergency response from an operability of plant systems standpoint.
- Ensures each shift is manned with the minimum trained personnel to meet Fire Emergency Response Team (FERT) requirements.

Incident Commander/Assistant Shift Operations Supervisor (ASOS)

- Directs the on-scene fire response.
- Assesses the fire emergency and advises the Main Control Room (MCR).
- Concurs with activities associated with extinguishing the fire at the plant.

Fire Brigade Leader/Fire Protection Shift Supervisor

- Directs actual firefighting activities and obtains concurrence from the Incident Commander/ASOS.
- Determines extinguishing agent to use.
- Requests additional personnel, equipment, supplies, and outside aid.
- Coordinates removal from service of any equipment contributing to the fire or hindering firefighting activities.
- Supervises cleanup and overhaul of fire scene.

Fire Brigade Members/Fire Operators

- Reports directly to fire brigade leader.
- Extinguishes fire or mitigates emergency following instructions from the fire brigade leader.

b. MEDICAL EMERGENCIES

The responsibilities for medical emergencies are covered in Emergency Plan Implementing Procedure (EPIP)-10, "Emergency Medical Response," and are as follows:

SOS

- Maintain control of the emergency situation.
- Contact the offsite medical care providers (e.g., ambulance service, hospital)

Incident Commander

- Establish communications with the SOS and Emergency Medical Service leader.
- Direct personnel in support of the medical response (i.e., Radcon, Nuclear Security, AUOs, Nurse).
- Direct onscene Security to address site access badging needs.
- Control access to the accident scene until all hazards are removed to the extent the area can be returned to unrestricted access (i.e., radiological, physical, or bio-hazard blood borne pathogens).

Emergency Medical Service Leader/Fire Protection Shift Supervisor

- Establish communication with incident commander and coordinates necessary support.
- Determine which ambulance (if any) is to be used.
- Advise the incident commander of the patient's destination (specific hospital, site Health Station or decontamination room or no further TVA care).
- Obtain SOS concurrence if a TVA ambulance is to be taken offsite.
- Ensure necessary actions are taken for blood borne pathogen controls at the accident scene. Assistance may be available from site Health Services. Advise the incident commander of cleanup status.

Emergency Medical Technician (EMT)

- Provide medical care until relieved by appropriately trained personnel.

c. HAZARDOUS MATERIALS SPILL

The responsibilities during a hazardous materials spill are covered in the Environmental Compliance Manual, Chapter 8, "Spill Prevention Control and Countermeasures (SPCC) Plan."

Emergency Coordinator [SOS until relieved by the site Environmental Manager]

- Mitigate hazardous materials spills by stopping the release or containing it.
- Ensure that spills are properly cleaned up.

Emergency Response Personnel

- Control or contain spill to ensure release effects are minimized. Cleanup is normally provided by others as directed by the Emergency Coordinator.

d. RESCUE SITUATIONS

The responsibilities for rescue operations are not covered by a written procedure, but emergency response personnel receive annual training on proper response to rescue situations.

It is the responsibility of the incident commander and the fire brigade leader to determine when more firefighting personnel are needed and to request that the Emergency Coordinator call such personnel in to the plant. TVA has contracts with the city of Dayton Fire Department and the Rhea County Fire Department to respond with manpower and equipment to WBN in the event of an emergency that would require more manpower than is available at the plant. An off-duty-call-in list of WBN Fire Brigade Members is available to the MCR. The Emergency Coordinator or SOS will have personnel called in when requested by the incident commander or when they feel it necessary. The incident commander and fire brigade leader are well aware of the need to get the event under control as soon as possible and are trained during fire drills to start offsite response requests as quickly as possible after a determination has been made that there is a working fire in progress that may require additional manpower.

The Fire Protection Report covers Fire Brigade Staffing under Section 9.1. This states that "the fire brigade composition may be less than minimum requirements for a period of time not to exceed two hours, in order to accommodate unexpected absence, provided immediate action is taken to fill the required positions." A life-threatening medical emergency, requiring the plant ambulance and EMT responders to leave the site for transport of the patient, is the most likely type of emergency that would prevent the full fire brigade from being available onsite. This is expected to be a rare occurrence.

9. NRC REQUEST

"Section 9.3, Training and Qualifications, Item c., Fire Drills, establishes the criteria for conducting the various types of fire brigade drills (announced and unannounced) annually. However, this section does not specify the drill attendance criteria for individual fire brigade members and leaders. Please describe the attendance criteria that has been established for individual fire brigade members and leaders".

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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TVA RESPONSE

Drill attendance criteria for fire brigade members and fire brigade leaders is found in site instruction FPI-0120, "Training." All fire brigade leaders and members are required to participate in at least two drills per year. The Fire Protection Report is presently being revised to reflect these requirements.

10. NRC REQUEST

"Section 9.5, Fire Emergency Procedures and Prefire Plans, indicates that prefire plans are developed to support fire-fighting activities in safety-related and safe shutdown areas. Fire emergency preparedness should not be limited to just those areas, consideration should be given to developing fire preplans for those plant areas which may not be safety-related or safe shutdown areas but, if were involved in a fire, could present a direct or indirect fire exposure to plant areas important to plant safety. Please confirm your intentions to expand the scope of the preplans to cover those areas which may present a potential fire hazard to plant areas important to safety".

TVA RESPONSE

The prefire plans are presently being generated for plant areas that are safety-related or safe shutdown, or present a hazard to safety-related equipment. This is consistent with NRC guidance provided in the R. Ferguson and P. Mathews memorandum dated June 20, 1977, with a subject title of "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." WBN believes these areas are inclusive of those intended by the phrase "plant areas important to safety." The Fire Protection Report is under revision to reflect the additional requirement to address areas that present a hazard to safety-related equipment.

11. NRC REQUEST

"Section 9.5, Fire Emergency Procedures and Prefire Plans, a summary of the information included in the prefire plans was identified. In reviewing this information, it was noted that the prefire plans do not address smoke control. For each specific fire area please provide a description of how you intend to control smoke and establish ventilation to vent smoke from the area of the fire".

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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TVA RESPONSE

The Fire Protection Report criteria provided to NRC for review did not specify ventilation and smoke control. However, the proposed prefire plans for WBN will address ventilation and smoke control. This section of the Fire Protection Report is presently being revised to reflect that ventilation concerns are to be addressed in prefire plans and to reflect the information provided on the prefire plans.

12. NRC REQUEST

"Section 10.0, Control of Combustibles, indicates that the use and handling of combustible materials such as fire retardant-treated lumber, paper, plastic, and flammable/combustible gases and liquids are prohibited or controlled in safety-related areas. Please confirm that the areas required to support safe shutdown are covered by this program. In addition, please provide a description of your program and describe the administrative limits placed on transient combustibles for these plant areas".

TVA RESPONSE

The administrative procedure for the control of transient fire loads (FPI-0100) ensures that only controlled quantities of transient fire loads involving high hazard materials (acetone, alcohol, xylene, etc.) or large quantities of lesser hazard material (such as > 60 gallons of Class III lube oil) are introduced into critical plant areas. The procedure requires that a request to take these materials into critical plant areas be evaluated and approved by the Fire Protection Section. Periodic walkdowns are performed to verify compliance with program requirements and plant management will be informed of program discrepancies.

In addition, Combustible Control Zones are specifically identified in this procedure. Combustible materials may not be stored in these areas without an evaluation and/or compensatory actions being implemented.

FPI-0100, "Control of Transient Fire Loads," is available for review at the WBN site.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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13. NRC REQUEST

"In section 10.0, Control of Combustibles, the term limited combustible construction is used. This term is not defined in Section 5.0, Definition. Please provide a definition of this term".

TVA RESPONSE

The Fire Protection Report is presently being revised to add the following definition:

Limited-combustible construction is a building construction material or finish that does not comply with the definition of noncombustible material or materials having a structural base of noncombustible material, with a surface not exceeding a thickness of ⅛-inch that has a flame spread rating not greater than 50 when measured using ASTM E84 Test, "Surface Burning Characteristics of Building Materials."

14. NRC REQUEST

"In Section 10.0, Control of Combustibles, the term combustible control zones is used. This term is not defined in Section 5.0, Definitions. Please provide a definition of this term. In addition, please describe in detail the locations of these zones in the plant and the basis for how they are used to provide reasonable assurance that a fire will not propagate and jeopardize fire safe shutdown (FSSD) equipment".

TVA RESPONSE

A combustible control zone is a defined area in the plant in which transient combustibles may not be stored unless adequate evaluation and/or compensatory measures are implemented. An example of a combustible control zone is in the Diesel Generator Building corridor (Elevation 760.5) in the vicinity of the CO_2 system panels. This area is to be kept free of transient combustibles.

The Fire Protection Report, Section II, Paragraph 5.0, is under revision to clarify the definition of the term "combustible control zones." Section IV of this revision will identify the combustible control zones.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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15. NRC REQUEST

"Section 11.0, Control of Combustibles, indicates that the ignition source permits are reviewed and approved by appropriate plant personnel. Please provide a description of this program and an overview of the approval process".

TVA RESPONSE

The administrative procedure for the control of ignition sources (FPI-0101) ensures that a member of line supervision reviews and approves issuance of "hot work" permits based on plant conditions and a prior inspection of the proposed work area.

16. NRC REQUEST

"Section 11.0, Control of Combustibles, indicates that fire watches are provided for all ignition source work activities in safety-related areas. Please describe this program and confirm that it covers safe shutdown and those areas which could be a direct or indirect fire exposure to plant areas important to safety".

TVA RESPONSE

The procedure for the control of ignition sources (FPI-0101) is uniformly applied for plant operating areas, whether they are safety-related or not. This will ensure that the same controls are established for both critical and balance of plant operating areas. Fire watches are required whenever there is a potential for fire and vulnerability of damage to plant property or equipment. Any areas in question will be referred to the Fire Protection Engineer/designee for determination of fire watch requirements.

17. NRC REQUEST

"Section 12.1, Water Supply, describes the fire protection water supply and fire pump capacity in general terms. This system gets its source of water from the Chickamauga Lake and shares the underground piping used by the raw cooling water system (RCW). It is our understanding that this system is very similar to the system at your Sequoyah facility. Due to RCW demands and concerns over microbiologically induced corrosion, Sequoyah has made plans to modify this system and incorporate listed fire pumps, potable water supply and a dedicated underground fire water distribution system. In order to get a better understanding of the Watts Bar system, please provide a detailed comparison between it

and the one utilized by your Sequoyah facility. In addition, this discussion should address logic sequence for starting of the fire pumps, fire flow demands on the system, UL listed components, how future RCW demands will be controlled, and inspection and testing of the system".

TVA RESPONSE

The High Pressure Fire Protection (HPFP) Systems at WBN and the current HPFP systems at SQN are similar in that they take their supply from the Tennessee River and perform multiple functions. The primary safety functions of the system are to provide an emergency source of cooling water for the Steam Generators, the Auxiliary Boration Makeup Tank, and the Spent Fuel Pool in the event of a flood above plant grade. The secondary safety function of the system is to provide water for fire protection. The system is also interfaced with the Raw Service Water (RSW) system. The pumps are powered from 1E electrical boards that automatically transfer to the emergency diesel generators upon loss of offsite power. Comparisons of the SQN and the WBN HPFP systems are listed below.

a. WATER QUALITY

The water quality at WBN and at SQN is essentially comparable since the intake for both the WBN HPFP and the SQN HPFP are obtained from the Tennessee river and are approximately 33 miles apart.

b. PUMPS

SQN has four electric motor driven submersible pumps each rated at 1500 gpm @ 400 feet of head. SQN HPFP pumps satisfy the draft ASME code for valves and pumps for Nuclear Power (1968).

WBN has four electric motor driven vertical pumps each rated at 1590 gpm @ 300 feet of head. WBN's pumps were designed, built, and stamped in accordance with ASME B&PV Code, Section III, Class 3 requirements. Since WBN's HPFP pumps perform a primary safety function, they are N-stamped rather than UL listed and/or FM approved for fire protection service. The fact that the pumps are N-stamped exceeds the normal UL/FM levels of Quality Assurance.

c. PRESSURE CONTROL

SQN has three system pressure control valves (PCV) located downstream of the pumps with no relief valves at the pump.

WBN has one system PCV downstream of the four pumps and each pump is provided with a relief valve.

d. STARTING LOGIC

The fire pumps at SQN and WBN do not start upon a drop in system pressure as is common for industrial fire protection systems. The pump starts are automatically initiated upon actuation of the fixed automatic detection system or manually from either the hand switches in the MCR or push buttons typically located at each standpipe and hose stations. Additional fire pump start hand switches are located in the Shutdown Board Rooms located in the Auxiliary Building Elevation 757 at WBN.

The normal starting logic of the WBN system is as follows:

The pumps are in the automatic mode with the MCR handswitch for one train A and one train B pump in the A-P auto position and MCR handswitch for the other two pumps in the A auto standby position. Upon receipt of an automatic start signal, the train A pump in A-P will start, followed by the train B pump after a 10 second delay. If at any time after 20 seconds from the receipt of an automatic start signal the system pressure cannot be maintained above 105 psig, the train A pump in A auto standby will start, followed in 10 seconds by the train B pump in A auto standby.

e. FIRE FLOW DEMANDS AT WBN

The fire pumps and system at WBN are sized to meet the following criteria:

A sufficient number of pumps are provided such that 100% fire fighting capacity is available with either one pump inactive or with the hydraulically least demanding portion of any one loop main out of service. The capacity of the fire pumps is sufficient to supply water at design flow to the largest sprinkler or water spray system with design flow to non-isolated RSW loads and is capable of supplying 500 gpm for hose stream.

f. UL LISTED COMPONENTS AT WBN

As stated earlier, due to the primary safety function of the HPFP pumps at WBN, the pumps are N-stamped rather than UL Listed. Other key components of the HPFP such as sprinkler system flow control valves, sprinkler heads, standpipe control valves, and hydrants are typically UL Listed and/or FM approved components as required by TVA's Augmented QA program.

g. RAW COOLING WATER (RCW) LOAD CONTROL AT WBN

The HPFP system interfaces with the RCW system through a connection between the HPFP fire main and the RCW header in the Turbine Building. The RCW connection is automatically isolated when the high pressure fire pumps are started. Future demands added to the RCW loads will be controlled by the WBN design change process. This process requires a review for fire protection/safe shutdown concerns.

h. INSPECTION AND TESTING AT WBN

The requirements for the inspection and testing of the water supply system are provided in the Fire Protection Report, Part II, "Fire Protection Plan," Section 14.0, "Fire Protection Systems and Features Operating Requirements (OR)," "Testing and Inspection Requirements (TIR)," and the "Basis" for these two sections (for a comprehensive description of the MIC program see the letter from W. J. Museler [TVA] to NRC dated August 31, 1993). TIR Section 14.2.c addresses a system flush. This system flush is to include the corrective action requirements of significant corrective action report (SCAR) WBSCA920028. This SCAR addresses biofouling due to clams and is to mitigate the build up of biofouling material in the fire protection system. TIR Section 14.2.f addresses a system flow test. The flow test specified in this TIR is to be performed every five years, but at this time the system description (design output) requires this test to be performed annually for at least three years and then every three years thereafter. This testing will provide trending data to determine the effectiveness of the SCAR corrective action to mitigate biofouling and to adjust the performance testing frequency in the system description to that of the FPR.

ENCLOSURE 1

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18. NRC REQUEST

"In your submittal dated May 1, 1992, Response to Question 3, you identified how you intend to control microbiologically induced corrosion (MIC) in the fire protection system. In your response to this question, it was indicated that a nonconforming condition was identified that the fire protection system may experience greater than expected corrosion of piping which could lead to unacceptable system performance. Therefore, system connections were added to the system and periodic system testing is conducted to detect unacceptable degradation in system performance based on the most hydraulically remote areas of the plant. In order to get a better understanding of how MIC control is performed, please describe how the program will control corrosion and detect degradation in the various deadlegs of the standpipe/hose station system piping, the distribution headers to the various sprinkler systems, etc".

TVA RESPONSE

A permanent monitoring (test program) has been established for the standpipe and suppression systems. Permanent test capability has been installed for the hydraulically most remote areas of the plant to facilitate periodic monitoring and testing. Specifically, testing capability has been provided as follows:

- Control Building suppression systems flow test connection - Permanent piping has been provided downstream of sprinkler flow control valves (FCV) 0-FCV-26-211 and -215.

- Auxiliary Building suppression system flow test connection - Permanent piping has been provided downstream of sprinkler FCVs 0-FCV-26-143 and -322 and a test connection has been provided downstream of 0-FCV-26-151 and -326.

- Diesel Generator Building suppression system flow test connection - Permanent piping has been provided downstream of sprinkler FCV 0-FCV-26-167.

The existing piping at the standpipe systems highest hose station will serve as the test point for monitoring and testing the standpipe system in each building. Additional testing could be performed at individual hose stations if necessary. Periodic testing of the HPFP distribution system will be performed once a year for the first three years and then once every three years thereafter depending upon the results of the first three years testing.

The design basis pressure and flow requirements have been calculated and will be used as the basis to monitor system performance. The design basis for the system hydraulic analysis takes into account the requirements of TVA Design Standard DS-M3.5.1, "Pressure Drop Calculations for Raw Water Piping and Fittings." The design standard requires a 0.8-inch reduction of the actual pipe inside diameter and Hazen-Williams C factor of 55 for the sections of the system that are normally wetted. The purpose of these restrictions is to predict a 40 year service life of the pipe. The results of the periodic testing will be compared against these values. This data will be trended to predict system degradation and initiate prompt corrective actions. The trending program is presently under development at WBN.

All raw water systems at WBN are treated with oxidizing biocides for MIC (bacterial infestation) and a non-oxidizing biocide for clams and MIC. An additional treatment system provides chemistry to clean up corrosion products and inhibit corrosion of carbon steel and copper/copper alloy materials. To better distribute the biocides in normally stagnant portions of the system, periodic flushes are coordinated with periods for chemical injection. Typically, biocide residual is confirmed before the flush is terminated.

Pipe wall thickness monitoring is performed in several locations on HPFP pipe by ultrasonic techniques. The monitoring activity is established in TI-31.13 and is conducted semi-annually to maintain confidence in the structural integrity of the piping system. This test is independent of the performance based testing described earlier.

19. NRC REQUEST

"Section 12.1, Water Supply, indicates that the underground fire main loop is provided to serve both units and sectional isolation valves are provided so that maintenance can be performed. Please clarify if these valves are the indicating type. If they are not, describe how you intend to verify that these valves are maintained in their operating position".

TVA RESPONSE

Most valves in the fire suppression system are the indicating type. Some valves in the yard portion of the system are the key operated (curb) type which are not a visually indicating type of valve. For these valves, the roadway box is provided with a mechanism that can lock, seal, etc., the box cover in place. Administrative controls place the valves in the proper position and lock or seal them using the verification process as required by plant procedures. Those valves that are in the flow path are inspected each month as required by the FPR,

Part II, Section 14.2.b, "Testing and Inspection Requirements," to verify the valve is still locked, sealed, etc. No additional checks are performed since the valve was confirmed to be in the correct position before locking or sealing.

20. NRC REQUEST

"Section 12.1, Water Supply, indicates that credit is taken for hose/hydrant houses and the associated fire fighting equipment as backup manual fire suppression capability to the intake pumping station and is the primary and backup for the diesel generator buildings conduit interface room. Section 14.7, Fire Hydrants, indicates that these hydrants are required to be operable whenever equipment in the intake pumping station and diesel generator buildings conduit interface room is operable. Generally, hydrants that provide primary or backup protection to safety-related or safe shutdown plant areas are provided with fire fighting equipment houses. Please verify that these hydrants and others that may be important to providing protection for areas that are important to plant safety and may be used to protect safety-related structures in the event of a exposure fire are provided with fire fighting equipment houses. In addition, please confirm for those hydrants that fit into this category are equipped with equipment houses, identify the type of equipment in these houses, and verify that the equipment in these houses are included in the testing/inspection requirement for these specific hydrants".

TVA RESPONSE

The WBN dedicated fire brigade is trained and equipped for firefighting to ensure adequate manual firefighting capability for all areas of the plant containing structures, systems, and components important to safety. In lieu of firefighting equipment houses, the fire brigade equips and maintains mobile apparatus with sufficient equipment to perform firefighting activities using the fire hydrants identified in Section 14.7. The equipment maintained on the mobile apparatus consists of, at a minimum:

- 300 feet of 2½-inch fire hose (or equivalent)
- 200 feet of 1½-inch fire hose (or equivalent)
- One 2½-inch x 1½-inch x 1½-inch gated wye (or equivalent)
- Two spanner wrenches (or equivalent)
- Two 1½-inch electrically approved fire nozzles (or equivalent)

Simultaneous fires are not postulated to occur that would require the use of multiple primary or backup hydrants. This equipment inventory is satisfactory to provide sufficient supply lines and hand lines for a primary attack line and a backup attack line for the Diesel Generator Building conduit interface room from the more remote hydrant (0-HYD-026-

535). This inventory is also adequate to provide sufficient supply lines and hand lines for a primary attack line and a backup attack line as a backup manual suppression for the Intake Pumping Structure from hydrant 0-HYD-026-574.

Testing and Inspection requirement 14.7.a requires that a visual inspection of the fire hose equipment dedicated to support the use of fire hydrants is performed once every 31 days to assure all equipment is available.

21. NRC REQUEST

"Section 12.3.2, Fixed Spray Systems with Closed Heads, identifies that these type of systems provide protection for the charcoal type HEPA filter units, reactor coolant pumps, area of divisional interaction within the containment annulus, and the cable tray penetrations through the turbine/control building wall. These systems provide protection for safety-related functions, or assist in mitigating hazards that can present an exposure to a safety-related structure. Please confirm that these systems are or are going to be included in the testing/inspection requirement for water based fire suppression systems (Section 14.3)".

TVA RESPONSE

The particular systems referenced are addressed in the FPR, Part II, and are included in the testing/inspection requirement for water based fire protection systems, as noted below:

a. Charcoal filter units - Section 14.3.c, Auxiliary Building-ABGTS filters, EGTS filters, and Containment Purge Air Exhaust filters and Section 14.3.e, MCR air filters.

b. Reactor Coolant Pumps - Section 14.3.a, Unit 1 Reactor Building-RC pump area.

c. Area of divisional interaction within the containment annulus-Section 14.3.a, Unit 1 Reactor Building-Annulus.

d. Cable tray penetrations through the Turbine/Control Building wall-Section 14.3.g, Turbine Building-Control Building wall.

22. NRC REQUEST

"Section 12.8, Communications, indicates that adequate radio communications is provided for all areas of the plant that contains equipment that must be manually operated in the event of a fire. In

some rooms, such as the RHR heat exchanger room, two-way radio communications may not be adequate. Please identify all areas of the plant where two-way radio communications may not be available. In addition, please describe those communications systems that are considered as backup to the two-way radios and how it was determined that these systems would be free of fire damage and available for post-fire safe shutdown and firefighting operations".

TVA RESPONSE

The very high frequency (VHF) radio system is the primary means of communication for manual operator actions and for the fire brigade. Availability of the VHF radio system is evaluated in Calculation WBPEVAR9205004, "Appendix R Analysis for Intraplant Communication Systems." This system has been upgraded under Design Change Notice (DCN) 19796-A to relocate major system components to the Turbine Building (TB), Elevation 729 and 755, and to provide another separate and redundant antenna system in the Auxiliary Building such that a fire cannot disable both antenna systems. The VHF radio system is available for all fires except for a fire on the VHF equipment in the TB, Elevation 729 or 755. No manual operator actions are associated with a fire in these TB locations. Adequate radio communications at or near each manual operator action was field verified by manual action walkdowns.

The backup systems to the two-way radios are as follows and are not maintained free of fire damage since radio communications are available for the areas requiring manual operator actions:

a. PAX telephone, public telephone, and CAP (Codes Call, Alarms, and Paging) Systems.

b. Backup Control Center Communication System which consist of an independent primary and alternate sound-powered telephone system.

23. NRC REQUEST

"Section 12.10.1, Walls, Floors and Ceilings, indicates that fire areas are separated by 3-hour equivalent fire barriers. Areas rooms within the fire areas are separated into fire zones that have equivalent 1-hour, 2-hour, or, 3-hour fire barriers. It is not clear if these barriers are actually rated and constructed in the same fashion as the fire test assembly, in context, please clarify what is meant by the term equivalent".

TVA RESPONSE

In general, the fire barriers (walls, ceilings, floors) are of either reinforced concrete construction or reinforced concrete block construction. The concrete barriers are normally a minimum of 12 inches thick and the block barriers are normally 8 inches thick. The UL Fire Resistance Directory identifies similar concrete block barriers as Design No. U904, U905, U906 and U907 which are 2-hour to 4-hour fire rated designs. The Fire Protection Handbook (Seventeenth Edition), Section 6, Chapter 5, provides a correlation between the fire rating and the thickness of reinforced concrete. Figure 6-5G indicates that fire resistance rating of a reinforced concrete floor with a thickness of 6 inches should be approximately 4-hours. Based on this, the 12 inch thick reinforced concrete exceeds the maximum 3-hour rating assigned to these barriers at Watts Bar.

24. NRC REQUEST

"Section 12.10.4, Fire Doors states that modifications to fire doors must be performed in accordance with acceptance criteria approved by a fire protection engineer. Please describe the modification acceptance criteria for fire doors and the technical basis for this criteria".

TVA RESPONSE

Fire door modification/repair acceptance criteria is documented in Modification/Addition Instruction (MAI) - 5.6, "Fire Rated Doors, Safety-Related Doors and Hatches" and in General Engineering Specification G-73, "Installation, Modifications, and Maintenance of Fire Protection Systems and Features," and is available for review. The acceptance criteria was developed by a Fire Protection Engineer from information gathered from other nuclear utilities, fire door manufacturers, and Underwriters Laboratories evaluations of fire doors at Watts Bar.

25. NRC REQUEST

"Section 12.10.6.B, Electrical Penetrations, indicates that conduit penetrations generally require only internal seals. Please describe TVA's general criteria for when an internal fire rated seal is to be installed".

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TVA RESPONSE

The intent of Section 12.10.6.B is to explain that most conduit penetrations are embedded conduits that have no annular space between the conduit and the concrete. These penetrations require only an internal conduit seal. The internal conduit seal criteria is documented on drawing series 45W883 and is as follows.

Smoke and gas seals shall have a (min) 3 inch RTV silicone foam and 1 inch ceramic fiber damming at the bottom/back side of the foam. The fiber damming may or may not exist in the front/top side of the foam. The silicone foam shall be installed at the first available opening. Conduits that terminate in junction boxes or other non-combustible enclosures need no additional sealing except for Auxiliary Building secondary containment envelope boundaries. See table below for sealing instructions. A closed electrical cubical similar to a motor control center or switchgear cabinet is not considered a non-combustible enclosure.

CONDUIT	TOTAL LENGTH OF CONDUIT FROM BARRIER					
SIZE	CONTINUOUS THRU AREA	<1'	≥1' - <3'	≥3' - <5'	≥5' - <22'	≥22'
<1"	NSR	F	NSR	NSR	NSR	NSR
1"	NSR	F	S	S	NSR	NSR
>1"-<2"	NSR	F	S	S	NSR	NSR
2"	NSR	F	F	S[5]	NSR	NSR
>2"-≤4"	NSR	F	F	F[5]	S[5]	NSR
>4"	NSR	F	F	F	S	NSR

Notes:

1. NSR - No Seal Required
2. S - Smoke and Hot Gas Seal Required
3. F - Fire Seal Required
4. A smoke and gas seal is required when a conduit passes through an ABSCE boundary and the junction box or non-combustible enclosure is the first accessible opening.
5. NSR if cable fill exceeds 40%.

ENCLOSURE 1

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26. NRC REQUEST

"Section 13.0, Fire Protection System Impairments and Compensatory Measures, indicates that compensatory actions for impairments to fire protection systems or features generally consists of fire watches as defined in the applicable sections of this plan. This section also indicates that alternate measures can be imposed on a case-by-case basis. In order to complete the review in this area, please describe these alternate measures in detail, provide the criteria for establishing one or a combination of the measures, the technical basis which establishes the technical equivalency of these measures to fire watches, and provide some example cases where you would implement these alternative measures".

TVA RESPONSE

The alternative compensatory measures are identified as additional/alternative fire protection equipment, temporary/portable detection systems, or closed circuit television. The alternative measures are considered when primary methods are too restrictive, create further hazards, or represent personnel safety concerns.

A summary of each of these measures is as follows:

a. Additional/alternative fire protection equipment

Additional/alternative fire protection equipment consists of first aid firefighting features such as fire hose and wheeled fire extinguishers, or mobile apparatus.

Normal compensatory measures for inoperable fire protection features such as hose stations consist of physical routing and/or staging of backup fire hose capable of supplying water from the nearest operable fire hose station to the area left unprotected by the inoperable hose station. Additionally, the use of wheeled fire extinguishers or mobile apparatus may be considered when physical constraints such as fire barrier integrity preclude breaching the barrier to stage compensatory fire protection equipment. In the event an alternative compensatory measure is considered, an evaluation will be performed and documented to demonstrate technical equivalency to standard compensatory measures identified in standard technical specifications.

b. Temporary/portable detection systems

A temporary/portable detection system consists of one or more listed or approved detectors, a power supply and monitor unit, connecting cable, and a method of transmitting an alarm to a constantly attended location. Fire detectors may be placed in more than one room or more than one elevation of the plant. The temporary/portable fire detection system is similar to the one used by the Toledo Edison Company's Davis-Besse Nuclear Plant, other utilities, and approved for use by the NRC. An evaluation will be performed for each type of temporary/portable detection system to ensure it is equivalent to a continuous fire watch. Portable detection systems are used in instances where plant configuration and conditions would be acceptable for its use.

c. Closed circuit television (CCTV)

CCTV equipment consists of CCTV cameras and monitors. Cameras may be placed in more than one room or more than one elevation of the plant. CCTV systems are similar to the ones used by other utilities for monitoring of inoperable fire barriers as well as CCTVs previously utilized at Browns Ferry Nuclear Plant in inaccessible tunnels. CCTV monitors are monitored by trained personnel at the same frequency that would be required by the physical fire watch. CCTV is used in instances where personal safety, operational conditions, or ALARA preclude using a human fire watch in the area.

27. NRC REQUEST

"Describe by fire zone/area, what actions you have taken to assure that advertent or inadvertent actuation of water fire suppression systems would not impact the operability of both redundant trains of safety-related or safe shutdown equipment or components".

TVA RESPONSE

An evaluation of suppression system discharge is documented in calculation EPM-RAC-032392. This calculation determines the potential for unacceptable damage to equipment required for safe shutdown caused by the expected firefighting water flow as required by Appendix A to BTP 9.5-1. Enough time is available for the onsite Fire Brigade to respond to the fire alarm and take actions necessary to prevent equipment damage caused by excessive water accumulation. Where floor drains are provided, additional time is available. The conclusion of the calculation was that there would be no unacceptable damage to safety-related equipment.

Another evaluation was performed to determine if water from the fire suppression system could cause water damage to redundant fire safe shutdown (FSSD) equipment located in common fire suppression area due to open conduits providing a flow path into the required equipment. This evaluation is documented in calculation WBPE2929302002. Equipment or enclosures that required corrective action to seal against moisture intrusion are being addressed by design change notice (DCN) M-23920-A.

28. NRC REQUEST

"Describe how the design of the hydrogen system precludes the potential for a release in safety and safe shutdown systems. In the event that a hydrogen leak were to occur, describe what plant design provisions (e.g., excess flow check valves) there are to assure that there is not an accumulation of hydrogen gas in excess of the lower explosive limit".

TVA RESPONSE

A 1-inch seismically designed hydrogen line is routed through the Auxiliary Building (AB) on Elevation 713 from the A15 wall (exterior wall) to each unit's volume control tank. Two isolation valves are installed in the hydrogen supply line outside the AB. These valves close automatically when the downstream flow rate reaches 50 scfm.

Any hydrogen leakage less than 50 scfm will be diffused and carried away by the building ventilation system, keeping the hydrogen concentration below the lower explosive limit.

29. NRC REQUEST

"Appendix A, comparison to position D.4.f, indicates that the design of the stairwells in the control building, intake pumping station, and emergency diesel generator building are enclosed and designed to minimize smoke infiltration. Please describe the life safety design features for the various stairwells and how they minimize smoke from infiltrating into them in the event of a plant fire".

TVA RESPONSE

Stairwells in the Control Building, Intake Pumping Station, and EDGB are either enclosed or separated from the remainder of the building. They are constructed of either reinforced concrete or reinforced concrete block. The doors are self-closing fire rated and the penetrations are sealed with fire rated seals.

ENCLOSURE 1

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30. NRC REQUEST

"Appendix A, comparison to position E.2.e, indicates that the flow rate and the pressure of the fire water system with two of the four pumps running will provide 500 gpm for hose streams while flowing water at design capacity to the single largest sprinkler or deluge system protecting safety-related areas and simultaneously providing the raw service water system flow requirements. In order to assess the adequacy of this system, please summarize the flow and pressure requirements for these pumps, the raw service water system flow demands and for each automatic water suppression system protection safety-related, safe shutdown and plant areas that can create a fire exposure to safety or safe shutdown related areas of the plant or can cause a plant transient that can challenge reactor safety".

TVA RESPONSE

The adequacy of the HPFP system is documented in the design basis calculations for the system. The fire pumps and supply piping have been modeled using the TVA developed (and QA verified) computer software program "EZFLOW." Calculations have been performed that determined the HPFP water supply (flow and pressure) available at each flow control valve. The calculation takes into account the expected raw service water (RSW) users (min. RSW load = 77 gpm, max. RSW loads = 893 gpm). Each calculation is composed of numerous case runs taking into account potential system variables such as pipe condition (aging) and impairments. Typical case runs include: clean pipe (actual pipe ID, C = 100), corroded pipe (0.8-inch reduction in pipe ID, C = 55), RSW loads (min. and max.), system impairments (e.g., closed valves, hydraulically most advantageous route unavailable), and the number of pumps running.

Each individual suppression system has its own unique design basis calculation that determines the required flow and pressure requirements at the flow control valve. These calculations were performed in accordance with the requirements of NFPA 13 (NFPA 15 for water spray systems). The calculations are performed on licensed, QA verified copies of the commercial sprinkler software "HYPERCALC." The unique flow control valve flow requirement (as determined by the HYPERCALC program) is plotted against the flow and pressure available curves (as determined by the EZFLOW program). The results are then plotted and the available flow for hose streams (minimum 500 gpm) is determined as depicted in NFPA 13 (1991) figure A-6-2.2(d).

These calculations are available to the NRC for review at WBN.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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31. NRC REQUEST

"Appendix A, comparison to position F.11, Safety Related Pumps, was not addressed. Please describe for each safety-related pump area in the plant how Watts Bar conforms with the guidance".

TVA RESPONSE

Page VI-85 of the Fire Protection Report was inadvertently omitted from the NRC review copy. However, the following discussion provides the requested information.

Essential pump areas have been evaluated to the separation criteria of Appendix R to ensure safe shutdown of the plant. Standpipe, hose stations and portable extinguishers are located throughout the plant. Floor drains, pedestals and curbs are provided to accommodate the removal of water away from safety-related equipment. Normal ventilation systems may be used at the discretion of the fire brigade leader. Portable smoke ejectors are available for the site fire brigade's use.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
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POST-FIRE SAFE SHUTDOWN CAPABILITY

1. NRC REQUEST

"Section 2.0, Analysis Methodology, indicates that the potential impact of Type II (spurious actuation) circuits was determined by a system analysis which identified components that, as a result of a spurious operation, could prevent a safe shutdown system from performing its required function or could lead to a significant loss of reactor coolant inventory. Please confirm that your analysis took into the consideration the information presented in NRC Information Notice 92-18. In addition, please summarize the results of this portion of the analysis and any modifications that resulted from this review".

TVA RESPONSE

The valve circuit arrangement described in NRC Information Notice (IN) 92-18 is not used in the Watts Bar design. All WBN Appendix R motor operated valve circuits use one set of limit switch contacts for valve position indicating lights and another set for valve control. The control limit switches are schematically located between the control station and the open/close coil in the motor control center (MCC); therefore, hot shorts of Control Building cables cannot bypass the limit switches. In addition, spurious actuation of the thermal overload bypass relay from a fire in the Control Building could cause the motor operated valve overloads to be bypassed and the 120VAC ungrounded control circuit could become grounded by fire damage. However, neither of these potential occurrences hinder any of the Appendix R valves from achieving their required function.

No modifications were required for this Information Notice.

2. NRC REQUEST

"The fire hazard analysis is included in Chapter IV. This analysis provides a description for each fire area in the plant, identifies the fire zones (rooms) located within the area, discusses the potential fire loading and protection provided for the fire zone, and identifies deviating conditions. For each fire zone, the analysis indicates if safe shutdown systems are either located in or not located in the zone. However, the potential impact a fire may have on safe shutdown is not discussed. In order to complete the review, a detailed summary of the systems used to achieve hot shutdown and subsequent cold shutdown is requested for each fire zone/area. This detailed summary should also identify the trains used, their separation, the fire protection features provided for the preferred shutdown path, potential manual operator

actions, type of actions, and where in the plant these actions take place. If repairs are needed to get the plant in cold shutdown, a detailed summary of these repairs should be included for each affected fire zone/area. The discussion should also include resources, materials, and equipment needed to implement these repairs".

TVA RESPONSE

The response to this request will be provided by October 15, 1994. The extension was requested by TVA since WBN is presently implementing a Thermo-Lag reduction program which will affect the information requested in this response. This was discussed with P. M. Madden and P. S. Tam, of the NRC office of Nuclear Reactor Regulation on June 29, 1994.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

FIRE PROTECTION SURVEILLANCE AND TESTING

1. NRC REQUEST

"Section 14.1, Fire Detection (Early Warning Fire Detection and Notification Only), Table 14.1 states that there are no early warning fire detection devices provided for a majority of the plant. Understanding the design of your pre-action sprinkler systems, the system deluge valve is opened when the fire detection device (smoke detector) senses a fire condition in the area. This same fire detection device also provides early warning notification to the control room. Using this logic, shouldn't these detectors be Function A detectors since, if the detection system alone were to become inoperable, the deluge valve could be tripped and the suppression system be placed in the wet pipe mode? This would affect the early warning capability only and therefore, an hourly fire watch would be recommended. In the event that the suppression system is inoperable and detection is operable, a continuous fire watch would be considered an appropriate compensatory measure for those suppression systems protecting redundant systems or components. Please clarify your position regarding compensatory measures for inoperable primary (e.g., automatic) suppression capability".

TVA RESPONSE

Table 14.1, Page 18, specifically defines the difference between a Function A instrument (detector) and a Function B instrument as follows:

- Function "A" are early warning Fire Detection and notification only instruments.

- Function "B" are for actuation of Fire Suppression systems and early warning notification instruments.

As stated above, both Function A and B detectors are provided to serve as early warning devices, with the Function B detector also providing suppression system initiation functions. Early warning fire detection devices are, therefore, provided for a majority of the plant areas.

The philosophy used in determining compensatory measures for inoperable detection and suppression systems was to not only consider the systems intended function or purpose but also to capitalize on the system design features. The interrelationship of suppression systems and associated detection systems afford multiple opportunities (or redundancy) to satisfy remote notification and suppression of a fire condition.

An operable early warning detection system protecting an area (room, location, elevation, building, etc.) is equivalent and in most cases

superior to a continuous fire watch. An early warning detection system provides more effective monitoring of an area than an individual conducting fire watch activities. The early warning detection system, by design, is capable of detecting a fire in its incipient stage throughout the entire area of coverage simultaneously. A detection system would be less likely to be subjected to personnel errors, administrative deficiencies or inattentiveness which all could potentially occur when reliance is placed on human actions versus installed equipment.

It should also be noted that according to Standard Technical Specification requirements, inoperable early warning detection systems only require hourly fire watch patrols as compensatory measures. If the early warning detection system is operable, then no fire watch is required. It is reasonable to conclude that an operable early warning detection system, regardless of its application (Function A or B), provides acceptable, continuous coverage or monitoring of an area, thus making a fire watch excessive.

When an interfacing water based suppression system is inoperable an hourly fire watch is considered acceptable. This determination is based on the logic used in the previous discussion with respect to operable detection being equivalent to a continuous fire watch. Specifically, the area protected by the suppression system would already be continuously monitored by the operable Function B detection system. The establishing of an hourly fire watch would serve as an added conservative level of safety due to the inoperable suppression only provided that the Function B early warning detection system was operable.

The only exception to the above compensatory actions would be for systems, both Function A and/or B detection and water based suppression, that are in inaccessible areas. The alternative compensatory action is to either establish a roving fire watch once per eight hours or monitor the air temperature in the zone once per hour. This alternate compensatory measure is consistent with standard technical specification requirements.

2. NRC REQUEST

"Section 14.1, Fire Detection (early Warning Fire Detection and Notification Only), indicates that with any of the required Function A fire detectors in any of the fire zones identified on Table 14.1 inoperable in an inaccessible area, within 8-hours, restore the inoperable detector, or either establish a roving fire watch which patrols the affected area once every 8-hours or monitor the air temperature in the zone once per hour. In order to better understand how a fire within the containment would be detected in a timely manner

under these conditions, please provide the technical basis (e.g., temperature threshold and rise above ambient) for your determination that the air temperature monitoring can provide an equivalent level of fire safety to that provided by the fixed fire detection devices".

TVA RESPONSE

WBN Technical Specification (TS) 3.6.5, "Containment Air Temperature," requires that containment average air temperature be maintained $\geq$85°F and $\leq$110°F for the containment upper compartment and $\geq$100°F and $\leq$120°F for the containment lower compartment. WBN surveillance requirements SR 3.6.5.1 and 3.6.5.2 verify average air temperature is within limits for upper containment and lower containment, respectively. Verifying that containment average air temperature is within the LCO limits ensures that containment operations remains within the limits assumed for the containment analyses. The 24-hour frequency of the aforementioned technical specification surveillance requirements is considered acceptable based on observed slow rates of temperature increase within the containment as a result of environmental heat sources (due to the large volume of the containment). Furthermore, the 1-hour frequency for air temperature monitoring is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to abnormal containment temperature conditions.

Fire detection instrumentation is not assumed to be operable to mitigate the consequences of a design basis accident or transient. In designing the accident sequence for theoretical hazard evaluation, fires are not assumed to take place simultaneously with the design basis event (DBE) or transient. Therefore, increasing the frequency of SRs 3.6.5.1 and 3.6.5.2 from once every 24-hours to once per hour along with the other indications available in the control room, including alarms to alert the operator of abnormal containment temperature conditions, provides an equivalent level of fire safety without exposing personnel to unnecessary radiation exposure. Additionally, this method of compensatory measures for inoperable detection systems in the Reactor Building has been approved by NRC for Sequoyah Nuclear Plant in TS 3.3.3.8.a and is consistent with industry standard technical specification requirements.

3. NRC REQUEST

"Section 14.2, Water Supply, establishes the actions necessary to assure the site has fire protection water supply and pumping capacity. The action necessary when one or more fire pumps become inoperable consists of establishing a backup pump and in some cases establishing a supplemental water supply. From the information provided in the

technical bases for this action statement, it is not clear as to what the flow and pressure characteristics are of the backup pump. Is this capability sufficient to provide water to those fire suppression systems that protect safety-related, safe shutdown, and those plant areas which present a fire exposure to plant areas important to safety? In addition, since the fire pumps take suction from the lake, please explain how a backup water supply is established to these pumps. The action statement indicates that under certain conditions a backup water supply needs to be established within 48-hours, while 7 days is allowed to establish the backup pumping capacity. This appears to be inconsistent with the bases. Please clarify the action statement to make it consistent with the bases statement".

TVA RESPONSE

Different terms were used in the FPR, Part II, Section 14.2.1, 14.2.2, and 14.2.3 to attempt to distinguish between the different pumping capacities needed depending upon the number of required pumps that were inoperable. These terms are presently being revised so they are similar but still unique to provide some distinction as to the replacement pumping capacity needed. The backup pump(s) that is provided, when one or more of the required pumps is inoperable, will have the following characteristics:

a. The flow and pressure characteristics will equal or exceed those for the required pump being replaced. The backup pump can be of reduced capacity provided the pumping capacity needs have been documented to be reduced (e.g., isolation of raw service water users, largest demand sprinkler system not needed). WBN could use one or more pumps to provide the backup capability for each designed, required pump out of service depending on the availability and specifications of temporary, portable pumps.

b. The water supply for the backup pumps will be from a reliable water source such that it will be of sufficient size to qualify as a sole source of water such as the Cooling Tower Basin.

c. The driver for the backup pump will be capable of operating upon the loss of offsite power.

d. The controls for the backup pump will be annunciated if capable of an automatic start.

These three sections provide for varied response based on the seriousness/number of pumps inoperable. If one pump is inoperable, then 100% pumping capacity is available and 7 days are allowed to provide a backup pump or restore the pump to operable status. If two pumps are inoperable then 50% pumping capacity is available and less time (forty-

eight hours) is allowed to provide backup pumps or restore the pumps to operable status. These three sections only apply to the restoration of inoperable pumping capacity and how to provide substitute capacity.

4. NRC REQUEST

"Section 14.3, Water Based Fire Suppression, paragraph 14.3.9, indicates that if the automatic actuation capability is inoperable for any of the water based fire suppression systems that no compensatory measures are required. The applicant's position is that the loss of the automatic actuation feature does not prevent the manual actuation of the system. The intended function of these systems is to provide automatic fire suppression control. Unless the system can be reconfigured to perform its intended function, it should be treated as if it were inoperable and the appropriate compensatory measures should be established. Please provide your technical justification for your position".

TVA RESPONSE

As previously stated in the response to Question 1 (Fire Protection Surveillance and Testing), when an interfacing water based suppression system is inoperable (manual or automatic features), an hourly fire watch is considered acceptable. This determination is based on the logic utilized in the previous response to Question 1 with respect to operable detection being equivalent to a continuous fire watch. Specifically, the area protected by the suppression system would already be continuously monitored by the operable Function B detection system. Establishing an hourly fire watch would serve as an added conservative level of safety due to the inoperable suppression. Paragraph 14.3.9 has been deleted and the applicable sections in 14.3 have been revised to reflect this information.

5. NRC REQUEST

"Section 14.4, Carbon Dioxide Suppression Systems, paragraph 14.4.4 indicates that if the automatic actuation capability is inoperable for any of the carbon dioxide suppression systems that no compensatory measures are required. The applicant's position is that the loss of the automatic actuation feature does not prevent the manual actuation of the system. The ability of a gaseous fire suppression system to control a fire is related to prompt detection and actuation. The intended function of these systems is to provide automatic fire suppression control. Since these systems cannot perform their intended function, they should be treated as if they were inoperable and the appropriate compensatory measures should be established. Please provide your technical justification for your position".

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

TVA RESPONSE

As previously stated in the response to Question 1 (Fire Protection Surveillance and Testing), when an interfacing suppression system, in this case a carbon dioxide suppression system, is inoperable (manual or automatic features) an hourly fire watch is considered acceptable. This determination is based on the logic utilized in the previous response to Question 1 with respect to operable detection being equivalent to a continuous fire watch. Specifically, the area protected by the suppression system would already be continuously monitored by the operable detection system. Establishing an hourly fire watch would serve as an added conservative level of safety due to the inoperable suppression. Paragraph 14.4.4 has been deleted and the applicable sections in 14.4 have been revised to reflect this information.

6. NRC REQUEST

"Throughout the various action statements the applicant specifies a time frame for restoring the operability of certain fire protection features. For example, Section 14.6, Fire Hose Stations/Standpipes, indicates that the inoperable fire hose stations/standpipes shall be restored to an operable status within 14 days. Please, in general terms, describe what actions would be taken if the allowable restoration time was exceeded, both from a compensatory measures and a licensing perspective, to expedite restoring the operability of the degraded fire protection feature and justify continued operation".

TVA RESPONSE

It is assumed that the equipment is inoperable due to equipment failure. The work request (WR) process of SSP-6.02, "Maintenance Management System," is used to fix such equipment. This WR process has levels of priority based on factors such as possible equipment degradation, threat to personnel safety, and time to complete limiting conditions of operation. In addition, WRs that are noted as "fire protection" get an additional review by Fire Protection personnel. This process is intended to address and repair equipment in an expeditious manner by assigning the correct priorities. Should WBN not be able to restore the degraded fire protection feature within the specified amount of time, then compensatory measures will be extended/continued and a 10 CFR 50.72 and/or a 10 CFR 50.73 review will be performed and documented in accordance with site administrative procedures.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

7. NRC REQUEST

"Section 14.8, Fire-Rated Assemblies (Fire Barriers), these action statements do not appear to be applicable to raceway fire barrier assemblies. Please provide the appropriate clarification to the bases and the applicable action statements to cover these fire-rated assemblies to the staff for review".

TVA RESPONSE

Bases B.14.8 used the term "encapsulations [fire wraps]" to describe raceway fire barriers. To add clarity to the FPR the term "encapsulations [fire wraps]" is presently being revised in the Bases B.14.8 to read "encapsulations [raceway fire wraps]".

8. NRC REQUEST

"Throughout the Bases sections for Testing/Inspection Requirements the specified test frequencies are based on industry operating experience. In order to verify that the test frequencies being specified are adequate to identify potential failures or malfunctions in plant fire detection and suppression features, please provide a summary of TVA specific operating data which justifies the test frequencies by testing/inspection requirements".

TVA RESPONSE

The following provides additional information pertaining to the specific source of reference used in the determination of surveillance test frequencies and criteria. The applicable bases section has also been revised to include this information.

14.1.a The surveillance frequency and criteria is consistent with NFPA 72E.

14.1.b The surveillance frequency and criteria is consistent with NFPA 72E.

14.1.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.2.a The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.2.b The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.2.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.2.d The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.2.e The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.2.f The surveillance frequency and criteria is consistent with NFPA 25.

14.3.a The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.3.b The surveillance frequency and criteria is consistent with NFPA 25.

14.3.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.3.d The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.4.a The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 12.

14.4.b The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.4.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.4.d The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.a The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.6.b The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.6.d The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.e The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.f The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.g The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.h The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.6.i The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.7.a The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.7.b The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25.

14.7.c The surveillance frequency and criteria is consistent with Standard Technical Specification requirements.

14.7.d The surveillance frequency and criteria is consistent with Standard Technical Specification requirements and NFPA 25

14.8.a The surveillance frequency and criteria is based on engineering judgement. NFPA consensus standards do not delineate specific frequencies for visual inspections of fire doors. Plant personnel are provided training in General Employee Training of the importance of maintaining fire doors closed and operable. Plant fire doors are conspicuously identified as fire doors. Therefore, the 32 day frequency is considered acceptable.

14.8.b The surveillance frequency and criteria is consistent with NFPA 80.

14.8.c The surveillance frequency and criteria exceed current industry practice of ensuring all barriers are inspected within 15 years.

14.9.a The surveillance frequency and criteria is based on vendor recommendations and industry practice.

14.9.b The surveillance frequency and criteria is based on vendor recommendations and NFPA 101.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

CONDUIT AND CABLE TRAY FIRE BARRIER ASSEMBLIES

1. NRC REQUEST

"In reviewing your fire test program, it has been noted that it focused on qualifying the fire barrier systems for major raceway components (e.g., conduits, junction boxes, lateral bend boxes) and it did not qualify the transition portions of the raceway system. For example, this program did not test a cable air drop from a conduit to a cable tray or an air drop of cables from one tray to another. Please justify how you intend to ensure that the fire endurance performance of fire barrier system applied to these transition portions of the raceway system is equal to or greater than the fire barrier system applied to the conduit or cable tray".

TVA RESPONSE

The upcoming fire testing program will include transition configurations. The results of the fire test on transition configurations will be provided to NRC upon conclusion of the testing program.

2. NRC REQUEST

"In considering the applicability of Thermo-Lag as a fire raceway fire barrier, seismic analysis of this material is assumed to have been done. In order to determine the acceptability of this analysis additional information is needed. Please provide a summary of your Thermo-Lag seismic analysis, include discussions of the possible scenarios of seismic-induced Thermo-Lag failures which might affect the functionality of cables, cable trays and other components, what design considerations were incorporated to prevent this from occurring and the criteria used in the cable tray analysis design for dead, thermal, seismic and impact loads or combinations thereof".

TVA RESPONSE

The seismic qualification of Thermo-Lag 330 electrical raceway fire barrier systems at WBN is in progress. The cable trays and supports are to be designed to carry the dead weight and seismic inertial load of the Thermo-Lag 330 material, using the cable tray and support civil design criteria as stated in the Final Safety Analysis Report. WBN construction specifications, as validated by tests and analyses, will be used to ensure the Thermo-Lag 330 material will maintain its configuration during a design basis seismic event. The validation tests

will include shake table qualification for a simple span cable tray with cables and a Thermo-Lag 330 fire barrier covering, for enveloping the WBN seismic demand levels. TVA will perform seismic testing of Thermo-Lag 330 configurations and the results will be provided to NRC upon completion of the tests.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

ALTERNATIVE SHUTDOWN AND ASSOCIATED CIRCUITS

1. NRC REQUEST

"Spurious Actuation of Pressurizer Spray Valves TVA calculation WBN-OSG4-031 "Equipment Required for Safe Shutdown" develops the shutdown logic diagram and identifies equipment required to achieve safe shutdown of the reactor in the event of fire. This calculation also addresses the potential effect of spurious equipment actuation on the plants ability to achieve and maintain safe shutdown conditions.

With regard to the potential for spurious actuation of the pressurizer spray valves Section 6.3.3 of this document was found to state, "An analysis determined that the pressurizer spray valves could not be prevented from spuriously opening, this would prevent a safe shutdown per Appendix R guidelines. Therefore, the reactor coolant pumps (RCPs) must be stopped for all fires to prevent RCS depressurization (and subsequent SI signal initiation)."

Appendix G of this calculation (WBN-OSG4-031) documents the TVA resolution of internal audit findings. Apparently in response to the above, Item 4.1.1 of this Appendix states, in part, that RCP trip capability from the main control room and from outside the Control Building must be provided. The TVA response to this finding indicates that since the pressurizer spray valve instrumentation circuits located outside the control building will be protected by fire wrap stopping the RCPs is only required in the event of fire in the Control Building. In the event of fire in the Control Building, the TVA response states that the RCPs will be tripped from the control room.

With regard to the above, the TVA analysis appears to describe different approaches to preventing spurious pressurizer spray actuation. While WBN-OSG4-031, indicates that the RCPs will be stopped in the event of fire in any area in order to remove the motive force required for pressurizer spray, the TVA response in Appendix G indicates that additional modifications will be preformed (i.e., fire wrap) to prevent the spurious opening of the pressurizer spray valves. Please explain this apparent discrepancy and define which approach is correct. Additionally, it should be noted that in accordance with GL 86-10, a manual trip of the reactor is the only operator action typically permitted to be performed prior to evacuation of the control room (see Comment 4)".

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

TVA RESPONSE

Section 6.3.3 and Appendix G of calculation WBN-OSG4-031 is presently under revision and will reflect the following:

In the Auxiliary Building (AB), the cables for the pressurizer spray valves (1-PVC-68-340B and 1-PCV-68-340D) will be protected by an electrical raceway fire barrier system (ERFBS) to prevent spurious valve opening.

Shared raceways in the Reactor Building (RB) present the remote possibilities that fire damage could cause "hot shorts" between the pressurizer spray valve's 10-50 ma signal level cables and other similar signal level cables. Manually tripping the reactor coolant pumps removes the fluid force to the spray nozzles.

The pressurizer pressure spray instrument loops (1-P-68-340B and/or D) are located in three areas in the Control Building (CB); main control room (MCR), auxiliary instrument room, and cable spreading room.

A fire on the spray loops located in the main control room panel M4 could cause spurious actuation. The fluid motive force can be stopped by de-energizing the dedicated Reactor Coolant Pump (RCP) Board. The handswitch controls are located in panel M5 which is separated from M4 by a metal barrier. As an alternative to the RCP Board control circuitry on panel M5, the control circuit to the RCP Start Board (also a dedicated board) located on the Electrical Control Board (ECB) can be used. Panel M5 and ECB, both located in the MCR, are separated horizontally by approximately twenty feet.

The Fire Safe Shutdown (FSSD) analysis normally assumes instantaneous burnout of the entire zone of fire influence, it is reasonable to predict that a fire in the MCR or a MCR panel would be a slow growth fire that would be detected in its early stages by either an operator or installed smoke detector. The RCP Start Board breaker controls are widely separated (greater than 20-feet) from the pressurizer spray valve controller cables; therefore, a fire involving one would not affect the other instantaneously. Certainly there would be ample time to establish back-up control and thereby isolate the RCP breaker controls from the CB.

A fire on 1-P-68-340B and/or D loops located in the auxiliary instrument room could cause spurious actuation. The RCP Board control circuitry is not located in the auxiliary instrument room. The auxiliary instrument room is provided with automatic detection and a total flooding CO_2 suppression system. A fire would be detected early, develop slowly, controlled by the suppression system, and contained within the Auxiliary Instrument Room. Since the RCP Board control circuitry does not pass through this room, the RCP breakers can be tripped from the MCR and fire

damage would have no affect on the RCP and RCP Board control circuits prior to establishing backup control and electrical isolation from the CB.

A fire on the spray loops cables in the cable spreading room (CSR) could cause spurious actuation. The control cables for the RCP Start Board feeder breakers are separated horizontally by 20-feet from the spray loop cables. Thus, the RCPs can be de-energized as described earlier via the RCP Start Board control circuit on the ECB. Due to the horizontal cable separation, detection and suppression, compartmentation, and capability to electrically isolate the control circuitry, the operator will be able to de-energize the RCP Boards before a fire could progress to involve their control circuits. Upon MCR abandonment, the RCP control circuitry will be isolated from the effects of a CB fire by backup control transfer switches.

2. NRC REQUEST

"TVA Detailed Design Criteria No. WB-DC-30-13, 10 CFR50 Appendix R Type I, II, and III Circuits, Revision 3, dated May 13, 1993, Section 3.3 Design Requirements for Potential Type III Circuits (Common Enclosure), paragraph d. of this section of the design criteria states. "For 480 VAC auxiliary power circuits where full coordination between the cable damage curve and the molded-case circuit breaker instantaneous trip curve cannot be attained, UL standard 489, 'Molded-Case Circuit Breakers and Circuit Breaker Enclosures,' can be used to show the downstream cables are adequately protected against short circuits up to the breakers interrupting capability in the instantaneous region of the circuit breaker (reference Table 8.1 of UL 489)."

UL Standard 489 addresses design specifications for the manufacture of molded-case circuit breakers and circuit-breaker enclosures. Section 8 "Current Carrying Parts" of this standard addresses the capacity of pressure wire connector type fields wiring terminals that are to be supplied with each breaker. Specifically, Table 8.1 provides a listing of acceptable terminal capacities as a function of the size and type of cable. Based on a review of this standard, it is not clear how it was applied to satisfy the thermal capability and ampacity concerns of the common enclosure associated circuit concern. Please provide the technical basis supporting the use of this standard. Additionally, please explain why this standard was used in place of the information available in NFPA 70 (National Electrical Code)".

TVA RESPONSE

WB-DC-30-13, Section 3.3, allows using UL Standard 489 to demonstrate cable protection in situations where the cable damage curve crosses the knee of the breaker curve (i.e., near the intersection of the overload and instantaneous trip element characteristic curves). The UL standard is cited for this purpose because it requires a breaker instantaneous response test which includes a short section of cable faulted at the load end. The "no cable damage" acceptance criteria coincides with the Type III Associated Circuit cable protection criteria of WB-DC-30-13. The smallest acceptable cable size tested with each size molded case breaker is listed in Table 8.1 of UL Standard 489.

UL 489 was used instead of the National Electric Code because the breaker instantaneous response test and acceptance criteria matched the specific application of interest.

3. NRC REQUEST

"TVA document WB-DC-40-51 contains design criteria established by TVA to ensure compliance with the design requirements of Appendix R. Section 7.13.2 of this document states, "For other than high-to-low pressure boundaries, FSSD capabilities shall not be adversely affected by any one (emphasis added) spurious actuation or signal resulting from damage to a power or control circuit from a postulated fire.

The Watts Bar Fire Protection Report and equipment logic diagrams (Calc WBN-OSG4-031) state that components whose spurious operation could adversely affect the achievement of safe shutdown conditions in the event of fire were evaluated in the same manner as "required" circuits. From our review thus far, it is our understanding that for each safe shutdown function identified on the logic diagram (FPR Fig. 4-1), equipment whose spurious operation could affect the performance of that function was identified and an appropriate resolution (operator action, modification, etc.) was implemented for each case as necessary.

Section 7.13.2 of the FPR appears to imply that only one spurious operation was considered to occur as a result of fire in any area, regardless of the number of unprotected circuits that may potentially be affected. To illustrate this concern consider the following example: The cooling water flow path to a required piece of equipment consists of two parallel flow paths. Each flow path is equipped with its own block valve. Fire damage (i.e., single hot short) to the control cable of either valve may cause a spurious change in valve position. The cables for both valves are located in the same fire area and their level of separation does not comply with Appendix R Section III.G.2. In this case, if only one flow path was required, was the potential for spurious closure of both valves considered, or was a literal interpretation of

the statement in Section 7.13.2 of the FPR applied? That is, was the spurious closure of only one block valve considered or did the analysis consider the potential for spurious closure of both valves?

With regard to the above, please provide the TVA interpretation of the statement contained in Section 7.13.2 of WB-DC-40-51, and a clear description of how this interpretation was applied during the performance of the WBN safe shutdown analysis".

TVA RESPONSE

Components whose spurious operation could adversely affect the achievement of safe shutdown conditions in the event of fire were evaluated in the same manner as components that are required to operate. That is, circuits which could cause undesirable spurious operation were identified and evaluated for potential fire damage. If circuits for redundant components could be affected by a common fire, they were evaluated concurrently and corrective action identified as needed.

In the illustration provided above, the potential for spurious action of both valves due to fire damage of their cables would have been considered (i.e., the consideration of spurious closure of only one block valve would not satisfy Design Criteria WB-DC-30-13 nor WB-DC-40-51). Section 7.13 of WB-DC-40-51 is based on Generic Letter 86-10, Enclosure 2, "Appendix R Questions and Answers," response to question 5.3.10.

4. NRC REQUEST

"From a review of the FPR it appears that several manual operator actions may need to be performed prior to control room evacuation. As stated in Section 3.8.4 of GL 86-10, the only operator action normally credited prior to control room evacuation is a manual trip of the reactor. Any additional actions require a demonstration of the capability of performing such actions. Additionally, assurance would have to be provided that such actions could not be negated by subsequent spurious action signals resulting from the postulated fire".

TVA RESPONSE

Reactor trip and Reactor Coolant Pump trip are the only manual operator actions to be performed prior to MCR evacuation. These are addressed in this enclosure under response number 1 to Alternate Shutdown and Associated Circuits.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

5. NRC REQUEST

"Appendix F of TVA calculation WBN-OSG4-031 identifies the High/Low pressure interface valves of concern at WBN. However, neither this document nor the FPR appears to provide a description of how the spurious operation of these components is prevented and/or controlled".

TVA RESPONSE

The Fire Protection Report references the calculation WBPEVAR9007003, "Appendix R - Cable Interaction Analysis - RCS Inventory and Pressure Control - Keys 7, 8, 28 and 48," that evaluates the interaction of High/Low pressure interface valves. The following briefly describes the results of the evaluation for each of the listed High/Low pressure interfaces:

a. RHR Isolation Valves: Motive power (480 VAC) is removed during plant operation. The 480 VAC power cables for series valves either are not routed where they are both subject to damage from a common fire or they are not routed in a raceway with other energized 480 VAC cables (hot short source).

b. Pressurizer PORV and Block Valves: Cables for PORV and associated Block valves are not subject to concurrent damage due to a common fire. Fire barrier wrap (Thermo-Lag) is used where necessary to protect cables for one valve or the other. The Block valves can be closed and isolated for Control Building fires.

c. Excess Letdown Valves: Cables for both valves are not subject to damage from a common fire or are not routed with other energized cables (hot short source). Fire barrier wrap is used where needed. Circuits can be de-energized and isolated for Control Building fires.

d. Normal Letdown Valves: Cables for both valves are not subject to damage from a common fire or are not routed with other energized cables (hot short source). Fire barrier wrap is used where needed. Circuits can be de-energized and isolated for Control Building fires.

e. Head Vent and Isolation Valves: Cables for either the vent valves or the block valves are protected with fire barrier wrap where exposed to damage from a common fire. Both sets of valves can be de-energized and closed from outside the Control Building.

f. SIS-RHR leakage test valve: This valve is connected between the two sets of RHR isolation valves. Its cables are not subject to fire damage due to a fire which could also cause a hot short on the 480 VAC power cable for either of the upstream (high pressure) RHR isolation valves.

6. NRC REQUEST

"From a review of the FPR and TVA calculation WBN-OSG4-031 it appears that certain Unit 2 equipment is credited for use in the event of fire in Unit 1. It is understood that this equipment may include the Unit 2 EDGs, CCS pumps and fire water pumps.

With regard to the above, please provide a complete listing that identifies all Unit 2 equipment and the Unit 1 Fire Areas for which the use of this equipment may be credited. Additionally, since WBN Unit 2 is not operating, concerns exist with regard to equipment availability and operability. Please address how the operability and availability of this equipment will be assured".

TVA RESPONSE

Watts Bar has an extensive program to identify Unit 2 equipment which is required to function for Unit 1 operation. This effort is required at WBN because many systems are shared between the two units. As an example, the three items (emergency diesel generators, component cooling water pumps, and fire water pumps) noted in your question are all required for Unit 1 operation even though some of the components are tagged with a Unit 2 identification number. (Note, this requirement applies to many design basis events in addition to Appendix R.)

The operability and availability of this required Unit 2 equipment is addressed in the same manner as Unit 1 equipment required for operation. This listing of Unit 2 equipment required for Unit 1 operation will be available for your review at WBN during the Appendix R inspection.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
RESPONSE TO FIRE PROTECTION REPORT REQUEST
FOR ADDITIONAL INFORMATION

DEVIATIONS

1. NRC REQUEST

"Deviation 1.1.4, Intervening Combustibles, indicates that the safe shutdown components in the auxiliary building are in compliance with Appendix R, Section III.G.2.b requirements except that intervening combustibles, in the form of cable insulation, is located between the redundant components. To mitigate the potential consequence of an exposure fire from transient combustibles on the floor, floor level sprinklers are installed under the intermediate obstruction in the intervening combustible space for up to a 30 foot wide path between the spatially separated redundant safe shutdown functions. This deviation indicates that the specifics of this criteria is included in Attachment 2. In order to complete the review of the acceptability of this deviation, please provide a copy of Attachment 2 since it appears that this document was inadvertently left out of the submittal. In addition, please provide detail drawings that identify the location of these intervening zones.

To provide an equivalent level of fire safety to that required by Appendix R, the applicant is relying strongly on the operability and the adequacy of these auxiliary building enhanced sprinkler systems. In the event that these systems became inoperable, the proposed Testing Inspection Requirements (see Section 14.3.3) would require an hourly fire watch patrol. Based on the potential safe shutdown impact a fire in the overhead cables may have in these intervening zones, it appears, when these systems are inoperable, that the proposed compensatory measure does not address the potential safety significance. Based on the important safety role these systems have, please address how you intend to maintain configuration control over sprinkler head placement in these intervening spaces and how you intend to assure that an equivalent level of fire safety is maintained in the event one of these sprinkler systems becomes inoperable".

TVA RESPONSE

A copy of Attachment 2 is presently being included in the Fire Protection Report. In addition, Attachment 2 has been provided in this letter as Enclosure 2 for you review. The criteria for additional sprinklers to compensate for intermediate obstructions are applied throughout the Auxiliary Building, Control Building, Diesel Generator Buildings and Intake Pumping Station. This criteria is not applied to just those areas where intervening combustibles are present between redundant fire safe shutdown components.

Configuration control over sprinkler head placement is administratively controlled through approved procedures for design engineering practices, configuration management/control, and plant modification and design change control. Design outputs define the technical requirements of fire protection systems and features for plant activities such as construction, installation, operation, maintenance, modification, surveillance, and testing. The use of any other type of document to communicate engineering requirements outside the design organization must be approved by the chief engineer. WBN may only take engineering requirements from those documents identified by the Site Engineering Manager as design output.

An operable early warning detection system protecting an area (room, location, elevation, building, etc.) is equivalent and in most cases superior to a continuous fire watch. An early warning detection system provides far greater continuous coverage or monitoring of an area than an individual conducting fire watch activities. The early warning detection system by design is capable of detecting a design basis fire in its incipient stage throughout the entire area of coverage simultaneously. A detection system also would not be subjected to personnel errors, administrative deficiencies or inattentiveness which all could potentially occur when reliance is placed on human actions versus installed equipment.

As a backup to the installed fixed preaction suppression systems, interior manual hose installations are provided. These hose stations are supplied from risers separate from those for preaction sprinkler systems serving the same area. The exceptions are the Reactor Building and the Intake Pumping Station in which both hose stations and the preaction sprinkler systems are supplied from the same riser. It is therefore reasonable to conclude that an operable early warning detection system, along with a roving fire watch and operable manual hose stations, provide an acceptable compensatory measure, making a continuous fire watch unnecessary.

2. NRC REQUEST

"Deviation 1.2.1, Lack of Total Area Suppression and Detection, Corridor (675.0-A1), the exposed conduits that contain each train of RHR power cables are protected with 1-hour raceway fire barriers. This area has automatic fire detection. According to your evaluation the in-situ combustibles in this area are considered insignificant and transient combustibles are controlled via site implementing instructions. When the plant is in refuel operations, the RHR system is needed to assure decay heat removal. This would make this area of the plant important during these modes of operations. Please summarize any potential additional administrative controls which you may take to assure that combustibles and ignition sources are controlled in plant areas

important to maintaining the operation of decay heat removal capability".

TVA RESPONSE

The need for the protection of the decay heat removal capability during outages is recognized. The existing administrative controls will be adequate to provide the required protection. The administrative control of ignition sources is designed to require that adequate controls are established to ensure the work area is clear of combustibles or that they are adequately protected and that plant equipment is protected. This is accomplished by a pre-work inspection by the responsible supervisor/designee with this inspection documented on the "hot work" permit.

In addition, the administrative control of transient fire loads will define specific Combustible Control Zones which will require an evaluation and approval of the fire hazard being introduced by the fire protection engineer/designee.

These existing controls will ensure that adequate protection is provided for this equipment during all modes of operation.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1
SPRINKLER SYSTEM CRITERIA FOR RESOLVING
INTERVENING COMBUSTIBLE CONCERNS

ATTACHMENT 2

SPRINKLER SYSTEM CRITERIA FOR RESOLVING
INTERVENING COMBUSTIBLE CONCERNS

1.0 OBJECTIVE

The objective of this criteria is to provide compensation for the lack of a horizontal distance of more than 20 feet free of intervening combustibles between redundant divisions being protected in accordance with 10 CFR 50 Appendix R, Section III.G.2.B. Compensation is provided by installing, in the defined areas, supplemental sprinkler protection for floor level combustibles when adequate coverage by ceiling level sprinklers is not verified by this criteria.

2.0 AREAS OF CRITERIA APPLICATION

This criteria shall be applied when redundant divisions are separated by horizontal space, if more than 20 continuous feet of the space is not free of intervening combustibles. The criteria shall be applied to any continuous 30 foot wide path located between the redundant divisions if the divisions are greater than 30 feet apart. If the redundant divisions are greater that 20 feet but less than 30 feet apart, the criteria shall be applied to the entire horizontal space between the divisions.

3.0 ACCEPTANCE CRITERIA FOR EXISTING SPRINKLER HEADS

3.1 Existing sprinkler heads, which have been located to produce fully developed spray patterns at the ceiling, will provide acceptable floor coverage if there are no intermediate obstructions in their patterns which are greater than 48-inch wide. When individual obstructions overlap or have less than a 4-inch flue space between them when viewed from immediately below, they shall be considered a single obstruction for determining their cumulative horizontal width. No combination of obstructions may traverse the 4-inch flue space and block more than 2-feet of any 8-feet of flue space.

3.2 Lateral discharge from existing sprinkler heads may be utilized for floor coverage if the portion of their discharge pattern that is being relied on has no significant obstructions. Significance shall be evaluated considering the typical shape of a sprinkler spray pattern and the obstruction guidelines of NFPA 13.

3.3 Acceptance of existing heads shall be based on visual observations in the plant.

4.0 CORRECTIVE ACTIONS

4.1 When Section 3.0 is not satisfied, sprinkler heads shall be provided under the obstructions utilizing one of the following options:

a. Relocate existing heads below intermediate level obstructions if adequate coverage can be maintained at the ceiling level, or,

b. Add new heads below intermediate level obstructions. System adequacy shall be demonstrated using NFPA 13 pipe schedules or hydraulic calculation. If necessary, pipe sizes and supply header arrangements shall be changed to satisfy this requirement.

4.2 The maximum floor area that can be protected by a single sprinkler head shall be 130 square feet.

4.3 When more than one head must be located below obstructions, the distance between heads shall not exceed 15 feet.

4.4 When hydraulic calculations are used to verify sprinkler system adequacy, the calculations shall be based upon the hydraulically most remote 1500 ft^2 area or the area of the largest room, whichever is smaller. The systems shall be capable of discharging a density of 0.16 gpm/ft^2 assuming all sprinkler heads in the analyzed area are open.

4.5 If a system designed in accordance with the NFPA 13 pipe schedules supplies sprinkler heads in two or more rooms that are separated by 2 hour rated construction, the maximum number of heads in each room must satisfy the pipe schedule limits for pipe size with each room considered separately. If this condition is satisfied, the maximum number of heads per pipe size may be exceeded for all the rooms taken together.

ENCLOSURE 3

LIST OF COMMITMENTS

1. TVA is presently revising the Fire Protection Report to include the areas of concern identified in Enclosure 1.

2. The results of the fire test on transition configurations will be provided to NRC upon completion of the testing.

3. The results of the seismic testing of Thermo-Lag 330 configurations will be provided to NRC upon completion of the testing.

4. Section 6.3.3 and Appendix G of calculation WBN-OSG4-031 is presently being revised to address the areas of concern identified in Enclosure 1.

5. The response to Question 2 under Post-Fire Safe Shutdown Capability, will be provided by October 15, 1994. The extension was requested by TVA since WBN is presently implementing a Thermo-Lag reduction program which will affect the information requested in this response. This was discussed with P. M. Madden and P. S. Tam, of the NRC office of Nuclear Reactor Regulation on June 29, 1994.

The commitments identified as items 1 through 4 will be completed prior to fuel load at WBN.