TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

January 17, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Denton:

In the Matter of the	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

Enclosed is our response to your October 30, 1979, letter to all operating reactors in which you requested documentation of the methods used for implementation of the NUREG-0578 short-term requirements.

Also, in response to your January 2, 1980, Confirmatory Order letter to H. G. Parris regarding Browns Ferry unit 1, unit 1 is presently in cold shutdown for a refueling outage and will be in full compliance with the NUREG-0578 short-term requirements before restart as indicated in my November 16, 1979, letter to you.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

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2.1.1 EMERGENCY POWER SUPPLY

TVA Response

Pressurizer Heater Power Supply

This position is not directly applicable to Browns Ferry; boiling water reactors do not use a pressurizer system to establish and maintain primary system pressure.

Natural circulation in the BWR, as discussed in NEDO-24708, is strong and inherent in all off-normal modes of operation as long as sufficient vessel inventory is maintained, and natural circulation is independent of any powered system. This is because, even in normal operation, the BWR is essentially an augmented natural circulation machine. Because the BWR operates in all modes with both liquid and steam in the reactor pressure vessel, saturation conditions are always maintained irrespective of system pressure. Thus, there is no need for emergency power to maintain natural circulation or to keep the system pressurized.

Power Supply for Pressurizer Relief and Block Valves and Pressurizer Level Indicators

All main steam line relief valves that are part of the automatic depressurization system (ADS) are supplied with safety grade, diverse control power. Motive air is supplied to these valves by redundant air compressors, which are energized by diverse safety grade power sources. The ADS valves also have accumulators, which allow multiple remote operations even in the absence of control air from the compressors.

BWR's do not have block valves.

The reactor vessel level indication instrument channels for safety system activation and control are already powered by emergency power.

For the reasons stated above, there is no need for action in response to NRC position 2.1.1.

2.1.2 PERFORMANCE TESTING FOR RELIEF AND SAFETY VALVES

TVA Response

The conditions under which BWR relief and safety valves would be expected to experience single-phase liquid or two-phase flow are divided into two categories: (1) high-pressure conditions, and (2) low-pressure conditions. The high-pressure conditions would result from a failure to shut off the high-pressure ECCS systems and the feedwater system prior to putting water into the main steam lines. The low-pressure conditions would result from intentionally establishing alternate shutdown cooling through the relief valves with makeup from the LPCI mode of RHR, or from the inadvertent overfilling of the vessel from the low-pressure ECCS.

As a result of NRC's November 14, 1979, response to the BWR Owners Group generic position, the Owners Group is preparing a test program to address those conditions which could result in single-phase liquid or two-phase flow through the relief and safety valves at low-pressure conditions. The high-pressure conditions will be addressed by either high-pressure testing under two-phase flow conditions or by installation of high reliability, high level trips for high-pressure ECCS and reactor feedwater systems. This trip will preclude the conditions of two-phase flow through the relief and safety valves at high pressures. We believe that this proposition will satisfy the intent of NRC's November 14, 1979, comments. By January 31, 1980, the BWR Owners Gruop will present their program for the high level trips and for testing relief and safety valves under the low-pressure conditions. This presentation will include the scope of testing and analysis to be performed, and a schedule for completion of testing and analysis. We commit to accept the negotiated NRC/Owners Group resolution of this item. Resolution of this item will be discussed in the upcoming meeting (January 31, 1980) with NRC.

2.1.3.a DIRECT INDICATION OF RELIEF AND SAFETY VALVE POSITION

TVA Response

TVA is providing unambiguous main control room indication of valve position by use of an acoustic monitoring system on the relief and safety valves. An alarm is provided in the control room in conjunction with the system.

The new valve position indication is single train, using a class IE power supply. As a backup, individual valve positions will be determined using the existing temperature sensor located in the discharge piping downstream of each valve. The use of the primary and backup valve position indicators is discussed in the appropriate emergency procedures.

The acoustic monitoring system is qualified as seismic class I, and is environmentally qualified for the appropriate temperature and pressure. Qualification for high radiation fields is currently being conducted.

The required modifications have been completed for Browns Ferry unit 2 and 3, and will be completed for Browns Ferry unit 1 during the refueling outage scheduled to begin in early January.

2.1.3.b INSTRUMENTATION FOR INADEQUATE CORE COOLING

TVA Response

GE has examined this requirement on a generic basis for the BWR Operating Owners Group. The conclusions of this study are documented in NEDO-24708, which has been recently submitted to NRC. A need for additional instrumentation has not been identified.

Development of improved procedures to be used by the operator to recognize inadequate core cooling with currently available instrumentation is discussed in the TVA response to item 2.1.9.

2.1.4 CONTAINMENT ISOLATION

TVA Position

The containment isolation system at Browns Ferry is designed to prevent the release of radioactive material to the environment after an accident while ensuring that systems important for post-accident mitigation are operational. Systems were evaluated and containment isolation provisions provided based on the following:

1. Non-essential Systems - These systems are not required for post-accident mitigation and are isolated automatically upon receipt of a primary containment isolation signal (PCIS) or are provided with manual valves which are locked closed when containment integrity is required.

2. Essential Systems - These systems are required for post-accident mitigation and are not isolated automatically upon receipt of a PCIS. However isolation of these lines, if required, is possible from the main control room. The following systems are classified as essential, as a result of their accident mitigation function:

(1) Standby Liquid Control (SLC)

(2) Reactor Core Isolation Cooling (RCIC)

(3) High Pressure Coolant Injection (HPCI)

(4) Residual Heat Removal - Low Pressure Injection and Containment Cooling Modes (RHR)

(5) Core Spray (CS)

(6) Containment Atmospheric Dilution (CAD)

Each line penetrating primary containment has been reviewed to ensure that (1) isolation of the line was based on its need to be in service post-accident and (2) that each containment isolation valve received the proper isolation signal.

The Browns Ferry PCIS are provided by diverse and redundant safety grade equipment. Browns Ferry complies with SRP 6.2.4 by isolating on, in general, (a) low reactor level or (b) high drywell pressure. The PCIS setpoints were chosen such that isolation will occur prior to or at the time of ECCS initiation. There are several other isolation modes in addition to the main PCIS logic. For example, main steam line isolation valves will also close as a result of high steam line radiation, high steam flow, or high steam line tunnel temperature. The primary containment ventilation system isolates on reactor building high radiation. The HPCI and RCIC systems have instrumentation to detect pipe breaks within their own flow paths, and to subsequently isolate the system.

TVA is modifying the isolation logic on 35 valves on each unit to meet the requirements of item (4). The design is such that resetting the main primary containment isolation signals will not result in the automatic reopening of these isolation valves. The logic modification has been completed on units 2 and 3, and will be completed for unit 1 during upcoming refueling outage in early January, 1980.

2.1.5.a DEDICATED HYDROGEN CONTROL PENETRATIONS

TVA Response

Post-accident hydrogen control for Browns Ferry is provided by inerting the primary containment during normal operation. After an accident, long-term combustible gas concentrations are maintained by the containment atmospheric dilution (CAD) system. This system is designed to purge small quantities of the containment atmosphere to the standby gas treatment system while adding makeup nitrogen to the containment. The CAD system meets NRC regulations on redundancy and single failure criteria.

During CAD system operation, containment atmosphere is vented in a controlled manner to the standby gas treatment system through a two-inch line. Failure of one vent path will not disable the CAD system, since a redundant vent line is available.

For the reason stated above, there is no need for action in response to NRC position 2.1.5.a.

2.1.5.c INSTALLING HYDROGEN RECOMBINERS IN LWR'S

TVA Response

This requirement is not applicable to Browns Ferry. The Browns Ferry design utilizes inerted containment design for combustible gas control.

2.1.6.a Systems Integrity for High Radioactivity

TVA Response

TVA has implemented a leak detection and reduction program for systems outside primary containment which could contain highly radioactive fluids during a serious accident or transient.

Each designated system will be inspected and will include measurement of actual leakage with the system operating when possible. Identified leakage paths will be repaired in order to maintain as-low-as-practical levels.

Also, as requested in NRC's letter of October 17, 1979, to Operating Plants, (North Anna problem) TVA has investigated Browns Ferry systems to ensure similar release paths as described do not exist. Although no pathways were identified, the review recommended some minor changes to improve our radwaste handling procedures.

1791 297

2.1.6.b Plant Shielding Review

TVA Response

TVA plants are specifically designed to mitigate major design basis events with no access outside the MCR being required. With this goal in mind, the plants were not specifically designed for any access outside the main control room.

TVA has performed a shielding review for Browns Ferry Nuclear Plant for vital access of the plant where access may be desirable after an accident. These vital areas include the spreading room, computer room, auxiliary instrument rooms, DC equipment rooms, battery rooms, battery board rooms and the communications room in the control building, the shutdown board rooms in the reactor building, and the diesel generator building. Shielding for normal operation in these areas is adequate for required access after an accident.

Access to other areas of the reactor building on elevation 593.0' and below is severely limited because of exposed RHR system and Core Spray system piping. However, no vital access areas have been identified in these areas. Access to areas of the reactor building on elevation 621.25' and above would not be limited by contained sources; however, access may be limited by airborne activity for large accident cases.

As the current plant design allows limited access to vital areas discussed above, no plant modifications are foreseen at this time.

2.1.7.a AUTO INITIATION OF AUXILIARY FEEDWATER

TVA Response

Although Browns Ferry does not have an auxiliary feedwater system, portions of the Browns Ferry ECCS network perform comparable functions. These ECCS systems are safety grade and meet the intent of the NRC's positions and clarifications.

2.1.7.b <u>AUXILIARY FEEDWATER FLOW INDICATION</u>

<u>TVA Response</u>

As noted in the response to 2.1.7.a, portions of the Browns Ferry ECCS network serve similar functions for post-accident recovery as the auxiliary feedwater system for PWR's. The flow indications for these systems are safety grade and meet the intent of NRC's positions and clarifications.

1791 300

2.1.8.a Improved Post-Accident Sampling Capability

TVA Response

The design and operational review of the reactor coolant and containment atmospheric sampling systems and analysis facilities have been completed. Due to the location of the current sampling systems, access is limited for large accident cases. Using the results of this review, engineering analysis of post-accident sampling facility needs have begun. The routine sampling facilities, representative of TVA plants, have been inspected to familiarize a potential TVA consultant with the existing sampling capabilities. Two possible contracting options for assistance needed by TVA to provide a post-accident sampling capability have been developed and analyzed for effectiveness. A decision will be made shortly on the option that best meets TVA needs. Work will then proceed to locate the new sample station and procure the facilities and equipment needed for this post-accident sampling capability. At that time a detailed schedule for implementation will be available.

Until the design modifications are complete, procedures have been devised to evaluate the primary coolant system activity depending on the accessibility of the sampling stations for particular degraded conditions.

2.1.8.b Increased Range of Radiation Monitors

TVA Position

TVA will provide redundant safety high-range noble gas effluent monitors.

A method or methods of sampling effluent particulates and iodine will be chosen and redundant particulate and iodine effluent monitoring systems qualified to the present state-of-the-art will be implemented.

TVA will provide redundant safety grade radiation monitors to meet NRC's high-range monitor requirements. These monitors will be isolated from the containment atmosphere yet not located outside the containment shielding. Exposure rates at selected detector location from activity within the containment will be high enough such that instrument readings can be correlated with containment activity throughout the course of the accident.

In the interim, procedures have been developed as practical to estimate release rates if existing effluent instrumentation goes off scale.

2.1.8.c IMPROVED INPLANT IODINE INSTRUMENTATION

TVA Response

Browns Ferry has portable low-volume air samplers, each equipped with a particulate filter followed by a charcoal adsorber to collect iodine isotopes. The particulate filter will be counted in the health physics laboratory for gross activity and the charcoal adsorber sent to the radiochemical laboratory for a gamma isotopic analysis for radioactive iodines. If necessary, as necessitated by a high-gross activity, the particulate filter will also be sent to the radiochemical laboratory for an isotopic analysis. The primary difference in obtaining inplant airborne isotopic concentrations for accident and routine operating conditions is the time required for sampling. A shorter sample time could be necessary for accident conditions because of the presence of high isotopic concentrations.

The plant has procedures for sampling and analysis of inplant air spaces incorporated in the Health Physics Laboratory Instruction Manual and the Radiation Control Instruction Manual.

Plant health physics technicians are required to complete a formal training program plus receive inplant training which includes the use of health physics procedures and instrumentation.

2.1.9 Transient and Accident Analyses

TVA Response

1. Small Break Loss-of-Coolant Accidents

The small break analyses have been completed as a revision to NEDO-24708. This document has been sent to NRC staff. The considerations expounded in the subject NEDO have been incorporated into plant emergency operating procedures.

2. Inadequate Core Cooling

The analyses for inadequate core cooling, procedures development, and operator training, will be completed according to the schedule agreed upon by the BWR Owners Group and the B&OTF. Also, the reactor water level instrumentation in the main control has been distinctively coded to alert the operator to which are reliable under LOCA conditions as recommended by General Electric's guidelines presented in SIL 299.

3. Transients and Accidents

The transients and accidents analyses, procedures development, and operator training will be completed according to the schedule agreed upon by the BWR Owners Group and the B&OTF.

2.1.9 CONTAINMENT PRESSURE INDICATION

TVA Response

TVA will provide new instrumentation capable of meeting Regulatory Guide 1.97 (revision 1), requirements on this position. This system will be divisionalized with division I and II, each having a -5 psig to +5 psig and a 0-300 psig differential pressure transmitter. The division I transmitters will interface with a control room pressure recorder. The division II transmitters will interface with a control room indicator. Both divisions will be powered by divisionalized emergency onsite power. We expect to have this modification completed by January 1, 1981.

1791 305

2.1.9 Containment Hydrogen Monitor

TVA Response

A Hayes-Republic hydrogen concentration monitoring system will be installed. A continuous indication of hydrogen concentration in the containment atmosphere shall be provided in the control room.

Measurement capability shall be provided over the range of 0-20 percent hydrogen concentration through a containment pressure range of 12 psia to maximum containment design pressure (56 psig).

The hydrogen concentration monitoring system will meet the design and qualification provisions of Reg. Guide 1.97.

2.1.9 CONTAINMENT WATER LEVEL INDICATION

TVA Response

TVA will provide new instrumentation capable of meeting Regulatory Guide 1.97 (revision 1), requirements on this position. The system will be divisionalized with division I and II each having a range of at least the lowest ECCS suction point to five feet above normal water level. The division I transmitter will interface with a control room level recorder, and division II with a level indicator. Both divisions will be powered by divisionalized emergency onsite power. This additional system will require two torus penetrations per division (four total), which presently do not exist. We expect to have this modification completed by January 1, 1981.

2.1.9 REACTOR COOLANT SYSTEM VENTING

TVA Response

TVA concurs in the consensus of the BWR Owners Group that the Browns Ferry existing reactor venting capability is fully satisfactory. The justification for our position was presented to NRC during the October 11, 1979, topical meeting and is also contained in the BWR Owners Group submittal in response to NUREG-0578. The existing Browns Ferry reactor venting system is represented accurately in the BWR Owners Group submittal.

2.2.1.a SHIFT SUPERVISOR'S RESPONSIBILITIES

TVA Response

1. TVA's administrative procedures, shift supervisor job description, and training programs strongly emphasize the primary management responsibility of the shift supervisor. In addition, periodic retraining acts to reinforce his command responsibilities. While these existing measures provide a high level of confidence that the shift supervisor has primary management responsibility for safe operation of the plant, TVA will annually issue a management directive which emphasizes this assignment of responsibility.

2a. Plant administrative procedures have been reviewed to ensure that they clearly define the authority and responsibilities of each position on shift. The duties and responsibilities of the shift supervisor, as specified in the job description, are consistent with position statement 2a.

2b. The shift crew in TVA plants consists of the following: (1) a shift engineer who has a SRO license and who has overall responsibility for the plant when higher level "in-line" management personnel are not present, (2) an assistant shift engineer (also has a SRO license) for each unit who has supervisory responsibility for all normal, abnormal, and emergency activities on his assigned unit, (3) a unit operator (with an RO license) for each unit, and (4) other personnel as appropriate. The duties of the shift supervisor as discussed in NUREG-0578 are performed by the assistant shift engineer on each unit. For purposes of our response, we will use the term assistant shift engineer for shift supervisor.

The assistant shift engineer's normal work station is in the control room, but he periodically makes inspections of plant equipment. He will immediately go to the control room during emergency situations.

He remains in the control room at all times during accident situations to direct the activities of the unit operator unless formally relieved of this function by the shift engineer. The shift engineer may, in turn, be formally relieved by the assistant operations supervisor or the operations supervisor (both also hold an SRO license).

2c. In the event that the assistant shift engineer (shift supervisor) is absent, the unit operator will be the lead operator on the unit to which he is assigned. An additional licensed operator will be available in the control complex to act as an assistant to the unit operator in abnormal or emergency situations.

3. The shift engineer and assistant shift engineers have received such training.

4. The administrative duties of the shift supervisor will be periodically reviewed by the senior officer of TVA responsible for plant operations. Administrative functions that detract from or are

subordinate to ensuring safe operation of the plant have been assigned to other employees. A clerk has been assigned to the shift engineer's office on each shift to perform administrative details formerly done by the shift-engineer and assistant shift engineers.

2.2.1.b SHIFT TECHNICAL ADVISOR

TVA is using experienced staff nuclear engineers to meet this requirement. These engineers will be on shift continuously at the plant site.

The Shift Technical Advisors have college degrees in engineering, and have received additional simulator training concerning normal and off-normal operations in order to enhance the accident and operating assessment function at the plant. This person will be assigned other duties when his duties as Shift Technical Advisor, provided that his availability is not compromised.

TVA believes that a multi-disciplined review group is necessary to adequately investigate LER's. TVA's Nuclear Experience Review Panel presently reviews all licensee event reports. When applicable, results of the review are incorporated in TVA's Operator and Shift Technical Advisor training and requalification programs. In addition, periodic training sessions are conducted for each shift crew. The material covered during these sessions include, but is not limited to, licensee event reports, operator errors, recent equipment problems, changes to technical specifications, and general plant status. The Shift Technical Advisors have additional responsibilities in being cognizant of the results of this material as applied to Browns Ferry.

2.2.1.c <u>SHIFT AND RELIEF TURNOVER PROCEDURES</u>

TVA has implemented shift and relief turnover procedures that provide assurance that the oncoming shift possesses adequate knowledge of critical plant status information and system availability. A checklist or similar hard copy is completed by offgoing and oncoming shifts at each shift turnover.

This checklist includes critical plant parameters and allowable limits, availability and proper alignment of safety systems, and a listing of safety system components in a degraded mode along with the length of time in that mode. This checklist is signed by the offgoing unit operator and the oncoming assistant shift supervisor and unit operator. All shift personnel responsible for the status of critical equipment have relief checklists for oncoming and offgoing shifts that include any core cooling equipment under maintenance or test that would degrade a safety system. In addition, a system will be established to evaluate the effectiveness of the turnover procedures.

2.2.2.a CONTROL ROOM ACCESS

TVA Response

TVA has established plant administrative procedures to control access to the control room during normal and accident conditions. This security procedure also addresses identification of authorized personnel.

Plant administrative procedures have also been issued defining the responsibilities under both normal and accident conditions. These procedures define the chain of command for operating and support personnel.

2.2.2.b Onsite Technical Support Center

TVA Response

The onsite Technical Support Center (TSC) has been established in the Shift Engineer's Office and the relay room in the powerhouse control bay. The plans for manning the TSC are prescribed in the Browns Ferry Radiological Emergency Plan.

Phones have been provided in the Shift Engineer's Office to communicate with the control room, inplant locations, NRC, vendor representatives, and the Chattanooga Division Emergency Center. Available in the TSC is a complete set of functional plant drawings and necessary technical information.

This center is located in the control bay, and therefore, meets the same habitability requirements of the main control room.

TVA is planning to upgrade the TSC by January 1, 1981.

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2.2.2.c ONSITE OPERATIONAL SUPPORT CENTER

An onsite Operational Support Center has been established in the powerhouse control bay. The use of this facility is described in the Browns Ferry Radiological Emergency Plan. Telephone communications with the main control room are available.

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