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

Gentlemen:

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

BROWNS FERRY NUCLEAR PLANT (BFN) - CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS) CORRECTIVE ACTIONS (TAC NOS. M83348, M83349, AND M83350)

References: 1) TVA letter to NRC, dated July 31, 1992, Resolution of Control Room Emergency Ventilation System (CREVS) Issues

2) NRC letter to TVA, dated January 29, 1993, Control Room Emergency Ventilation System Corrective Actions - Browns Ferry Nuclear Plant

In Reference 1, TVA provided its proposed resolution for the previously identified deficiencies with the CREVS. Once these proposed corrective actions are completed, TVA will be in full compliance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 19. In Reference 2, NRC provided TVA with two lists of requests for additional information, observations, and outstanding issues. The requested responses are provided in Enclosure 1.

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A summary list of commitments contained in this letter is provided as Enclosure 2. If you have any questions, please contact G. D. Pierce, Interim Manager of Site Licensing, at (205) 729-7566.

Sincerely,

G. J. Zeringue

Enclosure
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ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)

BACKGROUND:

The Control Room Emergency Ventilation System (CREVS) is designed to protect the control room operators by automatically starting on receipt of a control room isolation signal and pressurizing the main control bay habitability zone with filtered outdoor air during accident conditions that could result in radioactive releases. The CREVS uses charcoal adsorbers to assure the removal of radioactive iodine from the air and high efficiency particulate absolute (HEPA) filters for removing radioactive particulate matter.

During the Unit 2 Cycle 5 outage, an employee concern identified a specific condition that could impact the ability of the CREVS to provide an environment suitable for personnel occupancy. The Control Building air supply ducts are not designed or fabricated to be leak tight. Unfiltered outside air could leak from the seams/joints of the supply air ducts that traverse the control bay habitability zone. This duct leakage could result in outside air bypassing the CREVS and introducing potentially contaminated and unfiltered outside air into the control bay habitability zone.

In Reference 1, TVA provided its proposed resolution for the identified deficiencies with the CREVS. Once these proposed corrective actions are completed, TVA will be in full compliance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 19. It should be noted that as part of Reference 1, TVA stated that the additional CREVS capacity would require swapping of loads from a more heavily loaded diesel generator to a diesel generator with greater margin. As a result, TVA committed to amend the Technical Specifications to reflect this change. TVA has since determined that the swapping of loads and the amending of the Technical Specifications would not be required. In Reference 2, NRC provided TVA with two lists of requests for additional information, observations, and outstanding issues.

TVA RESPONSES:

RESPONSE TO REFERENCE 2, ENCLOSURE 1, DECEMBER 11, 1992 EXIT MEETING REGARDING BROWNS FERRY CONTROL ROOM HABITABILITY -

It should be noted that the NRC issues start with Number 2 since the first set of NRC preliminary conclusions reflect a summary of actions that TVA had previously completed and do not require a TVA response.

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2) The NRC raised questions about the assumptions in TVA's revised GDC 19 accident analysis. Some of these questions are associated with:

A) Whether EOIs reflect the accident analysis assumptions made with respect to the timing of operator actions involving dampers in the non-safety stack exhausts and the single isolation damper in the habitability zone (FCO 150B).

TVA RESPONSE:

The dampers used to isolate potential ground level release paths from the stack are considered safety related. They are seismically qualified, redundant, have qualified power supplies, and are bubble tight. No dose reduction credit is taken for non-safety related dampers.

The safety related stack exhaust isolation dampers currently are closed manually from the Main Control Room when the annunciator on Panel 9-7 activates. The Alarm Response Procedure for Panel 9-7 and the Operating Instruction for System 65, Standby Gas Treatment, and System 66, Off-gas, direct the closing of these safety related stack exhaust isolation dampers within thirty minutes upon verifying that the radiation monitor has reached or exceeds 1,000 Rad/hour. The 30 minute time frame assumed in the control room habitability dose calculation is considered reasonable for the closure of these dampers.

During the current Unit 2 Cycle 6 outage, TVA will replace the manually operated isolation dampers with safety related dampers that will automatically close if there is a backdraft through the ductwork. This will reduce the overall dose to the control room operators and significantly reduce the ground level release at the base of the stack during the first 30 minutes of the accident.

The acceptability for using non-single failure proof isolation dampers in the Control Room is documented in Supplement No. 1 to the Safety Evaluation Report for the Browns Ferry Nuclear Plant, Units 1, 2 and 3, dated December 21, 1972.

Section 8.4, Control Room Ventilation Systems, of the Safety Evaluation states:

> "Although redundant filter trains are provided the applicant is relying on single valves for isolation of the Control Room from the normal ventilation paths. Failure of one of these valves to close would reduce the effectiveness of the proposed system. The applicant has stated that the isolation valves are all located in the Control Room area with local position indicators and means for manually closing a failed open valve. We conclude that sufficient time is available for the operators to assure isolation from the normal ventilation system and that the Control Room Ventilation System, as proposed, is acceptable."

A single failure of one of these isolation dampers to close was not modeled as part of the control room operator dose calculation. These dampers receive redundant isolation signals and normally fail in the closed position. The single habitability zone isolation dampers close automatically upon receiving a Group 6 or a Control Room High Radiation isolation signal. Abnormal Operating Instruction 0-AOI-31-1 states that the dampers should be verified closed or manually closed if the automatic isolation capability did not function.

B) Assumed MSIV leakage

TVA RESPONSE:

It should be noted that the consideration of MSIV leakage in control room operator dose calculations has not previously been part of TVA's licensing or design basis. TVA has voluntarily included the dose contribution from MSIV leakage in its latest assessment of control room operator doses in an effort to resolve the CREVS deficiencies.

TVA assumed an MSIV leakage rate of 11.5 scf/hr for 30 days in the control room operator dose calculations. This assumption is consistent with Technical Specification Surveillance Requirement 4.7.A.2.i, which states:

> "The main steamline isolation valves shall be tested at a pressure of 25 psig for leakage during each refueling outage. If the leakage rate of 11.5 scf/hr for any one main steamline isolation valve is exceeded, repairs and retest shall be performed to correct the condition."

Also, as part of a voluntary program to address MSIV leakage, two Engineering Change Notices (ECNs), P0613 and P0614, were issued to reduce MSIV leakage. These design changes were partially implemented on the Unit 2 MSIVs prior to Unit 2 Cycle 6. ECN P0613 modifications included weld buildup and machining the upper and lower guide ribs, the installation of an additional guide rib to align the poppet with the main seat, application of hardfacing to the lower guide ring of the poppet, and installation of a forged steel poppet. ECN P0614 allows for the replacement of the existing valve stem with one of a larger diameter, modification of the valve bonnet backseat and stuffing box for the new stem, and installation of an anti-rotation device on the valve poppet. ECN P0613 was implemented on MSIVs 01-14, 15, 26, 27, 37, 38 and 52. ECN P0614 was implemented on MSIVs 01-26, 37, 38, and 52.

The following conditions were recorded for the valves noted above, leakage rates are in scfh per valve pair:

Valve Pair	As Found 1984	As Left 1991	As Found 1993
1-14 and 15	13.1	7.05	3.16
1-26 and 27	1017.8	8.03	17.21
1-37 and 38	2711.6	0.35	1320.26
1-51 and 52	17.4	0.69	1.21

The need for additional work on the Unit 2 MSIVs during the Unit 2 Cycle 6 outage is being determined based on the as-found Local Leak Rate Test results.

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C) Assumed adsorber efficiency.

TVA RESPONSE:

During the December 8 - 11, 1992, NRC site visit and in Items 6A and 6B, the NRC expressed a specific concern with the assumed adsorber efficiency due to use of the temperature and relative humidity specified in the BFN Technical Specifications and the lack of a specific required flow rate for this test in the Technical Specifications.

The temperature and relative humidity specified in the BFN Technical Specifications was developed in response to a Notice of Violation for improper analysis of carbon samples from the Standby Gas Treatment System (SGTS), that was cited in NRC Inspection Report 85-57, dated February 11, 1986. In response, on February 11, 1987, TVA submitted a proposed Technical Specification amendment to perform carbon sample analysis in accordance with ASTM D3803. The Bases change that was included in this Technical Specification amendment stated:

> "The laboratory carbon sample test results should indicate a radioactive methyl iodide removal efficiency of at least 90 percent for expected accident conditions. If the efficiencies of the HEPA filter and charcoal adsorbers are as specified, the resulting doses will be less than the 10 CFR 100 guidelines for the accidents analyzed."

This amendment was approved by NRC letter, dated February 12, 1988. ASTM D3803-1979 is the year of the standard specifically cited in the NRC's Safety Evaluation. Therefore, the current test is in accordance with BFN's licensing basis.

TVA has reviewed NUREG-1433, Standard Technical Specifications General Electric Plants, BWR/4, dated September 1992. The Main Control Room Environmental Control (MCREC) System is addressed in Section 3.7.4 of the Improved Standard Technical Specifications (ISTS). Surveillance Requirement (SR) 3.7.4.2 states:

> "Perform required [MCREC] filter testing in accordance with the [Ventilation Filter Testing Program (VFTP)]."

Charcoal efficiencies, test standards, temperatures, humidity, or flow rates are not specified.

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The Bases for ISTS SR 3.7.4.2 states:

> "This SR verifies that the required [MCREC] testing is performed in accordance with the [Ventilation Filter Testing Program (VFTP)]. The [MCREC] filter tests are in accordance with Regulatory Guide 1.52 (Ref. 5). The [VFTP] includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the [VFTP]."

It is TVA's understanding that one of the underlying purposes of the Technical Specification Improvement Program, including ISTS and Technical Specification line item improvements, is the removal of Technical Specification requirements that are adequately controlled by other means. The relevant testing parameters, including a design flow of plus or minus ten percent, is specified in Surveillance Instructions (SIs), 0-SI-4.7.E.2.A and .B and 0-SI-4.7.E.3.A and .B. These SIs perform the in place leak test and the charcoal halogenated hydrocarbon test. Changes in the test parameters constitute a change to the facility and thus would be subject to the provisions of 10 CFR 50.59. Therefore, TVA considers the inclusion of required flow rates for this test in the Technical Specifications to be an unnecessary level of detail.

The overall removal efficiency of the Standby Gas Treatment System (SGTS) and the CREVS was assumed to be 90 percent for inorganic and organic iodine. This efficiency is less than the value used by NRC in determining the acceptability of the original control room ventilation system design. Section 8.4, Control Room Ventilation Systems, of SER Supplement No. 1, dated December 21, 1972, states:

> "Based on an assumed 95% iodine removal efficiency for elemental and 90% for organic by the charcoal filters, the dose rates are within Criterion 19 guidelines."

The 90 percent iodine removal efficiency was chosen by TVA based on several considerations, including the general guidelines provided in Regulatory Guide 1.52, Revision 2, "Design, Testing, and Maintenance Criteria for Post Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants". For the SGTS and new CREVS units, TVA uses an activated carbon bed depth of 2 inches, located outside containment, and uses heaters to control the relative humidity of the filtered air to less than 70 percent. TVA has extensive history on as-found testing of the charcoal iodine removal efficiency. This testing has generally shown an efficiency of greater than 99 percent.

D) Exclusion of the dose contribution from the leakage associated with the operation of RHR during accident recovery operations.

TVA RESPONSE:

NUREG-0737 (TMI Action Plan), Item II.B.2, "Plant Shielding Modifications", states:

> "Radiation from leakage of systems located outside of containment need not be considered for this analysis."

The NRC Safety Evaluation for BFN's implementation of the TMI Action Plan Item II.B.2, dated March 8, 1983, states:

> "The assumptions and methodology employed by the licensee in the shielding design review were found to be consistent with the requirements. Source terms were based on source term requirements contained in NUREG-0737. The systems identified as potentially containing high concentrations of radioactivity following an accident were found to be consistent with system functions."

TVA's calculation of the post-accident radiological dose to the control room operators does not take into account the potential leakage associated with system operation during accident recovery operations. This is consistent with the licensing and design basis of BFN.

Although not explicitly cited by the NRC, the only regulatory guidance identified by TVA with regard to the consideration of the radiological consequences of leakage from the recirculation system after an accident, was contained in Standard Review Plan, Section 15.6.5, Appendix B. The construction permits for all three Browns Ferry units were issued, and two of the units were in commercial operation, prior to the issuance of the Standard Review Plan. TVA's correspondence on control room habitability, TMI Action Plan Item III.D.3.4 was dated December 23, 1980, March 17, 1981, June 24, 1982, and July 27, 1982. The NRC's Safety Evaluation on this Action Item was provided by letter, dated August 30, 1982. None of the correspondence commits TVA to SRP 15.6.5. Therefore, TVA was not designed as an SRP plant and is not specifically committed to follow the guidelines of SRP 15.6.5.

E) Exclusion of 36 mph wind speed event as an incredible event without a demonstration that it meets the exclusionary criteria in SRP 6.5.3.

TVA RESPONSE:

The NRC has previously stated that a probabilistic argument is a reasonable basis for concluding that the exfiltration scenario need not be encompassed in BFN's control room design. In the NRC's September 18, 1989 Safety Evaluation, which reviewed the current cycle of operation with the unfiltered inleakage problem, the NRC stated that:

> "The staff reviewed the circumstances of the bounding event in accordance with Regulatory Guide 1.97, Section 2.3.4.2, and determined the event to be too infrequent to be credible."

TVA's correspondence on control room habitability, TMI Action Plan Item III.D.3.4 was dated December 23, 1980, March 17, 1981, June 24, 1982, and July 27, 1982. The NRC's Safety Evaluation was provided by letter, dated August 30, 1982. None of the correspondence commits TVA to SRP 6.5.3. As previously discussed, TVA is not committed to follow the guidelines of the Standard Review Plan due to the vintage of the Browns Ferry design.

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F) Justification for new Chi/Q values.

TVA RESPONSE:

Copies of the calculations that were used to determine the new Chi/Q values are available in TVA's Rockville office for review. The actual Chi/Q values used in the dose calculation are provided in response to Item 5a.

From the Top of the Stack -

The Chi/Q value for fumigation conditions for the first 30 minutes of the accident, which are released from the top of the stack to the nearest control room air intake, was developed utilizing the Regulatory Guide 1.145 methodology. This methodology was expanded to include enhanced lateral plume spread under fumigation conditions when the plume is emitted from a tall stack.

The non-fumigation values were developed using a bivariate normal, or Gaussian diffusion model obtained from Regulatory Guide 1.145, Revision 1. As such, the following inputs/assumptions were made:

- Plume rise was not considered at any time during the stack release.
- The effective stack height was based on the elevation difference between the stack and control room air intake elevations.
- All short term (0 - 2 hour) elevated accident Chi/Q values were calculated based on conservative meteorology (i.e., Pasquill Class A and 0.3 meter per second wind speed). This maximized the Chi/Q at the control room air intake.
- Logarithmic interpolation was applied to locate Chi/Q values for the time periods corresponding to 0 to 8 hours, 8 to 24 hours, 1 to 4 days, and 4 to 30 days, following an accidontal release. The calculation of the annual average Chi/Q values used in the logarithmic interpolation scheme was based on the methodology outlined in Regulatory Guide 1.111, Revision 1.

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From the Base of the Stack -

The Chi/Q dilution factors for the release from the base of the stack to the nearest control room air intake were determined using a bivariate normal, or Gaussian diffusion model (Regulatory Guide 1.145, Revision 1) modified for source configuration and lateral meander under neutral and stable conditions. As such, the following inputs/assumptions were made:

- The modeling technique used meteorological data that consisted of hourly average ten meter wind speed, wind direction and ninety to ten meter delta-temperature parameters recorded at BFN during the five year period from January 1, 1987 to December 31, 1991.

- Only those meteorological parameters that occurred in the influencing directional sectors (WSW, W, WNW, and NW) were considered in the analysis.

- A vertical plane cross sectional stack area of 168 square meters was used for building wake considerations.

- The short term accident Chi/Q values were calculated for the influencing directional sectors. The other sectors were assumed to be zero. These values were then ranked in descending order. As a result, the five percent overall value was selected as the controlling 0 - 2 hour Chi/Q.

- Logarithmic interpolation was applied to locate Chi/Q values for the time periods corresponding to 0 to 8 hours, 8 to 24 hours, 1 to 4 days, and 4 to 30 days following an accidental release. The calculation of the annual average Chi/Q value used in the logarithmic interpolation scheme was based on the methodology outlined in Regulatory Guide 1.111, Revision 1.

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From Turbine Building -

The MSIV leakage will be exhausted through non-safety related ventilators mounted on the Turbine Building roof. The Chi/Q values for the MSIV release from the Turbine Building were determined by a methodology that accounted for the release from the roof vents and the effect of building downwash. Some of the specific assumptions for determining the Chi/Q values were:

- A uniform mixing throughout a vertical layer of air next to the side of the building. The effluent was assumed to be uniformly mixed throughout a volume having cross sectional dimensions equal to the height and projected width of the building, and having downwind dimensions equal to the numerical value of the wind speed.

- A worst case short term (0 - 30 minute) average impact was determined by calculating the impact associated with a matrix of eleven wind speeds, from 2 to 22 meters per second, and 360 wind directions.

- An annual average was estimated by applying the matrix of Chi/Q values obtained in the above step to frequency distributions of wind speed and direction for each of 14 years of on site meteorological data. The highest of these 14 values was selected for use as the annual average.

- Estimates for averaging times between 30 minutes and one year were obtained by logarithmic interpolation.

G) Need to address leakage through stack sumps.

TVA RESPONSE:

Until the CREVS conformance to GDC 19 issue is resolved, TVA will be unable to determine if sufficient margin is available to permit the stack divider plate drain valve to be left open and therefore, to permit operation of the Hardened Wetwell Vent without prior manual operator action to open this valve. The current configuration for this manual valve is normally closed and fails as-is. The current operator dose calculation reflects the current configuration. Any minor leakage through this normally closed valve would not be expected to have a significant effect on the overall conservatism included in the control room operator dose calculation.

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H) Seismic nature of ducts supplying exhaust to the stack.

TVA RESPONSE:

The modeling of the stack and associated components is conservative and in accordance with BFN's licensing and design basis. TVA assumes that the non-safety related fans do not operate and that the non-safety related, spring loaded, fail closed dampers fail to close.

General Design Criterion 2 requires design basis accidents be mitigated with seismically qualified equipment. However, TVA does not rely on non-safety related ductwork to mitigate the consequences of a design basis accident. Further, it is BFN's understanding that, for the purpose of design basis accident analyses, the simultaneous occurrence of a design basis accident and an earthquake need not be postulated. Therefore, the non-safety related ductwork in the stack need not be designed to account for a simultaneous design basis earthquake and accident.

Irrespective of the above, BFN does postulate a design basis earthquake associated with a recirculation line failure as the limiting design condition only for the Protection and Engineered Safeguards Systems (Limiting postulated events are defined in Section F.1 of the BFN FSAR). Further, nuclear safety systems and engineered safeguards systems are defined in FSAR Section 7.1.1. Ventilation/offgas systems are not included in this list. Therefore, the BFN design criteria does not require non-safety related ductwork be designed to perform its intended function after a design basis accident or earthquake.

I) New control room intakes not designed to include tornado missile protection in accordance with the discussion in SRP 6.4.

TVA RESPONSE:

A lack of tornado missile protection for equipment located in the control bay vent towers was originally reported by TVA under LER 50-259/86006. Closure of the LER is documented in NRC Inspection Report 88-32, dated February 19, 1989. The review of the probability calculations and coordination with the Materials Engineering Branch of NRR is cited in the Inspection Report.

Additionally, NRC Inspection Report 89-42, dated February 26, 1990, reviewed the tornado protection issue as part of the Civil Calculation Review Program. The report states that instructions contained in operating instructions AOI-100-7 and OI-31 would assure sufficient cooling for safety related equipment in the mechanical equipment room would be maintained following tornado missile damage to the Unit 1 ventilation tower.

TVA's correspondence on control room habitability, TMI Action Plan Item III.D.3.4 was dated December 23, 1980, March 17, 1981, June 24, 1982, and July 27, 1982. The NRC's Safety Evaluation was provided by letter, dated August 30, 1982. None of the correspondence commits TVA to SRP 6.5.3. As previously discussed, BFN was not designed as an SRP plant and is not specifically committed to follow the guidelines of SRP 6.5.3. The cited correspondence delineates the BFN licensing basis for control room habitability and compliance with the TMI Action Plan Item.

Calculation XD-N0000-890003, Revision 2, "Probability of Occurrence of Tornado Generated Missile Strike of Safety Related Equipment in Vent Tower", documents that this event has a probability of occurrence of 7.09×10^{-8} for the Units 1 and 3 towers and a probability of 8.14×10^{-8} for the Unit 2 tower. TVA evaluated the probability of a missile strike on the additional ductwork that provides a suction path for the vent tower equipment. It shows a missile strike frequency of 1×10^{-7}. Based on the result of these analyses and the operating procedures, no tornado missile protection was provided for the new ductwork. However, the new ductwork is fabricated from ⅜" plate, which is heavier than the normal requirements for three psi ductwork.

J) Leakage performance capability of Ruskin and Press dampers in non-safety related exhaust lines in stack.

TVA RESPONSE:

Post-modification testing of the existing Ruskin dampers installed in the various leakage paths in the stack shows that the leakage values are less than the acceptance criteria. The current Technical Instruction, 0-TI-225 for these dampers states an acceptance limit of not greater than 1.75 SCFM. A copy of this Technical Instruction is available for review in TVA's Rockville office. This leakage limit is verified during each refueling outage. The combined leakage values recorded for the post-modification test are included in the operator dose calculations.

As discussed in response to Item 2A above, TVA will replace the manually operated isolation dampers during the current Unit 2 Cycle 6 outage with safety related dampers that will automatically close if there is a backdraft through the ductwork. This will reduce the overall dose to the control room operators and significantly reduce the ground level release at the base of the stack during the first 30 minutes of the accident.

The Press replacement dampers are anticipated to have leakage values at least as good as the existing Ruskin dampers. The LOCA control room dose calculation will be revised as part of the normal design process when the Ruskin dampers are replaced with the Press dampers. Acceptance limits for damper leakage and test requirements has been developed as part of the design and post-modification testing process.

K) Demonstration that the LOCA is the limiting accident with respect to control room operator doses.

TVA RESPONSE:

The conclusion that the LOCA is the limiting accident with respect to control room operator doses was previously reached by NRC as documented in SER Supplement 1, dated December 21, 1972. Section 8.4, Control Room Ventilation Systems, of the Safety Evaluation states:

> "The overall system design has been analyzed by the Staff. Doses to the control room operators have been calculated assuming conservative iodine source terms from a LOCA or a main steam line break accident. The LOCA is the controlling accident."

A calculation was developed for control room doses after a main steam line break. This calculation shows that the LOCA dose calculation is the most limiting. A copy of this calculation is available for review at TVA's Rockville office.

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3) Based upon the questions raised in Item 2 above, the possibility exists that the NRC's assessment of the capability of the Browns Ferry control room to meet GDC 19 could result in a different conclusion than that drawn by TVA. With that potential existing, TVA may want to identify specific leakage sources, quantify the volume associated with those sources and initiate corrective actions to ensure restart in accordance with the schedule. Some of the sources of in-leakage which the staff believes needs to be quantified include the leakage past damper FCO 150B, infiltration via the contaminated ductwork which penetrates the control room habitability zone, and the spread of contaminated air throughout the habitability zone due to the lack of integrity of the relay room and control room air handling units.

TVA RESPONSE:

As discussed in the TVA/NRC meeting of February 3, 1993 and in detail later in this submittal, the corrective action approach taken by TVA does not require the individual unfiltered inleakage paths be identified and/or quantified. After having implemented significant efforts to identify and seal the habitability zone boundary leak paths, the gross boundary leakage was established by the performance of a special test. The resulting unfiltered inleakage was then established by analysis. This value was used in the control room operator dose calculation.

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4) Amendment 173 of Unit 2 included in the SE a requirement that TVA provide a TS surveillance requirement for the demonstration of in-leakage values as a part of the redesign of the CREVS. TVA has not provided such a surveillance requirement in their TS submittal. The staff still believes that such a requirement is applicable. The staff believes that such a test must definitively demonstrate system integrity, must have an established baseline which is related to the accident assumptions, and must confirm acceptability with respect to the accident assumptions. It is important that the baseline test and subsequent tests all reflect the anticipated configuration of the ventilation systems including those associated with adjacent areas.

TVA RESPONSE:

The Main Control Room Environmental Control (MCREC) System is addressed in ISTS Section 3.7.4. Surveillance Requirement (SR) 3.7.4.2 states:

> "Perform required [MCREC] filter testing in accordance with the [Ventilation Filter Testing Program (VFTP)]." Surveillance Requirement 3.7.4.4 states: "Verify each [MCREC] subsystem can maintain a positive pressure of ≥ [0.1] inches water gauge relative to the [turbine building] during the [pressurization] mode of operation at a flow rate of ≤ [400] cfm."

The Bases for SR 3.7.4.4 states:

> "This SR verifies the integrity of the control room enclosure and the assumed inleakage rates of potentially contaminated air. The control room positive pressure, with respect to potentially contaminated adjacent areas (the turbine building), is periodically tested to verify proper function of the [MCREC] System. During the emergency mode of operation, the [MCREC] System is designed to slightly pressurize the control room ≥ [0.1] inches water gauge positive pressure with respect to the turbine building to prevent unfiltered inleakage. The [MCREC] System is designed to maintain this positive pressure at a flow rate of ≤ [400] cfm to the control room in the pressurization mode. The Frequency of [18] months on a STAGGERED TEST BASIS is consistent with industry practice and other filtration systems SRs."

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A test to determine the unfiltered inleakage rate will be established as a Surveillance Instruction and will be performed once per cycle. The surveillance test will require each CREVS unit be started and the following parameters addressed:

1) The CREVS flow rate into the habitability zone will be measured,

2) The habitability zone overall boundary outleakage will be measured,

3) The habitability zone pressure will be measured. The design pressure will be the acceptance criteria,

4) The inleakage into the habitability zone will be determined, and

5) A one time baseline test will be established as part of the Post-Modification Testing for the CREVS corrective actions. Fan alignment and damper positions will be aligned consistent with the baseline test. Readings will be taken at different pressures during the CREVS post-modification baseline testing to determine the outleakage at different pressures.

A substantial change in the flow rates required to maintain the habitability zone boundary pressure would indicate boundary degradation. TVA has a program in place to control penetrations of the habitability zone and a maintenance program for door seals. With these programs in place, TVA does not anticipate significant degradation of the habitability zone pressure boundary.

The current Browns Ferry Technical Specification Surveillance Requirement 4.7.E.3 is similar to the ISTS Surveillance Requirement. Therefore, a change to the BFN Technical Specifications to explicitly cite the new Surveillance Requirement is not necessary.

5) Additional information needs to be provided on the docket to enable the NRC staff to document the basis for concluding that the control room is capable of meeting GDC 19. Some of the information necessary for the docket includes:

A) A summary of the assumptions and the results of the revised dose evaluation.

TVA RESPONSE:

A copy of the dose calculation is also available in TVA's Rockville office for review. The major assumptions/parameters used in the dose calculation were:

- A flow rate from all three trains of the Standby Gas Treatment System (SGTS) of 22,000 cfm.
- The maximum unfiltered inleakage into the habitability zone was 3717 cfm.
- The activity is released under fumigation conditions for the first 30.5 minutes.
- The charcoal filter efficiency for CREVS and SGTS is 90 percent for inorganic and organic iodine.
- There is a release from the base of the stack for 30.5 minutes at a flow rate of 3,400 cfm. A continuous leakage of 5 cfm exists for the remainder of the accident.
- The source terms are based on TID-14844 methodology using a design power of 3458 MWt and 1,000 effective full power days.
- The drywell leak rate is 2 percent volume per day (235.8 cfh).
- The LOCA source term is composed of 100 percent of the core inventory of noble gases and 25 percent of the iodines. It is released instantaneously to the primary containment. The iodines are comprised of 4 percent organic and 96 percent inorganic (91 percent elemental plus 5 percent particulate) iodines. The particulate portion is assumed to plate out.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

- The leakage from the primary containment is assumed to mix instantaneously and uniformly in 1,931,502 cubic feet of the reactor zone and refueling floor before passing to the Standby Gas Treatment System.

- The Containment Atmospheric Dilution (CAD) System is assumed to operate for a period of 24 hours at a flow rate of 139 cfm at 10 days, 20 days, and 29 days post-accident.

- One train of the CREVS operates at a flow of 3,000 cfm.

- The stack dilution fans leak into the rooms at the base of the stack. The total volume is 69,120 cubic feet. Half of the total volume is assumed to be used as a mixing volume.

- The following Chi over Q values were utilized for the stack release:

Release Path	Time Period	Chi over Q
Top of Stack	0 - 30 minutes	3.31×10^{-5}
	30 min. - 2 hrs.	5.90×10^{-15}
	2 - 8 hrs.	3.80×10^{-15}
	8 hrs. - 1 day	3.02×10^{-15}
	1 - 4 days	1.90×10^{-15}
	4 - 30 days	9.60×10^{-16}
Base of Stack	0 - 30 minutes	8.89×10^{-4}
	30 min. - 2 hrs.	8.89×10^{-4}
	2 - 8 hrs.	7.30×10^{-4}
	8 hrs. - 1 day	6.60×10^{-4}
	1 - 4 days	5.40×10^{-4}
	4 - 30 days	4.00×10^{-4}

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

- The following Chi over Q values were utilized for the MSIV leakage from the Turbine Building release:

Release Path	Time Period	Chi over Q
MSIV Turbine Building	0 - 30 minutes	3.48×10^{-4}
	30 min. - 2 hrs.	3.48×10^{-4}
	2 - 8 hrs.	2.94×10^{-4}
	8 hrs. - 1 day	2.53×10^{-4}
	1 - 4 days	2.01×10^{-4}
	4 - 30 days	1.44×10^{-4}

- The dose from both the top and bottom of the stack released during the first 30.5 minutes was divided by a factor of 1.7 to account for the ICRP-30 conversion factors. The remaining doses were divided by a factor of 1.35.

- The control room operator occupancy factors were:

Percent Occupancy	Time Period
100	0 - 1 day
60	1 - 4 days
40	4 - 30 days

- The dimensions of the Unit 2 control room are 153.95 by 36.83 by 15.33 feet.

- The Control Room roof is 2.25 feet thick and is constructed of concrete.

- The free volume of the habitability zone is 210,000 cubic feet.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

- The following Adult Inhalation Thyroid Dose Conversion Factors were utilized:

Isotope	REM/Curie
I-131	1.48×10^6
I-132	5.35×10^4
I-133	4.00×10^5
I-134	2.50×10^4
I-135	1.24×10^5

- The following breathing rates were utilized:

Time Period	Rate in C^3/Sec.
0 - 8 hours	3.47×10^{-4}
8 - 24 hours	1.75×10^{-4}
1 - 30 days	2.32×10^{-4}

- The piping from the Main Steam Isolation Valves (MSIVs) to the Condenser and the Condenser itself remains intact.

- The free volume of the low pressure turbines and the condensers was taken as 51,000 and 136,000 cubic feet, respectively.

- The MSIV leakage rate was 11.5 scfh per valve and for each steam line.

- The free volume of the turbine building associated with each unit was 2,100,000 cubic feet. This value was used as the mixing volume.

- The flow rate from the Turbine Building vents was 8,640,000 cfh.

- There are four lines from the reactor to the MSIVs. The average length is 141 feet and the inside diameter is 23.65 inches.

- The average pipe length from the MSIVs to the Turbine Stop Valve Pipe Compartment is 189 feet and the inside diameter is 21.56 inches.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

- The drain lines from the main steam lines to the condenser remain open.

- Doses due to MSIV leakage, including the effects of iodine plateout and re-suspension, were calculated in accordance with BWROG methodology.

The results of the calculation were an operator whole body gamma dose of 1.55 REM, Beta dose was 0.41 REM, and thyroid dose was 18.0 REM.

B) Whether the new CREVS design meets the recommendation of RG 1.52, ASME Code AG-1 or ASME N509 and will be tested in accordance with ASME N510.

TVA RESPONSE:

Procurement Request (PR) BF92-0141 provides the technical requirements for the new filter units. It specifies that the components that make up the complete assembly shall meet the intent of the requirements specified in ASME N509-1989. It also states that each assembly shall be equipped with all facilities - ports, distributors, probe taps, etc., for the convenient and reliable in-place testing of the carbon adsorber and the post-filter bank in accordance with ASME N510. The PR requires factory testing of each fully assembled filter system in accordance with the requirements of ASME N509-1989, Table 1 (acceptance testing) for a leakage Class 1 system per ASME N509-1989.

C) Data on special tests conducted to determine unfiltered inleakage into the control room habitability zone and backflow through the non-safety related exhaust ducts.

TVA RESPONSE:

A copy of the special test and the associated calculation are available in TVA's Rockville office for review. The major parameters/data/results used in the determination of the unfiltered inleakage rate were:

- The average habitability zone pressure during the door fan test to measure boundary outleakage was 0.224" WG at a flow rate of 2,392 cfm. This resulted in a calculated equivalent leakage area of 289 square inches.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

- After the door fan was disconnected, the Unit 3 board room supply and Unit 3 spreading room supply fans were started. This resulted in an average pressure of 0.20" WG, which correlates to a calculated unfiltered inleakage flow rate of 2,280 cfm.

- Next, the following exhaust fans were started: Unit 3 Battery and Board Room, Unit 3 toilet, Unit 3 Board Room, Unit 1 toilet, Spreading Room, Unit 1 Board Room, and Unit 1 Battery and Board Room. This resulted in an average pressure of 0.17" WG, which correlates to a calculated unfiltered inleakage flow rate of 2,103 cfm.

- Then, the Unit 1 Emergency Board Room Supply and Unit 1 Spreading Room Supply fans were started. This resulted in an average pressure of 0.49" WG, which correlates to a calculated unfiltered inleakage flow rate of 3,540 cfm.

- Removing the allowance from the air removed by the exhaust fans, the overall unfiltered inleakage rate was determined to be 3,717 cfm.

D) Seismic nature of piping and dampers of ductwork in exhausts to the stack.

TVA RESPONSE:

The only seismically qualified ductwork leading to the stack are the SGTS headers. The steel "bottle" and all the attachments for the "bottle" back to the various isolation valves are seismically qualified. The dampers used to isolate potential ground level release paths from the stack are considered safety related. A request for specific information to be docketed will receive a prompt TVA response. Please also refer to the response to Item 2A.

E) There is no Item 5.E contained in the NRC's January 29, 1993 letter to TVA.

TVA RESPONSE:

No TVA response required.

F) Demonstration as to why the new supply ductwork for the control room is not required to have tornado missile protection.

TVA RESPONSE:

Refer to TVA's response to Item 2I.

G) Type of test to demonstrate leakage associated with Press dampers.

TVA RESPONSE:

Refer to TVA's response to Item 2J.

H) Background information for the generation of site specific Chi/Q values for the accident evaluations.

Refer to TVA's response to Item 2F.

I) Demonstration that the Loss of Coolant Accident (LOCA) is the limiting accident for the determination of the conformance to GDC 19.

TVA RESPONSE:

Refer to TVA's response to Item 2K.

6) NRC staff believes that TVA should ensure that the TS associated with the CREVS and the SGTS reflect system design. Potential review items include:

A) Performance of in-place DOP and freon tests at systems rated flow rate.

TVA RESPONSE:

Refer to TVA's response to Item 2C.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
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(CONTINUED)

B) Laboratory test performed utilizing ASTM D3803-1989 test method at a test temperature of 30°C and a relative humidity of 70 percent.

TVA RESPONSE:

Refer to TVA's response to Item 2C.

C) Demonstration of an acceptable positive pressure with respect to all adjacent areas of the control room habitability zone at the fated flow.

TVA RESPONSE:

Included in Reference 1 was TVA's commitment to perform testing to periodically ensure the ability to maintain a positive pressure in the control bay habitability zone. This will be done with respect to all adjacent areas on the control room habitability zone with the acceptance range of rated flow. Also refer to TVA's response to Item 4.

D) Demonstration of a negative pressure in the reactor building of 0.25 inches water gauge.

TVA RESPONSE:

Technical Specification Surveillance Requirement 4.7.C.1.a states:

> "Secondary containment capability to maintain ¼ inch of water vacuum under calm wind (<5 mph) conditions with a system leakage rate of not more than 12,000 cfm, shall be demonstrated at each refueling outage prior to refueling."

Surveillance Instruction 0-SI-4.7.C requires the ability to maintain the reactor building at ¼ inch water pressure within the allowable value be verified.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
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(CONTINUED)

The calm wind provision is discussed in Section 5.3, Secondary Containment, of the original BFN Safety Evaluation (SE), dated June 26, 1972. The original SE states: "With the reactor building isolated, each train has the necessary capacity to reduce the building pressure and maintain it a negative pressure of ¼ inch of water (under neutral wind conditions)." It should be noted that BFN was originally designed as a two unit plant with two trains of Standby Gas Treatment (SGTS) and went to three units of SGTS when BFN Unit 3 was added.

7) Some issues that the NRC will be reviewing are:

A) The toxic gas challenge to the control room operators.

TVA RESPONSE:

NRC letter to TVA, dated November 20, 1990, regarding habitability of the control room at Browns Ferry, stated:

> "... total probability of the ingress of all toxic gases to the control room is determined to be approximately 3E-6. It should be remembered, however, that before the 10 CFR Part 100 guidelines could be exceeded, all control room operators would have to be incapacitated at the same time that an accident occurs which, without the operators intervention, would cause a core melt and result in release of radioactivity. For a normal operating plant, the probability that a core melt would occur within two hours after the operators became incapacitated is also estimated to be very low, approximately 2E-6. Therefore, the total probability that the 10 CFR 100 guidelines will be exceeded are definitively well below the SRP Section 2.2.3 criterion of 1E-6."

Since the supporting toxic gas habitability analysis was performed, the only known change in assumptions is an increase in the estimated infiltration rate from 2750 cfm to 3717 cfm. This increase would not raise the probability of exceeding 10 CFR 100 allowables, from a previously estimated value of 6×10^{-12}, to the SRP allowable criterion of 1×10^{-6}.

As discussed in TVA letter to NRC, dated December 20, 1991, Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities (Generic Letter 88-20, Supplement 4), BFN will conduct the transportation and nearby facility accidents IPEEE using the screening type approach outline in Generic Letter 88-20, Supplement 4. BFN will complete the transportation and nearby facility accidents IPEEE for all three units and provide a summary report to NRC within one hundred twenty days after the restart of Unit 2 from the next refueling outage (Cycle 7 outage).

B) The seismic nature of the exhaust ductwork and dampers in the stack.

TVA RESPONSE:

Refer to TVA's response to Items 2H, 2J and 5D.

C) The requirement for tornado missile protection in the supply ductwork to the control room.

TVA RESPONSE:

Refer to TVA's response to Item 2I.

D) Implementation of TMI Action Item III.D.3.4 at Browns Ferry, including TS.

TVA RESPONSE:

TVA responded to TMI Action Plan Item III.D.3.4 by letters dated December 23, 1980 and March 17, 1981. NRC requested additional information in its February 12, 1982 and May 5, 1982 (Generic Letter 82-10) letters. TVA responded by letters dated June 24, 1982 and July 27, 1982. The NRC's August 30, 1982 Safety Evaluation concluded that BFN acceptably meets the requirements of Item III.D.3.4.

NRC provided proposed Technical Specifications for Item III.D.3.4 by letter dated November 1, 1983 (Generic Letter 83-36). TVA responded by letter dated March 7, 1984 and stated that no revisions to the BFN Technical Specifications were required.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

E) Requirement for NRC safety evaluation addressing accident doses for operation with reactor building equipment hatches open.

TVA RESPONSE:

TVA did not request nor require an NRC Safety Evaluation prior to operating with the reactor building equipment hatches open. TVA applied the provisions of 10 CFR 50.59 when it determined that the increased offsite dose, resulting from operation with the reactor building equipment hatches open, was acceptable since the doses were below the limits of 10 CFR 100.

NSAC 125, Guidelines for 10 CFR 50.59 Safety Evaluations, Section 3.8 addresses the margin of safety as defined in the basis of any Technical Specification and provides examples for determining acceptance limits.

> "For example, for a very low probability event, such as a double ended feedwater line break, the Standard Review Plan specifies a limit of 120% of design pressure (or 3000 psig for a PWR) as the reactor coolant system pressure acceptance limit. The analysis in the FSAR for a double ended feedwater line break calculated a peak reactor coolant pressure of 2740 psig. The NRC's SER accepted this value because, "it was below the Standard Review Plan value of 3000 psig."
>
> In this case the acceptance limit is 3000 psig. A change that increases the peak reactor coolant pressure in a PWR during a double ended feedwater line break from 2740 psig to 2760 psig would then be judged not to be a reduction in the margin of safety and would not be an unreviewed safety question since the Standard Review Plan criterion continues to be met. However, if the NRC's SER had just stated that 2740 psig was acceptable without any reference to the SRP limit, then the increase to 2760 psig would represent an unreviewed safety question since the acceptance limit would be 2740 psig."

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
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(CONTINUED)

Section 9.1 of the original Safety Evaluation, Accident Analysis - General, established the acceptance limit for offsite doses. It states: "We performed conservative analyses of these design basis accidents to assess the adequacy of the engineered safety features to control and minimize the possible escape of fission products from the facility. The design basis accidents analyzed were: (1) loss-of-coolant accidents, (2) refueling, (3) control-rod-drop, and (4) steam-line-break. Our evaluation of these accidents shows that the calculated doses resulting from these postulated accidents are well within the 10 CFR Part 100 guideline values."

RESPONSE TO REFERENCE 2, ENCLOSURE 2, COMMENTS ON SPECIAL TEST TO DETERMINE UNFILTERED IN-LEAKAGE -

NRC Comments Regarding TVA's Special Test to Determine Unfiltered Inleakage into the Browns Ferry Control Room Environment:

The staff is concerned that TVA may not have taken appropriate corrective actions to solve the problem of control room habitability at the Browns Ferry Nuclear Plant. This concern is based on the fact that the licensee may not have adequately quantified the amount of unfiltered inleakage. This preliminary conclusion by the staff is based upon the following three points, and subsequent rationale:

1. The staff considers the test methodology utilized by TVA in special test procedure 0-ST-91-07 inappropriate for quantifying the absolute infiltration rate.

2. TVA neglected to quantify the in-leakage associated with the ductwork which penetrates the control bay habitability zone (CBHZ); and

3. The special test procedure was not performed in a configuration consistent with the expected alignment of affected systems during an accident.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

TVA's special test procedure employed the standard ASTM E 779. During our review of TVA's special test procedure, the staff referred to ASTM E 779-87. This standard states the following:

1. Section 1.4 states that the test method cannot be interpreted as a direct measurement of air change rates that would occur under natural conditions.

2. Section 5.6 states, "It is better to use the fan-pressu: tion method for diagnostic purposes and measure the absolute infiltration rate with the tracer dilution method". ASTM E 741 is the tracer dilution method standard.

3. Section 5.6 also states, "When the absolute infiltration rate is needed, the tracer dilution method should be used over a wide range of wind speeds and directions and indoor-outdoor temperature differences".

Based upon ASTM E 779-87, stated above, the staff would conclude that the test method employed by TVA was an inappropriate test and would not have adequately quantified the absolute infiltration rate.

Sources of unfiltered inleakage into the CBHZ are from the leakage past damper FCO 150B, the ductwork which penetrates the control room envelope and the floor, ceiling and side walls of the control room envelope itself. Special test procedure 0-ST-91-07 only measured the in-leakage associated with the latter. In the special test's "Background" section, it clearly states that the ductwork which penetrates the CBHZ contributes to the unfiltered in-leakage to the CBHZ. However, it goes on to state that the test is limited to the walls and the ceiling and the floors, in that "Isolating these ducts from the outside air will ensure that only leakage from the CBHZ is measured. This will more accurately reflect the system configuration after the duct leakage issue is resolved". Therefore, it is the staff's position that the test, which was performed by TVA, may have underestimated the unfiltered in-leakage.

TVA's special test was not performed in a manner consistent with the operating alignment expected to exist in the event of an accident. There was no flow in ductwork which would ordinarily have flow during and following an accident. Furthermore, CREVS itself was not operating. These conditions are inconsistent with the manner that one would expect the control room envelope to be configured in the event of an accident.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

TVA RESPONSE

The Control Bay habitability zone is located on the top floor of the Control Building. The habitability zone contains the Units 1, 2, and 3 control rooms, equipment rooms, relay room, lunch room, rest rooms, and office spaces. The Control Bay ventilation towers, located on the north wall of the reactor building, provide the outside air for the Control Building supply ductwork. Ventilation fans, which are located in the ventilation towers, pressurize this supply ductwork, including the ductwork that traverses the main control bay habitability zone. Some of the fans operate during the accident recovery period (30 days) to supply necessary cooling for essential equipment. In addition, the cable spreading room ventilation system, while not required to operate after an accident, is not prohibited from functioning after an accident. This could also contribute to the unfiltered inleakage into the habitability zone. The existing CREVS units take suction from these positively pressurized ducts.

As committed in TVA's May 5, 1992 submittal, a Special Test was conducted on May 23, 1992 to determine if the existing CREVS was adequately sized to pressurize the CBHZ. This test was conducted by isolating the CBHZ, including the supply and exhaust fans and ductwork that provide ventilation air to and from the outside, isolating the CREVS, and pressurizing the CBHZ by using a test fan.

TVA determined the amount of flow required to pressurize the CBHZ by recording the flow rate of the test fan and measuring the resulting pressure increase in the CBHZ. This allowed TVA to:

1) Demonstrate by test, that each 3000 cfm replacement CREVS unit would be capable of pressurizing the CBHZ, and

2) Calculate the bypass flow area of the CBHZ. This can be ascertained with relative certainty since the other two variables, flow rate in to the CBHZ (which equals flow rate out of the CBHZ) and pressure in the habitability zone, were known.

The major parameters/data/results used in the determination of the unfiltered inleakage rate are discussed in TVA's response to Item 5C.

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
CONTROL ROOM EMERGENCY VENTILATION SYSTEM (CREVS)
(CONTINUED)

Then, testing was performed to determine amount of habitability zone pressurization that results from unfiltered inleakage. This was accomplished by disconnecting the door fan and starting groups of vent tower fans. The habitability zone pressure was measured after each fan group was started. The unfiltered inleakage rate was then calculated in a manner similar to the analysis discussed above. The outleakage area and the habitability zone pressure was known. Therefore, the unfiltered inleakage into the entire zone, from the supply ductwork was calculated.

This calculation is considered to be conservative. The CREVS units or the special test fan were not running. Pressurization of the habitability zone from the CREVS units, which would occur during post-accident habitability zone isolation conditions, would result in a decrease in the rate of unfiltered inleakage. Since the habitability zone would be at a relative high pressure compared to adjacent areas, all other leakage would be out of the habitability zone. The analysis performed to calculate unfiltered inleakage rate was in accordance with NFPA 12A.

During the TVA/NRC meeting of February 3, 1993, NRC questioned the basis for TVA's use of a fan pressurization method for calculating the outleakage area and the rate of unfiltered inleakage versus a tracer gas dilution method. TVA's understanding is that the tracer gas method was developed to measure leakage rates in residential and commercial buildings that were the result of small pressure differentials caused primarily by varying meteorological conditions. The habitability zone is mechanically pressurized to a half inch water gauge, which is a significantly larger pressure difference than that found in residential or commercial buildings. The fan pressurization method also eliminates the effects of varying meteorological conditions.

In order to be sensitive to the possibility of the unfiltered inleakage rate increasing over the life of the plant, TVA will develop a Surveillance Instruction to quantify the unfiltered inleakage rate once per cycle. The following parameters will be addressed in the testing:

1) The CREVS flow rate into the habitability zone will be measured,

2) The habitability zone overall boundary outleakage leakage will be measured,

3) The habitability zone pressure will be measured. The design pressure of ½ inch water gauge will be the acceptance criteria,

ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)
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(CONTINUED)

4) The inleakage into the habitability zone will be determined, and

5) A one time baseline test will be established as part of the Post-Modification Testing for the CREVS corrective actions. Fan alignment and damper positions will be aligned consistent with the baseline test. Readings will be taken at different pressures during the CREVS post-modification baseline testing to determine the outleakage at different pressures.

A substantial change in the flow rates required to maintain the habitability zone boundary pressure would indicate boundary degradation. TVA has a program in place to control penetrations of the habitability zone and a maintenance program for door seals. With these programs in place, TVA does not anticipate significant degradation of the habitability zone pressure boundary.

The wording of the current BFN Technical Specification Surveillance Requirement 4.7.E.3 is similar to the Improved Standard Technical Specification Surveillance Requirement. Therefore, a change to the BFN Technical Specifications to explicitly cite the new Surveillance Requirement is not necessary.

In summary, the identification of individual inleakage contributors within the Habitability Zone is not necessary to show compliance with GDC 19; only the total amount of unfiltered inleakage is needed for the dose calculations. TVA's estimate of unfiltered inleakage into the habitability zone was conservative and addressed the ductwork that penetrates the control room envelope and the leakage past dampers FCO 150B and 150D. Leakage for the floor, ceiling, and side walls of the control room envelope would be outleakage. TVA's analysis enveloped the operating alignment that would exist in the event of an accident that required isolation of the habitability zone.

ENCLOSURE 2

BROWNS FERRY NUCLEAR PLANT (BFN)

SUMMARY OF COMMITMENTS

1) During the current Unit 2 Cycle 6 outage, TVA will replace the manually operated stack isolation dampers with safety related dampers that will automatically close if there is a backdraft through the ductwork.

2) TVA will develop a Surveillance Instruction to quantify the unfiltered inleakage rate once per cycle.