TENNESSEE VALLEY AUTHORITY

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SEP 17 1990

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) - RESPONSE TO NRC RECOMMENDATIONS REGARDING PRIMARY CONTAINMENT ISOLATION (TAC NOS. R00080, R00081, AND R00082)

This letter is in response to the NRC staff recommendations regarding primary containment isolation at Browns Ferry. These recommendations were discussed in a working level meeting between TVA and the NRC staff on July 10 and 11, 1990 and are documented in the NRC meeting notes, which were provided to TVA by letter dated August 17, 1990. Background information and responses to each recommendation are provided as Enclosure 1 to this letter.

A summary list of commitments contained in this letter is provided as Enclosure 2. If you have any questions, please contact Patrick P. Carier, Manager of Site Licensing, at (205) 729-3570.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Patrick Carier

for E. G. Wallace, Manager
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Enclosures
cc: See page 2

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ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT
RESPONSE TO NRC RECOMMENDATIONS
CONCERNING PRIMARY CONTAINMENT ISOLATION

Background:

TVA and the NRC staff have had an ongoing dialogue regarding the overall Browns Ferry containment isolation valve configuration and specifically the configuration of the Reactor Building Closed Cooling Water (RBCCW) system. (This configuration is shown on Figure 27 of TVA's July 13, 1989 letter.) These discussions were initiated after TVA submitted Technical Specification No. 251 on August 2, 1988. This amendment proposed an update to Table 3.7.A, Containment Isolation Valves, to reflect modifications to the plant and to better align the table with the BFN Appendix J program.

One of the proposed changes was the inclusion of the two RBCCW isolation valves. The RBCCW system contains a single containment isolation valve on the supply and return piping. There is a check valve on the supply line outside of containment and a remote manually operated valve on the return line outside of containment. The A-C powered valve does not receive a primary containment isolation signal but does have remote-manual control from the control room. These valves were not previously considered primary containment isolation valves.

On June 15, 1989, TVA and NRC held a working meeting to discuss TVA's program and to resolve NRC staff concerns. Supplement 1 to Technical Specification No. 251 was submitted on July 13, 1989 to provide the specific information requested by the NRC staff on the docket in order for the NRC staff to complete their review.

Information Notice 89-55 was issued on July 30, 1989 and postulates a scenario in which a recirculation line failure (a High Energy Line Break [HELB]) inside containment causes the loss of the RBCCW system integrity. The failure mechanism is not specified. A subsequent single failure of either of the single RBCCW containment isolation valves on the inlet or outlet piping would cause the loss of containment integrity. The pressurized post-accident containment atmosphere could displace water in the RBCCW piping and ultimately vent to the reactor building. Thus, NRC's position as stated in the Information Notice is that the RBCCW system should not be considered a closed system inside containment.

TVA and the NRC staff held a working meeting at Browns Ferry on July 10, 1990, to review the BFN containment isolation valve configuration and the Appendix J program. TVA presented material to the NRC staff in that meeting which supports TVA's position that BFN's RBCCW containment isolation valve configuration is in conformance with Browns Ferry's licensing and design basis. This information was summarized and is presented below. The primary HELB and missile protection design objectives were to ensure that HELBs and missiles would not damage the primary containment vessel and to minimize the potential for a breach the primary containment. No consequential failure of safety related systems or the breach of other system's integrity were required to be postulated.

Background (Continued):

The BFN licensing and design basis for the RBCCW containment isolation valve configuration was established in Final Safety Analysis Report (FSAR) Section 5.2.3.5, Isolation Valves, Section 5.2.4.6, Missile and Pipe Whip Prevention, FSAR Appendix A, Conformance to Proposed AEC General Design Criterion, the Technical Specifications, and in the original Safety Evaluation Report (SER) and its Supplements. A discussion of each is provided below:

FSAR Section 5.2.3.5 stated that lines such as the closed cooling water lines, which neither connect to the reactor primary system nor are open into the primary containment, were provided with at lease one a-c powered valve located outside primary containment, or a check valve on the influent line inside the containment. FSAR Figures 10.6-1a and -1b, RBCCW P&ID, clearly showed the containment isolation valve configuration.

Section 5.2.4.6 summarized the design consideration given to missile and pipe whip prevention. All of the containment penetrations and isolation valves were protected from pipe whip by anchors located at or near the isolation valves. If a pipe leak should occur, means for detecting leaks were available so that proper action could be taken before it could develop into an appreciable break. Nevertheless, the recirculation lines within the primary containment were provided with a system of pipe restraints designed to limit excessive motion associated with pipe split or circumferential break.

This section further stated that the design of the containment and piping systems considered the possibility of missiles being generated from the failure of flanged joints, such as valve bonnets, valve stems, and recirculation pumps, and from instrumentation such as thermowells. The design philosophy was that no missiles would penetrate the containment. In addition, a decoupling device was installed between the recirculation pump and motor to prevent destructive motor overspeed. A probabilistic study was initiated by General Electric to see if additional restraints to maintain pipe alignment after the pipe break in order to contain the pump missiles were warranted. The study concluded that incorporation of additional restraints would not provide substantially greater protection for the health and safety of the public, whereas the cost was disproportionally increased for the concomitant minimal increase in overall safety.

Appendix A to the FSAR presented the interpretation, discussions, and conclusions on how the design of BFN conformed to the AEC proposed general design criteria at the time of the BFN design. During the construction permit licensing process, unit 2 was evaluated against the draft of the 27 General Design Criteria (GDC) which was issued on November 22, 1965. The design bases was reevaluated at the time of

Background (Continued):

initial FSAR preparation and license application against the draft of the 70 GDC which were issued on July 10, 1967. Draft GDC 53, Containment Isolation Valves, stated that penetrations that require closure for the containment function be protected by redundant valving and associated apparatus. TVA concluded that the design of the plant was in conformance with draft GDC 53, since pipes which penetrate the primary containment and which connected to the primary system, or were open to the drywell, were provided with at least two isolation valves in series.

Technical Specification Bases Section 3.7.D/4.7.D, Primary Containment Isolation Valves, stated that double isolation valves were provided on lines penetrating the primary containment and open to the free space of the containment. Automatic initiation was required to minimize the potential leakage paths from the containment in the event of a Loss of Coolant Accident (LOCA).

Section 5.2.5, Isolation Valves, of the original Safety Evaluation Report concluded that the isolation valves and their control systems were reviewed to assure that no single accident or failure could result in a loss of containment integrity. The sole exception occurred in the case of instrument lines and that was found to be acceptable. Section 14.0, Conformance with General Design Criteria, concluded that there was reasonable assurance that the intent of the GDC for Nuclear Power Plants, published in the Federal Register on March 21, 1971, in the final design of the station would be met.

The BFN licensing basis for postulation of HELBs inside containment was established in FSAR Section 5.2.4.6, Missile and Pipe Whip Prevention, by receipt of, and in response to, Questions 4.1.4 and 5.19 which were issued by the Atomic Energy Commission (AEC) on March 25, 1971, in the original Safety Evaluation and its Supplements, and in the reconstituted design baseline of BFN unit 2. A discussion of each is presented as follows:

FSAR Section 5.2.4.6 and the responses to the NRC Questions provided the major design considerations for missile and pipe whip protection:

Emphasis was placed upon prevention of the occurrence of pipe breaks through design, procurement, quality control, inservice inspections, and the detection of pipe leaks,

Energy absorbing material added to the interior of the drywell,

Siding attached to the pressure vessel, and

Physical separation of safety-related components.

Background (Continued):

The response to Question 4.1.4 referenced FSAR Section 5.2.4.6 and stated that it was never intended to claim BFN impervious to the consequences of a whipping pipe, and it was because these consequences were not ignored that BFN was designed for the prevention of pipe failures. Further, since the plant was in final stages of construction, it was necessary to consider installation complications, in addition to the contribution to safety, in the resolution of the pipe whip issue.

Question 5.19 requested BFN describe the measures taken to assure that the damage caused by component failure within primary containment, and resulting in pipe whip and jet forces, would not remove from service more than one redundant subsection of a vital system. BFN responded by referring to Question 4.1.4 and by stating that redundant subsections of vital systems were physically separated within the primary containment to minimize the damage probability. It is important to note that protection of non-vital systems was not questioned. The logical conclusion being that the AEC did not consider the protection of non-vital systems to be of major safety significance.

The NRC staff accepted the adequacy of BFN's designed protection against pipe whip during the initial licensing process as documented in Section 5.2.2 of the Safety Evaluation to the TVA BFN units 1, 2 and 3, dated June 25, 1972, in the revised section which was contained in Supplement 1, dated December 21, 1972, and in Section 3.0 of Supplement 4, dated September 10, 1973.

The NRC recently reviewed the reconstituted design basis for BFN concerning jet impingement inside primary containment as part of the Design Baseline Verification Program (DBVP). A presentation of this topic was given to the NRC in Knoxville on March 6, 1989. NRC accepted TVA's position that jet impingement loads did not need to be applied to structural steel as part of the BFN design basis, as documented in Inspection Report 50-259, 50-260 and 50-296/89-07. The Inspection Report conclusions are as follows:

> "Primary emphasis for jet impingement protection inside the drywell was directed toward protecting the primary containment. In addition to the recirculation, main steam and reactor feedwater system restraints, further consideration to containment protection was provided by installation of honeycomb panels on the inside surface of the drywell shell and jet deflectors over the main vent openings to the wetwell. Protection of other equipment in the drywell is inherent in the plant arrangement of equipment. Redundant systems and devices are located on opposite sides of the drywell to minimize the concerns of dynamic forces associated with a pipe break. ... TVA's response to this item is acceptable and this item is closed.

Background (Continued):

While Browns Ferry and other similar vintage BWR RBCCW systems do not explicitly conform to current regulatory guidance, the Browns Ferry RBCCW configuration is considered acceptable and does not pose an undue risk to public health and safety. Without prejudice to its position regarding the design and licensing basis of RBCCW, TVA is providing the following responses to the NRC staff's recommendations in order to assist the NRC staff in justifying the Browns Ferry RBCCW configuration when compared against current regulatory guidance.

Response to NRC Staff Recommendations:

The following recommendations were provided by the NRC staff at the July 11, 1990 exit meeting and documented in NRC's August 17, 1990 letter to TVA. TVA's response to each recommendation is provided as follows:

NRC Staff Recommendation:

"Manual valves used as primary containment isolation valves should be locked (or sealed) and included within the BFN locked valve program."

TVA Response:

Normally closed manual containment isolation valves will be locked closed in accordance with Procedure GOI-300-3, General Valve Operation. This procedure will be revised by November 30, 1990 to include valves 2-2-1383, 2-12-742, and 2-33-1070.

NRC Staff Recommendation:

"Auxiliary Boiler and Demineralized Water Systems utilized in-series check valves for primary isolation. TVA could diversify the isolation arrangement by incorporating an associated block valve to establish a more positive means of isolation (i.e., one check valve and one block valve)."

TVA Response:

The auxiliary boiler and demineralized water block valves are currently tested with the associated check valves in accordance with the current Appendix J program as part of the testing for the containment isolation valves on these lines. Browns Ferry believes the demineralized water block valve is currently tested in the reverse direction. The valve would have to be disassembled to verify the installed direction. In addition, the line containing this valve is not Seismic Class I. TVA intends to continued to test this block valve but not to formally consider the valve a containment isolation valve. TVA will submit a Technical Specification Amendment request to formally cite the auxiliary boiler block valve as a primary containment isolation valve. This Technical Specification amendment request will be submitted within one hundred twenty days after restart.

Response to NRC Staff Recommendations (Continued):

NRC Staff Recommendation:

"For Residual Heat Removal recirculation and pump test lines, one of the isolation barriers is the suppression pool. The staff does not consider the suppression pool an adequate barrier, and suggested that an existing test valve in the piping run be designated the isolation valve."

TVA Response:

The RHR recirculation and pump test line isolation valve is currently tested in accordance with the current Appendix J program as part of the group of the containment isolation valves on this line. It is TVA's understanding that the use of the suppression pool as an isolation barrier is consistent with other plants of Browns Ferry's vintage. Citing the RHR test line isolation valve as a containment isolation valve would lead to an inconsistent application of containment isolation valve philosophy at Browns Ferry. TVA intends to continue to test the RHR test line isolation valve but not to formally consider this valve a containment isolation valve.

NRC Staff Recommendation:

"Some systems use two check valves in series as primary containment isolation. Although this arrangement was part of the original design basis, and as such is acceptable, it would not be acceptable if evaluated to the current GDC. However, most of these systems already have a downstream manual valve that could be identified in the BFN Emergency Operating Instructions (such valves would not require Appendix J testing) as additional assurance for long term isolation."

TVA Response:

Emergency Operating Instruction (EOI) 2-EOI-3, Secondary Containment and Radioactive Release Control, will be revised to identify the valves which potentially could be used for the isolation of leaks from high energy primary systems into secondary containment. These changes will be included in the next issued revision of the EOIs. Similar changes will be incorporated into the units 1 and 3 EOIs prior to the restart of each unit.

NRC Staff Recommendation:

"With regard to the adequacy of the Reactor Building Closed Cooling Water (RWCCW) System to function as a closed system, the staff suggested that TVA could take the actions listed below as a method to resolve this issue:"

Response to NRC Staff Recommendations (Continued):

NRC Staff Recommendation, Item 1:

"Assess the pipe restraint program for all drywell piping."

TVA Response:

The high energy piping inside the drywell is Seismic Class I . Seismic Class I piping restraints inside the drywell are being requalified during this outage as part of the Bulletin 79-14, control rod drive insert and withdrawal piping, small bore, or torus integrity long-term programs.

These restart programs have been reviewed by the NRC staff as documented in Supplement 1 to the Safety Evaluation Report (SER) on the Browns Ferry Nuclear Performance Plan - NUREG-1232, Volume 3, dated October 24, 1989. The acceptability for restart of the Bulletin 79-14, control rod drive insert and withdrawal piping, small bore, and torus integrity long-term programs are documented in SER Sections 2.2.3.1, 2.2.3.2, 2.2.3.3, and 2.2.4.4, respectively. These sections provide an adequate description of these programs.

NRC Staff Recommendations, Item 2:

"Identify those components or sources in the drywell which could become missiles that would endanger RBCCW integrity inside containment."

TVA Response:

As discussed above, protection of RBCCW integrity inside containment was not considered in the original design of Browns Ferry. However, the overall design scheme for BFN minimized the number of valves inside the drywell to the extent practical for reasons such as maintenance and equipment qualification. This design feature also service to limit the number of potential missile sources. A randomly generated missile (e.g., a valve stem) is considered to have a very low probability of occurrence. The probability of this missile then causing of breach of RBCCW is even lower. Even if such an event occurred, the RBCCW outboard containment isolation valves would still be available for RBCCW system isolation. The probability of one of these valves failing concurrent with a missile generated breach of RBCCW is extremely low.

Response to NRC Staff Recommendations (Continued):

NRC Staff Recommendation, Item 3:

"Establish procedures for manually isolating all coolers upon receipt of a valid isolation signal to minimize loss of RBCCW integrity."

TVA Response:

TVA has reviewed the practicality of manually isolating the RBCCW drywell coolers upon receipt of a valid isolation signal in order to maximize the survivability of RBCCW system integrity. The current plant design does not permit the manual isolation of the coolers. The valve arrangement is shown on FSAR Figure 10.6-1b. The discharge line from the RBCCW drywell coolers can be remotely isolated, however, the supply line cannot. The valve on the discharge line is non-safety related, not environmentally or seismically qualified, fails open, and is operated with non-safety related control air.

RBCCW system operation after an accident is desirable since it provides one of two diverse cooling sources to the reactor recirculation pump seals. Proper seal cooling minimizes the potential for seal leakage. The RBCCW coolers are also the preferred method for removing heat from the drywell.

ENCLOSURE 2
BROWNS FERRY NUCLEAR PLANT
SUMMARY OF COMMITMENTS

1. Normally closed manual containment isolation valves will be locked closed in accordance with Procedure GOI-300-3, General Valve Operation. This procedure will be revised by November 30, 1990 to include valves 2-2-1383, 2-12-742, and 2-33-1070.

2. TVA will submit a Technical Specification Amendment request to formally cite the auxiliary boiler block valve as a primary containment isolation valve. This request will be submitted within one hundred twenty days after restart.

3. Emergency Operating Instruction (EOI) 2-EOI-3, Secondary Containment and Radioactive Release Control, will be revised to identify the valves which potentially could be used for the isolation of leaks from high energy primary systems into secondary containment. These changes will be included in the next issued revision to the EOIs. Similar changes will be incorporated into the units 1 and 3 EOIs prior to the restart of each unit.