TVA

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

July 25, 1997

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) - NRC BULLETIN 96-03, POTENTIAL PLUGGING OF EMERGENCY CORE COOLING SUCTION (ECCS) STRAINERS BY DEBRIS IN BOILING-WATER REACTORS (TAC NOS. M96135, M96136, M96137)

This letter provides TVA's response regarding the resolution of the subject bulletin's concerns. TVA has determined that replacement of the current ECCS suction strainers with larger, higher debris capacity strainers is the best option for BFN Units 2 and 3. In a letter dated November 4, 1996, TVA committed to provide a submittal describing a plan and a schedule to resolve NRC Bulletin 96-03. Furthermore, TVA would notify the staff within 90 days following approval of the Boiling Water Reactor Owners Group Utility Resolution Guidance (BWROG) (URG) [NEDO-32686], "Application Methodology for General Electric Stacked Disk ECCS Suction Strainers". Even though the staff has not formally approved the URG, TVA is providing this letter describing the resolution of the bulletin's concerns utilizing this industry criteria.

The proposed design and analysis is consistent with Section 2.3 of Regulatory Guide (RG) 1.82, Revision 2, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident". TVA's approach to resolve this issue is

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to install new, larger, higher debris capacity, passive strainers. The new design utilizes the strainers that have approximately 60 times the flow area of the existing strainers. These are the largest strainers that can be installed without adversely affecting the structural integrity of the BFN torus. This strainer size was then used as a basis for calculations to ensure that the debris loading postulated in RG 1.82 will not result in an available net positive suction head (NPSH) below the required NPSH for the ECCS pumps during a postulated loss of coolant accident (LOCA) event, the new strainers will have a significantly larger straining surface area. The analytical methodologies for debris source terms contained in the URG will be employed. As part of TVA's methodology for resolution of this bulletin, containment over pressure in excess of atmosphere will be relied on to maintain adequate ECCS pump NPSH.

As discussed in the letter issued November 4, 1996, TVA is planning to replace the strainers for Unit 2 during the outage currently scheduled for the fall of 1997, and for Unit 3 during the fall of 1998. This scheduled implementation of the Unit 3 strainer replacement was approved by the NRC by letters dated January 29, 1997, and February 19, 1997, with condition of compensatory action to be taken in the interim. The specific compensatory actions were communicated to the NRC in a letter dated April 25, 1997.

Unit 1 is shutdown and in an extended outage. Appropriate modifications will be implemented on Unit 1 prior to its restart.

Enclosure 1 provides a detailed description of the TVA proposed resolution and analysis used for sizing the new strainers at BFN Units 2 and 3. Enclosure 2 contains the revised commitments made in this letter.

If you have any questions, please telephone me at (205) 729-2636.

Sincerely,

T. E. Abney
Manager of Licensing
and Industry Affairs

Scribed and sworn before me
on this 25th Day of July 1997.

Barbara A. Blanton
Notary Public
My Commission Expires My Commission Expires 10/06/96

Enclosures
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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 2 AND 3

NRC BULLETIN 96-03
POTENTIAL PLUGGING OF EMERGENCY CORE COOLING SYSTEMS (ECCS)
SUCTION STRAINERS BY DEBRIS IN BOILING-WATER REACTORS

INTRODUCTION

By letter dated May 6, 1996, the NRC issued Bulletin 96-03, which requested BWR owners to implement appropriate measures to minimize the potential clogging of the Emergency Core Cooling Systems (ECCS) suppression chamber strainers by potential debris generated during a loss of coolant accident (LOCA). The subject bulletin concerns the potential for loss of ECCS suction following a LOCA due to inadequate net positive suction head (NPSH) resulting from accumulated debris on the ECCS suction strainers during the recirculation phase of a LOCA. In the bulletin, NRC requested that corrective actions be implemented by end of the first refueling outage starting after January 1, 1997. This corresponded to the Unit 3 Cycle 7 refueling outage, which was completed in March of 1997.

By letter dated November 4, 1996, TVA petitioned the NRC for a delay in the implementation for Unit 3 until the Fall of 1998. This delay was necessary to allow the completion of technical criteria development and strainer fabrication, both of which were critical to the successful resolution of the issue. Based on the time table for formation and implementation of the Boiling Water Reactor Owners Group (BWROG) ECCS Suction Strainer Committee Utility Resolution Guidance (URG), the earliest opportunity to evaluate and implement any needed modifications for BFN was the Unit 2 Cycle 9 refueling outage in the fall of 1997.

By letters dated January 29, 1997, supplemented February 19, 1997, NRC granted TVA's petition to defer the actions required to resolve NRC Bulletin 96-03 during the Unit 3 Cycle 7 refueling outage. As a condition for the deferral, the staff requested that compensatory actions be implemented until modifications to the ECCS auction strainers could be realized. BFN performed the required actions during the cycle 7 refueling outage as described in a letter dated April 25, 1997. TVA will replace the strainers for Unit 3 during the outage currently scheduled for the fall of 1998.

A description of TVA's resolution to the subject bulletin for Units 2 and 3 is provided below:

SYSTEM DESCRIPTION

The current Browns Ferry plant ECCS configuration includes an ECCS ring header circumscribing the suppression chamber with connecting piping to four inlet penetrations through the torus wall into the suppression chamber. Inside the suppression chamber, each connecting line is fitted with a flanged surface for mating to the ECCS strainer flanges. The ECCS ring header is the normal suction for the low pressure Residual Heat Removal (RHR) and Core Spray (CS) System pumps and the alternate suction for the High Pressure Core Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) System pumps. The normal suction path for the HPCI and RCIC System pumps is the Condensate Storage Tank. The important function of the HPCI and RCIC Systems is for events that do not result in the depressurization of the reactor vessel to the level where the low pressure ECCS systems (RHR and CS) can inject to the vessel. Strainer design is governed primarily by strainer flows and pump required NPSH. When low pressure ECCS is not injecting to the vessel, the total flow demand of the ECCS strainers is much lower than when low pressure ECCS is injecting to the vessel. Furthermore, the HPCI and RCIC pump required NPSH values are significantly lower than the low pressure ECCS pumps. Therefore, HPCI and RCIC operation is not bounding and is not a concern for strainer design.

Currently four, 1/8 inch mesh strainers take suction on the suppression chamber and direct ECCS flow to a common ring header. The common ring header supplies water to two loops of RHR (2 pumps per loop) and 2 loops of CS (2 pumps per loop). The range of suppression pool temperatures for design basis events is from 95°F to 177°F.

During the first 10 minutes of the LOCA event, all automatic RHR and CS pump starts occur and operate with a total design flow rate of 57,550 gpm across the ECCS strainers. To maximize strainer flow, it is assumed that 2 RHR pumps are at runout flow (11,000 gpm per pump), 2 RHR pumps are at design flow (10,000 gpm per pump), 2 CS pumps are at runout flow (4,650 gpm per pump), and 2 CS pumps are at design flow (3,125 gpm per pump).

At ten minutes into the DBA-LOCA manual actions are assumed to secure ECCS pumps not required for core cooling and to align RHR into its suppression pool cooling mode. The minimum flow required for accident analyses is 2 RHR pumps on one loop at design flow in the containment cooling mode (6,500 gpm per pump) and 2 CS pumps are at design flow providing injection to the reactor pressure vessel (3,125 gpm per pump) for a total flow of 19,250 gpm.

PLANT MODIFICATION AND ANALYSIS

TVA is pursuing Option 1 of Bulletin 96-03, installation of a large capacity passive strainer design. TVA has selected a larger, higher debris capacity, passive, "stacked disk" strainer configuration to replace each currently installed ECCS suction strainer. The general design is a bolt-on replacement for the current strainer design with no structural modifications required. The new strainers are approximately four and one-half feet long and four feet in diameter. While the existing strainers have a flow area of approximately 5 square feet per strainer, with a total flow area of approximately 20 square feet for four strainers, the new strainers will have a flow area of 298 square feet per strainer and a total flow area of 1,192 square feet for four strainers.

The strainer design is consistent with Regulatory Guide (RG) 1.82, Revision 2, "Water Sources For Long-Term Recirculation Cooling Following A Loss-Of-Coolant Accident," as implemented using the BWROG Utility Resolution Guidance (URG) document. The use of the methods provided in the URG is necessary to address the options identified in the RG to achieve an optimum solution. The URG includes criteria and reference limits on a number of issues that are required to successfully address the RG.

The existing strainers were evaluated as part of the Browns Ferry Long Term Torus Integrity Program (LTTIP), as described in the Plant Unique Analysis Report (PUAR) for that program. The LTTIP PUAR was reviewed and accepted as documented in the associated NRC Safety Evaluation Report dated May 6, 1985. The structural analysis methodology used to evaluate the new strainers and their effect on the ECCS systems and components is consistent with the LTTIP General Design Criteria (Section 4 of the PUAR).

DEBRIS LOADING

Insulation

The primary insulation type used on drywell piping systems in the Browns Ferry drywells is reflective metal insulation (RMI) of both aluminum and stainless steel. This includes insulation on piping systems, on the reactor pressure vessel, and at the bioshield wall penetrations to the reactor pressure vessel nozzles. The replacement strainers provide adequate NPSH margin with a saturation thickness of foils of either aluminum or stainless steel insulation.

There is a mix of RMI materials at Browns Ferry. Some of the RMI has 6 mil aluminum foils, and others have 2.5 mil stainless steel foils. Head loss calculations have been performed using both types of materials, and the one producing the greatest head loss was used as the basis for the strainer sizing calculations.

Walkdowns were performed during the fall of 1995 to determine whether any permanent fibrous materials were installed in the Browns Ferry Units 2 and 3 drywells. The walkdown results identified the use of non-RMI insulation in ten Unit 2 drywell penetrations and eleven Unit 3 drywell penetrations. Sampling identified the following types of insulation materials: 1) asbestos insulation (combination of rock wool insulation covered by asbestos cloth); 2) fiberglass insulation; and 3) calcium silicate.

As stated above, the only fibrous materials that are in the drywell at Browns Ferry Units 2 and 3 are insulation materials located in the drywell penetrations and, in Unit 2 only, one additional 0.2 cubic foot piece of insulation. The largest volume of insulation in a single drywell penetration is approximately 31.7 cubic feet of rock wool insulation covered in an asbestos wrap with a density of approximately 19.5 pounds per cubic foot. In lieu of performing tests or analyses of the potential for destruction of fibrous insulation enclosed in drywell penetrations, TVA has conservatively designed the replacement strainers to accommodate 11.1 cubic feet of insulation debris. This assumed fiber loading results from a 100% destruction and 35% transport of the fibrous insulating material from the penetration with the highest fiber quantity providing approximately 216.5 pounds of fibrous insulation debris in the suppression pool. An assumption that 35% of the insulation in the penetration with the largest insulation volume is transported to the suppression pool is conservative, both in light of the URG debris generation and transport values (all penetrations are above the lowest grating level) and the NUREG/CR-6224 blowdown/washdown values.

The strainer sizing/head loss process utilizes separate calculations for the first 10 minutes after the LOCA and the post 10 minute period. The amount of debris that accumulates on the strainers is less than the amount of fiber that will sustain a pressure drop across the 1/8 inch holes in the perforated plate. This is substantiated by the following:

1) As documented in the URG, Volume I, Tab 2, Appendix I, stacked disk strainers do not collect fibers such that a thin uniform bed can be formed. The fiber is observed to be thickest at the inner radius of the strainer, where for clean strainer conditions, the velocities are highest. Since the fiber does not have a perfect particulate filtration efficiency, the fiber bed first builds up then begins to trap corrosion products. The fiber bed at the inner radius of the strainers will, therefore, have a greater thickness over which the trapped corrosion products will be distributed. Areas of the perforated plate towards the outside of the strainer will not have any fiber bed buildup, and, therefore, a significant portion of the perforated plate area will be open to full flow (essentially zero delta P).

2) As documented in NUREG/CR-6224, Appendix B, the head loss model is applicable only to fiber bed thickness where uniform bed formation is expected. Typically, this is valid for fiber bed thickness greater than 0.125 inches. Below this value, the bed does not have the required structure to bridge the strainer holes and filter the sludge particles. This conclusion is also supported by test data in the URG where a stacked disk strainer with a fiber bed thickness (t) to diameter (D) ratio of about .009 was tested, and essentially zero head loss across the strainer was observed. In the case of the Browns Ferry strainer, the t/D ratio is even lower (<.003). Similar head loss results are expected (~0).

3) In June 1997, testing performed at the Browns Ferry site using a gravity head loss rig and actual asbestos/rockwool material from the plant. As part of this test, asbestos/rock wool fiber with RMI test was compared to Nukon fiber in the same test rig. This test shows that when RMI is combined with asbestos/rockwool fiber the head loss is about 50-60% of the head loss with Nukon fiber alone. It has also been shown in previous testing that RMI combined with sludge gives about the same pressure drop as RMI alone. This is due to the fact that the sludge cannot appreciably collect on the strainer due to the "thin bed effect" discussed above.

   For the maximum volume of fiber predicted to be in the suppression pool (11.1 cubic feet of asbestos/rockwool insulation), calculations based on the flow area of the new strainer (~300 square feet) show that the fiber bed thickness is about 0.1 inches.

The conclusion of the above argument is, that for the Browns Ferry debris load mix, the pressure drop across the GE strainer will be dominated by RMI head loss for both the first 10 minutes following a LOCA as well as the post 10 minute period when the flow is throttled back.

Sludge

TVA will assume dry sludge generation to be 150 pounds per year as specified in the guidance provided in Section 3.2.4.3.2 of the URG. TVA has a desired desludging interval of 5 cycles of operation with a nominal cycle length of 2 years. Accordingly, TVA assumes 1500 pounds of sludge in the suppression chamber when the LOCA event occurs.

Paint

The minimum quantity of paint chips recommended by the URG is 85 pounds. This source term only addresses the quantity of paint directly removed by the break jet. There is paint located in the drywell at BFN that is not qualified for a post-LOCA temperature and pressure environment. BFN has identified a maximum of 157 square feet of unqualified coatings. The unqualified coatings represent an additional 18 pounds of paint chips. A total value of 103 pounds of paint debris is assumed for sizing the strainers. A 100% drywell to suppression pool transport factor is conservatively assumed for paint chips in the strainer debris loading calculations.

Miscellaneous Debris

The URG recommended value for rust flakes of 50 pounds and dirt/dust of 150 pounds is assumed present in the suppression pool when performing strainer debris loading calculations. The following table provides a listing of the assumed debris loads in the suppression chamber:

Type	Quantity	URG Section
Sludge	1500 pounds	3.2.4.3.2
Dirt / Dust	150 pounds	3.2.2.2.1
Paint Chips and Zinc Oxide	103 pounds	3.2.2.3.3
Rust	50 pounds	3.2.2.2.2
RMI	Saturation	3.2.6.2.3
Fibrous Debris	216.5 pounds	3.2.3.2
Transportable Foreign Materials	0.2 cubic feet of fibrous insulation	Site evaluation

No settling is credited in the suppression pool for any of the debris types. The head loss correlation used to determine the strainer head loss is documented in the GE licensing topical report NEDC-32721P, "Application Methodology For GE Stacked Disk ECCS Suction Strainers".

ECCS PUMP NPSH

Containment pressure response analyses were generated to evaluate the suppression pool temperature and suppression chamber airspace pressure responses for the limiting short-term and long-term LOCA events with respect to available NPSH for the RHR and CS pumps. Input assumptions are used which maintain the overall conservatism in the evaluation by maximizing the suppression pool temperature and minimizing the suppression chamber airspace pressure, and, therefore, minimize the available NPSH. The pressure calculation's initial conditions and input assumptions minimize the initial non-condensable gas content and thereby minimize the containment pressure during the LOCA. Suppression pool temperature in this letter refers to the bulk average suppression pool temperature.

The LOCA short-term containment analysis (the first 10 minutes of the LOCA event) analyzes a postulated break in one recirculation pump discharge line. No credit is taken for operator actions to control pump flows or to initiate containment cooling. This analysis assumed that the flow of two LPCI pumps was injected into the broken recirculation loop and subsequently directed into the drywell, and the flow of the other two LPCI pumps injected into the unbroken recirculation loop and subsequently into the vessel. The cold water spilling into the drywell cools the drywell atmosphere similar to drywell sprays, which reduces the drywell pressure and temperature. This scenario results in minimum suppression chamber airspace pressures and maximum suppression pool temperatures during the first ten minutes of the accident.

The LOCA long-term containment analysis (after the first 10 minutes of the LOCA event) models a double-ended recirculation suction line break with no off-site power and the failure of one emergency diesel generator. It is assumed that the operator controls pump flows and initiates containment cooling. This analysis also assumed two RHR heat exchangers, with two RHR pumps and two service water pumps available for containment cooling. A drywell and suppression chamber spray efficiency of 100 percent was assumed to minimize the suppression chamber airspace pressure. This scenario results in minimum suppression chamber airspace pressures and maximum suppression pool temperatures after the first ten minutes of the accident.

NPSH calculations were performed for both RHR and CS systems at the three DBA-LOCA ECCS state points that will represent bounding points for this analysis. These include: Time = 0, Time = 10 minutes, and peak suppression pool water temperature = 177°F. Table 1 provides a compilation of limiting plant condition descriptions and NPSH at the pump for these selected analyzed plant conditions. For state point comparison, a containment pressure in excess of atmosphere by 2 psi is utilized for each case analyzed. From the containment pressure response analysis, 2 psig overpressure is less than the minimum containment overpressure subsequent to the DBA-LOCA event. Tables 2 and 3 and Figures 1 through 4 present the results of the containment response analysis. A discussion of the analyzed situations is presented below.

As stated in the system description section of this letter, from the initiation of the DBA-LOCA to ten minutes (600 sec.) into the event, all ECCS pumps have started and are running at design flow except for the pumps that are in a runout condition (see Table 1). Calculations demonstrate that there is sufficient NPSH at this bounding data point.

At ten minutes, suppression pool temperature has increased to approximately 150°F, and the calculated NPSH margin at this point is positive for the RHR and CS pumps. Additionally, at ten minutes, the RHR pumps are assumed to be manually switched by the operators from LPCI mode to containment cooling mode, and the flow through the ring header is reduced to 19,250 gpm (2 RHR pumps on one loop are at design flow in the containment cooling mode and 2 CS pumps are at design flow providing injection to the reactor pressure vessel).

As the event progresses and with no change in system operation, the suppression pool reaches a maximum temperature of 177°F. The calculated NPSH margin at this point remains positive for the RHR and CS pumps.

POOL CLEANING AND CLEANLINESS CONTROL

In a letter dated November 4, 1996, TVA stated specific programs utilized to minimize the risk of clogging ECCS strainers; 1) Site Standard Practice (SSP)-9.3, "Plant Modifications and Design Change Control" requires that any proposed addition of fibrous material in the drywell be coordinated with the Lead Mechanical Nuclear Engineer in accordance with Browns Ferry Engineering Procedure (BFEP) Project Instruction (PI) 89-06, "Design Change Control." BFEP PI 89-06 requires an evaluation of fibrous material being introduced into the drywell that could become dislodged during a LOCA or other event and contribute to ECCS strainer blockage. Also, in the April 18, 1994, letter, TVA detailed SSP-12.8, "Foreign Material Exclusion," an administrative program that ensures maintenance activities will not introduce debris that could induce clogging of the ECCS strainers and affect ECCS pump performance.

As requested by the staff in Bulletin 95-02, a program for periodic cleaning of the suppression pool should be established. This program is currently under development. Plant specific and industry information will be used to generate the criteria needed to establish suppression chamber cleaning frequency and procedures needed for pool cleaning. TVA currently performs a visual inspection of the ECCS strainers during refueling outages. If the inspection results indicate desludging is necessary, TVA will desludge the suppression chamber at that time.

TVA does not believe that a Technical Specification is necessary to ensure that ECCS strainer function and ECCS pump NPSH values are maintained during a LOCA. The program currently under development will ensure that cleanliness criteria are maintained. NRC Improved Standard Technical Specifications subcommittee is reviewing the need for specifications governing ECCS strainers. TVA is following the progress of this committee.

CONCLUSIONS

TVA intends to replace existing ECCS suction strainers with high efficiency stacked disk strainers. The strainer design will be in accordance with the current provisions of the URG.

The strainer sizing evaluation has shown that maintaining acceptable NPSH without reliance upon containment overpressure is not practical. A containment pressure of two psig above atmosphere will be required to maintain acceptable NPSH given the associated debris loading postulated in RG 1.82. The NPSH available values presented in the following Table 1 incorporate a credit of 2 psig. Tables 2 and 3 and Figures 1 through 4 present the results of the containment response analysis.

The debris generation is based on the BWROG URG. The resulting head loss across the strainers was calculated using these debris loadings. The NPSH margin values presented in Table 1 indicate a range of NPSH margin from approximately 4 feet to 13 feet (with one exception) when credit for 2 psig overpressure is taken. One RHR pump has a positive NPSH margin of approximately 0.2 feet at the 10 minute (600 second) post DBA-LOCA state point.

The discussion above has demonstrated that the BFN design has conservatively implemented the guidance of RG 1.82, Revision 2 and utilizes the applicable portions of the BWROG URG document. The proposed strainers and analytical methodologies are adequate to properly address the issues raised in Bulletin 96-03.

TABLE 1

RHR AND CORE SPRAY PUMP NPSH CASES WITH CREDIT FOR 2 PSIG OVERPRESSURE

	RHR PUMP FLOW CONDITION	RHR PUMP FLOW RATE	MINIMUM RHR PUMP NPSH MARGIN	CORE SPRAY PUMP FLOW CONDITION	CORE SPRAY PUMP FLOW RATE	MINIMUM CORE SPRAY PUMP NPSH MARGIN	TORUS TEMP.
Initial ECCS Start Maximum flow in one RHR loop and in one CS loop	2 pumps on one loop @ runout and 2 pumps on one loop @ design flow (in LPCI Mode)	11,000 gpm (x2) 22,000 gpm plus 10,000 gpm (x2) 20,000 gpm Total Flow 42,000 gpm	6.16′	2 pumps @ runout flow and 2 pumps @ design flow	4650 gpm (x2) 9,300 gpm plus 3,125 gpm (x2) 6,250 gpm Total Flow 15,550 gpm	12.87′	95.0
Within First 10 minutes, LPCI maximum flow in one RHR Loop, CS at normal design flow	2 pumps on one loop @ runout and 2 pumps on one loop @ design flow (in LPCI Mode)	11,000 gpm (x2) 22,000 gpm plus 10,000 gpm (x2) 20,000 gpm Total Flow 42,000 gpm	0.24′	2 pumps on each loop @ design flow	3125 GPM (x4) 12,500 GPM	7.01′	150.0
Within First 10 minutes, Maximum flow in one CS Loop, RHR at normal design flow	2 pumps on both loops (in LPCI Mode) at design flow	10,000 GPM (x4) 40,000 GPM	5.21′	2 pumps on one loop @ runout and 2 pumps on one loop @ design flow	4650 gpm (x2) 9,300 gpm plus 3,125 gpm (x2) 6,250 gpm Total Flow 15,550 gpm	6.8′	150.0
Long Term ECCS pump flows at peak torus temperatures	2 pumps on one loop at design flow (Containment cooling))	6,500 gpm (x2) 13,000 gpm	10.49′	2 pumps on one loop at design flow	3125 gpm (x2) 6250 gpm	4.17′	177.0

TABLE 2

ANALYSIS RESULTS FOR SHORT-TERM CONTAINMENT RESPONSE

Time (sec.)	P_{sc} (psia)	T_{SP} (°F)
0	14.40	95
50	35.88	122.6
89	37.46	136.0
111	35.57	137.1
155	25.12	138.7
205	19.82	141.2
304	17.00	144.4
404	16.46	146.4
504	16.49	148.1
600	16.51	149.7

TABLE 3

ANALYSIS RESULTS FOR LONG-TERM CONTAINMENT RESPONSE

Time (sec.)	P_{sc} (psia)	T_{SP} (°F)
0	14.40	95
94	38.18	140.3
306	33.59	142.0
611	21.70	148.7
1803	17.88	161.7
3512	18.32	167.9
5511	18.64	171.8
8008	18.85	174.9
11991	19.03	176.8
12735	19.04	177.0

FIGURE 1

CONTAINMENT PRESSURE RESPONSE FOR SHORT-TERM ANALYSIS

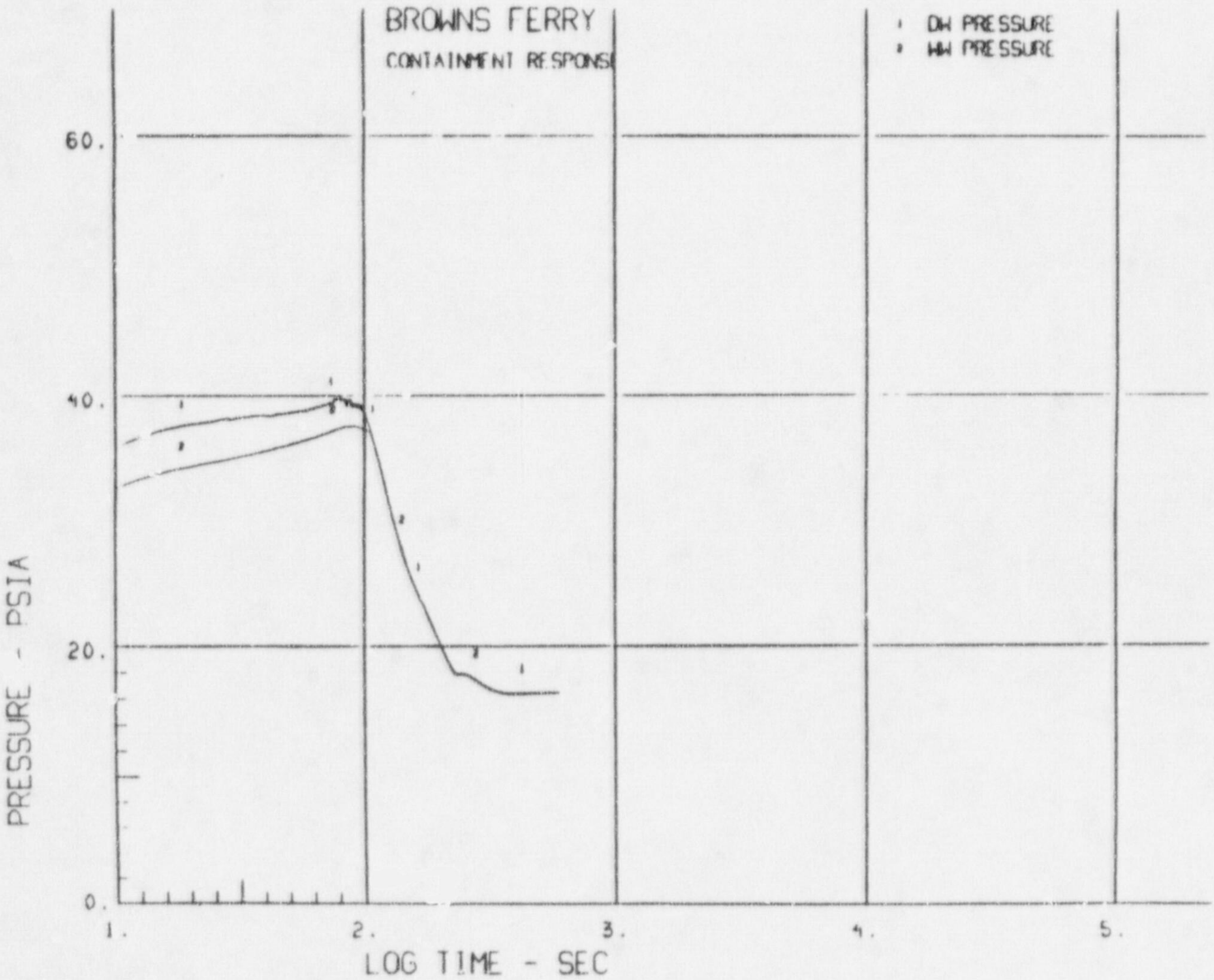


FIGURE 2

SUPPRESSION POOL TEMPERATURE RESPONSE FOR SHORT-TERM ANALYSIS

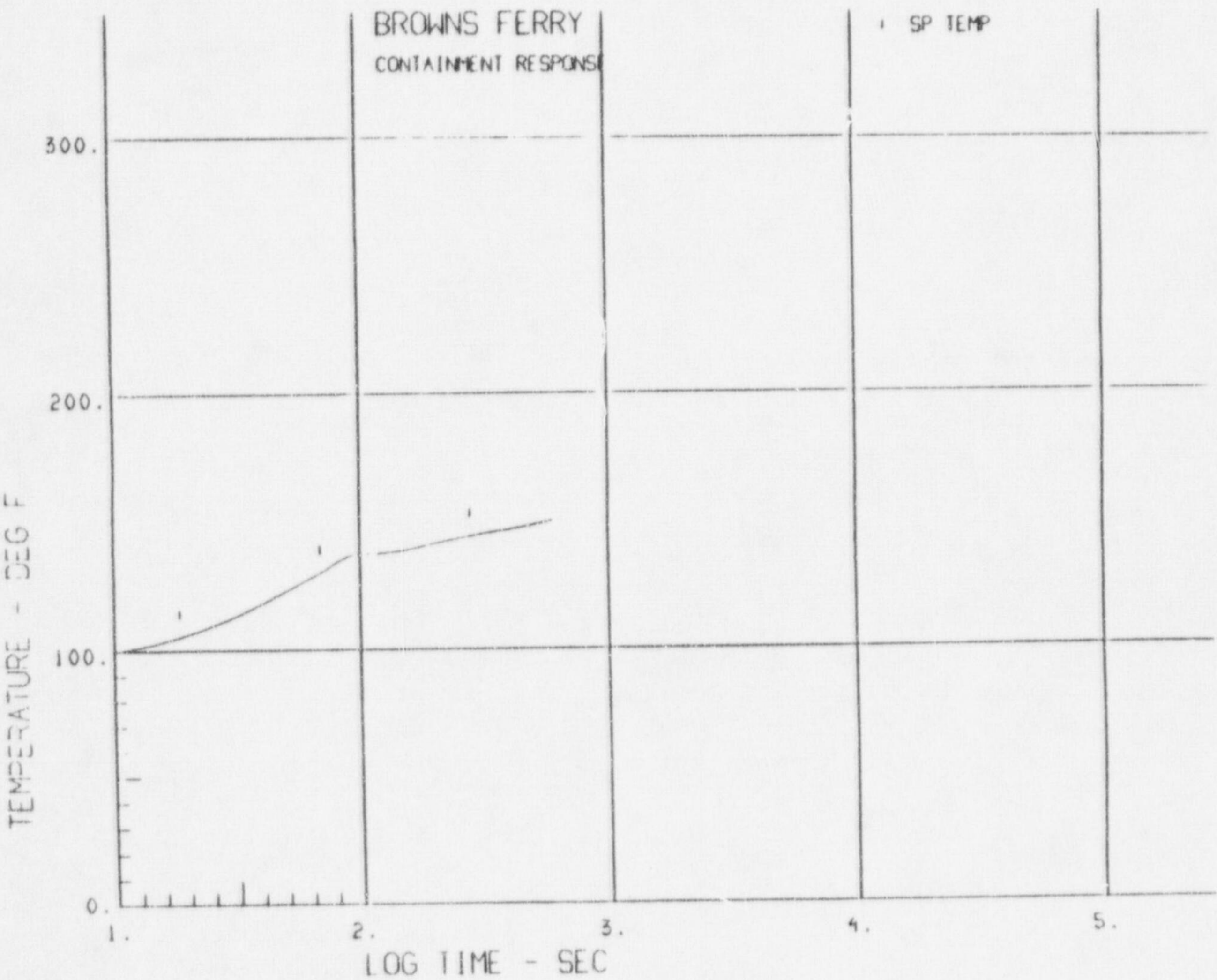


FIGURE 3

CONTAINMENT PRESSURE RESPONSE FOR LONG-TERM ANALYSIS

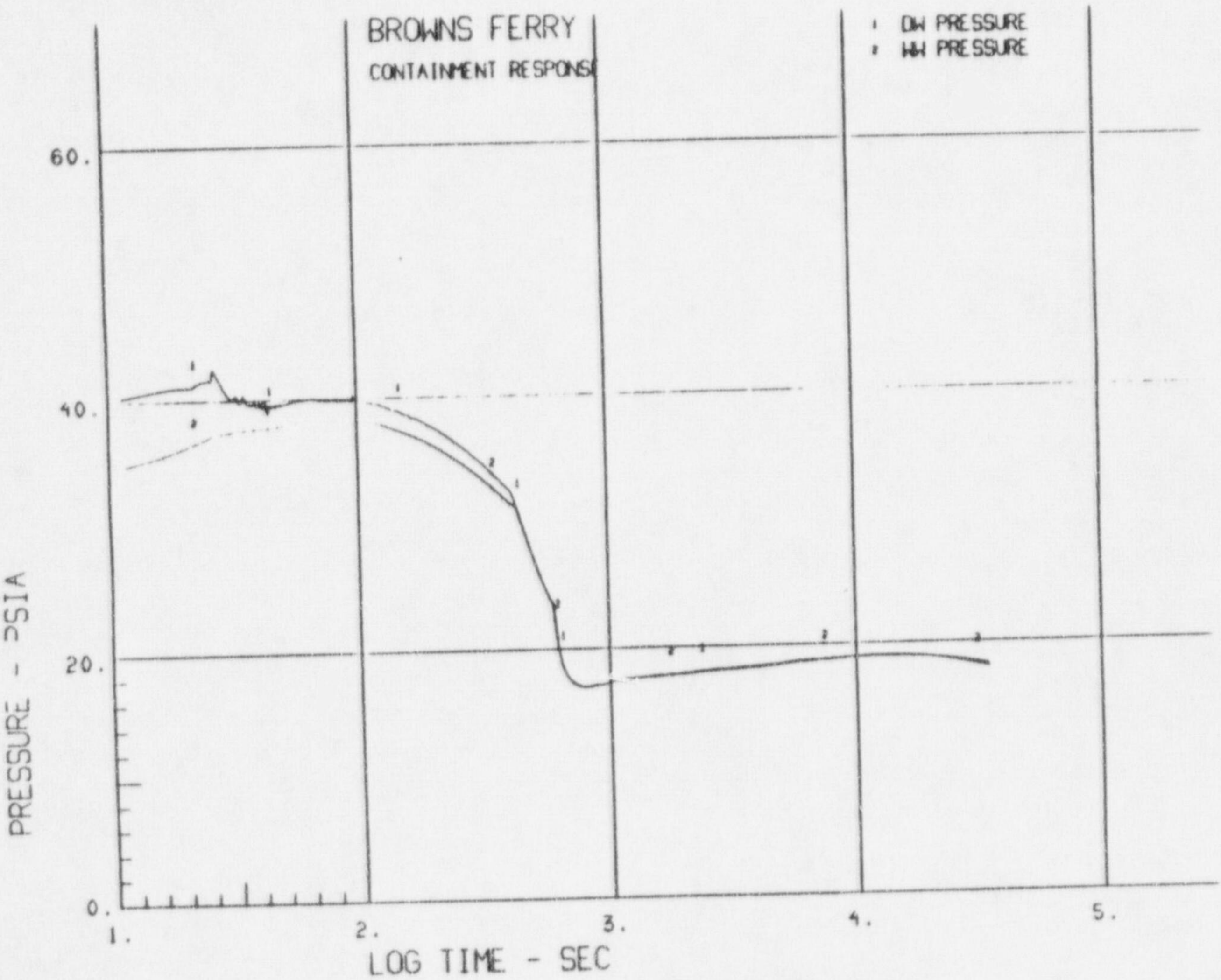
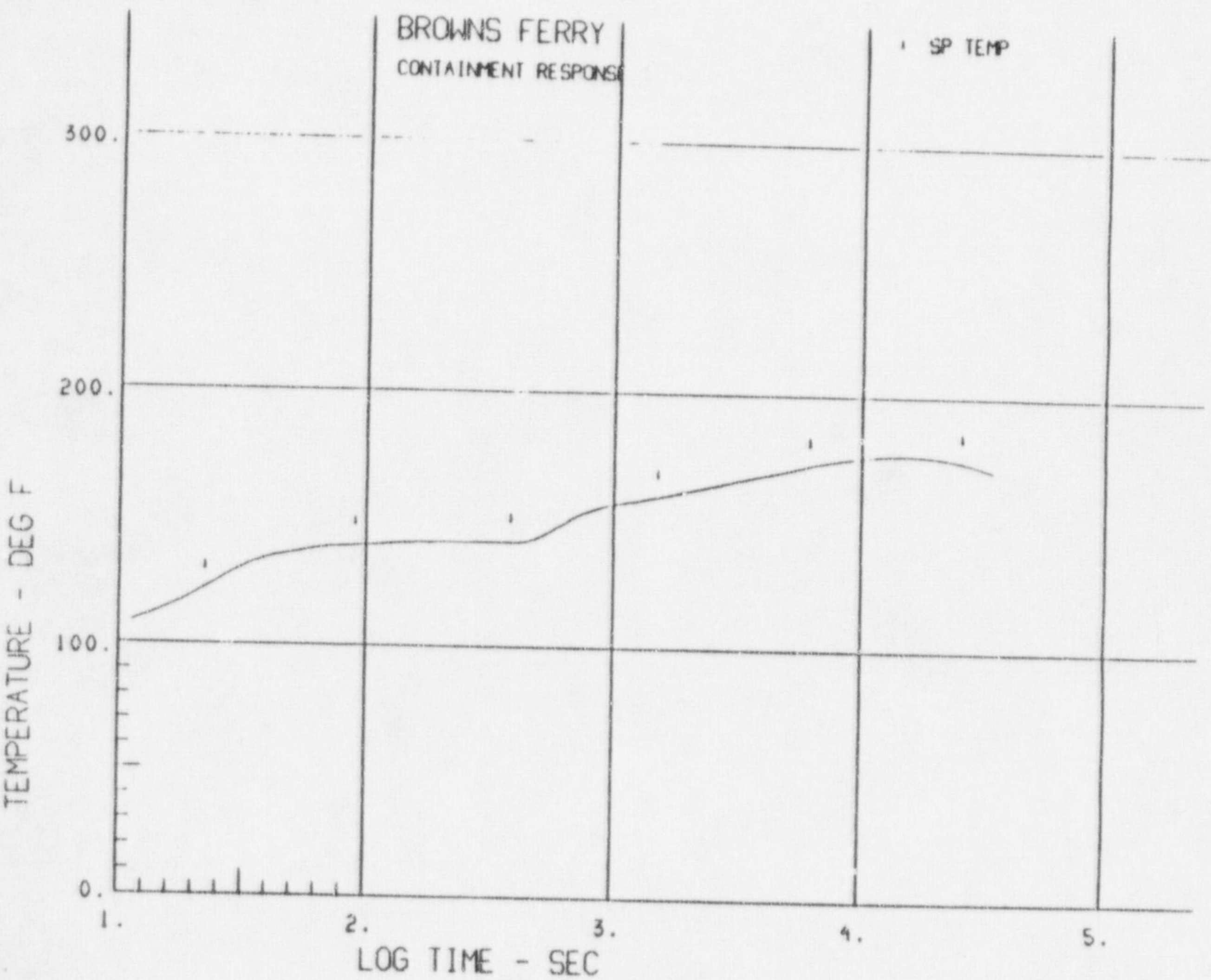


FIGURE 4

SUPPRESSION POOL TEMPERATURE RESPONSE FOR LONG-TERM ANALYSIS



ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2 AND 3

NRC BULLETIN 96-03,
POTENTIAL PLUGGING OF EMERGENCY CORE COOLING SUCTION
STRAINERS BY DEBRIS IN BOILING-WATER REACTORS

SUMMARY OF COMMITMENTS

1. Appropriate modifications to address NRC Bulletin 96-03 will be implemented on Unit 1 prior to its restart.

2. TVA will replace the strainers for Unit 2 during the outage currently scheduled for the fall of 1997.

3. TVA will replace the strainers for Unit 3 during the outage currently scheduled for the fall of 1998.