TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II



July 2, 1981

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

Dear Mr. Denton:

In the Matter of the )
Tennessee Valley Authority )

Docket Nos. 50-259
50-260
50-296
STN 50-518
STN 50-519
STN 50-520
STN 50-521
STN 50-553
STN 50-554

In response to D. G. Eisenhut's February 26, 1981 letter to All Licensees, Holders of Construction Permits and Applicants for Operating Licenses, regarding implementation of NUREG-0313, Revision 1, we are providing our response for the Browns Ferry Nuclear Plant in Enclosure 1 and our interim response for Hartsville and Phipps Bend Nuclear Plants is provided in Enclosure 2. Our response for Browns Ferry provides an item by item summary of our position and summarizes exemptions requested from NUREG-0313, Revision 1. Additional information for the Hartsville and Phipps Bend Nuclear Plants will be provided in the FSAR for each plant which is now tentatively scheduled to be submitted in September 1983.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Subscribed and sworn to before
me this 2 day of July 1981.

Lynn Bradbury
Notary Public

My Commission Expires 10-4-81

Enclosures



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ENCLOSURE 1

IMPLEMENTATION OF NUREG-0313, REVISION 1
BROWNS FERRY NUCLEAR PLANT
(DOCKET NOS. 50-259, -260, -296)

This provides a response to NUREG-0313, Revision 1, as it applies to Browns Ferry Nuclear Plant, addressing the leak detection and augmented inservice inspection requirements suggested in Part IV of NUREG-0313 for sensitized stainless steel piping which is not in conformance with the material selection, testing, and processing guidelines of Part III of NUREG-0313. This response includes a description, schedule, and justification for our alternate plans to implement leak detection and augmented inservice inspection of the nonconforming stainless steel piping systems at Browns Ferry. Our augmented inservice inspection plans in response to NUREG-0313 are primarily based on stress rule index rationale. General Electric (GE) has performed stress rule index calculations for Browns Ferry under contract to TVA.

Our responses to the items outlined in Part IV are as follows:

IV.B.1.a

Section 3.4.3.2.e of the model technical specifications requires that an increase in unidentified drywell leakage of 2 gpm within a 24-hour period would constitute a limiting condition for operation at Browns Ferry. The method for measuring drywell leakage is through drywell equipment and floor drain sump pump effluent flow totalizers. The difference between this quantity as it is read periodically and the actual drywell leakage is the change in the sump inventory over the given period. This, combined with errors in sump level switches and flow totalizers, may at times cause the leakage determination to fluctuate more than 2 gpm over a 24-hour period when the actual leakage does not. We consider this technical specification requirement impractical from an operational standpoint. It is our opinion that the existing requirement of less than 5 gpm unidentified leakage is sufficient to detect any significant leak due to pipe cracking. Accordingly, TVA does not intend to submit additional technical specifications on this subject matter.

IV.B.1.b.(1).

The ASME Code Class 1 pressure-retaining dissimilar metal welds in the "nonconforming, nonservice sensitive" category are the 28-inch diameter recirculation outlet nozzle safe end welds and the 20-inch diameter residual heat removal (RHR) supply line isolation valve welds. We take exception to the NUREG-0313 IV.B.1.b.(1) requirements for these welds because: (1) the largest stress rule index for the recirculation outlet nozzle safe end weld is 1.14 which is below the threshold value of 1.2 for which the estimated failure rate due to intergranular stress corrosion cracking is zero, and (2) the 20-inch stainless RHR valves are castings which are considered to be immune to sensitization.

IV.B.1.b.(2)(a).

The ASME Code Class 1 welds at terminal ends of pipe at vessel nozzles are the recirculation outlet nozzle pipe welds. We take exception to IV.V.1.b.(2)(a) requirements because the largest stress rule index for these terminal end welds is 1.11.

IV.B.1.b.(2)(b) and IV.B.1.b.(2)(c).

We take exception to the requirements for welds to be examined if the design primary plus secondary stress range is 2.4 $S_m$ or more, and if the design cumulative fatigue usage factor is 0.4 or more. NUREG-0313 philosophy is based on the 1978 Section XI Summer Addenda, while the Browns Ferry inservice inspection program is based on the 1975 Section XI Summer Addenda.

The primary plus secondary stresses and the fatigue usage factors are not available because the earlier codes as applicable to Browns Ferry did not require fatigue analysis. A very rigorous stress analysis on the piping systems would be required to determine the primary plus secondary stresses and the fatigue usage factors. We believe that using stress rule index rationale for addressing intergranular stress corrosion cracking is more meaningful.

IV.B.1.b.2.(d).

The ASME Code Class 1 piping systems in the "nonconforming, nonservice sensitive" category are: (1) 28-inch diameter recirculation piping, (2) 22-inch diameter recirculation piping manifold, (3) 24-inch diameter RHR return lines, and (4) 20-inch diameter RHR supply lines. We will select welds in each of these piping systems to be examined based on values of stress rule index numbers.

The criteria for selecting the welds to be examined will be: (1) the stress rule index must be 1.2 or more and (2) the maximum number of welds to be examined will be sufficient to make the total equal to 25 percent of the welds in similar piping systems. The sweepolet welds in the 22-inch diameter recirculation manifolds are assumed to be exempt from NUREG-0313 augumented inspections because these welds were solution annealed with the cold bent manifold. We take exception to the initial 80-month inspection interval because plant statistics show increasing frequency of intergranular stress corrosion cracking incidents with service. We will inspect the selected welds at 120-month intervals which will allow these inspections to be done at the same time the Section XI inservice inspections are done.

IV.B.1.b.(3) and IV.B.1.b.(4).

All of the ASME Code Class 2 stainless steel piping systems are exempt from the inservice inspection requirements of the 1975 Section XI because the control of chemistry of the contained fluid which is intended to minimize corrosive effects, particularly stress corrosion, is verified by periodic sampling and test. Therefore, we will not perform any augmented inservice inspections on class 2 stainless piping.

Our response to Part IV.B.2.b., augumented inservice inspection of "nonconforming" lines that are "service sensitive" is as follows.

IV.B.2.b.(1).

The 4-inch diameter recirculation bypass lines have been removed from Browns Ferry units 1, 2, and 3. It is our opinion that the remaining portions of the bypass lines (pipe extensions/stub tubes) will have low stress rule index numbers because the pipe reaction loads have been eliminated by removing the bypass lines. We take exception to the frequency of the initial series of inspections as required by NUREG-0313. We will inspect the stub tube welds at 60 $\pm$ 12 month intervals. This time interval will allow half of these inspections to be done at the same time the Section XI inservice inspections are done. We believe that a 60-month inspection interval for the stub tubes is adequate because the stress rule indexes are anticipated to be low, plus the fact that Browns Ferry has been in operation approximately this long without experiencing problems in the stub tubes.

The 12-inch diameter stainless steel core spray piping has been replaced with carbon steel on units 2 and 3 out to the first isolation valve; therefore, these lines are exempt from the NUREG-0313 augmented inservice inspection requirements. The dissimilar welds in the replaced lines are at the cast stainless isolation valves, at the L grade stainless spoolpieces near the core spray nozzles, and at the butter on the end of the core spray nozzles. These dissimilar welds are considered to be immune to sensitization and exempt from NUREG-0313 requirements. The stainless piping from and including the first isolation valves out to and including the second isolation valves will be inspected at each refueling outage until it is replaced.

All of the core spray line welds on unit 1 out to and including the second isolation valves will be inspected during the torus modification outage. This piping will be inspected at each refueling outage until it is replaced.

IV.B.2.b.(2).

The dissimilar metal welds included in the ASME Code Class 1 "service sensitive" piping are: (1) 12-inch diameter recirculation inlet nozzle safe end welds, (2) 4-inch CRD hydraulic return nozzle cap welds, (3) 4-inch diameter CRD hydraulic return line to cast stainless valve welds, and (4) 6-inch diameter head spray line to cast stainless valve welds. The stainless steel CRD hydraulic return lines on units 1, 2, and 3 have been replaced with carbon steel lines and rerouted to tie into the reactor water cleanup lines instead of the CRD hydraulic return nozzles.

We take exception to the NUREG-0313 inservice inspection requirements for the dissimilar welds at the recirculation inlet nozzle safe ends because the stress rule index is equal to 0.72 which is well below the threshold value of 1.2. The CRD nozzle cap welds are exempt from the NUREG-0313 inservice inspection requirements because the caps are L grade stainless material and the butter on the nozzle ends is considered to be immune to sensitization. The dissimilar welds at the cast stainless valves in the CRD hydraulic return and head spray systems are also considered to be immune to sensitization and exempt from NUREG-0313 requirements.

IV.B.2.b.(3).

The other ASME Code Class 1 "service sensitive" piping subject to the inservice inspection requirements of Section XI include: (1) 12-inch diameter recirculation riser lines, (2) 6-inch diameter reactor water cleanup lines including sweepolets, and (3) 6-inch diameter head spray lines. We take exception to the sampling plan described in IV.B.1.b.(2); instead, we will select welds in the recirculation riser lines based on values of stress rule index numbers. GE has already performed these stress rule index calculations for Browns Ferry under contract to TVA. The criteria for selecting the welds in the recirculation riser lines to be examined will be: (1) the stress rule index must be 1.2 or more and (2) the maximum number of welds to be examined will be sufficient to make the total equal to 25 percent of the welds in the recirculation riser lines. The recirculation riser sweepolet welds in the 22-inch diameter recirculation manifolds are exempt from NUREG-0313 augmented inspections because these welds were solution annealed with the cold bent manifold. We take exception to the NUREG-0313 assumption that the recirculation riser lines are "service sensitive" because no intergranular stress corrosion cracking has been observed in these lines in domestic plants. Also, these lines are not subjected to stagnant, intermittent, or low flow coolant for extended periods. Therefore, we will inspect the selected welds in the recirculation riser lines at 120-month intervals which will allow these inspections to be done at the same time the Section XI inservice inspections are done.

We will select welds to be examined from each stainless steel reactor water cleanup line, including sweepolets, which based on engineering judgement have a high potential for cracking. The number of welds selected will be sufficient to make the total equal to 25 percent of the welds in each piping system. We will inspect the selected welds in the reactor water cleanup lines at each refueling outage until it is replaced. We will select welds to be examined from each stainless steel head spray line which based on engineering judgement have a high potential for cracking. The number of welds selected will be sufficient to make the total equal to 25 percent of the welds in each piping system. We take exception to the frequency of the initial series of inspections as suggested by NUREG-0313. We will inspect the selected welds in the head spray lines at 60 $\pm$ 12 month intervals. This time interval will allow half of these inspections to be done at the same time the Section XI inservice inspections are done. We believe that a 60-month inspection interval for the head spray lines is adequate because of the fact that Browns Ferry has been in operation approximately this long without experiencing problems in these lines.

IV.B.2.b.(4).

We take exception to the NUREG-0313 suggested frequency of examination of the adjoining areas of internal attachment welds in the recirculation inlet lines at safe ends where crevices are formed by the welded thermal sleeve attachments. We also take exception to examining all of the recirculation inlet nozzle safe end crevices and adjoining areas. We will select a number of safe end crevices to be examined that will be sufficient to represent 25 percent of the crevices. We will inspect the selected crevices at 60 $\pm$ 12 month intervals. This time interval will allow half of these inspections to performed at the same time the Section XI inservice inspections are done. We believe that a 60-month inspection interval for the recirculation inlet nozzle safe end crevices is adequate because of the fact that Browns Ferry has been in operation approximately this long without experiencing problems in these areas. We also believe that selecting 25 percent of the crevices for examination is consistent with the intent of NUREG-0313.

Replacement of "Nonconforming" Lines That Are "Service Sensitive"

The "service sensitive" piping components which have been replaced with "conforming" materials to date are the core spray lines out to the first isolation valves on units 2 and 3 and the CRD hydraulic return lines on units 1, 2, and 3. These lines were replaced with carbon steel piping. The CRD hydraulic return nozzles on units 1, 2, and 3 have been capped off, and the replaced CRD hydraulic return lines are connected to the reactor water cleanup piping. We have contingency plans based on future inspections to replace the core spray piping out to the first isolation valves on unit 1 with carbon steel piping. We also have contingency plans to replace the core spray piping from the first isolation valves to the second isolation valves including containment penetrations with L grade stainless on units 1, 2, and 3.

Concluding Remarks

Intergranular stress corrosion cracking in boiling water reactor pressure boundary piping, although undesirable from an availability standpoint, is not considered by NUREG-0313 to be a safety issue. Because NUREG-0313 is basically an availability issue, we believe that taking exception with parts of NUREG-0313 is reasonable. We will revise our Technical Specifications as necessary to implement our proposed response to NUREG-0313 upon NRC approval of our plans.

ENCLOSURE 2

HARTSVILLE AND PHIPPS BEND NUCLEAR PLANTS
IMPLEMENTATION OF NUREG-0313, REVISION 1

The subject of carbon level and sensitization in 304 and 316 stainless steels has been addressed in considerable detail by TVA for Hartsville and Phipps Bend Nuclear Plants. Related vendor and internal documents are still under review, but because of the extended fuel loading dates (1986 and later) and the more immediate pressing activities associated with other units coming online in 1981, 1982, and 1983, the priority for this effort has been low. TVA has not at this time completed its review of Hartsville and Phipps Bend documents pertaining to the response to Generic Letter 81-03. TVA will complete their investigation of this matter and include the results in the FSAR for these plants. The review accomplished to date on the subject request is as follows.

Class 1 Piping

Specifications for all Class 1 piping require low carbon grades. In fact, the recirculation piping is 316K (0.020 C max, 0.10 N max). This does not mean to infer, however, that TVA necessarily endorses the need for 316 SS over 304 SS or that restriction of carbon levels to 0.020 max is required.

Completion of relevant EPRI programs presently underway and an overall evaluation of industry experience is required to make a final cost-effective, as well as safety-related, decision on the carbon level and alloy content necessary for this piping.

Class 2 and Class 3 Piping

Grade 304L is specified for welded fabrication of systems such as Standby Liquid Control System, Suppression Pool Makeup, Reactor Core Isolation Cooling System, Fuel Pool and Containment Pool Cooling.

Castings

Specifications for CF8 and CF8M require a 5-percent minimum ferrite.

Welds

Stainless welds are controlled to 5-percent mirimum ferrite.

Material Test Requirements

Material test requirements include one or more of the following tests; ASTM A262 Practice E, A Modified Practice A and EPR (Electrochemical Potentiokenetic Tests)

TVA considers the EPR test of potential significance in the qualification of material and heat-affected zone evaluation. However, a number of variables can affect this test and more experience is needed to properly qualify its use, particularly for welds. Standardization of this test procedure is presently under review by ASTM.

Thermal Sleeves and Safe Ends

The problem of intergranular stress corrosion cracking (IGSCC) is recognized by TVA and positive action has been undertaken with our NSSS supplier, General Electric (GE) to resolve this concern. TVA has initiated efforts to replace the reactor coolant recirculation inlet safe ends at our Hartsville and Phipps Bend Nuclear Plants. The material will be changed to a corrosion-resistant material such as 316L or 316K. Final details will be provided in the FSAR for each plant.