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SOUTHERN COMPANY
Energy to Serve Your World℠

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant
Unit 1 Updated Analysis of Core Shroud Vertical Welds
Response to Request for Additional Information

Ladies and Gentlemen:

By letter dated December 3, 2004, Southern Nuclear Operating Company (SNC) submitted responses to questions asked by the staff per the electronic communication dated March 11, 2004 and provided the most recent analysis prepared by Structural Integrity Associates, Inc. By electronic communication dated March 29, 2005, as revised on April 5, 2004 the staff requested additional information. The Enclosure provides the NRC RAI questions and SNC responses.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

H. L. Sumner, Jr.

HLS/IFL/sdl

Enclosure: Unit 1 Updated Analysis of Core Shroud Vertical Welds Response to Request for Additional Information

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. G. R. Frederick, General Manager – Plant Hatch
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Enclosure

Unit 1 Updated Analysis of Core Shroud Vertical Welds
Response to Request for Additional Information

NRC Question L-1

In your letter you stated, "SNC contracted Structural Integrity Associates, Inc. to perform an update to the flaw analysis using the most recent inspection results and the guidance provided by BWRVIP-76." Since BWRVIP-76 is currently under staff review, please clarify that your future inspections will be performed in accordance with BWRVIP-76, as accepted or modified by the NRC safety evaluation for that report.

SNC Response:

As per prior agreement between the BWRVIP utilities and NRC, SNC will inform the staff within 45 days of the issue of an "approved" version of BWRVIP-76 if we intend to deviate from the guidance contained therein.

NRC Question E2-1

On Page 2-2, Figure 2-1 shows that the flaws characterized by ultrasonic testing in 2004 for the V-6 weld of the core shroud are drastically shorter than those of the 1999 inspection results. Please provide an explanation of the inspection discrepancies in terms of specific non-destructive examination (NDE) information (procedures, equipment, and personnel qualification) associated with the 1999 and 2004 inspection results.

SNC Response:

The 1999 examination was a two-sided enhanced visual examination (EVT). The measurements were taken by holding a metal tape measure and feeding the tape while lowering the camera by rope and following the indication. This process was repeated at least two times. This is a good method for determining the indications length considering the location. However, a number of factors exist that could lead to measurement discrepancies including:

- There were multiple indications beginning in the 98" long welds (V-5 and V-6). It is possible measurement errors were introduced when transferring from one flaw end to the next flaw beginning.
- The camera angle changing while lowering.
- The measuring tape may have been shorter than the indication and the examiners may have lost the position.
- Measurement landmark errors could have been introduced when transferring the <98" measuring tape from one location along the length to another.
- Because of the aforementioned difficulties excessive conservatism may have been applied.

SNC does not believe there are any personnel or procedure issues. Personnel were qualified Level II examiners with extensive experience. The results were conservative relative to previous examinations of these welds in that they showed larger flaws. In hindsight, the 1999 results possibly should have been questioned more due to their difference from the 1997 UT results. This was not done due to the fact that the results were conservative and adequate margin remained for structural integrity.

The 2004 UT was performed using Technatom's TEIDE II tool. It is a fully demonstrated tool and technique that has been used extensively for BWR shroud examinations. When the 2004 ultrasonic results did not compare to the 1999 visual examination data, they were also compared to the previous (1997) UT results. The 1997 UT used an earlier version of the Technatom Teide tool that had not (at the time) been fully demonstrated. The 1997 results compared quite favorably with the 2004 results in flaw location, depth and length showing some flaw growth.

In order to attempt to reconcile the 1999 EVT results with the 2004 UT results, a decision was made to perform an EVT of the two welds from the outer diameter (location of the indication). The results of the OD visual examination compared quite favorably with the 2004 UT in both location and length. It was therefore concluded that measurement errors occurred during the 1999 examination.

NRC Question E2-2

On Page 5-5, Figure 5-3 depicts a very steep slope (almost vertical) for the applied J-integral/Tearing modulus (J/T) curve. Explain the shape of the curve. Incorporate into your response how the definitions of applied and material T explain the steepness of the curve under faulted conditions.

SNC Response:

The slope of the applied J-T curve depends on the crack geometry and loading. The shape of the curve for the $J_{applied}$ versus crack size is usually of a parabolic or exponential form. The $J_{applied}$ can be fairly constant for a range of crack sizes and then increases quickly when it approaches the critical size, [1]. Under those conditions (when the curve is relatively flat), the dJ/da can be very small, until the crack size approaches a critical value where the $J_{applied}$ increases asymptotically. Since in this case, the stresses are so low and the crack size is not near the critical crack size, the $J_{applied}$ versus crack size curve is relatively flat.

Since the tearing modulus (T) is defined as a function of dJ/da, the $T_{applied}$ can be very small, if the $J_{applied}$ does not change significantly as the crack size increases. This causes a steep slope of the $J_{applied}$-$T_{applied}$ curve, regardless of the magnitude of the $J_{applied}$. As shown in Reference 2, for HSST vessel tests, the slope of the $J/T_{applied}$ curve can be very steep with a slope from 230 to 370. In some instances, the slope can be negative, for a low compliance system, [1].

For this case, the table below provides the $J_{applied}$ versus crack size results that were used to develop the J-T curve.

	J-Integral (psi-in)		*dJ/da*		*Tearing Modulus*	
a	*Pln Strn*	*Pln Strs*	*Pln Strn*	*Pln Strs*	*Pln Strn*	*Pln Strs*
64.16	413.08	316.27	-	-	-	-
64.15	413.35	316.47	26.51	20.29	0.0914	0.0700
64.14	413.58	316.65	24.85	19.02	0.0857	0.0656
64.13	413.84	316.85	25.40	19.45	0.0876	0.0671
64.12	414.08	317.03	24.85	19.02	0.0857	0.0656
Average:	413.71	316.75			0.0876	0.0671

1. German, M. D., et. al., "Elastic-Plastic Fracture Analysis of Flawed Stainless Steel Pipes," EPRI Report NP-2608-LD, Research Project T118-8, Final Report, September 1982.

2. NUREG-0744, "Resolution of the Reactor Vessel Material Toughness Safety Issue, Task Action Plan A-11," Vol. 1 and 2, September, 1981.