



Department of Energy
Washington, D.C. 20545

Docket No. 50-537
HQ:S:83:181

JAN 11 1983

Mr. Paul S. Check, Director
CRBR Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Check:

ADDITIONAL INFORMATION ON STEAM GENERATOR NON-DESTRUCTIVE EXAMINATIONS (NDE)
AND REACTOR VESSEL (RV) CORE SUPPORT CONE STRUCTURAL INTEGRITY

Enclosure 1 to this letter provides additional information concerning NDE of the Clinch River Breeder Reactor Plant (CRBRP) steam generator. This information responds to questions raised at the December 8, 1982, project/Nuclear Regulatory Commission meeting regarding in-service inspection of the steam generator module.

Enclosure 2 to this letter provides a report on CRBRP RV core support cone structural integrity. This information responds to questions raised at the August 18, 1982, Advisory Committee on Reactor Safeguards subcommittee meeting and the project/Mechanical Engineering Branch meeting of November 22-24, 1982.

Questions regarding the enclosures may be addressed to Mr. R. Spear (FTS 626-6098) of the Project Office Oak Ridge staff.

Sincerely,

John R. Longenecker
Acting Director, Office of
Breeder Demonstration Projects
Office of Nuclear Energy

2 Enclosures

cc: Service List
Standard Distribution
Licensing Distribution

Dool
1/40

Enclosure 1

Non-destructive Examination of the Steam Generator
Steam Generator Shell and Tube Sheet

To ensure the integrity of the water and/or sodium boundary in the CRBRP steam generator, the following inspections will be performed during fabrication:

- a. Pressure boundary welds will be double volumetrically inspected with a radiographic examination before Post Weld Heat Treated (PWHT) and an ultrasonic examination after PWHT in accordance with Code Case 1594-3. The surface of the welds will be inspected either by magnetic particle or liquid penetrant inspection per the Code.
- b. The tubesheets will be ultrasonically inspected 100% to an acceptance criteria based on a calibration to a 1/2" diameter Flat Bottom Hole (FBH) and the portion which will be involved in the tube to tubesheet welds will be calibrated to a 1/16" dia. FBH. External machined surfaces will be liquid penetrant inspected.
- c. Tube/tubesheet welds are radiographed using the micro-focus rod-anode examination equipment and penetrant examined on the exterior surface of the weld zone. The weld thickness, concavity and convexity are examined ultrasonically and visually. The welds are also subjected to a Helium leak test both individually and as a completed module.

The CRBRP program for inservice inspection of the steam generator shell welds is continuous monitoring leak detection and periodic visual examinations as defined in PSAR Appendix G. The Project does not consider additional supplementary UT examination of shell welds to be necessary.

Steam Generator Tubes

- a. During fabrication, the steam generator tubes were 100% ultrasonically and liquid penetrant examined.

- b. CRBRP steam generator tube inservice inspection will be by means of ultrasonic scanning of the interior surface for detection of wall thinning, corrosion, pitting, or other flaws in the tube wall along the entire length. The detectable flaw sizes and wall thinning are as given below:

Wall Thickness - Wall thinning of greater than .001 in./year. Measurement of wall thickness shall have repeat precision of no more than ± 0.1 millimeters (.004 in.) where precision is defined as three times the standard deviation. Determine if end-of-life tube wall thickness is .077 in. or greater.

Flaws - Flaw sizes equivalent to a 5% notch in the wall or less, a through wall hole of .005 in. or less, or both.

The wall thickness measurement uses an ultrasonic probe with a rotating beam. The beam is transmitted axially before impinging on a mirror which diverts the beam radially to the tube wall. Tube diameter is determined by beam reflection from the inner surface.

Shear wave ultrasonic techniques are used for the detection of tube wall flaws. The sound pulses are emitted axially onto a reflector which diverts the sound back into the tube wall as an angle beam shear wave. Detected flaws will reflect the sound back to the transducer.

In accordance with PSAR Appendix G, 3% of the tubes in each evaporator/superheater in each module will be examined during the first inspection interval (10 years). During each successive inspection interval, 1-1/2% of the tubes in a module will be inspected.

The following reports provide the status of the CRBRP ultrasonic testing program for the steam generator tubes.

- a. Day, R. A. and Kerr, D. S., "Ultrasonic Testing of the Clinch River Breeder Reactor Steam Generator Tubing," Materials Evaluation, Vol. 39, January 1981.
- b. R. W. McClung, et al, "Techniques for Inservice Inspection of Heat Transfer Tubes in Steam Generators", Second Joint U.S./Japan LMFBF Steam Generator Seminar, Conf. - 810615, Rev. 1, Vol. 1, UC-79TK, June 1981.

A final report of UT capabilities from the development program will be forwarded upon completion in December 1983.