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

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March 15, 1984

WBRD-50-390/82-52
WBRD-50-391/82-49

U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - OPERATING CONDITIONS USED IN PIPING ANALYSIS - WBRD-50-390/82-52, WBRD-50-391/82-49 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. V. Crlenjak on May 18, 1982 in accordance with 10 CFR 50.55(e) as NCR WBN CEB 8215. Interim reports were submitted on June 17, 1982; February 2, June 17, September 13, and October 27, 1983. Enclosed is our final report.

As discussed with NRC-OIE Inspector Paul Fredrickson on January 24, 1984, a new submittal date of March 16, 1984 was established for this report.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Enclosure
cc: Mr. Richard C. DeYoung, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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Institute of Nuclear Power Operations
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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
OPERATING CONDITIONS USED IN PIPING ANALYSIS
NCR WBN CEB 8215
WBRD-50-390/82-52, WBRD-50-391/82-49
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

The Quality Assurance Criteria of 10 CFR 50, Appendix B, section XVII, states, "Records shall be identifiable and retrievable." Also, section III states, "Measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations." These measures shall include the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces.

The operating conditions used in piping analysis are based upon data provided from different organizations. The thermal and seismic design basis "source" data is not in all cases identifiable as being current, valid data and in some cases, is not available. Original operational mode data for piping systems within the auxiliary building were not documented. Original operational mode data for inside containment were contained in CEB Report 76-2. No engineering procedure existed to control revisions to this data, i.e., assurance that the analysis is still valid for current operating conditions.

Also, piping analysis has been done by personal service contractors who have assumed that the data previously shown on the piping isometrics is still valid. They have signed off on the analysis checklist without verifying that it is still current and valid data.

Safety Implications

This condition could result in safety-related piping systems not being qualified to ASME Code requirements. Should the piping for these systems fail during a seismic event, there could be adverse effects to the safe operation of the plant.

Corrective Action

A sampling program was undertaken to determine if operating conditions used for Watts Bar rigorous piping analyses yield conservative results. The guidelines for the sampling program is set forth in TVA's Division of Engineering Design (EN DES) Special Engineering Procedure (SEP) 82-15. The operational modes data were compiled in accordance with Mechanical Design Guide DG-M5.1.1. TVA conducted the sampling survey as follows:

1. Twenty rigorously analyzed problems were selected.

   a. Eighty percent of the problems selected were common to units 1 and 2, unit 1 shown, unit 2 opposite hand, or unit 1 only.

   b. Twenty percent of the problems selected were from unit 2 only.

   c. There was one problem from each of the systems which had rigorously analyzed piping. At least two problems each for the reactor building and auxiliary building were chosen. One problem each for the essential raw cooling water (ERCW) pumping station and the control building was chosen.

Attachment 1 is a detailed listing of the problems chosen in the preliminary sampling program. New operational modes were generated and compared to those used in the analysis. The differences in the new operational modes data and the analysis data have been evaluated on a pass-fail basis. Decisions were based on engineering judgments using the guidelines set forth in EN DES-SEP 82-15 or by reanalyzing the piping system using TPIPE computer test runs with new operational modes data. Qualification of the flanges, nozzles, and supports was considered in TVA's evaluation of the effect of operational modes on the piping system. If any problem failed the sampling program, another sample was made of that system. This second random sample consisted of the larger of 10 problems or 25 percent of the problems for that system. If an additional failure was found, a 100-percent review of that system was done. Most system operational modes data are similar in nature. Therefore, it was judged that if a failure occurred, similar discrepancies were more likely to occur within that particular piping system.

Attachment 1 lists the results of the problem in the original sampling program. The pipe stresses for the test runs were within ASME Code allowables. Of the original sample, only two flanges in the safety injection system problem (N3-63-05A) exceeded the allowables. N3-63-05A was combined with problem N3-74-1A, which was reanalyzed under engineering change notice (ECN) 3608. The correct operating modes were incorporated during the reanalysis. The pipe stresses were held within ASME Code allowables and all flanges and nozzles met the allowables. Plant modifications due to changes in support design were made under ECN 3608. Support redesign and construction modifications were made in conjunction with the resolution of NCR WBN CEB 8221 (WBRD-50-390,391/83-03).

A second random sample of 10 problems in the safety injection system was selected and new operational modes generated. These 10 problems passed the sampling program. Attachment 2 lists the results of the expanded sample of safety injection system problems. The pipe stresses for the test runs were within ASME Code allowables. The flanges, nozzles, and supports were evaluated and qualified.

Early in TVA's design and construction of WBN, no single consistent approach was used for documenting operational mode data. Operational mode data for inside containment was originally tabulated in CEB Report 76-2. Although the information in the original issue was correct, CEB Report 76-2 was not updated for changes in operational modes. Since there was no requirement to document operational modes data in the auxiliary building, revising the CEB report was not thought to be necessary. CEB Report 76-2 was, therefore, no longer useful to the piping analyst as a source of current operational mode data. Results of the sampling program concluded that there was no compromise to the safety of plant design due to the possible misuse of CEB Report 76-2. CEB Report 76-2 has now been voided. A consistent approach will be undertaken in the review and documentation for all operational modes for WBN. This will be in the form of a new TVA document, controlled in accordance with TVA's Quality Assurance Program, which will be prepared to document all WBN operational modes. This documentation will be completed by January 31, 1986. Until this document is issued, current operational modes will be verified by WBN design project system engineers through the squadcheck procedure before any reanalysis is performed.

ATTACHMENT 1
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
RIGOROUSLY-ANALYZED PIPING PROBLEMS
FROM WHICH OPERATIONAL MODES DATA WERE DEVELOPED

System		Analysis Problem No.	Isometric Drawing No.
Main steam	a	0600200-06-01	06200-06-01
Auxiliary feedwater	a,d	N3-03-4A	47W427-201
Blowdown	a	0600200-07-01	47W400-208
Auxiliary boiler system	a,d	N3-12-01A	47W431-200 47W431-201 47W431-202
Reactor coolant system	a	0600200-13-05	47W465-209
High-pressure fire protection	a	N3-26-2R	47W491-208
Service air system	a	N3-33-10A	47W492-200
Chemical and volume control	a,d	0600250-08-13	0600250-08-13
Safety injection*	b,d	N3-63-05A	47W435-202
Essential raw cooling water	a	N3-67-04A	37W206-30
	a,d	N3-67-06A	47W450-208
	c	N3-67-15A	47W450-233
Component cooling water	a	N3-70-34A	47W464-232
Containment spray	a	N3-72-02A	47W437-200
Residual heat removal system	a	N3-74-03A	47W432-206
Spent fuel pit cooling	a	N3-78-08A	47W454-205
Upper head injection	a	0600250-15-02	0600250-15-02
Radiation monitoring	a,d	N3-90-06R	47W600-407
Ice condenser	d	N3-61-1R	47W462-100
HVAC	a	N3-30-1R	47W915-100

(a) Evaluation completed and acceptable
(b) Evaluation completed and unacceptable
(c) No discrepancy
(d) Computer analysis performed to evaluate results of new operating modes

*Note that safety injection is the only sample that has an expanded sample

ATTACHMENT 2
WATTS BAR NUCLEAR PLANT
EXPANDED SAMPLE OF SAFETY INJECTION
SYSTEM PROBLEMS FOR WHICH OPERATIONAL MODES
WERE DEVELOPED

System		Analysis Problem No.	Isometric Drawing No.
Safety Injection	a	N3-63-1A	47W435-200 R9
	a	N3-63-3A	47W435-205 R5
	a,d	N3-63-7A	47W435-206 R6 47W435-207 R6 47W435-208 R3 47W435-209 R6 47W435-210 R6
	a,d	0600200-09-01	47W435-260 R0 47W435-261 R0
	a	0600200-09-03	47W435-219 R1
	a	0600200-09-05	47W435-217 R4 47W435-259 R0
	a	0600200-09-07	0600200-09-07 R905
	a	0600200-09-09	0600200-09-09 R904
	a	0600200-09-11	47W435-228 R1 47W435-254 R1
	a,d	0600250-09-02	47W435-221 R0

(a) Evaluation completed and acceptable
(b) Evaluation completed and unacceptable
(c) No discrepancy
(d) Computer analysis performed to evaluate results of new operating modes