TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

84 MAR 14 A 8:37 March 8, 1984

WBRD-50-390/83-62
WBRD-50-391/83-57

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 - LOADING ON DIESEL GENERATOR FOR LOCA AND BLACKOUT CAUSING UNACCEPTABLE FREQUENCY TRANSIENT - WBRD-50-390/83-62, WBRD-50-391/83-57 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector Linda Watson on October 7, 1983 in accordance with 10 CFR 50.55(e) as NCR WBN EEB 8312. Interim reports were submitted on November 7 and December 22, 1983 and February 2, 1984. Enclosed is our final report.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. M. Mills

J. M. Mills, Manager
Nuclear Licensing

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

Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
LOADING ON DIESEL GENERATOR FOR LOCA AND BLACKOUT CAUSING
UNACCEPTABLE FREQUENCY TRANSIENT
NCR WBN EEB 8312
WBRD-50-390/83-62, WBRD-50-391/83-57
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

According to the results of an analysis done by Morris-Knudsen, the manufacturer of the Watts Bar diesel generators, the present TVA design loading on diesel generator 1B-B for a simultaneous loss-of-coolant accident (LOCA) and blackout could cause a frequency transient as high as 12 percent. This transient would appear in the interval from 0 to 8 seconds after the diesel generator connects to the 6.9-kV shutdown board 1B-B. This analysis has also shown that under the same LOCA/blackout conditions the diesel generator 2B-B could experience a frequency transient as high as 7 percent at approximately 35 seconds.

The cause of this condition is attributed to the fact that during the time this design loading was established (1972) there were no formal controls with sufficient detail concerning auxiliary power system performance or design review analysis.

Safety Implications

Due to the use of worst case data given to Morris-Knudsen for incorporation into their analysis, the conservatism built into the analysis itself, and the brief duration of the frequency transients, TVA is not convinced that the postulated frequency drop would occur or that, if it did, it would have any adverse safety effect on the inductive loads powered by the 6.9 kV shutdown board. However, the postulated frequency drops do exceed the 5-percent maximum allowed in NRC Regulatory Guide 1.9, section C.4, and, as such, TVA is taking the conservative position that the postulated frequency drops could hinder the starting or operation of some safety-related loads and adversely affect safe shutdown of the plant.

Corrective Action

An analysis performed to resolve this nonconformance evaluated the automatic sequential loading on each of the four diesel generators (DG) for both safety injection and containment isolation phase B modes of operation. This analysis identified the diesel generators, operating modes, and intervals within an automatic load sequence that represent the worst case kilo-watt load demands. (For DG 2A-A worst case load demand occurs from 0 to 18 seconds into the loading sequence during the safety injection mode; for DG 1A-

A it occurs from 18 to 34 seconds during the safety injection mode; and for DG 2B-B the worst case occurs from 34 to 120 seconds during the isolation phase B mode.)

To ensure that no diesel generator would experience frequency transients outside the limits of Reg. Guide 1.9 during automatic sequential loading, changes were made to all four DG loading sequences. The modifications necessary to implement these changes are being accomplished under engineering change notices (ECNs) 4479 and 4613 for unit 1 and ECNs 4480 and 4614 for unit 2. The work associated with ECNs 4479 and 4480 is completed. The design and construction work under ECNs 4613 and 4614 will be completed by April 9, 1984.

The following changes were made:

1. On the 480V shutdown boards 1A2-A and 2A2-A the loading sequence of the respective shutdown board room chiller packages (chiller packages B-B (0-MTR-31-49/2B) and A-A (0-MTR-31-36/2A)) have been changed from 0 seconds to 45 seconds after the respective DG connects to their 6.9 kV shutdown board.

2. Containment spray pumps 1A-A, 1B-B, 2A-A, and 2B-B have been sequenced to load onto their respective 6.9 kV shutdown boards at 120 seconds instead of at 35 seconds.

TVA has also noted that four air conditioner (A/C) compressors (two control room and two electrical board room A/C compressors) have a 60 second delay for every start designed into the compressors by the manufacturer. These four compressors (0-MTR-31-80/2-A, 0-MTR-31-96/2-B, 0-MTR-31-128/2-A, and 0-MTR-31-129/2-B) are each considered as part of the initial load of their respective diesel generators. Due to the vendor designed delay, actual loading will not occur until 60 seconds later. By delaying the start of the shutdown board room chiller packages 45 seconds, containment spray pumps 120 seconds, and taking credit for the 60 second delayed start of the control room and electrical board room A/C compressors, the load demand on the diesel generators is redistributed such that the DG engines can maintain the calculated frequency transients within the limits set by Reg. Guide 1.9.

Before initiation of this NCR, TVA had identified through NCR WBN EEB 8006 (WBRD-50-390/81-16, WBRD-50-391/81-15) a weakness in its controls concerning the auxiliary power system and had issued two electrical design standards (DS-E2.2.1 and DS-E4.1.2) which identify the criteria for medium and low voltage auxiliary power system performance and equipment application criteria as well as design guide DG-E2.4.3, which identifies the need for comprehensive in-program and as-built auxiliary power design review analysis. Although the design standards and design guide were initially identified and issued as action required to prevent recurrence of the condition described in WBN EEB 8006, they apply to this deficiency. Coupled with a management policy identifying that design standards must be utilized where applicable and design guides must be considered for use, they provide adequate actions to prevent recurrence. TVA considers this position as justified because the frequency transient problem described in this report was discovered during a design verification activity performed under the same design guides and standards discussed above.