TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
5N 157B Lookout Place

85 DEC 12 A8:46

December 5, 1985

BLRD-50-438/85-29
BLRD-50-439/85-27

U.S. Nuclear Regulatory Commission
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Dear Dr. Grace:

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - RELIEF VALVE THRUST FORCES WERE CONSIDERED NEGLIGIBLE IN ALTERNATE ANALYSIS PROBLEMS BLN KC-D054 09 AND 10 - BLRD-50-438/85-29 AND BLRD-50-439/85-27 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector Steve Weise on November 7, 1985 in accordance with 10 CFR 50.55(e) as significant condition report (SCR) BLN CEB 8509. 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. A. Domer

J. W. Hufham, Manager
Licensing and Risk Protection

Enclosure
cc (Enclosure):
Mr. James Taylor, 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
Atlanta, Georgia 30339

IE27

ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
RELIEF VALVE THRUST FORCES ASSUMED
NEGLIGIBLE IN ALTERNATE ANALYSIS PROBLEMS
BLN KC-D054 09 AND 10
BLRD-50-438/85-29 AND BLRD-50-439/85-27
SCR BLN CEB 8509
10 CFR 50.55(e)

FINAL REPORT

Description of Deficiency

While conducting a review of a potential generic condition of a problem identified for Watts Bar Nuclear Plant (WBN) under nonconformance report (NCR) WBN CEB 8420, CDR No. WBRD-50-390/84-50 and WBRD-50-391/85-07, it was discovered that on alternate analysis problems BLN KC-D054 09 and 10, the analyst assumed that the thrust forces on the 3" x 4" relief valves (Mark #900) were negligible. The calculated thrust forces were determined to be significant. This oversight resulted in the design loads used for the design of some pipe supports to be unconservative. Preliminary results of our investigation have shown for one support that the design load was increased by more than 300 percent when relief valve thrust loads were included.

Completion of the review shows that the thrust loads were considered to be negligible on all alternately analyzed piping. However, in all the rigorously analyzed piping, relief valve thrust loads were taken into consideration and no problem exists. This requirement is addressed in the Bellefonte Rigorous Analysis Handbook Section BLN-RAH-212 and also in the Checklist BLN-RAH-401 page I-10.

Article NC-3652.2 of the ASME Boiler and Pressure Vessel Code states that "The effect of pressure, weight, and other sustained loads and occasional loads including earthquake must meet the requirements of equation (9)." The introduction to CEB Report 76-11 says, "The criteria described in the subject report allows the determination of support locations, support types, and support loads such that the A.S.M.E. Section III code requirements (Equations 8, 9, 10, 11) for piping stresses are satisfied for standard piping components for loadings of weight, earthquake, thermal expansion and anchor movement." No other occasional loads were considered in the development of the criteria. TVA Design Criteria N4-50-D711, (Detailed Analysis and Seismic Qualification of Category I and I(L) Piping Systems), defines how TVA combines occasional loads in the evaluation of code equation (9). The greater of earthquake, waterhammer and valve thrust, or wind load is put into the equation 9 stress determination. Analysts have assumed that valve thrust loads on piping which fall within the scope of alternate analysis on the Bellefonte Project have been insignificant in comparison with earthquake loads and that following the criteria of CEB Report 76-11 would result in a support arrangement which would

Description of Deficiency (Continued)

insure that the piping meets the requirements of the ASME Code. This assumption has been found to be incorrect for the piping in the above mentioned alternate analysis problems. The root cause of this faulty assumption stems from a misunderstanding of the limitations of the alternate analysis criteria. The analysts assumed that the authors of the criteria considered the effects of the valve thrusts and determined them to be negligible because the need for additional valve thrust evaluation was not clearly stated in the criteria. Investigations into this deficiency done thus far indicate that the assumption that valve thrust loads are insignificant for alternately analyzed problems has been valid for over 98 percent of the problems evaluated.

As noted above, a similar deficiency was found at Watts Bar Nuclear Plant and has been evaluated as NCR WBN CEB 8420.

Safety Implications

The particular relief valve that was studied for this report (MK#3BW0456-KC-900) was analyzed under a Category I(L)A Analysis. This type of analysis requires that the piping system maintain pressure boundary and position. If a I(L)A system were to lose pressure boundary, it could spray water on safety related equipment in the immediate area causing damage. If the system were to lose position (break), it could fall on other pipes and or equipment in the immediate area. In this particular case, the damage would probably only be to equipment associated with the decay heat removal (DHR) and component cooling water (CCW) systems, which have already failed in that train when this relief valve lifts. However, a complete review of all relief valves would have to be done to determine the full extent of the safety implications.

In summary, a condition may exist such that piping fails due to relief valve thrust loads and it is in a location such that the piping failure causes other safety related equipment to fail. Therefore, if this condition was to remain uncorrected, it could jeopardize the safe operation of the plant.

Corrective Action

In order to correct this problem, TVA will review all Bellefonte alternate analysis calculations which have pressure relief valves. TVA will identify the relief valves with potentially significant thrust loads, calculate the thrust loads, and incorporate the effects of the thrust loads in the analysis calculation packages. TVA will also revise the support load tables to reflect increased support loads and new supports added to qualify the system due to the effect of valve thrust loads. TVA will review support designs to determine if increased support loads are significant. TVA will revise existing supports affected and design new supports as necessary. Engineering Change Notices will be written to identify and track this corrective action.

Corrective Action (Continued)

In order to eliminate the possiblility of the problem occurring again, we will revise the alternate analysis checklist to include evaluation of relief valve thrust loads. TVA will also revise the alternate analysis criteria (CEB 76-11) to add a statement in section 2.3.1 (Limitation of Dynamic and Static Support Evaluation) that the effect of relief valve thrust loads and other occasional loads (such as waterhammmer and wind load) were assumed negligible, and were not covered by the scope of application of the dynamic/static support evauation of the subject criteria. If these conditions exist in the systems where the alternate criteria is used, separate evaluation should be made and be included in the alternate analysis calculations.

All action to correct the deficient condition will be completed for unit 1 and unit 2 by one year before fuel load of the applicable unit.