

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401  
400 Chestnut Street Tower II

BLRD-50-438/82-79

03 DEC 13 1983  
December 9, 1983

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:

BELLEFONTE NUCLEAR PLANT UNIT 1 - DISRUPTION AND COLLAPSE OF SODIUM  
HYDROXIDE STORAGE TANK - BLRD-50-438/82-79 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector  
Paul Fredrickson on November 24, 1983 in accordance with 10 CFR 50.55(e) as  
NCR 2082. This was followed by our interim reports dated December 27, 1982  
and June 20, 1983. 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

*L. M. Mills*  
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

Records Center (Enclosure)  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
Atlanta, Georgia 30339

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ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNIT 1  
DISRUPTION AND COLLAPSE OF SODIUM HYDROXIDE STORAGE TANK  
NCR 2082  
10 CFR 50.55(e)  
BLRD-50-438/82-79  
FINAL REPORT

Description of Deficiency

During a filling operation for the sodium hydroxide storage tank, personnel discovered the following damage:

1. The base plate for the supports was lifted from the foundation.
2. The concrete foundation was broken.
3. The sway struts at three locations around the tank were sheared in half.

At the time of these discoveries the tank was full of water and overflowing, resulting in the filling of the adjacent expansion loop with water. The tank was drained and additional investigation revealed the tank had collapsed on three sides, and the associated piping was sprung. The specific cause of the NaOH tank damage could not be determined since there were many contributing factors which had a synergetic effect. Some of these contributing factors were:

1. Restricted flow in the pressure and vacuum relief pipe.
2. Filling procedure omitted the filling precaution found in B&W Technical Document No. 67-1003781-00.
3. Tank left in an unmonitored condition during filling operation allowing the overfill condition.
4. Basic design of the system allowing such a phenomenon to develop.
5. Failure to remove sump shoring.

A review of the actions leading up to and resulting in the NaOH tank damage reveals that the phenomenon would not have developed had the filling procedure specified the required level and the filling operation been closely monitored to assure that the tank was only filled to the desired level. The accident could also have been prevented if the precautions in the B&W Technical Document had been followed.

### Safety Implications

Shearing of the tank from its piping or tank rupture during a seismic event due to the reduced stability of its supports (if uncorrected) could result in air being introduced into the system. This air could in turn cavitate the reactor building spray pumps and decay heat removal pumps thereby preventing them from performing their intended safety function and adversely affecting safe plant operations.

### Corrective Action

A site investigation team was organized to determine the events leading to the collapse, the possible causes of the failure and the appropriate corrective action. The results of this investigation were provided by our second interim report on this 50.55(e) item. The contents of this report summarized their findings.

Approximately 50 percent of the tank has been repaired by Richmond Engineering Company (RECo) as authorized by Nuclear Steam Supply System (NSSS) Change of Contract (COC) No. 397. The tank support embedments have been inspected and the results sent to TVA's Division of Engineering Design (EN DES) for evaluation. No damaged embedments were discovered. All damaged foundation concrete has been removed and replaced according to TVA's Division of Construction (CONST) Specification G-34. TVA drawings have been revised as required to depict any necessary modifications. Engineering Change Notice (ECN) 3072 has been prepared which will provide fail-safe vacuum breakers for the sodium hydroxide tank. All remaining repairs will be completed by January 27, 1984.

To prevent recurrence of this deficiency, TVA has revised procedure BNP-CTP-6.1, "Cleaning and Flushing of Systems," to include positive measures for monitoring levels in tanks, a specific prerequisite QC verification of protective device installation, and a check of design limits and precautions (e.g., checking the B&W Technical Document previously referenced). In addition, EN DES has conducted an investigation to determine if there was a need to place a vacuum relief device on any safety-related tank which may be inadvertently overfilled. The results of this investigation proved that the condition does not exist for any other Bellefonte system or TVA plant.