

RAS M-234

FVA 84 (05-2-00)

UNITED STATES GOVERNMENT

NEC-JH_70

Memorandum

TENNESSEE VALLEY AUTHORITY

B25 '87 0127 028

TO : H. L. Abercrombie, Site Director, ONP, O&PS-4, Sequoyah Nuclear Plant

FROM : D. W. Wilson, Project Engineer, Sequoyah Engineering Project, DNE, DSC-E, Sequoyah Nuclear Plant

DATE : JAN 27 1987

SUBJECT: SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 - PRELIMINARY REPORT ON THE CONDENSATE-FEEDWATER PIPING INSPECTION - SUSPECTED EROSION-CORROSION AREAS

Attached for your review is the preliminary report of SQN condensate-feedwater inspection. The results indicate that there is no wall thinning due to erosion-corrosion. However, there may be ~~some~~ ~~erosion~~ ~~damage~~ ~~on~~ ~~the~~ ~~discharge~~ ~~pipings~~ ~~of~~ ~~the~~ ~~condensate~~ ~~feedwater~~ ~~pumps~~. The remaining wall in that area has not been reduced below the minimum design wall thickness. Appropriate surveillance instructions shall be written to monitor the suspect areas. The instruction will be written by Operations Engineering Services' metallurgical employees and is expected to be in place by June 30, 1987.

The final report will include the results of ultrasonic examinations of the elbows downstream of A and B pump and will be issued the week of February 6, 1987.

D. W. Wilson
D. W. Wilson

sub by RLD
CRB:DFG:RLP

Attachment
cc (Attachment):

- RIMS, SL 26 C-K
- M. J. Burzynski, ONP, O&PS-4, Sequoyah
- J. C. Key, DNE, DSC-E, Sequoyah
- J. H. Sullivan, ONP, SB-2, Sequoyah
- B. M. Patterson, ONP, POB-2, Sequoyah (Attn: E. L. Booker)

Principally Prepared By: Robert L. Phillips and Terry R. Woods, extension 6946

DOCKETED
USNRC

August 12, 2008 (11:00am)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF



HC7017.01

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of Energy Nuclear Vermont Yankee LLC

Docket No. 50-271 Official Exhibit No. NEC-JH-70

OFFERED by: Applicant/Licensee Intervenor NEC

NRC Staff Other _____

IDENTIFIED on 7/21/08 Witness/Panel Hopenfeld

Action Taken: ADMITTED REJECTED WITHDRAWN

Reported Clerk MAC

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

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DS-03

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 - PRELIMINARY REPORT ON CONDENSATE-FEEDWATER PIPING INSPECTION - SUSPECTED EROSION-CORROSION AREAS

- References:
1. D. W. Wilson's memorandum to H. L. Abrcrombie dated December 19, 1986, "Sequoyah Nuclear Plant Units 1 and 2 - Inspection of Feedwater Piping for Wall Loss" (B25 861219 001)
 2. Report by P. Berge and F. Khan, of Electricite de France, dated May 1982, "Corrosion Erosion of Steels In High Temperature Water and Wet Steam"
 3. EPRI NP 3944 report, "Erosion/Corrosion in Nuclear Plant Steam Piping; Causes and Inspection Program Guidelines"

Background

On December 9, 1986, Surry Station Nuclear Plant had a pipe rupture on the condensate-feedwater system that caused several fatalities. The rupture was caused by localized wall thinning at a pipe-to-elbow weld. The thinning mechanism was identified as erosion-corrosion (EC). Sequoyah Nuclear Plant (SQN) implemented a program to identify possible EC damage (see reference 1). The program was developed from technical information from Surry Station, INPO network, regional and resident NRC inspectors, and information from references 2 and 3. EC is characterized by dissolution of protective magnetite film by a high temperature liquid stream in contact with steel surfaces. EC damage is normally found in elbows on the extrados (outer radius); however, it may also be seen on the intrados (inner radius). The phenomenon is usually observed in plain carbon and low alloyed steels at elevated temperatures. The following are factors influencing the EC mechanisms:

- pH and water and/or steam chemistry
- Material composition
- Flow path geometry
- Velocity
- Temperature

(^aO₂ concentration) ?

Incorporating the above factors and experience from Surry Station, a temperature boundary of 300 to 400 degrees Fahrenheit was established for initial inspection. These areas were considered to have the highest probability of damage. The locations inspected are identified in figures 1, 2, and 3.

~~Surry and SQN both used ASTM A106 Grade B piping and fittings on the feedwater system.~~ The plants also had similar operating parameters at the time of failure (i.e., water chemistry). The piping that failed had

Conclusions and Recommendations

The test data and inspection results indicated that EC damage had not occurred in the areas examined. The selected areas were identified as the highest probability areas. However, there may be other thinning mechanisms occurring, i.e., cavitation. The lowest readings were found on the discharge side of the feedwater pump on 24- by 16-inch reducing elbows. None of these readings were below the design minimum wall thickness specified by DNE. The elbows further downstream of the A and B pumps will be examined and included in the final report. The piping upstream of the pump is acceptable but should be monitored by an SI each refueling outage. Feedwater pH should be optimized to the highest pH attainable to minimize the potential for EC damage throughout the balance of the plant carbon steel system.

RLP:HC
1/26/87
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