VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

W. L. STEWART
VICE PRESIDENT
NUCLEAR OPERATIONS

March 24, 1988

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 88-068
NO/RCB:jmj
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
RESPONSE TO NRC BULLETIN 88-02
RAPIDLY PROPAGATING FATIGUE CRACKS
IN STEAM GENERATOR TUBES

NRC Compliance Bulletin 88-02 dated February 5, 1988 requested holders of operating licenses for Westinghouse - designed nuclear power reactors with steam generators having carbon steel support plates to implement certain actions to minimize the potential for a steam generator tube rupture event caused by a rapidly propagating fatigue crack such as occurred at North Anna Unit 1 on July 15, 1987. Our response to this bulletin for North Anna Units 1 and 2 follows.

NORTH ANNA UNIT 1

By our letter of July 29, 1987 (Serial No. 87-474), we submitted our initial report of the steam generator tube rupture at North Anna Unit 1. On September 15, 1987, we submitted Revision 1 to this report (Serial No. 87-474A). Attached to this letter is Revision 2, which describes the current status of the Unit 1 steam generators and delineates those measures which have been taken to assure continued safe operation of the plant. In September of 1987, Westinghouse published WCAP-11601, "North Anna Unit 1 Steam Generator Tube Rupture and Remedial Actions Technical Evaluation." The following responses to the "Actions Requested" section of NRC Bulletin 88-02 refer to applicable Chapters of Revision 2 or to applicable sections of WCAP-11601.

A. Steam Generator Inspection Data Review

See Revision 2, Chapter VI.A, "North Anna Steam Generator Operating Experience."

B. Plants With No Denting

Not applicable; denting is present.

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C. Plants With Denting

1. An enhanced primary-to-secondary leak rate monitoring program has been implemented. See Revision 2, Chapter VII.C, "Improved Monitoring of Primary-to-Secondary Leakage." Chapter VI.C.4, "Establishment of Primary-to-Secondary Leak Limit," provides the rationale which was used to derive the leak limit. Appropriate allowances for instrument errors were considered.

   Chapter VII.C also describes the leakage measurement and trending methods, time intervals between measurements, and alarms and alarm setpoints. Administrative procedures are in place which govern actions on receipt of alarms and which provide guidance for reducing power or requiring plant shutdown. These procedures also specify action statements and compensatory measures to be taken in the event of out of service radiation monitors. The Standing Order which governs these actions was reviewed by the NRC prior to start up following the tube rupture event. (See NRC letter dated October 9, 1987 which confirms our commitment to follow these procedures). A license amendment request incorporating these measures into Technical Specifications was submitted on December 4, 1987 and is under review by the NRC at this time.

2. Long term corrective actions including preventive plugging of potentially susceptible tubes (mechanical plugs on the hot leg side, sentinel plugs on the cold leg side), installation of downcomer flow resistance plates to reduce stability ratios, and an enhanced leak rate monitoring program have been implemented. See Revision 2, Chapter VI.C.2, "Corrective Mechanism and Corrective Actions Summary."

   a. A detailed analysis was performed to determine the tube stability ratios. This analysis is described in Section 4.2 of the Westinghouse WCAP-11601.

   b. An assessment of the depth of penetration of each AVB was performed. See Section 4.2.4 of WCAP-11601.

NORTH ANNA UNIT 2

During the Unit 2 refueling outage following the Unit 1 Steam Generator Tube Rupture Event, Virginia Electric and Power Company performed a series of steam generator tube fatigue evaluations. Attached to this letter is a report entitled "North Anna 2 Steam Generator Evaluation and Remedial Actions Report," which describes the actions taken during this outage. The following responses to the "Actions Requested" section of NRC Bulletin 88-02 refer to applicable sections of this report.

A. Steam Generator Inspection Data Review

See Section 3.1, "Tube Denting"

B. Plants With No Denting

Not applicable; denting is present.

C. Plants With Denting

1. The Unit 2 primary-to-secondary leak rate monitoring program, leakage measurement and trending methods, time intervals between measurements, and alarm and alarm setpoints are identical to those described for Unit 1. The Standing Order governing Unit 1 actions also applies to Unit 2, as will the license amendment when it has been approved.

2. The long term corrective actions implemented for Unit 1 have also been implemented in Unit 2.

    a. Vibration analysis. See Section 4.0, "Unit 2 Vibration Analysis."

    b. Assessment of the depth of penetration of each AVB. See Section 3.2, "Identification of AVBs from Eddy Current Testing," Section 3.3, "0, 1, or 2 AVB Present Eddy Current Calls," and Section 5.0, "AVB Mapping and Supported Tubes." Also, see Section 6.0, "Corrective Actions."

Very truly yours,

W. L. Stewart

Attachments

cc: U. S. Nuclear Regulatory Commission
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Mr. J. L. Caldwell
NRC Senior Resident Inspector
North Anna Power Station

COMMONWEALTH OF VIRGINIA)
)
CITY OF RICHMOND)

The foregoing document was acknowledged before me, in and for the City and Commonwealth aforesaid, today by W. L. Stewart who is Vice President - Nuclear Operations, of Virginia Electric and Power Company. He is duly authorized to execute and file the aforegoing document in behalf of that Company, and the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 24 day of March, 1988.

My Commission expires: February 10, 1989.

Carol McMore
Notary Public

(SEAL)