March 26, 2001

Mr. David A. Christian
Senior Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

SUBJECT: NORTH ANNA POWER STATION UNIT 2 RE: ASME SECTION XI INSERVICE INSPECTION (ISI) PROGRAM RELIEF REQUEST NDE-46 (TAC NO. MB0750)

Dear Mr. Christian:

This letter authorizes the use of an alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a) for North Anna Power Station, Unit 2.

By letter dated December 14, 2000, Virginia Electric and Power Company (VEPCO) proposed relief request NDE-46 to authorize the use of an alternative to perform examinations on the welds of the Chemical and Volume Control System regenerative heat exchangers in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI.

Our evaluation and conclusion are contained in the enclosed Safety Evaluation. The staff has concluded that complying with the requirements of Section XI of the ASME Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. In addition, your proposed alternative requirements provide reasonable assurance of structural integrity. The alternative you requested is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the second 10-year ISI interval.

The staff has completed its evaluation of this request; therefore, we are closing TAC No. MB0750.

Sincerely,

/RA/

Maitri Banerjee, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-339

Enclosure: As stated

cc w/encl: See next page

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Virginia Electric and Power Company

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF NDE-46

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

NORTH ANNA POWER STATION, UNIT 2

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-339

1.0 INTRODUCTION

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for the North Anna Power Station, Unit 2, second 10-year ISI interval is the 1986 Edition of the ASME B&PV Code.

The staff has reviewed the information concerning the second 10-year ISI program request for relief NDE-46 for North Anna Power Station, Unit 2, described in Virginia Electric and Power Company (VEPCO's) letter dated December 14, 2000. VEPCO has requested relief, pursuant to 10 CFR 50.55a(a)(3)(ii), from ASME Section XI Code examination requirements associated with the regenerative heat exchanger.

2.0 EVALUATION

The information provided by the licensee in support of the request for relief from Code requirements has been evaluated and the basis for disposition is documented below.

2.1 Code Requirement

The 1986 ASME Code, Section XI, Table IWB-2500-1 Examination Categories B-B, B-D, B-H, and B-J, require that volumetric and/or surface examinations be performed, and Table IWC-2500-1, Examination Category C-A requires that volumetric examinations be performed.

2.2 Licensee's Code Relief Request

Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee proposed an alternative to the Code-required volumetric and/or surface examinations for the welds associated with the regenerative heat exchanger (2-CH-E-3), identified below:

(Drawing 12050-WMKS-CH-E-3)

Welds/Components	Description	Code Item#	Class
8	tubesheet-to-head	B2.60	1
10	tubesheet-to-head	B2.60	1
12	tubesheet-to-head	B2.60	1
2	circumferential head	B2.51	1
4	circumferential head	B2.51	1
6	circumferential head	B2.51	1
13	nozzle-to-vessel	B3.150	1
14	nozzle-to-vessel	B3.150	1
15	nozzle-to-vessel	B3.150	1
16	nozzle-to-vessel	B3.150	1
17	nozzle-to-vessel	B3.150	1
18	nozzle-to-vessel	B3.150	1
13NIR	nozzle inside radius	B3.160	1
14NIR	nozzle inside radius	B3.160	1
15NIR	nozzle inside radius	B3.160	1
16NIR	nozzle inside radius	B3.160	1
17NIR	nozzle inside radius	B3.160	1
18NIR	nozzle inside radius	B3.160	1
19	terminal end weld	B9.21	1
20	terminal end weld	B9.21	1
21	terminal end weld	B9.21	1
22	terminal end weld	B9.21	1
WS-1	welded attachment	B8.40	1
WS-2	welded attachment	B8.40	1
WS-3	welded attachment	B8.40	1
1	circumferential head	C1.20	2
3	circumferential head	C1.20	2
5	circumferential head	C1.20	2
7	tubesheet-to-shell	C1.30	2
9	tubesheet-to-shell	C1.30	2
11	tubesheet-to-shell	C1.30	2

(Drawing 12050-WMKS-0111 ST)

Welds/Components	Description	Code Item#	Class
1A	terminal end weld	B9.21	1

(Drawing 12050-WMKS-0111Z)

Welds/Components	Description	Code Item#	Class
46	terminal end weld	B9.21	1

2.3 Licensee's Basis for Requesting Relief:

Background

The regenerative heat exchanger (2-CH-E-3) provides preheat for the normal charging water going into the reactor coolant system (RCS). The preheat is derived from normal letdown water coming from the RCS. Charging and letdown constitute the normal chemical and volume control within the RCS. The heat exchanger itself is actually three heat exchangers or sub-vessels in series, interconnected with piping. See Figure NDE-46-1, attached.

Each heat exchanger has an outside shell diameter of 9.55 inches. The shells were manufactured with ASTM A351 CF8 type material. The heads were manufactured with ASTM A240 TP304 material. The 3-inch nozzle necks were manufactured with ASTM A182 F304 material. The entire regenerative heat exchanger was originally classified ASME Class 2 for ISI activities. Therefore, examinations were limited to one of the heat exchangers as allowed by the Code for multiple vessels of similar design and function (Table IWB-2500-1, Category B-B, Note (1) and Table IWC-2500-1, Category C-A, Note (3)). Refer to Figure NDE-46-1. However, a reanalysis changed the classification of the letdown side of the heat exchanger to ASME Class 1. This action significantly increased the examination requirements associated with the regenerative heat exchanger. Nozzles, which were previously exempt under Class 2 requirements, are now required to be examined. Additionally, all Class 1 nozzles are required to be examined, and the examinations are not limited to one heat exchanger.

The purpose of this request is to eliminate the examinations on the entire regenerative heat exchanger, including the terminal ends.

Geometric Restrictions

The nozzle-to-vessel welds and nozzle inside radius sections for this vessel were not designed for ultrasonic examination from the outside diameter of the vessel. The small diameter of the vessel and nozzles along with the cast stainless steel vessel shell prevents a meaningful ultrasonic examination of these components.

The Code-required volumetric examination on the vessel head circumferential welds is limited due to the weld crown, radius of the closure caps, and the nozzles. The Code-required volumetric examination of the tube sheet welds is limited by the weld crown and is obstructed by a support clamp. This clamp must be mechanically removed prior to the welds' examination.

Additionally, Weld 12 is partially obscured by the three integral attachments, which are themselves butted up against a clamp. It is estimated that between 21 and 42 percent of the circumferential welds could be examined, and 42 percent of the tube sheet welds could be examined, if the clamps are removed. Examination coverage of Weld 12 would be significantly less due to the integral attachment location. Previous partial examinations completed on these welds have identified no problems.

Dose Considerations

A dose evaluation has been conducted on each activity associated with the examinations for the entire regenerative heat exchanger. Table NDE-46-1, which is attached, gives dose expected from these activities. It is estimated that more than 11.68 man-rem will be required to complete these examinations over the interval. This estimate assumes optimum inspection and preparation times. If difficulties are encountered, a corresponding increase in dose would be expected. Shielding is not considered practical since the source of radiation is the component receiving the examinations.

Restricting the examinations to just the lower regenerative heat exchanger still results in a significant dose. Table NDE-46-2, which is attached, shows that the expected total dose for the examinations is 5.15 man-rem. Again, if difficulties are encountered, a corresponding increase in dose would be expected.

Licensee's Conclusion

If the Code-required examinations were performed, the geometric restrictions would severely limit the amount of meaningful information concerning the condition of the heat exchanger. Therefore, the exposure to significant radiation dose would result in a hardship without a compensating increase in the level of quality and safety. The licensee proposed the use of alternatives (described below), to the Code-required examinations on the regenerative heat exchanger, in accordance with the provisions of 10 CFR 50.55a(a)(3)(ii).

It should be noted that a similar relief request was submitted for the Joseph M. Farley Nuclear Plant that requested elimination of the Code-required examinations for the regenerative heat exchanger. The relief request was based on geometric restrictions and the hardship associated with a radiation dose of 2500 mrem, which is lower than the expected dose of 5150 mrem for the North Anna lower regenerative heat exchanger alone (see Table NDE-46-2). The relief request was granted by letter from the NRC dated November 16, 1998 (TAC No. MA3449).

2.4 Licensee's Proposed Alternative Examination:

Technical Specifications (TS) require that the RCS leak rate be limited to 1 gallon per minute unidentified leakage. This value is calculated periodically in accordance with TS requirements. Additionally, the containment atmosphere particulate radioactivity is monitored periodically per TS requirements. As a result, new leakage is rapidly identified and located during operation. Leakage identified from these components can be easily isolated by two upstream valves with manual operation from within the control room. The valves also receive an automatic control signal to close on inventory loss based on pressurizer level. However, these valves could not be used as the Class 1 boundary valves due to their non-safety-related actuation.

Correspondingly, as a result of the reclassification to Class 1, the regenerative heat exchanger components receive a system leakage test prior to startup after each refueling outage. During this system leakage test, the components receive a visual (VT-2) examination. The integral attachments receive a visual (VT-3) examination without insulation removal.

3.0 STAFF EVALUATION

The Code requires 100-percent volumetric and/or surface examination of the subject Class 1 and 2 regenerative heat exchanger welds noted in Section 2.2 above. However, examination of these items is restricted due to extreme radiological conditions and component geometric configuration. The licensee proposed to eliminate the examinations on the entire regenerative heat exchanger including the terminal ends, and, instead, to rely on RCS leakage detection systems and the associated TS allowable leakage limits to assure system integrity.

The heat exchanger is fabricated from materials that restrict ultrasonic examination. Radiation doses are estimated to be 5150 mrem in order to complete the Code-required examinations of the subject components. Furthermore, only between 21-42 percent of the required examinations of the circumferential welds and 42 percent of the tube-sheet-welds could be completed if the examinations were to be performed. Considering the requirement of 10 CFR 20.1101 that occupational radiation exposure be as low as reasonably achievable, as applied to the performance of these examinations, and the limited access to the subject welds, imposition of the Code requirements would result in hardship on the licensee. In addition, the inlet and outlet piping to this heat exchanger are exempt from Code volumetric and surface examination requirements, based on size (3-inch nominal pipe size). Therefore, a compensating increase in the level of quality and safety would not be provided by requiring the licensee to examine the heat exchanger, yet allowing it to exclude the connecting piping. The VT-2 visual examinations for evidence of leakage to be performed during the system leakage test prior to start up after each refueling outage and the VT-3 visual examination that the integral attachments receive, provide reasonable assurance of structural integrity of the regenerative heat exchanger.

4.0 CONCLUSION

The staff concludes that for Request for Relief NDE-46, imposition of the Code requirements on the licensee would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that VEPCO's proposed alternative provides reasonable assurance of structural integrity of the regenerative heat exchanger. Therefore, VEPCO's proposed alternative is authorized pursuant to 10 CFR 50.55a(3)(ii) for the second 10-year ISI interval.

Principal Contributor: T. McLellan

Date: March 26, 2001