VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 8, 2000

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

Serial No. 00-218
NL&OS/ETS
Docket No. 50-339
License No. NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 2
ASME SECTION XI INSERVICE INSPECTION PROGRAM
RELIEF REQUEST NDE-018

North Anna Power Station Unit 2 is presently in the second ten-year Inservice Inspection Interval and examinations are conducted in accordance with the requirements of 1986 Edition of ASME Section XI. In accordance with ASME Section XI, the welds on the regenerative heat exchangers in the Chemical and Volume Control System require examination. These examinations have been determined to be a hardship without a compensating increase in safety based on the following: the geometry of the welds precludes full coverage and radiation dose required to perform these examinations is excessive. Furthermore, a review of the failure modes for the regenerative heat exchanger indicates that failure of the heat exchanger does not contribute to any quantifiable increase in risk.

Therefore, pursuant to 10 CFR 50.55a (a)(3)(ii), relief is requested from certain ASME Section XI Code examination requirements associated with the regenerative heat exchanger. Relief request NDE-018 is attached and provides the bases for the relief request. A similar ASME Code relief request was requested by Joseph M. Farley Nuclear Plant and granted by the NRC in a letter dated November 16, 1998.

This relief request has been approved by the Station Nuclear Safety and Operating Committee. If you have questions concerning these requests, please contact us.

Very truly yours,

W R Matthews

William R. Matthews
Vice President - Nuclear Operations

Attachment

Commitments made in this letter: None

A047

cc: U. S. Nuclear Regulatory Commission
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Attachment

Relief Requests NDE-018

Virginia Electric and Power Company
North Anna Power Station Unit 2

RELIEF REQUEST NDE-18

I. IDENTIFICATION OF COMPONENTS

System: Chemical and Volume Control (CH)
Component: Regenerative Heat Exchanger (2-CH-E-3)
Connecting Circumferential Piping Welds

(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

Welds/ Components	Description	Code Item#	Class
(Drawing 12050-WMKS-0111ST)			
1A	terminal end weld	B9.21	1
(Drawing 12050-WMKS-0111Z)			
46	terminal end weld	B9.21	1

II. IMPRACTICAL CODE REQUIREMENTS

Examination Categories B-B, B-D (Inspection Program B), B-H, B-J, and C-A require that volumetric and surface examinations be performed as indicated by the Code item numbers above.

III. BASIS FOR 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. Refer to Figure NDE-18-1. This fact was identified previously in our request to limit examinations 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)).

The 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 classified ASME Class 2 for inservice inspection activities. 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 this 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.

This relief request was originally submitted by letter Serial No. 93-018, dated February 16, 1993. The relief was granted ("provided that the lower regenerative heat exchanger receives the Code-required examinations to the extent possible") by letter dated August 7, 1995, and its associated safety evaluation report. The request was revised to add four of six terminal end piping-to-vessel welds which are required to be selected for examination under Category B-J note 1(a) under item B9.21. Limiting the examinations to one of three vessels as described above does not apply to terminal end piping welds. Therefore, all six terminal end welds, two per heat exchanger, are subject to Code examinations. The revised relief request was granted with conditions by NRC letter dated 10/01/96 (Letter No. 96-525). The conditions state that the relief was granted provided that the lower heat exchanger (including the two terminal ends) receives the Code required examinations to the extent possible. The purpose of this revised relief request is to eliminate the examinations on the lower regenerative heat exchanger, including the two terminal ends, and to maintain the relief from performing examinations on the upper two heat exchangers.

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.

Risk Informed Assessment

The regenerative heat exchangers are not included in the Probabilistic Risk Assessment (PRA) because the heat exchangers function only as part of the charging and letdown functions, which are isolated during most accident situations. However, as part of an evaluation of accident situations other then those considered in the PRA, risk informed inservice inspection (RI-ISI) calculations were performed for Surry Unit 1 to determine the risk impact if the pipe segments connected to the regenerative heat exchanger were to fail. A catastrophic failure of the heat exchanger would have the same impact as a pipe segment failure. The piping and heat exchanger configurations for North Anna are similar to Surry.

A review of the Surry Unit 1 RI-ISI calculations shows that there is no increase over the base risk (core damage frequency or large early release frequency) for a complete failure of the connecting pipe segments and by analogy for the failure of the regenerative heat exchanger. Based on this review it was determined that the regenerative heat exchanger is not risk significant. Because of similarities in design between Surry and North Anna, it can be concluded that the North Anna regenerative heat exchanger is not risk significant.

Dose Considerations

A dose evaluation has been conducted on each activity associated with the examinations for the entire regenerative heat exchanger. Table NDE-1 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-18-2 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.

Conclusion

Considering the examination limitations due to geometry restrictions, the low safety significance of the heat exchangers, and the exposure to significant radiation dose, imposition of the required examinations on the lower heat exchanger results in a hardship without a compensating increase in the level of quality and safety.

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 8270 mrem for the North Anna lower regenerative heat exchanger. The relief request was granted by letter from the NRC dated November 16, 1998 (TAC NO. MA3449).

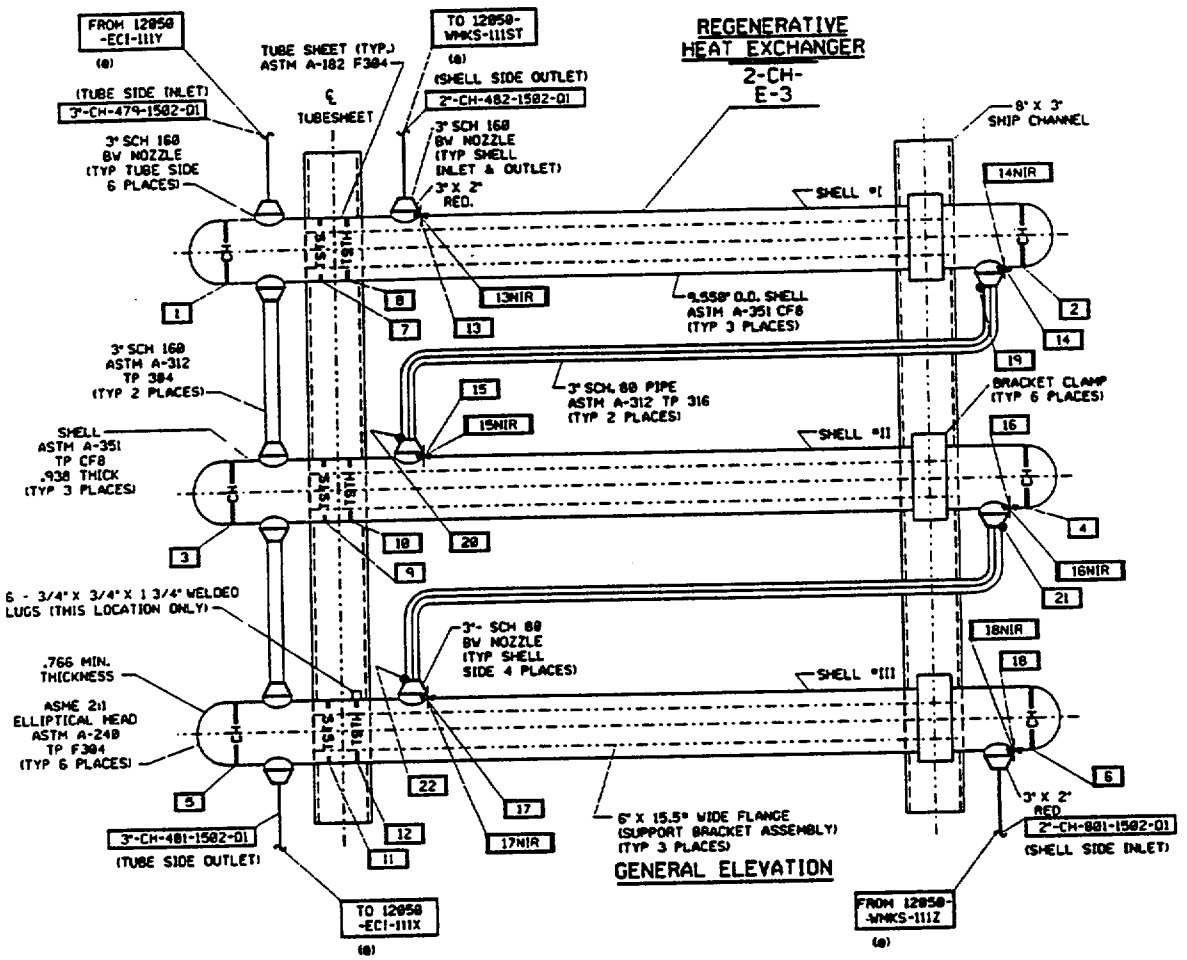
IV. ALTERNATE REQUIREMENTS

Technical Specifications require that the RCS Leak Rate be limited to 1 gallon per minute unidentified leakage. This value is calculated every 72 hours in accordance with Technical Specification requirements. Additionally, the containment atmosphere particulate radioactivity is monitored every 12 hours per Technical Specification 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 are not Class 1 boundary valves due to their nonsafety-related actuation.

As a result of the reclassification to Class 1, the regenerative heat exchanger components receive a system leakage test prior to start up after each refueling outage. During this system leakage test the components receive a visual (VT-2) examination. The support structures receive a visual (VT-3) examination to the extent required by the Code without insulation removal.

V. STATUS

Pending



REGENERATIVE HEAT EXCHANGER (2-CH-E-3)

FIGURE NDE-1

TABLE NDE-18-1
NORTH ANNA UNIT 2
REGENERATIVE HEAT EXCHANGER
2-CH-E-3 EXAMINATIONS
MAN-REM ESTIMATE FOR THE ENTIRE HEAT EXCHANGER

Work Task	Man-Hours (hrs)	Dose Rate (R/hr)	Man-Rem
Insulation Remove/Install	5.3	0.50	2.650
Scaffolding Install/Remove	2.0	0.30	0.600
Clamp Remove/Install	2.0	0.85	1.700
Weld Prep.	1.25	0.85	1.063
HP Coverage	6.25	0.02	0.125
Nozzle-to-Vessel Inspection (UT) (Welds 13, 14, 15, 16, 17 and 18)	3.0	0.70	2.100
Nozzle Inside Radius Inspection (UT) (Welds 13NIR, 14NIR, 15NIR, 16NIR, 17NIR and 18NIR)	2.25	0.85	1.913
Circumferential Head Inspection (UT) (Class 1 Welds 2, 4 and 6, and Class 2 Welds 1, 3 and 5)	0.75	0.30	0.225
Tube Sheet to Head Inspection (UT) (Welds 8, 10 and 12)	0.54	0.50	0.270
Tube Sheet to Shell Inspection (UT) (Welds 7, 9 and 11)	0.54	0.85	0.459
Welded Attachment Inspection (PT) (Welds WS-1, 2 and 3)	0.5	0.70	0.350
Terminal End Inspection (PT) (Welds 1A, 19, 20, 21, 22 and 46)	0.75	0.30	0.225
		Total Estimate =	**11.68**

TABLE NDE-18-2
NORTH ANNA UNIT 2
REGENERATIVE HEAT EXCHANGER
2-CH-E-3 EXAMINATIONS
MAN-REM ESTIMATE FOR THE LOWER HEAT EXCHANGER

Work Task	Man-Hours (hrs)	Dose Rate (R/hr)	Man-Rem
Insulation Remove/Install	1.8	0.50	0.900
Scaffolding Install/Remove	0.0	0.30	0.00
Clamp Remove/Install	2.0	0.85	1.700
Weld Prep.	0.5	0.85	0.425
HP Coverage	2.0	0.02	0.040
Nozzle-to-Vessel Inspection (UT) (Welds 17 and 18)	1.0	0.70	0.700
Nozzle Inside Radius Inspection (UT) (Welds 17NIR and 18NIR)	0.75	0.85	0.638
Circumferential Head Inspection (UT) (Class 1 Weld 6, and Class 2 Weld 5)	0.25	0.30	0.075
Tube Sheet to Head Inspection (UT) (Weld 12)	0.18	0.50	0.090
Tube Sheet to Shell Inspection (UT) (Weld 11)	0.18	0.85	0.153
Welded Attachment Inspection (PT) (Welds WS-1, 2 and 3)	0.5	0.70	0.350
Terminal End Inspection (PT) (Welds 22 and 46)	0.25	0.30	0.075
		Total Estimate =	**5.15**