

February 12, 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-47 (TAC NO. MB0964)

Dear Mr. Christian:

This letter grants the relief you requested for NDE-47 for North Anna Power Station, Unit 2.

By letter dated January 12, 2001, Virginia Electric and Power Company (VEPCO) proposed relief request NDE-47 to obtain relief from performing examinations on the pressurizer surge line nozzle-to-vessel weld and pressurizer nozzle inner radius welds in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI. VEPCO had indicated these required examinations were a hardship without a compensating increase in safety based on the expected radiation dose to be received when performing such examinations.

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 leakage integrity. Your request to use relief request NDE-47 is authorized pursuant to Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3)(ii) for the second 10-year ISI program.

The staff has completed its evaluation of this request; therefore, we are closing TAC No. MB0964.

Sincerely,

***/RA M. Banerjee Acting for:/***

Richard L. Emch, Jr., 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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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF NDE-47

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 performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(a)(3) proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g), and (h) may be used, when authorized by the NRC, if (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 and subject to Commission approval. 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, Section XI.

2.0 EVALUATION

The staff has reviewed the information concerning the second 10-year ISI program request for relief NDE-47 for North Anna, Unit 2, described in Virginia Electric and Power Company's (VEPCO's) letter dated January 12, 2001.

2.1 Request for Relief No. NDE-47

2.2 Code Requirement

The 1986 Edition of the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D (full penetration welded nozzles in vessels), Items B3.110 and B3.120, require 100-percent volumetric examination during each 10-year ISI interval for all nozzle-to-vessel welds as well as the nozzle inside radius section as defined by Figure IWB-2500-7.

### 2.3 Licensee's Proposed Relief Request

Pursuant to 10 CFR 50.55a(a)(3)(ii), VEPCO requested relief from ASME Code-required volumetric examination of pressurizer (2-RC-E-2) nozzle-to-vessel weld 9 and nozzle inner radius section 9NIR. VEPCO requested that relief be granted for the inservice examination to be performed during the second 10-year ISI interval.

### 2.4 Licensee's Basis for Relief Request

Access to the North Anna Unit 2 pressurizer surge line nozzle is obstructed by multi-layered, stainless steel mirror insulation and the cables for the pressurizer heaters. Removal of the insulation and cables would be difficult as well as labor and time intensive. It is also likely that cable or heater pin damage would occur during removal. In addition it is possible that the impingement shield would have to be removed to gain access to the examination area.

It is almost certain that some, and possibly all, heater cables would have to be disconnected so that the cables can be pulled back to allow access for removing insulation and doing the exam. The exact scope of work to gain access cannot be fully determined until the unit is shutdown for the next refueling outage. Dose rates are predicted using a step approach to build the total projected exposure. There are four options possible. The worst case option assumes that all 78 heater cables have to be disconnected and pulled back. These cables have brazed connections that will be time consuming to remove and replace following the exam. This option carries a dose estimate of 56 rem. If the outer ring of heaters can be left intact during the examination (disconnect/reconnect 46 heaters), then the dose estimate is 35.2 rem. If only the first ring of heaters has to be dealt with (20 heaters), then the dose estimate is 18.3 rem. For the highly unlikely scenario of not having to disconnect any heater cables, the dose estimate is 5.3 rem. Separately, if the impingement shield has to be removed, then an additional 5.8 rem must be added to all these totals. It should be noted that the amount of heater cable work expected is likely to have a significant impact on overall outage manning requirements to accommodate the anticipated high dose.

Other personnel safety concerns potentially involved in this examination include the increased risk for an unplanned exposure event and prevention of contamination with personnel wedged between the surge line and the exposed portion of the pressurizer heaters. While actions would be taken to prevent any such events, the large dose rate gradients in the under-pressurizer area would challenge even the protection afforded by the best available technology. Temporary shielding is considered impractical in this regard because placement of the shielding material would obstruct and potentially preclude accessibility to the examination surface. Other issues include actual accessibility after removal of all interferences and the likelihood of difficulties in replacing the insulation to its original configuration. Furthermore, the amount of examination coverage would be dependent on the overall accessibility obtained.

In conjunction with license renewal, Westinghouse has performed an evaluation to address the impact of operational transients for North Anna Unit 2, to account for insurge/outsurge transients in addition to design transients in the pressurizer lower head. The results of the evaluation show that the Cumulative Usage Factor (CUF), after service equivalent to 60 years of operation for the lower head to nozzle weld is [as shown in the following table.]

PRESSURIZER EVALUATIONS	CUMULATIVE USAGE FACTOR
Lower head to nozzle weld inside surface	0.32
Lower head to nozzle weld outside surface	0.07
Nozzle inner radius, inside surface	0.17
Nozzle inner radius, outside surface	0.09

These CUFs are considerably less than the design limit of 1.0 and are lower in magnitude than other locations on the pressurizer that are currently being inspected. For instance, the spray nozzle to safe-end weld has a CUF of 0.848 and the 6" safety and relief nozzle inside radius welds have a CUF of 0.148.

There are several uncertainties regarding an alternative examination of the inside surface of the pressurizer surge line area. An inspection may be able to be performed in which a boroscope could be fed through the manway and down through the middle of the pressurizer. Adding to the difficulty in performing such an exam, there is a screen device on the outlet of the surge line inner radius to control in-surge to the pressurizer. The boroscope would be positioned through the support plates, and then threaded through a screen inlet orifice, if possible, to the pressurizer surge line area. This examination could be partially obscured by the thermal sleeve. Furthermore, the resulting examination would only be of the cladding that covers the inside radius of the nozzle, which is considered to be only marginally beneficial in determining the structural integrity of the nozzle. Additionally, performing the visual inspection requires opening the reactor coolant system and establishing access and foreign material exclusion controls. The boroscope itself has the potential to become lodged inside the inlet screen device or behind a pressurizer heater support plate. This inspection effort

and the significant potential risk associated with it are not commensurate with the limited benefit that may be obtained by the inspection itself.

As such, we are also applying for relief per 10 CFR 50.55a(a)(3)(ii) due to the fact that compliance with the specified requirements would result in hardship or unusual

difficulties without a compensating increase in the level of quality and safety. A similar relief for North Anna Power Station Unit 1 was granted for use during the second interval by NRC Letter No. 92-255 dated 4/7/92, and during the third interval by NRC Letter No. 00-240 dated 4/25/00. Similar relief was also granted for Surry Power Station Unit 1, Letter No. 95-404, dated 7/19/95, Surry Power Station Unit 2 Letter No. 95-480, dated 8/30/95, Byron Station dated 12/30/98, and Beaver Valley dated 10/8/97.

## 2.5 Licensee's Proposed Alternative Examination

A visual (VT-2) examination of the pressurizer surge line nozzle-to-vessel weld will be performed during the normally scheduled system leakage test [, during] each refueling[,] and will provide continued assurance of component integrity. In addition:

1. Technical Specifications require that the Reactor Coolant System Leak Rate be limited to one gallon per minute unidentified leakage. This value is calculated at least once per 72 hours; and
2. The containment atmosphere particulate radioactivity is checked every 12 hours.

The proposed alternatives stated above will ensure that the overall level of plant quality and safety will not be compromised.

## 2.6 Staff Evaluation

The staff has reviewed the information concerning the ISI Program Request for Relief NDE-47 for the second 10-year ISI interval of North Anna, Unit 2, with regard to the inspection of the pressurizer surge nozzle-to-vessel welds and pressurizer surge nozzle inside radius section. ASME Code Section XI requires a 100-percent volumetric examination of these areas during each inspection interval. As stated by VEPCO, the pressurizer surge line nozzle is obstructed by insulation and pressurizer heater cables. To gain access for the examination, these items would have to be removed. Depending upon the amount of heater cables removed, the radiation dose was estimated to vary from 18.3 rem to 56 rem. In addition to removal of the insulation and heater cables, the impingement shield could also require removal. This would add an additional 5.8 rem to the exposure totals above. Removal of the heater cables could result in damage to the heater or cable pins. The use of temporary shielding would obstruct accessibility to the examined areas. VEPCO discussed the uncertainties of conducting an alternate examination of the inside surface of the pressurizer surge line area. A screen orifice located on the outlet of the surge line inner radius would interfere with the insertion of a boroscope. In addition, the location of the thermal sleeve would partially obstruct the examination if the boroscope was able to penetrate past the screen. The resulting examination would only be of the cladding that covers the inside radius of the surge nozzle.

This would be of a marginal benefit in determining the structural integrity of this nozzle. Therefore, the staff has determined that compliance with the ASME Code Section XI would result in hardship or unusual difficulty for VEPCO without a compensating increase in the level of quality and safety.

VEPCO proposed an alternative in its request for relief to perform visual (VT-2) examination of the pressurizer surge line nozzle-to-vessel weld during the normally scheduled system leakage test during each refueling. In addition, per Technical Specification Surveillance Requirement 4.4.6.2.1, the reactor coolant leakage is monitored using a water inventory balance and a containment atmosphere particulate radioactivity check. The proposed alternative will provide reasonable assurance that reactor coolant leakage, if it occurred in the surge line welds, would be detected early. Therefore, the staff has determined this proposed alternative has provided reasonable assurance of leakage integrity of the subject component.

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, VEPCO's proposed alternative has provided reasonable assurance of leakage integrity. VEPCO's request to use relief request NDE-47 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the second 10-year ISI program.

Principal Contributor: S. Monarque

Date: February 12, 2001