VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

January 26, 1996

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 95-605A
NL&OS/ETS
Docket No. 50-338
License No. NPF-4

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 1
REACTOR VESSEL HEAD PENETRATIONS
SUPPLEMENTAL INFORMATION FOR
USE OF AN ALTERNATIVE REPAIR TECHNIQUE

On November 22, 1995, Virginia Electric and Power Company submitted a plan for inspection of the North Anna Unit 1 reactor vessel head penetration tubes during the February 1996 refueling outage. In addition, pursuant to 10 CFR 50.55a(a)(3) we requested relief from the ASME Code required repair technique, in the unlikely event that repairs would be necessary.

It had been our intent to have the vendor modify the existing inspection and repair tooling to permit inspection of additional rings of reactor vessel head penetration tubes, if flaws were identified. However, the vendor will be unable to modify the inspection and repair tooling in time to support the inspection effort during the upcoming February refueling outage. The existing inspection and repair tooling will not permit an expanded scope of reactor vessel head tubes as identified in the relief request. Therefore, a revised expanded inspection scope, should unacceptable flaws be identified, is included in the attachment to this letter.

The revised relief request has been approved by the Station Nuclear Safety and Operating Committee. If you have any questions concerning this request, please contact us.

Very truly yours,

James P. O'Hanlon

James P. O'Hanlon
Senior Vice President - Nuclear

Attachment

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cc: U.S. Nuclear Regulatory Commission
Region II
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Mr. R. D. McWhorter
NRC Senior Resident Inspector
North Anna Power Station

ALTERNATIVE TO CODE REQUIREMENTS

I. IDENTIFICATION OF COMPONENTS

Drawing - 11715-WMKS-RC-R-1.2 Class 1

Ring[1]	Penetration #	Description
Initial Sample Group		
13	62 - 69	4" control rod drive tube (sleeved)
12	58 - 61	4" control rod drive tube (sleeved)
11	51, 53, 55, 57	4" thermocouple tube (not sleeved)
	50, 52, 54, 56	4" control rod drive tube, spare (sleeved)
Expansion Groups[2]		
10	46 -49	4" control rod drive tube (sleeved)
9	38 - 45	4" control rod drive tube (sleeved)

[1]Ring number identifies the distance from the center of the reactor vessel head. The higher the ring number the greater the distance from center and a higher probability of finding a flaw.

[2]Expansion scope - If an unacceptable flaw is found in the initial sample group, then the next ring will be examined. Expansion will continue through ring 9. The inspection/repair tooling developed does not have the necessary vertical travel to inspect /repair the inner rings of control rod drive tubes.

II. IMPRACTICAL CODE REQUIREMENTS

The North Anna Unit 1 reactor vessel closure head penetrations are scheduled to be examined during the 1996 refueling outage, as shown above. The initial inspection scope will include the twenty penetrations in the outer three rings. The closure head penetration tube base material in the region of the attachment weld will be examined volumetrically using eddy current. Any identified flaws will be characterized by ultrasonics. There are no inservice acceptance standards established for this area since this examination is not required by ASME Section XI, 1983 Edition, Summer 1983 addenda. As allowed by subparagraph IWA-3100(b) "If acceptance standards for a particular component, Examination Category, or examination method are not specified in this Division, indications that exceed the acceptance standards for materials and welds specified in the Section III edition applicable to the construction of the component shall be evaluated to determine disposition. Such disposition shall be subject to review by the enforcement authority having jurisdiction at the plant site."

Acceptance criteria have been established by Westinghouse and reported in WCAP 14024, "Inspection Plan Guidelines for Industry/Plant Inspection of Reactor Vessel Closure Head Penetration Tubes." The acceptance criteria have been reviewed and accepted by the NRC[1,2], with comments. The NRC comments have been incorporated in WCAP 14024. Virginia Power and Westinghouse are developing repair techniques in the event repairs are required. The Code requires flaws exceeding the acceptance criteria to be removed or reduced to an acceptable size, as stated in subparagraph IWB-3112(c) "Components whose examination (IWB-2200) reveals flaw indications, other than the indications of (b) above, that exceed the standards of Table IWB-3410-1 shall be unacceptable for service unless such flaws are removed or repaired to the extent necessary to meet the allowable flaw indication standards prior to placement of the component in service."

Thermal sleeves are installed in 56 of the 65 reactor vessel head penetration tubes. Due to the penetration configuration and the available tooling, complete removal of flaws greater than 0.25 inches deep requires the removal of the thermal sleeve. Removal and reinstallation of the thermal sleeve is a very difficult process. Any removal and reinstallation method involves special tooling, a significant amount of remote machining/welding, radiation exposure, and uncertainty.

III. BASIS FOR ALTERNATIVE TO CODE REQUIREMENTS

An alternative to removing the thermal sleeve and totally removing the flaw is to partially remove the flaw and weld overlay to the original wall thickness. This technique is referred to as an "embedded flaw repair." This repair technique is described in the Westinghouse Annotated Letter and WCAP 13998 (attached), entitled "RV Closure Head Penetration Tube ID Weld Overlay Repair."

The weld overlay eliminates the exposure of the flaw to the reactor coolant environment, which stops further flaw growth and results in a subsurface flaw as defined by ASME Section XI, IWA-3320. Acceptance standards for flaws will be based on the NEI/NUMARC guidelines. The penetration tube is sufficiently stiff, and constrained by the vessel head, so the integrity of the tube will be maintained by the weld overlay regardless of the extent of the flaw.

The other advantages to this type of repair verses a Code repair is that this technique results in lower residual stress than a complete excavation with a full weld build up and a better surface for reinspection than a complete excavation and a partial weld build up. Therefore, it is also advantageous to use this technique for unsleeved penetrations. Additionally the development of analysis and tooling for a single versatile repair technique is preferred.

[1]USNRC Letter, W.T. Russell to Raisin, NUMARC, "Safety Evaluation for Potential Reactor Vessel Head Adapter Tube Cracking," November 19, 1993.

[2]USNRC Letter, A.G. Hansen to R.E. Link, "Acceptance Criteria for Control Rod Drive Mechanism Penetrations at Point Beach Nuclear Plant, Unit 1," March 9, 1994.

IV. ALTERNATIVE TO CODE REQUIREMENTS

The embedded flaw repair method, proposed and supported by the stated Westinghouse documentation, will be used as an alternative to the Code requirements if repairs are required, for axial flaws up to 75% through-wall in reactor vessel head penetration tubes. The flaw will be partially removed using electric discharge machining (EDM). The excavation will be based on the depth of the measured flaw and will range from 0.090 to 0.125 inches. A weld overlay will be performed to restore the tube wall thickness. The final weld will be examined volumetrically using eddy current and ultrasonics and surface examined using liquid penetrant. The reactor vessel head will be VT-2 examined without removing the insulation during startup at nominal operating pressure.