VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 26, 1992

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

Serial No. 92-566
NL&P/EJW
Docket No. 50-338
License No. NPF-4

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 1
ASME SECTION XI RELIEF REQUEST
TEMPORARY NON-CODE REPAIR TO A CLASS 3 COMPONENT

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested from certain ASME Section XI Code requirements associated with a temporary repair of an ASME Class 3 pipe. A pinhole steam leak has been identified on a three inch drain pipe associated with the North Anna Unit 1 Main Steam system. A welded Code repair has been determined to be impractical because the affected piping cannot be verified to be sufficiently isolated to effect a permanent Code repair. Performance of a permanent Code repair would require a plant shutdown.

A relief request from the requirements of ASME Section XI is hereby submitted for your approval to allow a temporary non-Code repair for this condition and prevent unnecessary cycling of facility systems and components that would be presently required to support a Code repair. An engineering evaluation concluded that the present pipe condition does not affect the operability of the plant. However, a temporary repair is considered to be prudent until a permanent welded repair in accordance with the ASME Code requirements can be properly effected during the next scheduled outage. The unit is currently scheduled for refueling starting January 2, 1993.

This relief request for North Anna Unit 1 has been reviewed and approved by the Station Nuclear Safety and Operating Committee.

Should you have any questions regarding this request, please contact us.

Very truly yours,

W. L. Stewart
Senior Vice President - Nuclear

Attachments

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cc: U.S. Nuclear Regulatory Commission
Region II
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Mr. M. S. Lesser
NRC Senior Resident Inspector
North Anna Power Station

Relief Request For Engineered Mechanical Clamp on Main Steam Line Drain Piping

1.0 Background/Basis of Relief

North Anna Unit 1 is currently performing power operations at 95% rated power. A through-wall pinhole leak exists on a three inch line, 3"-SHPD-5-601-Q3. This location is downstream of the Main Steam drain header and upstream of valve 1-MS-TV-109.

Main Steam trap isolation valves for traps T-5, T-7, and T-9, and the upstream traps for valves 1-MS-TV-111A and B for the steam-driven auxiliary feedwater pump have been closed and placed under administrative control. The isolation valves associated with the traps installed for the steam-driven feedwater pumps are opened twice per day for approximately 5 minutes to allow accumulated water drainage.

A Code repair was originally considered. However, the affected piping cannot be verified to be sufficiently isolated to effect a permanent Code repair. Since any internal leakage identified during an attempted Code repair would preclude a welded repair and thereby necessitate shutdown of the unit to facilitate a permanent Code repair, the proposed temporary non-Code repair is considered the only practical alternative. The present condition of the pipe does not affect the operability of the plant. A Unit shutdown would impose unnecessary cycling of facility systems and components, when considering the size and location of the leak.

2.0 Evaluation

2.1 Component Identification

The line in question, 3"-SHPD-5-601-Q3, is designated ASME Class 3 in the ASME Section XI Program. The leak is located downstream of the Main Steam drain header and upstream of valve 1-MS-TV-109.

2.2 Impractical Code Requirements

Article IWA-4000 and IWD-4000 of ASME Section XI, 1983 Edition, Summer 1983 Addendum, describes the Code repair requirements. A Code repair would require removal of the flaw and subsequent weld repair. This repair weld is also subject to post-repair nondestructive examination (NDE) and pressure testing. These activities are considered impractical to perform due to the potential isolation difficulties previously discussed. Additionally, any replacement in accordance with IWA-7000 and IWD-7000 would be precluded for the same reasons.

2.3 Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), relief is requested from the stated Code requirements. A temporary non-Code repair using an engineered mechanical clamp is proposed. This temporary repair would remain installed until a permanent Code repair is performed during the next scheduled outage. Currently, the next outage for North Anna Unit 1 is scheduled to commence on January 2, 1993.

2.4 Proposed Temporary Repair

2.4.1 Repair Design Considerations

The temporary repair is an engineered mechanical clamp, which is sealed with a liquid compound. The clamp is designed consistent with formulas and tables found in ASME Section VIII, Division 1, Spring 1989 Edition, specifically Table UCS-23, Table UW-12, UG-34 formulas 3 & 4, and UCS-56 to maintain the pressure integrity of the steam drain line. This clamp is designed for operating conditions of 1205 psi pressure and 545° F temperature. The design addresses the through-wall leak and takes into account the strength of the adjoining pipe to transfer load due to deadweight, thermal, operational basis earthquake (OBE), and design basis earthquake (DBE) conditions.

2.4.2 Piping Design Analysis

The affected piping system, including the pinhole leak section of the steam drain line 3"-SHPD-5-601-Q3, has been verified acceptable based on an analysis from anchor to anchor in its current degraded state. The NDE results of the affected sections of this piping were factored into this analysis.

Analysis of the piping system indicated that one pipe support anchor was overloaded independent of the proposed mechanical clamp. A spring hanger is being added to the system to relieve the overstress condition.

The proposed configuration has been analyzed for pressure, deadweight, thermal expansion, OBE and DBE loadings. The results of the analysis indicate that the stresses in the piping system are within the allowable limits stipulated in the original piping Construction Code (ANSI B31.7, 1969, with addenda up to Winter 1970), except in the specific area of the pinhole leak which is within the area of the proposed clamp. The two pipe supports in the region of the repair were evaluated and found to

be acceptable consistent with the design basis requirements as referenced in the North Anna UFSAR Chapter 3.

2.4.3 Flaw Analysis

Nondestructive examinations were conducted within the general area of the leak. However, it was not possible to perform precise flaw characterization or wall thinning measurements at the exact leak location due to operating conditions. As an alternative, a conservatively large through-wall flaw was postulated at the leak location. In order to assess the ability of the section to transfer loads without catastrophic failure, the postulated flaw was based upon an application of the limited NDE data obtained and previous experience with wall thinning. An analysis was performed of the pipe section with the postulated flaw subjected to a resultant moment and an axial force due to pressure, deadweight, thermal, and design basis earthquake loading. This evaluation determined that the pipe section, with the clamp installed, will not result in a double ended rupture when subjected to the specified loading. There is a margin of at least 2.2 against a catastrophic failure. This analysis concluded that the piping will remain intact at the location of the clamp. It is concluded that jet impingement or pipe whip which could adversely affect adjacent structures or systems is no concern with this proposed configuration.

In summary, the proposed repair will not adversely affect the structural integrity of the piping system and its supports during normal operating and seismic conditions.

2.5 Root Cause

The leak appears to be the result of erosion wall thinning. Local wall thickness examinations conducted near the leak area show evidence of other thinning and supports this conclusion.

2.6 System Interactions

A walkdown of the general area has been performed to determine the consequences of pipe failure at the leak location to the surrounding area. It has been determined that the impact of flooding, pipe whip, jet impingement, or the spraying of water and/or steam on adjacent systems would be minimal. Engineering assessment has determined that a catastrophic pipe failure will not occur in the present condition. Additionally, safety related equipment in the area has been qualified to operate in a steam environment.

2.7 Augmented Inspections

An analysis of the line has been subsequently performed using the EPRI CHECMATE computer program. This analysis confirmed that the area around the pinhole leak should have the highest wear rates of this piping. As noted above, limited ultrasonic thickness examinations were performed around the pinhole leak to estimate the actual area of wall thinning. Information taken from this examination was used in determining the size of the proposed mechanical clamp. Additional ultrasonic thickness examinations were performed at two locations on the elbow just upstream of the leak and on one location just downstream of the affected elbow. One of the locations, an elbow downstream, was confirmed by the CHECMATE program as having the next highest wear rate. This component, as well as the two others, all met or exceeded design wall thickness requirements.

3.0 Operational Considerations

Operations personnel open the system isolation valves 1-MS-TV-111A and B once per twelve hour shift for the steam-driven auxiliary feedwater pump. Operators have also been directed to enter this area on a more frequent basis to monitor the condition of the pipe and the affected system. Following installation of the mechanical clamp, visual verification of the adequacy of the repair would be reduced to weekly. The additional operational activities would be required as a result of the proposed repair when the isolated portions would be returned to normal service.

4.0 Conclusion

It is our opinion that the proposed temporary repair provides adequate pressure boundary integrity, which will be verified weekly by visual inspection. Although the present condition of the pipe does not affect the operability of the plant and a permanent repair is not practical until the next scheduled outage, a temporary repair is considered prudent during the interim.