March 17, 2000

Mr. J. P. O'Hanlon
Senior Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

SUBJECT: SURRY POWER STATION UNITS 1 AND 2 - ASME SECTION XI RELIEF REQUEST RELATED TO TEMPORARY REPAIRS ON "D" COMPONENT COOLING HEAT EXCHANGER SERVICE WATER DISCHARGE PIPING (TAC NOS. MA6932 AND MA6933)

Dear Mr. O'Hanlon:

The purpose of this letter is to grant the relief you requested for Surry, Units 1 and 2, to allow a temporary non-Code repair on a section of component cooling heat exchanger discharge piping.
In your letter dated October 22, 1999, you stated that a throughwall leak was discovered on a 30-inch component cooling heat exchanger discharge pipe associated with the service water system common to Surry, Units 1 and 2. You requested relief, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(6)(i), from certain American Society of Mechanical Engineers (ASME) Section XI Code requirements associated with a temporary repair of an ASME Class 3 pipe, including the requirement for a weld repair of the pipe.

Based on our evaluation of your relief request, we conclude that performance of an immediate Code repair would constitute an undue burden (create a hardship) upon you because the repair would necessitate the shutdown of Unit 1 resulting in an unnecessary transient. Your proposed alternative provides an acceptable level of quality and safety and is, therefore, authorized pursuant to 10 CFR 50.55a(a)(3)(ii). The staff's evaluation and conclusions are contained in the Enclosure.

The staff has completed its evaluation of this matter and we are, therefore, closing TAC Nos. MA6932 and MA6933.

Sincerely,

/RA/
Richard L. Emch, Jr., Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

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 RELATED TO TEMPORARY REPAIR OF FLAWS IN

ASME CODE CLASS 3 SERVICE WATER SYSTEM PIPING

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-280 AND 50-281

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) requires nuclear power facility piping and components to meet the applicable requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code). Section XI of the Code specifies Code-acceptable repair methods for flaws that exceed Code acceptance limits in piping that is in service. A Code repair is required to restore the structural integrity of flawed Code piping, independent of the operational mode of the plant when the flaw is detected. Those repairs not in compliance with Section XI of the Code are non-Code repairs. However, the implementation of required Code (weld) repairs to ASME Code Class 1, 2 or 3 systems is often impractical for nuclear licensees since the repairs normally require an isolation of the system requiring the repair, and often a shutdown of the nuclear power plant.

Alternatives to Code requirements may be used by nuclear licensees when authorized by the NRC if the proposed alternatives to the requirements are such that they are shown to provide an acceptable level of quality and safety in lieu of the Code requirements [10 CFR 50.55a(a)(3)(i)], or if compliance with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety [10 CFR 50.55a(a)(3)(ii)].

Licensees may also submit requests for relief from certain Code requirements when they have determined that conformance with certain Code requirements is impractical for their facility [10 CFR 50.55a(g)(5)(iii)]. Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations of impracticality and may grant relief and may impose alternative requirements as it determines is authorized by law.

Enclosure

Generic Letter (GL) 90-05, entitled "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping," dated June 15, 1990, provides guidance for performing temporary non-code repairs of ASME Class 1, 2, and 3 piping. Specifically for Code Class 1 and 2 piping, licensees are required to perform Code repairs or request NRC to grant relief for temporary repairs on a case-by-case basis regardless of pipe size.

For Class 3 piping, licensees can perform temporary non-Code repairs as long as they follow the guidance included in GL 90-05. Licensee are required to document the repair by requesting the NRC to grant a relief for temporary non-Code repairs of Class 3 piping. The staff uses the guidance of GL 90-05 as its criteria for making its safety evaluation of relief requests for temporary non-Code repairs of Code Class 3 piping.

2.0 BACKGROUND

On October 22, 1999, Virginia Electric and Power Company (hereafter referred to as the licensee) submitted to the NRC a relief request to perform a temporary repair on service water piping at its Surry Power Station, Units 1 and 2. The temporary repair was requested because a throughwall leak was identified on the 30-inch component cooling heat exchanger (CCHX) service water discharge pipe, 30"-WS-41-10. The leak is downstream of the "D" CCHX (1-CC-E-11D) discharge isolation valve 1-SW-27 on a pipe that ties into the common 42-inch discharge header. The location of the leak is immediately (approximately 2 inches) above the turbine building concrete floor, which the 30-inch line penetrates. The licensee stated that performing a permanent Code weld repair at this time is considered impractical because: 1) the affected piping cannot be isolated from the common service water discharge header; 2) the Unit 1 service water discharge tunnel would have to be de-watered to conduct repairs; 3) a plant modification is required to install a temporary service water discharge jumper; and 4) Unit 1 would have to be shut down, resulting in an unnecessary plant transient. The licensee has concluded that with the temporary non-Code repair in place, the present condition of the pipe does not affect the operability of the service water system, and the discharge pipe continues to perform its design function.

3.0 LICENSEE'S RELIEF REQUEST

3.1 Component for Which Relief is Requested

Line 30"-WS-41-10 service water discharge pipe. The line in question, 30"-WS-41-10, is designated ASME Class 3 in the ASME Section XI program. The leak is located downstream of valve 1-SW-27, which is the service water discharge of the 1-CC-E-1D component cooling heat exchanger. The service water system is a moderate energy system with a maximum operating temperature of 110 degrees Fahrenheit and a maximum operating pressure of 20 psig.

The pipe material is carbon steel-welded construction with a nominal thickness of 0.5 inch. The inside of the pipe is coated with coal tar epoxy, and an anti-sweating coating called Erote is applied on the outside of the pipe.

3.2 Section XI Edition for Surry

The 1989 Edition of the ASME Code, Section XI, applies to Surry, Units 1 and 2.

3.3 ASME Section XI Code Requirement

The ASME Code Section XI requires that repairs or replacements of ASME Code Class components be performed in accordance with rules found in Articles IWA-4000 or IWA-7000, respectively. The intent of these rules serve to provide an acceptable means of restoring the structural integrity of a degraded Code class system back to the original design requirements.

3.4 Content of the Relief Request

In accordance with 10 CFR 50.55a(g)(6)(i) and the provisions of GL 90-05, relief is requested from the requirements of Article IWA-4000 or IWA-7000 of the ASME Code, Section XI. A temporary non-Code repair using soft patch material has been installed. The temporary repair, either the soft patch or a more substantial temporary non-Code repair, will remain in place until a permanent Code repair is performed. A separate relief request will be submitted for the installation of a more substantial temporary non-Code repair.

3.5 Basis for Relief

Request for relief has been submitted and alternatives to the Code requirements have been proposed by the licensee. The NRC staff reviewed the proposed alternatives for compliance with the provisions of 10 CFR 50.55a(a)(3)(ii). The licensee has evaluated the flaw in accordance with the guidance provided in GL 90-05. Based upon the evaluation, it was established that the discovered flaw satisfies the criteria for non-Code repair as described in GL 90-05. Performing permanent repair in accordance with the ASME Code would have constituted an undue burden (created undue hardship) upon the licensee since the repair would have necessitated a Unit 1 shutdown, resulting in an unnecessary plant transient. The licensee has analyzed the flaw in accordance with the guidance provided in GL 90-05, and the results of the structural analysis indicated that the piping is acceptable for non-Code repair as permitted by GL 90-05.

3.6 Licensee's Alternative Program

The licensee has performed a temporary repair on the leaking pipe. The temporary repair consisted of installing a rubber gasket patch material with a 1/8-inch steel backing plate, 4 inches in width and 8 inches in length (circumferential direction) over the leaking pipe. Two steel bands approximately ½-inch in width and 1/32-inch thick, similar to hose clamps, were used to hold the patch in place. The temporary repair is designed to minimize leakage from the hole in the pipe. The licensee has analyzed the patch and determined that the patch will remain in place and prevent excessive leakage during all normal modes of operation and during a design basis earthquake event.

4.0 STAFF EVALUATION AND CONCLUSIONS

4.1 Operability Determination, Root Cause Analysis and Structural Integrity Evaluation

The licensee determined that one location on the service water system had a "throughwall flaw" and the flaw was analyzed in accordance with the position stated in GL 90-05. The licensee evaluated the structural integrity of the flawed piping and found that the flaw can be temporarily repaired as permitted by GL 90-05. The piping was repaired by applying a rubber gasket patch over the flawed area held in place by steel bands. In addition, the discharge piping on the remaining three component cooling heat exchangers, the inlet piping on the "C" and "D" CCHXs, and the discharge piping of emergency service water pumps "B" and "C" were analyzed by taking ultrasonic testing (UT) thickness readings. The readings indicated that the pipe thickness is above the minimum Code-allowable pipe thickness. The actual flaw was analyzed based on the throughwall flaw approach provided in GL 90-05. The flaw measured 3 inches in circumferential length and 1.25 inches in the axial direction. Based on UT thickness readings in the area, a representative wall thickness of 0.106 inches around the flaw was used in the analysis. The flaw was evaluated by three different analyses. The results of these analyses provided the following conclusions:

1) The limit load analysis showed adequate margin against net section plasticity; therefore, a ductile rupture would not occur.

2) The fracture mechanics analysis proved a failure by brittle fracture was highly unlikely.

3) The area reinforcement analysis showed adequate base metal exists around the flaw to prevent possible failure due to ductile tearing.

With respect to these three failure modes, the licensee concluded that the flaw would not preclude the service water pipe from performing its intended function, and structural integrity would be maintained.

The licensee performed a root cause analysis to determine the cause of the throughwall flaw. Upon completion of the investigation of the exterior pipe condition and an examination of the inside of the pipe through the flaw, it was concluded that the throughwall flaw originated from the inner diameter and proceeded to the outer diameter. The failure mechanism for the flaw was general corrosion caused by failure of the internal coal tar epoxy coating. Although exterior corrosion is occurring due to moisture being trapped behind the Erote coating, the exterior corrosion was not a major contributor to the throughwall failure. The general wall thinning/corrosion seen on the "D" CCHX discharge piping is believed to have resulted from failure of the coal tar epoxy. The coal tar epoxy coating in these discharge lines is the original coating application.

4.2 Augmented Inspection

The licensee performed augmented ultrasonic examinations on the service water system in similar locations in order to assess the overall degradation of the service water system. Those locations included: the discharge piping on the remaining three component cooling heat

exchangers, the inlet piping on the "C" and "D" CCHXs, and the discharge piping of emergency service water pumps "B" and "C." The following minimum thickness readings were measured:

"A" CCHX Discharge piping, 30-WS-17-10, 0.500 in.
"B" CCHX Discharge piping, 30-WS-18-10, 0.418 in.
"C" CCHX Discharge piping, 30-WS-19-10, 0.439 in.
"C" CCHX Inlet piping, 30-WS-16-10, 0.326 in.
"D" CCHX Inlet piping, 30-WS-40-10, 0.524 in.
1-SW-P-1 B Discharge piping, 24-WS-39-10, 0.287 in.
1-SW-P-1C Discharge piping, 24-WS-52-10, 0.281 in.

The nominal wall thickness of the above piping is 0.5 inch. The minimum allowable wall thickness was determined for each pipeline considering stresses in all loading conditions, including seismic. This value was determined to be 0.1 inch for all lines inspected. Thus, the lines will remain within the allowable Code limits provided the wall thickness remains greater than 0.1 inch.

4.3 Proposed Temporary Non-code Repair and Monitoring Provisions

Upon discovery of the leak, the pipe was declared inoperable, the "D" CCHX was removed from service, and a flood watch was established in the immediate vicinity. Once the structural integrity of the pipe had been evaluated, and a temporary patch that was qualified for a design basis earthquake event had been installed, no immediate concern existed for surrounding equipment, piping and components. The flood watch was suspended.

Weekly visual inspections are being performed, and quarterly UT pipe wall thickness readings will be performed at the flaw area to detect potential further degradation. Flow through the "D" CCHX may be restricted, if necessary, by throttling the inlet and outlet valves 1-SW-25 and 1-SW-27, respectively.

4.4 Staff Conclusions

The staff has determined that the licensee's flaw evaluation has been consistent with the guidelines and acceptance criteria of GL 90-05. Therefore, the staff finds the licensee's structural integrity and operability assessments to be acceptable.

Furthermore, the staff finds that performance of an immediate Code repair would have constituted an undue burden (created undue hardship) upon the licensee since the repair would have necessitated the shutdown of Unit 1, resulting in an unnecessary transient. Therefore, shutting down the Unit to perform a Code repair is not in the best interest of plant safety, given the magnitude of the flaw and the licensee's alternative program. Therefore, the staff concludes that the licensee's alternative program is acceptable and in accordance with 10 CFR 50.55a(a)(3)(ii).

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Date: March 17, 2000

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