VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

May 20, 2005

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

Serial No. 05-327
NL&OS/GDM R0
Docket No. 50-281
License No. DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNIT 2
ASME SECTION XI INSERVICE INSPECTION (ISI) RELIEF REQUEST
MAIN STEAM LINE BRANCH CONNECTION WELDOLETS

In a letter dated May 18, 2005 (Serial No. 05-324), Virginia Electric and Power Company (Dominion) requested NRC approval to use a later edition and addenda to the ASME Section XI Code for specific repair/replacement activities at Surry Power Station. The request was made pursuant to 10 CFR 50.55a(g)(4)(iv) and the guidance provided in Regulatory Issue Summary (RIS) 2004-16. The request was associated with ASME Class 2 branch connections consisting of three 6-inch diameter (1-inch thick) weldolets attached to the 30-inch main steam line on each of three Unit 2 main steam lines and the difficulty associated with performing Code required radiography on the weldolets. During a conference call on May 19, 2005, the NRC identified that they were unable to approve Dominion's request as submitted. Specifically, a relief request would be required to propose an alternative to the requirement to perform radiography for the three main steam line weldolets. Consequently, a relief request has been prepared to propose an alternative to the ASME Code examination requirements for these components.

Surry Power Station Unit 2 is currently in the fourth ten-year Inservice Inspection (ISI) Interval and uses the 1998 Edition of the ASME Section XI Code through the 2000 Addenda. Pursuant to 10 CFR 50.55a(a)(3)(ii), Dominion requests relief from the ASME Section III radiography requirement for the components identified in the relief, and NRC approval to use a proposed alternative since compliance with the specified Code requirements would result in unusual difficulty without a compensating increase in the level of quality and safety. Relief Request SPT-008 is provided in the attachment and provides the basis for this request. The relief request has been approved by the Station Nuclear Safety and Operating Committee.

Dominion requests expeditious approval of the attached relief request to permit startup of Surry Unit 2 from Cold Shutdown conditions related to the current refueling outage. This letter supercedes our May 18, 2005 letter in its entirety.

A047

If you have any questions or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Very truly yours,

D. A. Christian
Senior Vice President – Nuclear Operations
and Chief Nuclear Officer

Commitments made in this letter:

1. Dominion will include one of the three welds in an Augmented Inspection Plan and perform a surface and best effort volumetric examination once per period for the next three periods.

cc: U. S. Nuclear Regulatory Commission
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Relief Request SPT-008 (Unit 2)
Surry Power Station Fourth Ten Year Interval

Alternative Ultrasonic Examination Method in Lieu of the Radiography Required by ASME Section III

I. Identification of Components

System: Main Steam

Components: Class 2 Weldolet on 6-inch Main Steam Trip Valve Bypass

Surry Component	Drawing	Weld Number
30"-SHP-101-601/ 6"-SHP-145-601	11548-WMKS-103A2-1	2-01BC
30"-SHP-102-601/ 6"-SHP-146-601	11548-WMKS-103A2-2	2-01BC
30"-SHP-103-601/ 6"-SHP-147-601	11548-WMKS-103A2-3	2-01BC

II. Applicable Code Edition and Addenda

Unit 2: Fourth 10-Year Interval/1998 Edition, 2000 Addenda

III. Code Requirement

IWA-4540 (2)(a) states "The nondestructive examination methodology and acceptance criteria of the 1992 Edition or later of Section III shall be met prior to return to service."

IV. Basis for Relief

The system hydrostatic test required by IWA-4540 (a)(1) is not practical as no isolation exists between the subject components and the steam generators. The alternative to the system hydrostatic test permitted by IWA-4540 (a)(2) requires that the nondestructive examination methodology and acceptance criteria of the 1992 Edition of ASME III be used. ASME III requires radiographic examination be performed on the welds. Radiographic examination would result in unusual difficulty without a compensating increase in the level of quality and safety. Radiography of the three weldolets would require approximately 48 exposures for each weld and installation of gamma ports into the 30-inch piping to facilitate the radiography process. Furthermore, a double wall radiography is not feasible with the weldolet configuration, and even with the large number of exposures, 100% coverage would not be attained.

V. Proposed Alternative

Surry proposes that in lieu of performing a radiography examination that the following be performed:

1) A surface examination was performed and was acceptable on the root pass, mid pass and final pass of the three subject welds. This is beyond the Owner's Specifications that require only a final surface examination.

2) An ultrasonic examination to the maximum extent achievable was performed on the welds. The welds were examined to meet the requirements of ASME Section III, and Section V methodologies with acceptance criteria to ASME, Section III Division I, NC-5330 Ultrasonics Acceptance Standards. In addition the procedures and examiners were qualified in accordance with ASME Section XI, Appendix VIII, Supplement 3, and the recording and acceptance criteria of ASME Section XI were also utilized.

   The welds were examined to the maximum extent possible from four scan directions with 45° and 60° angles. Coverage was limited in all four directions due to the joint configuration resulting in a combined coverage for the 45° transducer of 48% with coverage of the weld root in only one direction. For the 60° scans, the combined total of 58.7% coverage was attained, and the root was examined from one direction. Please see attached sketches.

   For scans searching for circumferentially oriented flaws with the 45° transducer, coverage of 5.3% was achieved in one direction and 84% coverage was achieved in the other direction. For scans searching for circumferentially oriented flaws with the 60° transducer, coverage of 41% was achieved in one direction and 91% coverage was achieved in the other direction. Coverage of the root and lower 1/3 of the weld was excellent for both the 45° and 60° transducers from one direction. For scans searching for axially oriented flaws, coverage was 51.3% with both the 45° and 60° transducers in both directions and was predominantly in the upper 1/2 of the weld.

   No flaw type reflectors were identified during the examinations and all three nozzles were reported as acceptable.

3) A system leakage test will be performed in accordance with IWA-5000.

4) These welds are Category C-F-2 Item C5.81 in ASME Section XI Table IWC-2500-1 and require a surface examination if selected for the ISI

Inspection Program. Dominion will include one of the three welds in an Augmented Inspection Plan and perform a surface and best effort volumetric examination once per period for the next three periods.

Dominion believes that the requirement to perform radiographic examination of the welds presents an unusual difficulty based on the reasons cited above and provides no compensating increase in quality or safety. The proposed alternative provides an acceptable level of quality and safety. Therefore, Dominion requests relief from the ASME Section III radiography requirement in accordance with 10 CFR50.55a(a)(3)(ii).

VI. Justification for Relief

The 6-inch main steam trip valve bypass lines were replaced during the Surry Unit 2 2005 refueling outage. Due to susceptible wall thinning detected by Dominion's Flow Accelerated Corrosion (FAC) program, the lines were replaced with a heavier schedule pipe. The subject welds were reworked to support this pipe replacement.

Under IWA-4540 any ASME Section XI repair/replacement activity that involves welding requires either 1) a system hydrostatic test or 2) a system leakage test along with all nondestructive examination requirements of the 1992 or later Edition of Section III and all Owner's Requirements prior to return to service.

The original Construction Code for Surry Power Station Unit 2 is the 1967 Edition of ANSI B31.1. Section III requires a radiography examination of these welds; however, neither the original Construction Code nor present Owner's specifications would require radiography.

The following discussion explains the processes used to make the welds and discusses anticipated weld quality:

The welding procedure selected for making the welds (Technique 508 Rev. H) used 3/32-inch and 1/8-inch diameter SFA5.28 ER80S-B2 GTAW filler metal for the root and hot pass and 3/32-inch and 1/8-inch diameter SFA 5.5 E8018-B2 SMAW electrodes for the remainder of the weld. A 400°F welding preheat and 750°F maximum interpass temperature was used for all welding. Minimum weld preheat was maintained continuously using resistance heating blankets until the start of the required post-weld heat treatment (PWHT). PWHT consisted of a 1300-1340°F soak for one hour minimum. Low hydrogen welding controls were employed. Electrodes were stored at the job site next to the welder in portable rod ovens maintained between 250°F and 350°F. The nominal wall thickness at the weld-o-let groove weld end preparation was approximately 1-inch. The weld deposit thickness inclusive of the excess groove weld reinforcement and reinforcing fillet varied between approximately 1.2-1.5 inches around the circumference of the weld joint. Please see attached photograph. All welding was accomplished in the horizontal position using stringer beads. The deposit thickness for the GTAW root and hot pass was approximately 1/8-inch. For the remaining SMAW process fill beads, the bead thickness was approximately 1/8-inch for each pass.

Relative to the anticipated weld quality using the above parameters, the low hydrogen controls on filler metal, 400°F preheat, and continuous preheat maintenance leading directly into PWHT ensures that hydrogen assisted cracking cannot occur. Welding using stringer beads produces the smallest possible weld puddle, which reduces the risk of incomplete fusion fabrication defects usually caused by carrying too large a weld puddle. Stringer beads additionally reduce the risk for trapped slag. Also, weld heat inputs per pass are lower than for weave beads and the greater number of beads may give a more uniform tempered metallurgical structure to the weld deposit. Final PWHT ensures that the resulting weld will have a microstructure free from untempered martensite. The principle flaws that might be reasonably postulated will be circumferential in nature. These flaws would be expected to be either incomplete fusion or trapped slag. The maximum through thickness dimension of a fabrication flaw occurring while welding would be associated with the weld deposit thickness per pass (approximately 1/8-inch). The larger number of weld beads needed to fill the groove when using stringer beads decreases the risk that postulated flaws through thickness would become larger aligned interbead flaws. The probable location for large aligned postulated flaws to occur is at the base metal fusion lines. Since MT inspection was performed on the root pass, at mid thickness, and final weld surfaces, the maximum through thickness flaw resulting from postulated aligned lack of fusion (LOF) or slag inclusions would be less than 1/2-inch measured from the root surface outward to just below the midwall MT surface. Similarly, the maximum through thickness flaw resulting from postulated aligned LOF or slag inclusions measured from the midwall thickness MT surface to the face of the reinforcing fillet weld would be under 1/2-inch to 1-inch. It would be unreasonable to expect that a through wall construction flaw would exist. Flaws of the magnitude described above are extremely unlikely to occur. The ultrasonic examination described herein did not identify any locations where cracks, LOF, or appreciable slag deposits occurred.

The weld quality for these welds was expected to be very good. The welds have been demonstrated to be sound. Satisfactory visual exams were achieved. Satisfactory MT exams at the root pass, mid thickness, and final were achieved. The UT exam of the accessible volume was satisfactory. The critical flaw sizes described below are much larger than what could be reasonably expected based on the examination results and welding processes utilized. A satisfactory system leakage test will be achieved. The welds will provide acceptable levels of quality and safety.

The following discussion further demonstrates that the proposed alternative provides an acceptable level of safety and quality.

The weld location was evaluated with a through wall flaw and with a flaw depth equal to half the wall thickness. These flaws were subjected separately to

Operation Basis Earthquake (OBE) and Design Basis Earthquake (DBE) loadings in addition to pressure, dead weight and thermal expansion loadings.

A234 WP22 Chrome Moly with E8018 welding material was used in the evaluation.

Allowable Stress Intensity Factor (K_{IC}) of 260,000 psi $(in)^{0.5}$ was used based upon Charpy V Notch (CVN) test data conducted at 450°F. This K_{IC} value was taken from the same material tested earlier.

Residual stress of 49,000 psi equal to the Yield Stress of the base metal was used in the analysis.

Linear elastic fracture mechanics analysis was performed. Results of the analysis show that a 5-inches long through wall flaw will remain stable in normal operating plus OBE condition with a Factor of Safety of 2.77 and in normal operating plus DBE condition with a Factor of Safety of 1.39.

A 5.75-inches long flaw with a depth equal to the half of the component wall thickness will remain stable in normal operating plus OBE condition with a Factor of Safety of 2.77 and in normal operating plus DBE condition with a Factor of Safety of 1.39.

A conservative limit load analysis was also performed for both kind of flaws with flow stress in the material equal to 36,000 psi (i.e., $2.4S_h$), and the results show there is significant margin against ductile rupture.

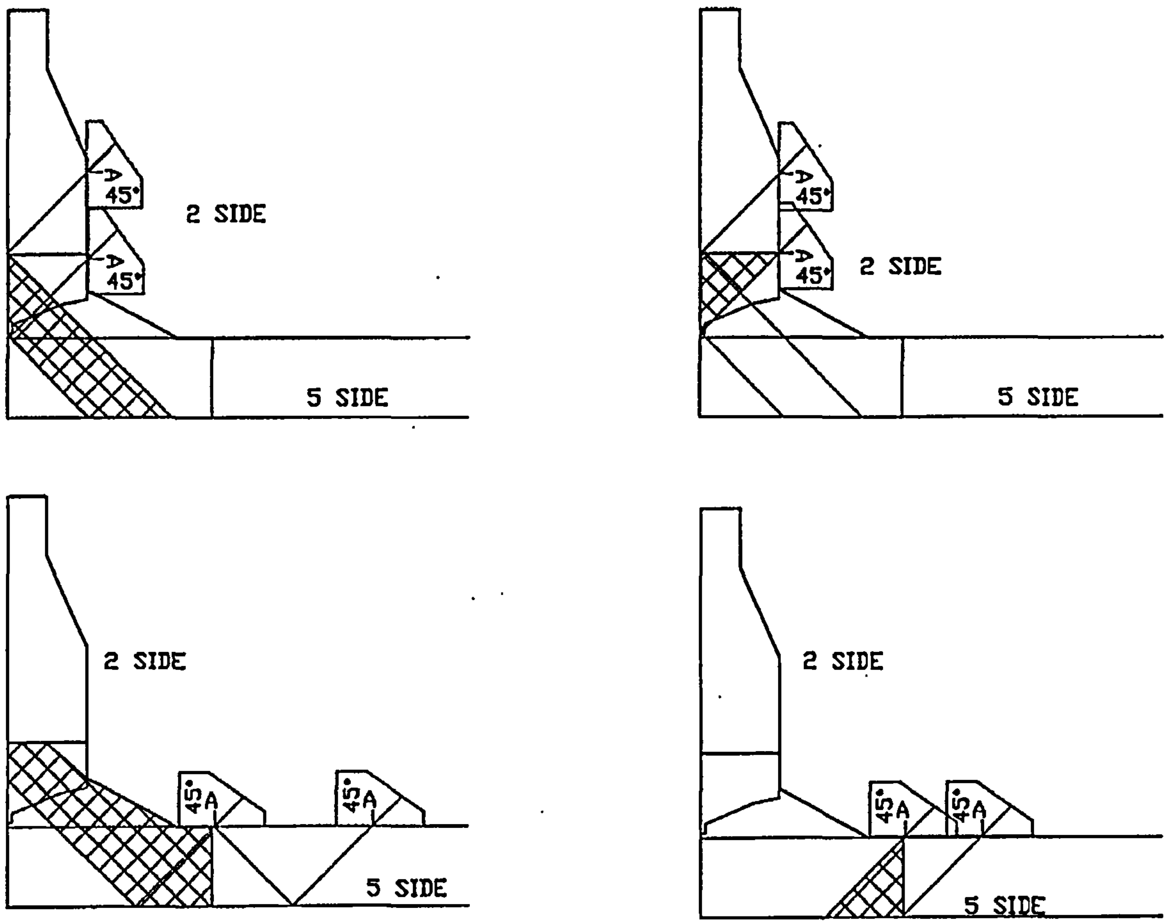
Based on the above results, it is concluded that any unidentified flaw during the current inspection will not affect the structural integrity of the piping.

VII. Duration of Proposed Alternative

This relief is necessary for the entirety of the Fourth ISI Interval for Surry Unit 2.

11548-WMKS-0103A2-1,2,3   2-01ABC

HATCHED AREA IS AREA EXAMINED FROM THE RESPECTIVE SCAN LEG

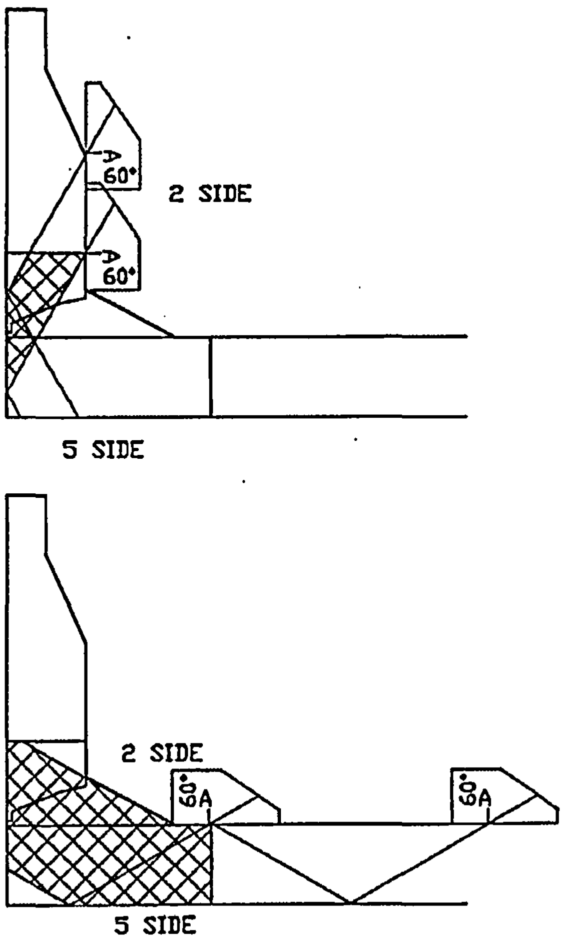


1/2 SCALE

45° FOR 6" MS BC

11548-WMKS-0103A2-1,2,3   2-01ABC

HATCHED AREA IS AREA EXAMINED FROM THE RESPECTIVE SCAN LEG



1/2 SCALE

60° FOR 6" MS BC