

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

October 1, 2007

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Serial No. 07-0652
NLOS /ETS R0'
Docket No. 50-338
License No. NPF-4

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNIT 1
RELIEF REQUEST CMP-022R1
REVISED NON-DESTRUCTIVE EXAMINATION REQUIREMENTS FOR THE 'A'
SAFETY VALVE PRESSURIZER NOZZLE USING WELD OVERLAY AS AN
ALTERNATIVE REPAIR TECHNIQUE

In a letter, dated January 3, 2007 (Serial No. 06-1007), as supplemented on March 13, 2007 (Serial No. 06-1007A), June 15, 2007 (Serial No. 07-0421), and July 25, 2007 (Serial No. 07-0421A), Dominion requested approval to use a proposed alternative to apply dissimilar metal weld overlays for repair/replacement activities associated with Alloy 600 materials. That request contained alternative requirements for the North Anna Units 1 and 2 Inservice Inspection (ISI) programs to perform full structural preemptive weld overlays (PWOLs) to mitigate the potential for primary water stress corrosion cracking (PWSCC) susceptibility for those pressurizer nozzles containing Alloy 600.

During the Unit 1 fall 2007 refueling outage, full structural mitigative PWOLs for the pressurizer safety, spray, relief, and surge nozzles were applied in accordance with Relief Request CMP-022R1. However, due to a previous fabrication repair on the 'A' safety valve pressurizer nozzle to safe end weld butter region, less than 100% volumetric examination coverage was obtained after application of the PWOL in accordance with Relief Request CMP-022R1. Therefore, this letter provides a revision to the non-destructive examination (NDE) requirements of the relief request for the Unit 1 'A' safety valve pressurizer nozzle PWOL. The revision provides the modified preservice and inservice examination requirements for the subject nozzle PWOL and the basis for the reduced examination volume. Please replace Sections 3(b) and (c) of Enclosure 1 to Attachment 2 of Dominion's March 13, 2007 letter with the revised paragraphs included in the attachment to complete the review of Relief Request CMP-022R1. Both the preservice examinations of these nozzle

welds and future inservice examinations in the current ISI interval will be completed in accordance with the revised NDE requirements of this relief.

If you have any questions regarding this submittal, please contact Mr. Thomas Shaub at (804) 273-2763.

Sincerely,



Gerald T. Bischof
Vice President – Nuclear Engineering

Attachment

Revised Sections 3(b) and (c) of the Enclosure to Attachment 2 of Dominion's March 13, 2007 (Serial No. 06-1007A) for CMP-022R1

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Mr. J. E. Reasor, Jr. (without attachment)
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, Virginia 23060

Mr. R. A. Jervey
NRC Project Manager – North Anna
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8G9A
Rockville, Maryland 20852

Mr. S. P. Lingam
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8-H12
Rockville, Maryland 20852

Mr. J. T. Reece
NRC Senior Resident Inspector
North Anna Power Station

Mr. M. M. Grace
Authorized Nuclear Insurance Inspector
North Anna Power Station

Serial No. 07-0652
Docket No. 50-338

ATTACHMENT

**REVISED SECTIONS 3(b) AND (c) OF THE ENCLOSURE TO ATTACHMENT 2
OF DOMINION'S MARCH 13, 2007 (SERIAL NO. 06-1007A) FOR CMP-022R1**

**NORTH ANNA POWER STATION UNIT 1
VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)**

(b) Preservice Inspection

- (1) The examination volume in Fig. 2 shall be ultrasonically examined. The angle beam shall be directed perpendicular and parallel to the piping axis, with scanning performed in four directions, to locate and size any flaws that might have propagated into the upper 25% of the base material or into the weld overlay.
- (2) The preservice examination acceptance standards of Table IWB-3514-2 shall be met for the weld overlay. In applying the acceptance standards, wall thickness, t_w , shall be the thickness of the weld overlay. Cracks in the outer 25% of the base metal shall meet the design analysis requirements of 2 (b).
- (3) The flaw evaluation rules of IWB-3640, IWC-3640 or, IWD-3640 shall not be applied to indications identified during preservice examination, which exceed the preservice examination standards of Table IWB-3514-2.
- (4) Due to a localized fabrication repair in the original dissimilar metal weld buttering region in 6-inch safe end-to-safety nozzle weld SW-31, and adjacent elbow-to-safe end weld number 17 (pipe identifier 6-RC-39-1502-Q1) in North Anna Unit 1, the examination is expected to result in less than the required volume in Figure 2, Preservice and Inservice Examination Volume. The calculated composite coverage of the required examination volume is 99.8%. The following provides the basis for the acceptability of the reduced examination coverage for this specific case:
 - (i) Due to a localized fabrication repair in the original dissimilar metal weld buttering region, the examination volume is extended 0.30" towards the nozzle taper for 114 degrees of the circumference of the weld. The 0.30" represents a conservative extension of the examination area based on the maximum width of the repair area in the center of the repair. The interface of the alloy 600 to low alloy steel which defines the examination boundary was confirmed by acid etching. The qualified ultrasonic examination procedure requires an examination of the volume to include an additional beam angle of 45 degrees to provide effective coverage of the outer 25% of the existing weld and base material for 1/2" on each side of the weld. This angle is required to provide coverage of 100% of this volume in four beam directions (two opposing axial and two opposing circumferential). In addition to the 100% examination coverage of the weld overlay volume, the outer 25% of the existing weld and base material volume can be effectively examined in three of the required four beam directions. The downstream axial beam direction is limited to 99.2% of the required examination volume due to the restriction of the nozzle taper. This does not allow access to scan the transducer the required distance from the weld to obtain coverage of the lower near corner of the examination volume. The limited examination volume is located at

least 0.25" from the alloy 600 buttering material and is effectively examined in the three other required beam directions. The calculated composite coverage of the required examination volume is 99.8%.

- (ii) North Anna considered several different options to resolve the examination coverage issue. One option was to apply additional overlay material (approximately 1/2") parallel to the PWOL. However, the addition of material would require a considerable additional dose expenditure and new PDI qualified transducers that are not readily available. Another option was to apply an additional overlay at a six degree slope. Even though this option results in less weld material being added, it would still involve considerable dose expenditure (2 manrem) and an additional qualified transducer that is not readily available. The final option was machining of the pressurizer nozzle to provide additional scan surface for the transducer. This option reduced the strength of the nozzle by increasing the cumulative usage factor by at least a factor of four. The option also required significant additional dose (0.750 manrem).
- (iii) The volume of material that will be un-inspectable by UT lies entirely in the low alloy steel, SA508 CL. 2, of the pressurizer nozzle. This zone of material is 0.25 inches or more from the alloy 82/182 butter on the nozzle. There is no likelihood of primary water stress corrosion crack initiation or propagation in the low alloy steel material itself and no likelihood of propagation of a postulated primary water stress corrosion crack from the alloy 82/182 butter into the low alloy steel. Consequently, there is no likelihood of any undetectable cracking occurring in the small zone of material with no UT inspection coverage. Furthermore, the PWOL was designed to accommodate a 360 degree through wall crack in the repaired area with no failure, which bounds the case of a crack that might be postulated to exist in the un-inspectable material.

Additionally, if the small volume of this base metal contained a flaw, the flaw would only potentially reduce the strength of the nozzle by an insignificant amount. However, cutting a transition in the nozzle in order to facilitate 100% inspection coverage will create a small but real reduction of strength of the nozzle. The reduction of strength for this small improvement in inspection coverage may be acceptable, but will constitute a deliberate reduction of strength in the nozzle to address a potential reduction of strength due to an inability to inspect the nozzle for an additional 0.2%.

(c) Inservice Inspection

- (1) The weld overlay examination volume in Fig. 2 shall be added to the inspection plan and ultrasonically examined during the first or second refueling outage following application.
- (2) Alternatively, for mitigative weld overlays, in which examinations are performed in accordance with 2(a)(2)(a), 3(a), and 3(b), and no inside surface connected planar flaws are discovered, the overlay may be placed directly into the population to be examined in accordance with (c)(5) below.
- (3) The weld overlay examination volume in Fig. 2 shall be ultrasonically examined to determine if any new or existing cracks have propagated into the upper 25% of the base material or into the overlay. The angle beam shall be directed perpendicular and parallel to the piping axis, with scanning performed in four directions.
- (4) The inservice examination acceptance standards of Table IWB-3514-2 shall be met for the weld overlay. If the acceptance criteria of Table IWB-3514-2 cannot be met, the acceptance criteria of IWB-3600, IWC-3600, or IWD-3600 as applicable shall be met for the weld overlay. Cracks in the outer 25% of the base metal shall meet the design analysis requirements of Section 2(b).
- (5) Weld overlay examination volumes in Fig. 2 that show no indication of crack growth or new cracking shall be placed into a population to be examined on a sample basis. Twenty-five percent of this population shall be examined once every 10 years.
- (6) If inservice examinations reveal crack growth, or new cracking, which meet the acceptance criteria of IWB-3514, IWB-3600, IWC-3600, or IWD-3600 the weld overlay examination volume shall be reexamined during the first or second refueling outage following discovery of the growth or new cracking.
- (7) For weld overlay examination volumes with unacceptable indications according to 3(c)(4), the weld overlay shall be removed, including the original defective weld, and the item shall be corrected by a repair/replacement activity in accordance with IWA-4000.
- (8) Due to a localized fabrication repair in the original dissimilar metal weld buttering region in 6-inch safe end-to-safety nozzle weld SW-31, and adjacent elbow-to-safe end weld number 17 (pipe identifier 6-RC-39-1502-Q1) in North Anna Unit 1, the examination is expected to result in less than the required volume in Figure 2, Preservice and Inservice Examination Volume. The calculated composite coverage of the required examination volume is 99.8%. The following provides the basis for the acceptability of the reduced examination coverage for this specific case:
 - (i) Due to a localized fabrication repair in the original dissimilar metal weld buttering region, the examination volume is extended 0.30"

towards the nozzle taper for 114 degrees of the circumference of the weld. The 0.30" represents a conservative extension of the examination area based on the maximum width of the repair area in the center of the repair. The interface of the alloy 600 to low alloy steel which defines the examination boundary was confirmed by acid etching. The qualified ultrasonic examination procedure requires an examination of the volume to include an additional beam angle of 45 degrees to provide effective coverage of the outer 25% of the existing weld and base material for 1/2" on each side of the weld. This angle is required to provide coverage of 100% of this volume in four beam directions (two opposing axial and two opposing circumferential). In addition to the 100% examination coverage of the weld overlay volume, the outer 25% of the existing weld and base material volume can be effectively examined in three of the required four beam directions. The downstream axial beam direction is limited to 99.2% of the required examination volume due to the restriction of the nozzle taper. This does not allow access to scan the transducer the required distance from the weld to obtain coverage of the lower near corner of the examination volume. The limited examination volume is located at least 0.25" from the alloy 600 buttering material and is effectively examined in the three other required beam directions. The calculated composite coverage of the required examination volume is 99.8%.

- (ii) North Anna considered several different options to resolve the examination coverage issue. One option was to apply additional overlay material (approximately 1/2") parallel to the PWOL. However, the addition of material would require a considerable additional dose expenditure and new PDI qualified transducers that are not readily available. Another option was to apply an additional overlay at a six degree slope. Even though this option results in less weld material being added, it would still involve considerable dose expenditure (2 manrem) and an additional qualified transducer that is not readily available. The final option was machining of the pressurizer nozzle to provide additional scan surface for the transducer. This option reduced the strength of the nozzle by increasing the cumulative usage factor by at least a factor of four. The option also required significant additional dose (0.750 manrem).
- (iii) The volume of material that will be un-inspectable by UT lies entirely in the low alloy steel, SA508 CL. 2, of the pressurizer nozzle. This zone of material is 0.25 inches or more from the alloy 82/182 butter on the nozzle. There is no likelihood of primary water stress corrosion crack initiation or propagation in the low alloy steel material itself and no likelihood of propagation of a postulated primary water stress corrosion crack from the alloy 82/182 butter into the low alloy steel.

Consequently, there is no likelihood of any undetectable cracking occurring in the small zone of material with no UT inspection coverage. Furthermore, the PWOL was designed to accommodate a 360 degree through wall crack in the repaired area with no failure, which bounds the case of a crack that might be postulated to exist in the un-inspectable material.

Additionally, if the small volume of this base metal contained a flaw, the flaw would only potentially reduce the strength of the nozzle by an insignificant amount. However, cutting a transition in the nozzle in order to facilitate 100% inspection coverage will create a small but real reduction of strength of the nozzle. The reduction of strength for this small improvement in inspection coverage may be acceptable, but will constitute a deliberate reduction of strength in the nozzle to address a potential reduction of strength due to an inability to inspect the nozzle for an additional 0.2%.