VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

April 2, 2003

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No.: 03-235
NL&OS/GDM R1
Docket Nos. 50-338, 339
50-280, 281
License Nos.: NPF-4, 7
DPR-32, 37

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2
RISK-INFORMED ISI RELIEF REQUESTS R-1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

In a letter dated June 13, 2002 (Serial No. 02-212), Virginia Electric and Power Company (Dominion) submitted Relief Request R-1 for Surry Unit 1 and revised Relief Requests R-1 for North Anna Units 1 and 2 and Surry Unit 2. These relief requests address socket-welded connections and their associated branch connections 2 inches and smaller nominal pipe size with respect to the difficulty of performing volumetric examinations on these type of connections.

During staff review of the relief requests, the NRC determined that additional information was necessary to complete their review. Conference calls were held on March 4, 6 and 10, 2003, to discuss the staff's questions, and at the conclusion of the conference calls, Dominion agreed to provide a written response to the NRC's questions. Our response is provided in the attachment.

If you have any questions or require additional information, please contact us.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachment

A047

Commitments made in this letter: None

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Attachment

Response to NRC Request for Additional Information
Relief Request R-1

North Anna Units 1 and 2
Surry Units 1 and 2

Virginia Electric and Power Co.
(Dominion)

Attachment

Response to Request for Additional Information
Relief Requests R-1
North Anna and Surry Power Station Units 1 and 2

(NRC question discussed during teleconference on March 10, 2003)

The licensee is requesting to perform a VT-2 examination in lieu of the volumetric examinations specified in WCAP-14572, Revision 1-NP-A, for American Society of Mechanical Engineers (ASME) Code Class 1 (and Class 2 and 3) socket welds and branch connections nominal pipe size (NPS) 2 and smaller, classified as high safety significant. However, the staff notes that Table IWB-2500-1 of the ASME Code requires surface examination, not volumetric examination, for socket welds. Surface examination (i.e., liquid penetration examination) is an effective method for discovery of potential piping outside surface initiated flaws – of specific concern, flaws induced by low cycle, high bending stress thermal fatigue or external chloride stress corrosion cracking (ECSCC).

Please address the external degradation mechanisms. What considerations have you made to address the potential for external degradation and the use of surface examinations for the socket welds? (See Watts Bar submittal dated May 21, 2001, Request for Relief 1-RI-ISI-02.)

What type of weld is associated with the branch connections covered by the subject relief request? What is the difficulty with performing an ultrasonic testing (UT) inspection of the branch connections? Please provide a representative drawing or drawings showing the types of branch connections and welds typically associated with the branch connections (NPS 2 and smaller) that are covered by this relief request.

Dominion Response

Westinghouse Owners Group Topical Report WCAP-14572, Revision 1-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," (WCAP) provides guidance in Table 4.1-2 for the performance of surface examinations (e.g., liquid penetrant) on piping segments with potential outside surface initiated flaws or relevant conditions. This consideration was part of the Risked-Informed Inservice Inspection (RI-ISI) program development.

Surry Unit 2 and North Anna Units 1 & 2

Surry Unit 2 and North Anna Units 1 & 2 are Class 1 RI-ISI programs. For the socket welds and their associated branch connections NPS 2 and smaller that are addressed by Relief Request R-1, the damage mechanisms identified were postulated as inside diameter (ID) initiated such that a surface examination would not be of significant benefit. The only outer diameter (OD) initiated damage mechanism to which the piping

would be subject is thermal fatigue. This mechanism of low cycle fatigue is considered in the design and has a very low probability of occurrence. Plant experience indicates other fatigue damage would be manifested as ID initiated cracking. The approved Class 1 RI-ISI programs also did not identify any locations susceptible to ECSCC. The Class 1 piping is not located in areas that are subject to an aggressive environment that would promote ECSCC, i.e., there are very low levels of chloride (if any) and moisture is not typically present on the pipe. No other externally driven damage mechanism can be reasonably postulated for this piping.

Surry Unit 1

Surry Unit 1 was a pilot full scale RI-ISI program containing Class 1, 2, 3 and non-class systems. Currently Relief Request R-1 addresses six Class 1, one Class 2, and six Class 3 piping segments. [Note: During the teleconference on March 10, 2003, the NRC and Dominion agreed to address Class 3 systems in Dominion's response to the NRC's request for additional information. The NRC stated that they would determine whether a relief request, an exception/deviation from the approved methodology or some other method was appropriate for addressing Class 3 systems. The NRC noted that they would make this determination and disposition the Class 3 systems in their safety evaluation (SE) for the subject relief requests.] The affected Class 1 and 2 segments are located in Containment and are subject to the same damage mechanisms and operating environments as discussed above for Surry Unit 2 and North Anna Units 1 and 2. The Class 3 segments are located outside containment and are fabricated of copper-nickel or carbon steel material. Although the Class 3 segments are located in areas where external chlorides could be introduced, the segment materials are not considered susceptible to ECSCC. Again, only ID initiated damage mechanisms were postulated for these segments.

Typical branch connection figures can be found in ASME Section XI, Figure IWB-2500-9, IWB-2500-10, and IWB-2500-11 of the 1989 Edition. The sockolet design used in the small branch and instrument connections on the Class 1, 2, and 3 piping most closely resembles Figure IWB-2500-10. ASME Section XI requires this design to be volumetrically examined on larger branch connections (i.e., NPS 4 inches and larger). However, the ASME Code does not require volumetric examination on smaller branch connection welds. The branch connections addressed by this relief request are NPS 2 inches and smaller. The size and geometry of these welds would preclude any meaningful results from a volumetric examination.

(NRC questions discussed during teleconferences held on March 4 and 6, 2003)

During the teleconferences held on March 4 and 6, 2003, Dominion noted that Surry Unit 2 and North Anna Units 1 & 2 previously received NRC safety evaluations on Relief Request R-1, as it had been submitted with the original RI-ISI program submittals. (Reference NRC letters to Virginia Electric and Power Company dated January 26, 2001 and September 18, 2001 for Surry Unit 2 and North Anna Units 1 & 2, respectively.) The re-submittal of Relief Requests R-1 for these units was merely to

clarify that the attached branch connection on the affected piping segments was included in the relief. The difficulties associated with performing a volumetric examination on a branch connection are discussed above. The RI-ISI submittal for Surry Unit 2 and North Anna Units 1 & 2 followed the requirements of WCAP-14572 Rev. 1-NP-A. The RI-ISI submittal assumed the approval of Relief Request R-1 and the alternative proposed examination method in the calculations associated with the evaluation (e.g., segment definition, consequence evaluation, Perdue model, change-in-risk, etc.). As such, it was agreed during the teleconference that the following questions were only applicable to Surry Unit 1.

1) *Please provide a list of segments and locations for which relief is being requested. Please identify why each location was originally selected for inspection.*

Dominion Response

A list of segments and locations for which relief is being requested and the reason each location was originally selected for inspection are provided in the following table. Note that the segments listed in the table are included in the drawings provided in our letter dated October 31, 1997 (Serial No. 97-640).

Surry Unit 1

Segment #	Location	Selection Reason
ECC-001	Class 1, in containment, common high and low head safety injection piping to RCS "A" loop, cold leg	These segments were numerically low risk significant. The expert panel noted that the segments were separated from a high safety significant segment by a single check valve and voted the segments high safety significant.
ECC-002	Class 1, in containment, common high and low head safety injection piping to RCS "B" loop, cold leg	
ECC-003	Class 1, in containment, common high and low head safety injection piping to RCS "C" loop, cold leg	
HHI-012A	Class 2, in containment, common high head safety injection header to RCS loops, cold legs	The segment was numerically high risk significant for LERF with Operator Action and CDF with Operator Action. This segment took credit

		for an augmented program to adjust the failure probability lower. The expert panel voted this segment high safety significant noting consequence of failure as the loss of all high head safety injection to the RCS cold legs.
RC-058 RC-059	Class 1, in containment, pressurizer PORV piping	These segments were found to be numerically low risk significant; however, the expert panel was concerned about high stress to allowable stress ratios on the segments and voted the segments high safety significant.
RC-060A	Class 1, in containment, pressurizer spray piping, attached drain	The segment was numerically below the RRW criteria of 1.005 (in the gray region), but originally voted as low risk significant by the expert panel. The segment was added back in for change-in-risk considerations.
SW-044 SW-045 SW-046 SW-047 SW-054	Class 3, outside containment in auxiliary building, piping associated with charging pump lube oil coolers and intermediate seal coolers	These segments were numerically low risk significant. The expert panel noted that the piping could affect, through indirect effects, the charging pump component cooling water pumps by water spray on the electrical components as there was no physical separation. This could lead to loss of all charging pump cooling and simultaneous loss of

		high head safety injection. The Unit 2 charging cross-tie would still be available however. The expert panel voted the segments high safety significant.
VS-001	Class 3, outside containment in mechanical equipment and emergency switchgear rooms, piping associated with control room and emergency switchgear room chilled water for air-conditioning	The segment was numerically below the RRW criteria of 1.005 (in the gray region), but was voted as high risk significant by the expert panel.

2) *Are there any other locations within these high safety significant segments that can be volumetrically inspected? If so, why are you not proposing to select these locations instead of the locations currently selected?*

Dominion Response

Some of the segments have welds that can be volumetrically examined. These welds are being volumetrically examined as required by the WCAP. As such, Relief Request R-1 is associated with the socket welds and the connecting branch connections only. We consider this to be a conservative interpretation of the requirements with regard to segments containing both sockets and butt welds and considering them different lots for the Perdue Model sample. However, the WCAP, page 178, states that the Perdue Model use has limitations when associated with socket welds. A table is provided indicating segments that have welds that can be volumetrically examined, the number of such welds, and the current sample.

Segment #	Number of Welds that are Available for Volumetric Examination	Sample for Volumetric Examination
ECC-001	7 (+ 2 socket welds and no associated branch connections)	2
ECC-002	7 (+ 2 socket welds and no associated branch connections)	2
ECC-003	5 (+ 2 socket welds and no associated branch connections)	2

HHI-012A	38 (+ >39 socket welds and associated branch connections)	1
RC-058	3 (+ 1 socket and no associated branch connection)	1
RC-059	3 (+ 1 socket and no associated branch connection)	1

The remaining segments had no welds for volumetric examination (sockets and branch connections only).

3) *How was the inspection of these locations reflected in the calculations that were compared to the acceptability guidelines provided on page 214 (Section 4.4.2) of the WCAP-14572, Rev.1-NP-A?*

Dominion Response

The acceptability guidelines provided in the WCAP are associated with change-in-risk, when comparing the original ASME Section XI program and the proposed RI-ISI program. In reviewing the calculations performed, the failure probabilities used corresponded to the anticipated examinations. If volumetric exams were to be used it was credited. In the cases where a volumetric exam could not be used (i.e., socket welds and associated branch connections), the numerical visual failure probability was credited. The SW segments are an exception, and the use of visual examination requires a review of the acceptability guidelines.

4) *If the inspection of these locations is reflected in the original calculations, please provide the new results reflecting the discontinuation of inspections in these locations and compare them to the acceptability guidelines.*

Dominion Response

A sensitivity study was performed on the change-in-risk calculation crediting only a visual examination for the service water segments above. The acceptability guideline results remained the same. The numerical CDF value of each service water segment was extremely low, i.e., in the 1E-11 range, and LERF was similar.