UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF THE

SECOND AND THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PLAN

REQUESTS FOR RELIEF NOS. SPT-17, 13, AND 7

FOR

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNIT 2

AND

SURRY POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-339, 50-280, AND 50-281

1.0 INTRODUCTION

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(6)(g)(i). Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. For North Anna Power Station, Unit 2,

the applicable edition of Section XI of the ASME Code for the second 10-year ISI interval is the 1986 Edition, and for Surry Power Station, Units 1 and 2, the applicable edition of Section XI of the ASME Code for the third 10-year ISI interval is the 1989 Edition.

2.0 EVALUATION

By letter dated June 24, 1999, Virginia Electric and Power Company (licensee), submitted Requests for Relief No. SPT-17 for North Anna Power Station, Unit 2, and Nos. 13 and 7, respectively, for Surry Power Station, Units 1 and 2. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is provided in Enclosure 2. Based on the results of the review, the staff adopts the contractor's conclusions presented in the technical letter report (TLR) in Enclosure 2.

The information provided by the licensee in support of the requests for relief from Code requirements has been evaluated and the basis for disposition is documented below.

Request for Relief No. SPT-17 (North Anna Power Station Unit 2):

ASME Code, Section XI, Table 2500-1, Category B-P, Items B15.51 and B15.71, require system hydrostatic testing and associated VT-2 visual examination of all Class 1 pressure-retaining piping and valves.

Pursuant to 10 CFR 55.55a(a)(3)(ii), the licensee proposed an alternative to the Code-required hydrostatic test of small diameter (≤1 inch) Class 1 reactor coolant system (RCS) pressure boundary vent and drain connections. Authorization was requested to perform the Class 1 System Hydrostatic Test with these vent and drain valves in the closed position.

For the licensee to perform the Code-required test, it would be necessary to remove a flange and connect a test rig, or open the first valve at normal system operating pressure, thereby eliminating the double isolation from the RCS boundary. Pressurization by this method would cause significant safety concerns for the personnel performing the examination due to the close proximity to the primary RCS piping. Testing by this method would expose plant personnel to an estimated 1.5 man-rem per test. Therefore, the Code requirement to perform the system hydrostatic test on these isolated line segments presents a substantial hardship for the licensee.

The licensee proposed to visually examine the isolation valves in the normally closed position for leaks and evidence of past leakage during the system leakage test each refueling outage. Also, the RCS vent and drain connections will be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test. The staff concludes that the licensee's proposed alternative provides reasonable assurance of structural integrity of the subject components. Imposition of the Code requirement on the licensee would result in a hardship without a compensating increase in quality and safety. The licensee's proposed alternative is authorized pursuant to 10CFR50.55a(a)(3)(ii).

Request for Relief No. 13 (Surry Power Station Unit 1), and Request for Relief No. 7 (Surry Power Station Unit 2):

ASME Code, Section XI, Table 2500-1, Examination Category B-P, Items B15.51 and B15.71, require system hydrostatic testing and associated VT-2 visual examination of all Class 1 pressure-retaining piping and valves.

Pursuant to 10 CFR 55.55a(a)(3)(ii), the licensee proposed an alternative to the Code-required hydrostatic test of small diameter (≤1 inch) Class 1 RCS pressure boundary vent and drain connections. Authorization was requested to perform the Class 1 System Hydrostatic Test with these vent and drain valves in the closed position.

For the licensee to perform the Code-required test, it would be necessary to remove a flange and connect a test rig, or open the first valve at normal system operating pressure, thereby eliminating the double isolation from the RCS boundary. Pressurization by this method would cause significant safety concerns for the personnel performing the examination due to the close proximity to the primary RCS piping. Testing by this method would expose plant personnel to an estimated 1.5 man-rem per test. Therefore, the Code requirement to perform the system hydrostatic test on these isolated line segments presents a substantial hardship for the licensee.

The licensee proposed to visually examine the isolation valves in the normally closed position for leaks and evidence of past leakage during the system leakage test each refueling outage. Also, the RCS vent and drain connections will be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test. The licensee's proposed alternative provides reasonable assurance of structural integrity of the subject components. Imposition of the Code requirement on the licensee would result in a hardship without a compensating increase in quality and safety. The licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3.0 CONCLUSION

The staff concludes for the North Anna Power Station Request for Relief SPT-17 and Surry Power Station Units 1 and 2, Request for Relief Nos. 13 (Unit 1) and 7 (Unit 2), that the Code requirements would result in a significant burden without a compensating increase in the level of quality and safety. The staff further concludes that the licensee's proposed alternative provides reasonable assurance of structural integrity of the subject line segments. The licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

Principal Contributor: T. McLellan

Date: January 20, 2000

TECHNICAL LETTER REPORT
ON SECOND AND THIRD 10-YEAR INTERVAL INSERVICE INSPECTION
REQUESTS FOR RELIEF SPT-17, 13, AND 7
FOR
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 2, AND SURRY POWER STATION UNITS 1 AND 2
DOCKET NUMBERS: 50-339, 50-280, AND 50-281

1. INTRODUCTION

By letter dated June 24, 1999, the licensee, Virginia Electric and Power Company, submitted Requests for Relief SPT-17, 13, and 7, seeking relief from the requirements of the ASME Code, Section XI, for the North Anna Power Station Unit 2, and Surry Power Station Units 1 and 2. These relief requests are for the second and third 10-year inservice inspection (ISI) intervals at each of the facilities, respectively. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the following section.

2. EVALUATION

The information provided by Virginia Electric and Power Company in support of the requests for relief from Code requirements has been evaluated and the bases for disposition are documented below. The Code of record for the North Anna Power Station Unit 2, second 10-year ISI interval, which began December 14, 1990, is the 1986 Edition of Section XI of the ASME Boiler and Pressure Vessel Code. The Code of record for the Surry Power Station Units 1 and 2, third 10-year ISI interval, which began October 14, 1993, and May 10, 1994 respectively, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

2.1 Request for Relief No. STP-17 (North Anna Power Station Unit 2), Examination Category B-P, Item Numbers B15.51 and B15.71, System Hydrostatic Testing of Small Diameter Piping and Valves

Code Requirement: The 1986 Edition of ASME Section XI, Examination Category B-P, Items B15.51 and B15.71 requires system hydrostatic testing and associated VT-2 visual examination of all Class 1 pressure retaining piping and valves.

Licensee's Proposed Alternative: Pursuant to 10 CFR 55.55a(a)(3)(ii), the licensee proposed an alternative to the Code-required hydrostatic test of small diameter (≤1 inch) Class 1 reactor coolant system pressure boundary vent and drain connections. Authorization is requested to perform the Class 1 System Hydrostatic Test with these vent and drain valves in the closed position. The licensee stated:

"1. The RCS vent, drain, instrumentation, and sample connections will be visually examined for leakage, and any evidence of past leakage, with the isolation valves in the normally closed position each refueling outage during the ASME XI Class 1 System Leakage Test (IWB-5221).

"2. The RCS vent, drain, instrumentation, and sample connections will also be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test (IWB-5222 and Code Case N-498-1). This examination will be performed with the RCS at nominal operating pressure and at near operating temperature after satisfying the required 4-hour hold time.

"In addition, during modes 1 through 4 the RCS will be monitored for leakage at the following frequency pursuant to TS requirements:

"1. Every 72 hours, during steady state operation, the reactor coolant system leak rate will be monitored to assure the limit of one gallon per minute unidentified leakage is maintained.

"2. Every 12 hours the containment atmosphere particulate radioactivity will be monitored."

Licensee's Basis for Proposed Alternative (as stated):

"These piping segments are equipped with valves, or valve flange, that provide for double isolation of the reactor coolant system (RCS) pressure boundary. These components are generally maintained closed during normal operation and the piping outboard of the first isolation valve is, therefore, not normally pressurized. The proposed alternative provides an acceptable level of safety and quality based on the following:

1. ASME Section XI Code, paragraph IWA-4400, provides the requirements for hydrostatic pressure testing of piping and components after repairs by welding to the pressure boundary. IWA-4400(b)(5) excludes component connections, piping, and associated valves that are 1 inch nominal pipe size and smaller from the hydrostatic test. Consequently, hydrostatic testing and the associated visual examination of these ≤ 1 inch diameter RCS vent/drain/sampling connections once each 10-year interval is unwarranted considering that a repair weld on the same connections is exempted by the ASME XI Code.

2. The non-isolable portion of the RCS vent and drain connections will be pressurized and visually examined as required. Only the isolable portion of these small diameter vent and drain connections will not be pressurized.

3. All piping connections are typically socket-welded, and the welds received a surface examination after installation. The piping and valves are nominally heavy wall (schedule 160 pipe) and 1500# valve bodies). This piping and valve/flanges are towards the free end of a cantilever configuration (stub end isolated by either a valve or a flange). There is no brace or support for this portion of the pipe. Consequently, this portion does not experience any thermal loading. This portion of the line is isolated during normal operation and does not experience pressure loading unless there is a leak at the first isolation valve. The valves do not have an extended operator, so the rotational accelerations at the valve do not produce significant stress. Since the lines are designed to the Code, the stresses towards the free end of the cantilever due

to every other type of loading are only a small fraction of the applicable Code allowable. As a result, this portion of the lines is not subjected to high stress or high intensity cyclic loading.

"The Technical Specifications (TS) require RCS leakage monitoring (TS 4.4.6.2.1) during normal operation. Should any of the TS limits be exceeded, then appropriate corrective actions, which may include shutting the plant down, are required to identify the source of leakage and restore the RCS boundary integrity.

"During the 1998 North Anna Unit 1 refueling outage similar piping segments were pressurized by removing a flange and connecting a test rig. A majority of these piping segments are located in close proximity to the RCS main loop piping thus requiring personnel entry into high radiation areas within the containment. The dose associated with this testing was 1.5 man-Rem."

Evaluation: The Code requires that all Class 1 components within the RCS system boundary undergo a system hydrostatic test once per interval. The licensee has proposed an alternative to the hydrostatic test requirements for the subject line segments. The line segments, as stated by the licensee, are typically socket welded schedule 160 pipe. The line configuration, as outlined, provides double isolation of the RCS system. Under normal plant operating conditions the subject line segments would see RCS temperatures and pressures only if leakage through the first normally closed valve occurs. For the licensee to perform the Code required test, it would be necessary to remove a flange and connect a test rig, or open the first valve at normal system operating pressure, thereby eliminating the double isolation from the RCS boundary. Pressurization by this method would cause significant safety concerns for the personnel performing the examination due to the close proximity to the primary RCS piping. Testing by this method would expose plant personnel to an estimated 1.5 man-Rem per test. Therefore, the Code requirement to perform the system hydrostatic test on these isolated line segments presents a substantial hardship for the licensee.

The licensee proposed to visually examine the isolation valves in the normally closed position for leaks and evidence of past leakage during the system leakage test each refueling outage. Also, the RCS vent and drain connections will be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test. The licensee's proposed alternative will provide reasonable assurance that operational readiness is maintained for the subject line segments. Imposition of the Code requirement on Virginia Electric and Power Company would result in a hardship without a compensating increase in quality and safety. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

2.2 Request for Relief No. 13 (Surry Power Station Unit 1), and Request for Relief No. 7 (Surry Power Station Unit 2), Examination Category B-P, Item Numbers B15.51 and B15.71, System Hydrostatic Testing of Small Diameter Piping and Valves

Code Requirement: Section XI, Examination Category B-P, Items B15.51 and B15.71 require system hydrostatic testing and associated VT-2 visual examination of all Class 1 pressure retaining piping and valves.

Licensee's Proposed Alternative: Pursuant to 10 CFR 55.55a(a)(3)(ii), the licensee proposed an alternative to the Code-required hydrostatic test of small diameter (≤1 inch) Class 1 reactor coolant system pressure boundary vent and drain connections. Authorization is requested to perform the Class 1 System Hydrostatic Test with these vent and drain valves in the closed position. The licensee stated:

"1. The RCS vent, drain, instrumentation, and sample connections will be visually examined for leakage, and any evidence of past leakage, with the isolation valves in the normally closed position each refueling outage during the ASME XI Class 1 System Leakage Test (IWB-5221).

"2. The RCS vent, drain, instrumentation, and sample connections will also be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test (IWB-5222 and Code Case N-498-1). This examination will be performed with the RCS at nominal operating pressure and at near operating temperature after satisfying the required 4-hour hold time.

"In addition the RCS will be monitored for leakage at the following frequency pursuant to TS requirements:

"1. The reactor coolant system leak rate will be monitored daily to assure the limit of one gallon per minute unidentified leakage is maintained.

"Additionally, TS 3.1.C.1 states the following:

"Detected or suspected leakage from the Reactor Coolant System shall be investigated and evaluated. At least two means shall be available to detect reactor coolant system leakage. One of these means must depend on the detection of radionuclides in the containment."

Licensee's Basis for Proposed Alternative (as stated):

"These piping segments are equipped with valves, or valve and flange, that provide for double isolation of the reactor coolant system (RCS) pressure boundary. These components are generally maintained closed during normal operation and the piping outboard of the first isolation valve is, therefore, not normally pressurized. The proposed alternative provides an acceptable level of safety and quality based on the following:

1. ASME Section XI Code, paragraph IWA-4700, provides the requirements for hydrostatic pressure testing of piping and components after repairs by welding to the pressure boundary. IWA-4700(b)(5) excludes component connections, piping, and associated valves that are 1 inch nominal pipe size and smaller from the hydrostatic test. Consequently, hydrostatic testing and the associated visual examination of these ≤ 1 inch diameter RCS vent/drain/sampling connections once each 10-year interval is unwarranted considering that a repair weld on the same connections is exempted by the ASME XI Code.

2. The non-isolable portion of the RCS vent and drain connections will be pressurized and visually examined as required. Only the isolable portion of these small diameter vent and drain connections will not be pressurized.

3. All piping connections are typically socket-welded, and the welds received a surface examination after installation. The piping and valves are nominally heavy wall (schedule 160 pipe and 1500# valve bodies). This piping and valve/flanges are towards the free end of a cantilever configuration (stub end isolated by either a valve or a flange). There is no brace or support for this portion of the pipe. Consequently, this portion does not experience any thermal loading. This portion of the line is isolated during normal operation and does not experience pressure loading unless there is a leak at the first isolation valve. The valves do not have an extended operator, so the rotational accelerations at the valve do not produce significant stress. Since the lines are designed to the Code, the stresses towards the free end of the cantilever due to every other type of loading are only a small fraction of the applicable Code allowable. As a result, this portion of the lines is not subjected to high stress or high intensity cyclic loading.

"The Technical Specifications (TS) require RCS leakage monitoring (TS Table 4.1-2A, Item No. 10) during normal operation. Should any of the TS limits be exceeded, then appropriate corrective actions, which may include shutting the plant down, are required to identify the source of leakage and restore the RCS boundary integrity.

"The required pressure testing was recently performed during the North Anna Unit 1 1998 refueling outage. Similar piping segments were pressurized by removing a flange and connecting a test rig. A majority of these piping segments are located in close proximity to the RCS main loop piping thus requiring personnel entry into high radiation areas within the containment. The dose associated with this testing was 1.5 man-Rem. Conditions at Surry would yield comparable exposure results, if the testing were performed."

Evaluation: The Code requires that all Class 1 components within the RCS system boundary undergo a system hydrostatic test once per interval. The licensee has proposed an alternative to the hydrostatic test requirements for the subject line segments. The line segments, as stated by the licensee, are typically socket welded schedule 160 pipe. The line configuration, as outlined, provides double isolation of the RCS system. Under normal plant operating conditions the subject line segments would see RCS temperatures and pressures only if leakage through the first normally closed valve occurs. For the licensee to perform the Code required test, it would be necessary to remove a flange and connect a test rig, or open the first valve at normal system operating pressure, thereby eliminating the double isolation from the RCS boundary. Pressurization by this method would cause significant safety concerns for the personnel performing the examination due to the close proximity to the primary RCS piping. Testing by this method would expose plant personnel to an estimated 1.5 man-Rem per test. Therefore, the Code requirement to perform the system hydrostatic test on these isolated line segments presents a substantial hardship for the licensee.

The licensee proposed to visually examine the isolation valves in the normally closed position for leaks and evidence of past leakage during the system leakage test each refueling outage. Also, the RCS vent and drain connections will be visually examined with the isolation valves in the normally closed position during the 10-year ISI pressure test. The licensee's proposed alternative will provide reasonable assurance that operational readiness is maintained for the subject line segments. Imposition of the Code requirement on Virginia Electric and Power Company would result in a hardship without a compensating increase in quality and safety. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3. CONCLUSION

The INEEL staff has evaluated the licensee's submittal and concluded for the North Anna Power Station Request for Relief SPT-17 and Surry Power Station Units 1 and 2, Request for Relief Nos. 13 and 7 respectively, that the Code requirements would result in a burden without a compensating increase in the level of quality and safety. It is further concluded that the licensee's proposed alternative will provide reasonable assurance that operational readiness is maintained on the subject line segments. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10CFR50.55a(a)(3)(ii).