Serial No. 16-448
Docket Nos. 50-280/281

ENCLOSURE 1A

Proposed Alternative to ASME Section XI Requirements for Repair/Replacement of Circulating and Service Water Class 3 Buried Piping in Accordance with 10 CFR 50.55a(z)(1)

[NON-PROPRIETARY]

Virginia Electric and Power Company
(Dominion)
Surry Power Station Units 1 and 2

Virginia Electric and Power Company (Dominion)
Surry Power Station Units 1 and 2
Fifth and Sixth 10-Year Inservice Inspection Intervals (Unit 1)
Fifth 10-Year Inservice Inspection Interval (Unit 2)

Proposed Alternative
in Accordance with 10 CFR 50.55a(z)(1)

1. Plant Site – Units

Surry Power Station Units 1 and 2

2. Interval Dates

The proposed alternative is requested for:

- The Surry Unit 1 fifth 10-year inservice inspection (ISI) interval that began on December 14, 2013 and ends on October 13, 2023, except for a Service Water (SW) line common to Surry Units 1 and 2,
- The Unit 2 fifth 10-year ISI Interval which began on May 10, 2014 and ends on May 9, 2024, and
- The Surry Unit 1 sixth 10-year ISI interval that begins on October 14, 2023 and ends on October 13, 2033, for the repair of a SW line common to Surry Units 1 and 2.

3. Requested Date for Approval

The requested date for approval is December 15, 2017.

4. ASME Code Components Affected

a) ASME Code Class 3

b) The affected piping consists of:

i) 96-inch Circulating Water (CW) System Inlet Piping from the Station Intake Canal to the Main Steam Condenser.
ii) 24, 30, 36, 42, 48-inch SW pipe headers from the CW system to the Recirculation Spray (RS) and Component Cooling (CC) Heat Exchangers' (HXs) supply lines.

c) These lines are concrete-encased and buried. The concrete encasement of the piping systems is a Seismic Category I structure and provides the seismic support for the piping systems.

d) The piping was fabricated of carbon steel material conforming to ASTM A-283 Gr. B in accordance with AWWA C201, "Standard Specification for Electric Fusion Welded Steel Water Pipe."

e) The piping was designed and installed in accordance with ASME B31.1 -1967, "USAS Code for Pressure Piping."

f) A detailed listing of the piping sections to be replaced is provided in Enclosure 2, which identifies the pipe number, size, configuration, function and preliminary construction schedule.

5. Applicable Code Edition and Addenda

ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components", 2004 Edition, No Addenda (Reference 1), for the Surry Units 1 and 2 fifth 10-year ISI intervals. The ASME Section XI Code Edition for the Surry Unit 1 sixth 10-year ISI interval has yet to be determined.

6. Applicable Code Requirement

The ASME Code requirement applicable to this activity of repairing carbon steel piping is ASME Section XI, Article IWA-4000, subparagraph IWA-4221(b)(1), which specifies the following requirement:

IWA-4221(b) An item to be used for repair/replacement activities shall meet the Construction Code specified in accordance with (1), (2), or (3) below.

(1) When replacing an existing item, the new item shall meet the Construction Code to which the original item was constructed.

7. Reason for Request

The use of a Carbon Fiber Reinforced Polymer (CFRP) system for internal repair of buried ASME pipe applications is a recent technology improvement that was not available in the 1960's or 1970's to meet the original construction code. There are no provisions in ASME Section XI or in an approved Code Case for installing CFRP systems as a replacement for carbon steel piping during a

repair/replacement activity. Therefore, Dominion is submitting an ISI Alternative Request for NRC approval to use CFRP systems for the repair of the pipe sections detailed in Enclosure 2.

8. Proposed Alternative

Pursuant to 10 CFR 50.55a(z)(1), an alternative is proposed for the repair of the Surry Units 1 and 2 CW and SW carbon steel supply lines, detailed in Enclosure 2, that provides an acceptable level of quality and safety. Specifically, it is proposed that the CW and SW lines be repaired with a CFRP system produced by Structural Technologies, LLC. Design, installation, qualification, testing, and inspection details of the CFRP system are discussed in subsequent sections of this request, as well as Enclosures 2 through 9. The ISI inspection activities that will be implemented following implementation of the CFRP system are discussed below.

a) Inservice Inspection and Testing

i) For CFRP systems installed under this Alternative, inservice inspection activities will include system flow testing at least once each ISI Interval (for the remaining life of the plant) to verify adequate flow through the CW and major SW supply piping. This testing will be in accordance with Surry Power Station Units 1 and 2, System Pressure Test Plans, fifth ISI Interval, as well as Surry Power Station Unit 1, System Pressure Test Plans, sixth ISI Interval for the common unit piping. The testing will demonstrate and document performance of VT-2 examinations required by Surry's ISI program on the CW and SW systems' flow paths that support the safety functions of the RSHXs, CCHXs, Main Control Room/Relay Room chillers, and the Charging Pump SW System.

b) Additional SW System Inspections

i) Surry Power Station Units 1 and 2 Updated Final Safety Analysis Report (UFSAR), Section 18.2.17, *Service Water System Inspections*, notes the requirement for compliance with NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Equipment,* July 18, 1989, and Supplement 1, dated April 4, 1990, which requires a variety of inspections, non-destructive examinations, and heat transfer testing for components cooled by SW.

ii) Surry SW System inspections are performed on a plant refueling outage frequency. The inspections check for biofouling, damaged coating, and degraded material condition. In addition, heat transfer parameters for components cooled by SW are monitored, and visual inspections are

performed to check for loss of material and changes in material properties. Heat transfer testing is also performed to identify the aging effects of loss of material and heat transfer degradation. The acceptance criteria for visual inspections are identified in the procedures that perform the individual inspections. The procedures identify the type and degree of anomalous conditions that are signs of degradation. In the case of SW, degradation includes biofouling, as well as material degradation. Engineering evaluations determine whether observed deterioration of material condition is sufficiently extensive to lead to loss of intended function for components exposed to the service water.

The information contained in brackets in Sections 8a through 8e and 9 below is requested to be withheld in its entirety in accordance with 10 CFR 2.390.

The information is requested to be withheld based on the following considerations:

- It reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by any of the submitter's competitors, without a license from the submitter, would constitute a competitive economic disadvantage to the submitter.

- Use by a competitor of the information requested to be withheld would reduce the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

- The information requested to be withheld reveals commercial strategies of the submitter or customers or suppliers.

- It reveals aspects of privately funded development plans or programs of commercial value to the submitter or owner of the information.

8a) Material Manufacturing

[redacted]

8b) Design

8c) Installation, Examination & Testing

8d) Qualifications and Training

[redacted]

8e) Failure Mode Effects Analysis

[redacted]

9. Basis for Use

a) Additional enclosures are attached to this ISI Alternative and are listed below:

i) Enclosure 2 - Scope and Schedule Summary

ii) Enclosure 3 - Definitions and Acronyms

(1) Section 3A - Definition of Terms
(2) Section 3B - Acronyms

iii) Enclosure 4 - Material Manufacture and Qualification Testing

[redacted]

iv) Enclosure 5 - Design

[redacted]

v) Enclosure 6- Sample Installation and QA/QC Procedures

[redacted]

vi) Enclosure 7- Qualification and Training

vii) Enclosure 8- Failure Modes Effects Analysis (FMEA)

viii) Enclosure 9- Operational Experience

10. Duration of Proposed Alternative

The CFRP repair system alternative will be implemented in the Unit 1 fifth 10-year ISI interval that began on December 14, 2013 and ends on October 13, 2023, except for a common Unit 1 and Unit 2 SW line that will be completed during the Unit 1 sixth 10-year ISI interval. The CFRP alternative for Unit 2 will be implemented during the Unit 2 fifth ISI interval that began on May 10, 2014 and ends on May 9, 2024. The CFRP repair system alternative will remain in place for the life of the plant.

11. Precedents

The proposed alternative is a first-of-a-kind installation of a CFRP repair system in nuclear safety related piping; consequently, there are no citable industry precedents. However, Surry has implemented multiple projects involving CFRP repair systems with the same project team on approximately 600 linear feet (LF) of 30-inch, 42-inch, and 96-inch CW and SW carbon steel pipe with similar configurations. (See Enclosure 9, Attachment A for additional operating experience information). These projects were non-safety-related, enhanced quality projects performed in preparation for the proposed safety related projects.

12. References

a) ASME Section XI, "Rules for In-service Inspection of Nuclear Power Plant Components", 2004 Edition No Addenda

b) ANSI B31.1 -1967, "USAS Code for Pressure Piping"

c) NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment", July 18, 1989 (Supplement 1 dated April 4, 1990)

d) Surry Power Station Units 1 and 2 Updated Final Safety Analysis Report:

i) Section 9.9 – Service Water System
ii) Section 10.3.4 – Circulating Water System
iii) Section 18.2.17 - Service Water System Inspections