Guzman, Richard

From: Guzman, Richard
Sent: Monday, September 10, 2012 1:57 PM
To: 'Wanczyk, Robert J'
Cc: Devincentis, James M
Subject: Draft RAI RE: LAR to Revise License Renewal Commitments - Selective Leaching Program
Attachments: Draft RAI buried piping - selective leaching.docx

Bob,

Please see attached draft RAI for subject license amendment request. Please review and let me know if you'd like to have a call w/the technical staff for any questions or clarifications. If a call is not necessary, I will send you the RAI formally requesting a response in a 30 day timeframe.

Thanks,
Rich

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING LICENSE AMENDMENT REQUEST TO REVISE

LICENSE RENEWAL COMMITMENTS

ENTERGY NUCLEAR OPERATIONS. INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

LICENSE NO. DPR-28

The Nuclear Regulatory Commission (NRC) staff is reviewing the information provided by Entergy Nuclear Operations, Inc. (the licensee) for Vermont Yankee Nuclear Power Station in its in its license amendment request (LAR) dated March 12, 2012, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12079A031), and has determined that additional information is necessary to complete its review. Please provide a response which addresses the following request for additional information (RAI):

Background for RAI-1

In the LAR dated March 12, 2012, it is proposed that License Renewal Commitment (LRC) No. 19 be amended to allow a soil corrosivity evaluation to be used in lieu of excavations for the sole purpose of inspections of the external surface of buried grey cast iron piping (i.e., plant maintenance activities do not result in inspection opportunities). LRA Section A.2.1.27 is proposed to be revised to state that if a soil corrosivity evaluation conducted in accordance with AWWA ANSI C105/A21.5-99, "American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems," Table A.1, results in a soil score of less than 10 points, then no selective leaching visual examination or hardness measurement needs to be conducted for this material and environment combination.

While the NRC staff has recognized the use of the soil corrosivity factors contained in AWWA ANSI C105 as a measure of the potential for general soil corrosivity, use of these parameters is not in and of itself sufficient to determine the potential for graphitic corrosion of gray cast iron components. The basis for this position is as follows:

- A review of "Corrosion Understanding the Basics," JR Davis, ASM International, 2000, states that, "[graphitic corrosion] is observed in gray cast irons in relatively mild environments." It also states, "Experience has demonstrated that graphitic corrosion is favored by relatively mild environments such as soft waters, waters having a slightly acidic pH, waters containing low levels (as little as 1 ppm) of hydrogen sulfide, and brackish and other high conductivity waters." It further states that graphitic corrosion is not normally observed in more aggressive environments because general corrosion dominates which results in removal of both the iron (anode) and graphite (cathode). The ASM Handbook, "Volume 13B: Corrosion: Materials," SD Kramer, 2005, Corrosion of Cast Irons (TC Spence), similarly states that graphitic corrosion occurs in mild

environments. This challenges the assumption that a general soil corrosivity factor could predict the potential for graphitic corrosion.

- A case study presented in M. Zamanzadeh, E. Larkin, W. Gretz and B. Bavarian, "Case Histories of Failures in Water Mains," Corrosion/90, paper no. 389 (Houston, Texas: NACE, 1990) demonstrated that gray cast iron piping buried in soil with a resistivity value varying from 1100- 2300 ohm-cm failed due to graphitic corrosion. AWWA ANSI C105 allows a rating factor of two points for soil resistivity in the range of 2100 – 2500 ohm-cm. Therefore, this rating system could under rate the impact of soil resistivity.

- A review of manufacturer recommendations and literature on graphitic corrosion resulted in a generally acceptable range of pH from neutral to slightly alkaline to minimize the potential of graphitic corrosion. AWWA ANSI C105 allows a rating factor of zero for pH values in the range of 4 – 8.5. Again, this rating system could under rate the impact of soil resistivity.

- A review of general literature on graphitic corrosion resulted in the determination that oxygen content and microbiological activity are also factors affecting graphitic corrosion. Although the redox potential factor utilized in AWWA ANSI C105 provides a relative measure of oxygen content and microbiological activity, the NRC staff is not aware of a direct link to the potential for graphitic corrosion in relation to the assigned factors because the standard addresses ductile-iron, not gray cast iron.

In addition, the proposed amendment does not state the number of soil samples to be obtained, frequency of testing, location of soil samples in relation to the in-scope buried cast iron components, and how often sampling will be conducted.

RAI-1

a) **Provide the technical basis for why each parameter and associated rating factor in AWWA ANSI C105 is sufficient to project the potential for graphitic corrosion in gray cast iron, or provide an alternative rating factor with accompanying technical basis.**

b) **State the number of soil samples to be obtained, frequency of testing, location of soil samples in relation to the in-scope buried cast iron components, and how often sampling will be conducted.**

Background for RAI-2

In the application, it is proposed that LRC No. 19 be amended to allow selective leaching inspections to be conducted by an ultrasonic inspection technique that is capable of discerning the sound metal/graphitic matrix transition boundary for gray cast iron components that are inaccessible for internal inspections.

The NRC staff lacks sufficient information to conclude that the ultrasonic inspection technique is adequate to detect the sound metal/graphitic matrix transition boundary. In addition, the staff lacks sufficient information to conclude that appropriate process controls will be in place to develop the procedures and qualify the test method and personnel.

RAI-2

a) **Provide sufficient technical detail on the ultrasonic methodology such as wave frequency (e.g., ½ to 1 megahertz), wave shape (L-wave), percentage of surface area inspected for each component, and grid spacing, in order for the NRC staff to conclude that the method is capable of detecting the metal/graphitic matrix transition boundary.**

b) **State how the following considerations and process controls will be implemented for the ultrasonic testing to detect the sound metal/graphitic matrix transition boundary in gray cast iron piping:**

   i) **use of proven technology and industry operating experience,**

   ii) **the test method and equipment is qualified subject to performance demonstration specific to the plant, including consideration for piping material, design, and service, and**

   iii) **test personnel are qualified.**