

From: Mahesh Chawla
To: Dale.Vincent@nmcco.com
Date: 5/2/06 5:07PM
Subject: Prairie Island Unit 1 and 2 - SG Tube Integrity TS Amendment Request - MD0209/MD0210

In reference to the above LAR, the NRC staff would like to discuss the following information in a teleconference:

1. Proposed Technical Specification (TS) 5.5.8.b.2 describe the accident induced leak rate limits for Prairie Island 1 and 2. For Unit 2, there is an exception allowed to the 1 gallon per minute (gpm) limit based on implementation of the voltage-based repair criteria; however, as currently proposed it appears that this limit could be inappropriately applied to Unit 1. In addition, the proposed Unit 2 limit appears to allow leakage from sources other than from degradation left in service with the voltage-based tube repair criteria to exceed 1 gpm. Please discuss your plans to modify your proposal to clearly indicate that the accident induced leakage limit for Unit 1 is 1 gpm (regardless of whether Unit 2 is implementing the voltage-based repair criteria). In addition, please discuss your plans to specify that for Unit 2, the leakage from all sources excluding the leakage attributed to the degradation associated with implementation of the voltage-based alternate repair criteria will not exceed 1 gpm per steam generator (SG).

For example: "For Unit 1 leakage is not to exceed 1 gpm per SG. For Unit 2, leakage from all sources, excluding the leakage attributed to the degradation described in TS Section [insert appropriate Section] is not to exceed 1 gpm per SG."

The staff notes that reference to the 1.42 gpm limit in your current proposal should not be needed since this should be consistent with your current accident analysis (which is addressed by the first sentence in your proposed accident induced leakage performance criterion). The staff also notes that your Bases may also need to be revised to clarify this issue (page B3.4.19-2).

2. Per your proposed structural integrity performance criterion, a safety factor of 1.4 against burst will be applied to the design basis accident primary to secondary pressure differentials. However, Generic Letter 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," indicated that there is a possibility that a tube may have a burst pressure less than 1.4 times the steam line break pressure differential (given the uncertainties associated with the various correlations); therefore, the GL 95-05 alternate repair criteria (ARC) imposed a limit on the probability of burst (POB) of 1×10^{-2} . As a result, it is not clear from your submittal that the structural integrity performance criteria is complete since it does not fully address all the performance criteria for implementation of the voltage-based ARC. Please discuss your plans to modify the performance criteria to fully address the voltage-based ARC. For example, discuss your plans for modifying the structural integrity performance criteria to indicate that for predominantly axially oriented outside diameter stress corrosion cracking at the tube support plate elevations the POB of one or more indications given a steam line break shall be less than 1×10^{-2} . Upon incorporation of this criterion into the structural integrity performance criterion, please discuss your plans to eliminate the associated reporting requirement in proposed TS 5.6.7.b.5 since operation in excess of this limit will not be permitted.

3. In your proposed TS (and Technical Specification Task Force-449), a SG tube is defined as the entire length of the tube including the tube wall [and any repairs made to it], between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. Given this definition and the possibility that sleeves can extend to near the tube-end, the proposed repair criteria in TS 5.5.8.c.2 may not be complete. In addition, the staff notes the following concerning your proposed tube repair criteria: (1) it is not clear that your proposed TS contains the appropriate repair limit for the parent tube at the locations of the sleeve-to-tube joint, (2) it is not clear whether the F^*/EF^* criteria could be applied in the cold-leg, (3) it is not

clear whether the EF* and the F* criteria must be satisfied below the mid-plane of the tubesheet, (4) there is redundancy regarding the use of the phrase "predominately axially oriented outside diameter stress corrosion cracking" in proposed TS 5.5.8.c.2(c), and (5) it is not clear that indications between 2.0 volts and the upper voltage repair limit may remain in service if no degradation is detected with a rotating pancake coil (or equivalent). Please discuss your plans to modify your TS to address these issues. For example, the TS may be modified by using something similar to the following:

For Unit 2, the non-sleeved region of a tube found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged or repaired except if the flaws are permitted to remain in service through application of an alternate tube repair criteria discussed below. Tubes shall be plugged if the sleeved region of a tube is found by inservice inspection to contain flaws in the (a) sleeve or (b) the pressure boundary portion of the original tube wall in the sleeve/tube assembly (i.e., the sleeve-to-tube joint).

The following alternate tube repair criteria may be applied as an alternative to the 40% depth based criteria.

a. Localized wall thinning in non-sleeved regions of the tube: For these areas, tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 50% of the nominal wall thickness shall be plugged or repaired.

b. F*/EF* criteria: For the non-sleeved regions of the tube in the hot-leg tubesheet, the plugging or repair limit is as follows:

If the bottom of the uppermost hardroll transition in the tubesheet is below the midplane of the tubesheet, then all defects located below 1.07-inches from the bottom of this uppermost hardroll transition (not including eddy current uncertainty) may be allowed to remain in service provided the tube does not contain any flaws within this 1.07-inch span (not including eddy current uncertainty). This 1.07-inch span (not including eddy current uncertainty) is referred to as the F* region. If flaws are contained within the F* region, the tube shall be plugged or repaired.

If the bottom of the uppermost hardroll transition in the tubesheet is above the midplane of the tubesheet but at least 2.0 inches below the top of the secondary face of the tubesheet, then all defects located below 1.67-inches from the bottom of the uppermost hardroll transition (not including eddy current uncertainty) may be allowed to remain in service provided the tube does not contain any flaws within this 1.67-inch span (not including eddy current uncertainty). This 1.67-inch span (not including eddy current uncertainty) is referred to as the EF* region. If flaws are contained within the EF* region, the tube shall be plugged or repaired.

c. Tube support plate voltage-based repair criteria: For non-sleeved regions of the tube affected by predominantly axially oriented outside diameter stress corrosion cracking confined within the thickness of the tube support plates, the plugging or repair limit is as follows:

If the bobbin voltage associated with the degradation is less than or equal to 2.0 volts, the degradation is allowed to remain in service.

If the bobbin voltage associated with the degradation is greater than 2.0 volts, the tube shall be plugged or repaired unless the voltage is less than or equal to the upper voltage repair limit (calculated according to the methodology in Generic Letter 95-05 as supplemented) and a rotating pancake coil (or comparable examination technique) does not detect the flaw. In this latter case, the flaw may remain in service.

If an unscheduled mid-cycle inspection is performed, [insert appropriate wording from currently approved TS]

4. In your proposed inspection requirements for Unit 2, please address the following:

a. You proposed that each time a SG is inspected that all tubes within that SG which have had the F*/EF* criteria applied will be inspected. If it is not your intent to inspect these tubes under all circumstances in which a SG may be inspected (e.g., a primary-to-secondary leak in the middle of a cycle), please clarify your intent. For example, the F* and EF* region of the tube shall be inspected every 24 effective full power months or one refueling outage (whichever is less) if flaws were allowed to remain in service in these tubes by using the F*/EF* criteria.

b. Your current proposal uses terms such as F* criteria and F* region without defining them. The staff notes that incorporation of the suggestions above may address this issue.

c. You proposed to exclude from inspection the region of the tube below the F* and EF* regions. Since sleeves may be installed below the F* and EF* regions, please discuss your plans to modify your proposal to ensure any such sleeves will be required to be inspected. The staff notes that incorporation of the suggestions above may address this issue.

d. In your current TS, there are requirements to perform inspections of intersections to which the voltage-based repair criteria apply (i.e., 5.5.8.b.5 and 5.5.8.b.6). Please describe the technical basis for deleting these requirements or alternatively propose to include similar requirements in your current amendment request.

5. Proposed TS 5.5.8.f.2 on tube repair methods for Unit 2 is not clear and appears to have more detail than is needed. Please discuss your plans to clarify and simplify your proposed specification. For example:

For Unit 2, the following are approved repair methods:

a. Alloy 690 tungsten inert gas welded sleeves in accordance with CEN-629-P, Revision 03-P, "Repair of Westinghouse Series 44 and 51 Steam Generator Tubes Using Leak Tight Sleeves."

b. Hardroll expanding portions of non-sleeved tubes in the hot-leg tubesheet in order to apply the F*/EF* criteria.

6. Confirm that as part of your proposed reporting requirement in TS 5.6.7.a.4 (location, orientation, and measured sizes of service induced indications) that you will identify tubes in which flaws were allowed to remain in service using the F*/EF* criteria (consistent with your current TS requirement). Similarly confirm that as part of your proposed reporting requirement in TS 5.6.7.a.9 that you intend to provide the number of tubes repaired by installing additional hardroll expansions and the cumulative number of tubes currently in service repaired by this method.

7. Given that your proposed TS do not allow operation when the accident induced leakage criteria is exceeded, please discuss your plans to omit TS Section 5.6.7.b.1.

8. One of the purposes of TSTF-449 is to allow licensees to update their TSs to accurately reflect their SG tube integrity program. For implementation of the voltage-based tube repair criteria, licensees have submitted "90-day reports" providing information concerning tube pulls and condition monitoring/operational assessment results. Consistent with the philosophy of TSTF-449, please discuss your plans to modify TS Section 6.9.7, SG Tube Inspection Report, to include a requirement to provide the information described in Section 6b of Attachment 1 of GL 95-05 to the U.S. Nuclear Regulatory Commission.

9. On page B 3.4.14-2 of your Bases, you indicate (in two places) that the accident induced leakage limit is 1 gpm; however, proposed TS 5.5.8.b.2 implies that this limit is 1.42 gpm for Unit 2. Please clarify this discrepancy.

10. On page B3.4.14-4, you indicate that the 150 gallon per day (gpd) limit is based on implementation of the voltage based tube repair criteria. Although the 150 gpd limit may have been adopted when the voltage based tube repair criteria was implemented, it is not the basis for the requirement. Please discuss your plans to modify your TS Bases to remove this discussion.

11. On page B 3.4.19-3, you indicate that the region of tube below the F* and EF* distances are not part of the tube. Please discuss your plans to clarify this statement in light of questions 3 and 4 above including your plans to clarify that this is only applicable to non-sleeved tubes.

CC: Yamir Diaz-Castillo

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