Duke Energy®

MCGUIRE NUCLEAR STATION

Duke Energy Corporation
12700 Hagers Ferry Rd.
Huntersville, NC 28078

704 875 4000

November 29, 2006

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC

McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370

Application for Technical Specification Improvement Regarding Steam Generator Tube Integrity and Other Administrative Changes - Response to NRC Request for Additional Information

In a letter to the NRC dated April 11, 2006, (ML061080500), Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke), submitted a license amendment request (LAR) to revise the steam generator tube integrity requirements in the Technical Specifications (TS) for McGuire Units 1 and 2. This LAR would revise the TS requirements related to steam generator tube integrity. The changes are consistent with NRC-approved Revision 4 to Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-449, "Steam Generator Tube Integrity." The availability of this TS improvement was announced in the Federal Register on May 6, 2005, (70FR24126), as part of the Consolidated Line Item Improvement Process (CLIIP). This letter provides Duke's answers to questions asked by the NRC staff on this LAR. Attachment 1 contains a statement of each NRC question followed by the Duke response. Attachment 2 provides revised TS and Bases page mark-ups for McGuire Units 1 and 2. As discussed in Attachment 1, these revised pages replace the corresponding pages contained in the original April 11, 2006 LAR.

In accordance with 10 CFR 50.91, a copy of this application, with enclosures, is being provided to the designated official of the State of North Carolina.

If you should have any questions regarding this submittal, contact J. S. Warren at 704-875-5171.

Very truly yours,

G. R. Peterson

G. R. Peterson

Attachments

A001

Attachments:

1. Response to NRC Questions

2. Revised Technical Specifications and Bases Changes (Marked Pages) for McGuire Units 1 and 2

xc (with attachments):

W. D. Travers
U. S. Nuclear Regulatory Commission
Regional Administrator, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

J. F. Stang (Addressee Only)
NRC Senior Project Manager (McGuire)
U. S. Nuclear Regulatory commission
Mail Stop 8 H4A
Washington, DC 20555-0001

J. B. Brady
Senior Resident Inspector
U. S. Nuclear Regulatory Commission
McGuire Nuclear Site

Beverly O. Hall, Section Chief
Radiation Protection Section
1645 Mail Service Center
Raleigh, NC 27699-1645

G. R. Peterson affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

G. R. Peterson

G. R. Peterson, Site Vice President

Subscribed and sworn to me: November 29, 2006
Date

Freda K. Crump, Notary Public

My commission expires: August 17, 2011
Date

SEAL

Attachment 1

Response to NRC Questions

By letter dated April 11, 2006, (ML061080500), Duke Energy, submitted a request to revise the steam generator tube integrity requirements in the technical specifications for McGuire Units 1 and 2. In order for the staff to complete its review, responses to the following questions are needed.

1. In proposed surveillance requirement 3.4.13.2, you have indicated that you can either verify the leakage rate through one steam generator is less than or equal to 135 gallons per day through any one steam generator or less than or equal to 389 gallons per day through all steam generators. Please confirm that it is acceptable (per your design and licensing basis) that it is acceptable to meet either of these conditions rather than meeting both conditions (i.e., please confirm that "or" should not be replaced with "and [≤ 389 ...]").

   Response

   McGuire has reviewed the use of the terms "and" versus "or" based on the discussion contained in the NRC question and the actual wording used in the current LCO 3.4.13. Based on this review, it has been determine that SR 3.4.13.2 should clearly verify that both of the leakage limits are met. Thus, the submittal has been modified as requested. The "or" in SR 3.4.13.2 has been changed to "and." A conforming change has also been made to the associated Bases. Remarked TS page 3.4.13-2 and Bases change labeled MCGUIRE INSERT B 3.4.13 D (WOG) are included in Attachment 2. The Bases change is indicated in the right margin.

2. In proposed technical specification (TS) 5.5.9.b.2, you indicate, in part, that accident induced leakage is not to exceed 0.27 "gpm" total, "except for specific types of degradation at specific locations as described in paragraph c of the Steam Generator Program." Since "gpm" is not defined in this technical specification, please discuss your plans to replace "gpm" with "gallons per minute". In addition, since the "exception" does not apply to McGuire, discuss your plans to remove the last part of the second sentence in TS 5.5.9.b.2.

   Response

   McGuire has reviewed this bracketed portion of TSTF-449 and the submittal has been modified as requested. The term "gpm" has also been eliminated. A remarked TS page (labeled MCGUIRE INSERT 5.5.9, Page 3) is included in Attachment 2 and the changes are indicated in the right margin.

3. In the second paragraph on page B 3.4.18-2, you indicate that your accident analysis is based on the total primary-to-secondary leakage from all steam generators of 389 gallons per day. The corresponding sentence in TSTF-449, however, adds that the primary-to-secondary leakage may "increase to 389 gallons per day as a result of accident induced conditions." The statements in TSTF-449 reflect that normal operating leakage can increase as a result of accident induced conditions. Please

discuss your plans to incorporate the additional clarification listed above. In addition, please discuss why you did not reference your 135 gallon per day limit through any one steam generator (since the staff assumes that all 389 gallons per day were not assumed to come from one steam generator).

Response

The McGuire safety analysis assumes leakage rate limits of 135 gallons per day per SG and 389 gallons per day total for all SGs (as discussed later in the Response to Question 7, administrative limits are lower than these values). No assumption is made for an increase due to accident induced leakage, thus it is not appropriate to include the referenced statement from TSTF-449 in McGuire's new TS 3.4.18 Bases. The 135 gallons per day per SG limit has been added here in this Bases for clarification and a remarked TS Bases page B 3.4.18-2 is included in Attachment 2 with the changes indicated in the right margin.

4. In the third paragraph in the Limiting Condition for Operation Section on page B 3.4.18-2, there is reference to "and any repairs made to it". Since tube repairs are not approved for McGuire Units 1 and 2, please discuss your plans to remove this statement.

   Response

   McGuire has reviewed this bracketed portion of TSTF-449 and the submittal has been modified as requested. The referenced statement has been removed. A remarked TS Bases page 3.4.18-2 is included in Attachment 2 and the changes are indicated in the right margin.

5. In the last paragraph on page B 3.4.18-3, you have the phrase "except for specific types of degradation at specific locations where the NRC has approved greater accident induced leakage." Since there are no alternate tube repair criteria approved for McGuire Units 1 and 2, please discuss your plans to remove this phrase.

   Response

   McGuire has reviewed this bracketed portion of TSTF-449 and the submittal has been modified as requested. The referenced phrase has been removed. A remarked TS Bases page B 3.4.18-3 is included in Attachment 2 and the change is indicated in the right margin.

6. In the first paragraph on page B 3.4.18-4, you indicated that it was acceptable to limit primary-to-secondary leakage to either 135 gallons per day through one steam generator or 389 gallons per day total. It would appear that "or" should be replaced by "and" since the limit placed on leakage through any one steam generator is limited by TSTF-449 to 150 gallons per day and your design basis limits it to 389 gallons per day total. Please clarify.

Attachment 1

Response

As discussed in the Response to Question 1, McGuire has reviewed the use of the terms "and" versus "or" based on the discussions contained in the NRC questions. Based on this review, the submittal has been modified as requested. The "or" has been changed to "and." A remarked TS Bases page B 3.4.18-4 is included in Attachment 2 and the change is indicated in the right margin.

7. It appears that the TS operational primary-to-secondary leakage limit is identical to what was assumed in your design bases accident analysis. As a result, please address the following:

   The NRC staff recognizes that plants have assumed that the leak rate during a design basis accident is the same as the leak rate during normal operation. However, it is important (required) to ensure that neither of these limits are exceeded. As a result, it may be necessary to ensure that the operational leak rate is kept well below the operational leak rate limit since the leak rate experienced during a design basis accident may be higher than that observed during normal operation. This increase in leak rate can be a result of either (1) the higher differential pressure associated with a design basis accident causing the leak rate from flaws leaking during normal operation to leak at higher rates or (2) the higher loadings associated with a design basis accident causing a flaw that was not leaking during normal operation to leak during the accident.

   Given the above, discuss whether your procedures recognize this potential leakage issue or discuss your plans to modify your procedures to ensure that you will not exceed the accident induced leak rate limit as a result of the higher leak rates that may be observed during a design basis accident (as a result of inducing "new" leakage or as a result of the higher driving force for leakage). Alternatively, discuss your plans (and the technical basis) for modifying your normal operating and accident induced leakage limit to address these effects.

   Response

   McGuire procedures recognize the potential leakage issue discussed in the NRC question. To address this issue, the McGuire procedures include a shutdown limit of 100 gallons per day (be in Mode 3 within 24 hours) and a prompt shutdown limit of 125 gallons per day (be in Mode 3 within 3 hours). These procedural limits will ensure that action is taken to maintain the leak rate below the operational leakage limit.

Attachment 2

McGuire Nuclear Station Units 1 and 2

Revised Technical Specifications and Bases Changes (Marked Pages)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.13.1 ----------NOTE---------- (S) 1. Not required to be performed ~~in MODE 3 or 4~~ until 12 hours after establishment of steady state operation. 2. Not applicable to primary to secondary LEAKAGE.	---------NOTE------- Only required to be performed during steady state operation
Verify RCS Operational LEAKAGE is within limits by performance of RCS water inventory balance.	72 hours
SR 3.4.13.2 ~~Verify steam generator tube integrity is in accordance with the Steam Generator Tube Surveillance Program.~~	~~In accordance with the Steam Generator Tube Surveillance Program~~

Verify primary to secondary LEAKAGE is ≤ 135 gallons per day through any one SG and ≤ 389 gallons per day total through all SGs.

72 hours

INSERT 3.4.13 A

MCGUIRE INSERT B 3.4.13 D (WOG)

This SR verifies that primary to secondary LEAKAGE is less than or equal to 135 gallons per day through any one SG and less than or equal to 389 gallons per day total through all SGs. Satisfying the primary to secondary LEAKAGE limit ensures that the assumptions of the safety analyses are met (Ref. 3). If this SR is not met, compliance with this LCO, as well as LCO 3.4.18, "Steam Generator Tube Integrity," should be evaluated. The 135 and 389 gallons per day limits are measured at a temperature of 585 °F as described in Ref. 3. The operational LEAKAGE rate limit applies to LEAKAGE through any one SG. If it is not practical to assign the LEAKAGE to an individual SG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one SG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the EPRI guidelines (Ref. 8).

MCGUIRE INSERTS

MCGUIRE INSERT 5.5.9

A Steam Generator Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the Steam Generator Program shall include the following provisions:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected or plugged to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

   1. Structural integrity performance criterion: All in-service steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down and all anticipated transients included in the design specification) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

   2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG . Leakage is not to exceed 0.27 gallons per minute total.

   3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube repair criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged.

BASES

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for SG tubes and avoiding an SGTR is the basis for this Specification. The analysis of a SGTR event assumes a bounding primary to secondary LEAKAGE rate equal to the operational LEAKAGE rate limits in LCO 3.4.13, "RCS Operational LEAKAGE," plus the leakage rate associated with a double-ended rupture of a single tube. The accident analysis for a SGTR assumes the contaminated secondary fluid is only briefly released to the atmosphere via safety valves and the majority is discharged to the main condenser.

The analysis for design basis accidents and transients other than a SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture). In these analyses, the steam discharge to the atmosphere is based on primary to secondary LEAKAGE from any one SG of 135 gallons per day and 389 gallons per day total from all SGs. For accidents that do not involve fuel damage, the primary coolant activity level of DOSE EQUIVALENT I-131 is assumed to be equal to the LCO 3.4.16, "RCS Specific Activity," limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel. The dose consequences of these events are within the limits of GDC 19 (Ref. 2), 10 CFR 100 (Ref. 3) or the NRC approved licensing basis (e.g., a small fraction of these limits).

Steam generator tube integrity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that SG tube integrity be maintained. The LCO also requires that all SG tubes that satisfy the repair criteria be plugged in accordance with the Steam Generator Program.

During an SG inspection, any inspected tube that satisfies the Steam Generator Program repair criteria is removed from service by plugging. If a tube was determined to satisfy the repair criteria but was not plugged, the tube may still have tube integrity.

In the context of this Specification, a SG tube is defined as the entire length of the tube, including the tube wall, between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. The tube-to-tubesheet weld is not considered part of the tube.

A SG tube has tube integrity when it satisfies the SG performance criteria. The SG performance criteria are defined in Specification 5.5.9, "Steam Generator Program," and describe acceptable SG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the SG performance criteria.

BASES

LCO (continued)

There are three SG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE. Failure to meet any one of these criteria is considered failure to meet the LCO.

The structural integrity performance criterion provides a margin of safety against tube burst or collapse under normal and accident conditions, and ensures structural integrity of the SG tubes under all anticipated transients included in the design specification. Tube burst is defined as, "The gross structural failure of the tube wall. The condition typically corresponds to an unstable opening displacement (e.g., opening area increased in response to constant pressure) accompanied by ductile (plastic) tearing of the tube material at the ends of the degradation." Tube collapse is defined as, "For the load displacement curve for a given structure, collapse occurs at the top of the load versus displacement curve where the slope of the curve becomes zero." The structural integrity performance criterion provides guidance on assessing loads that have a significant effect on burst or collapse. In that context, the term "significant" is defined as "An accident loading condition other than differential pressure is considered significant when the addition of such loads in the assessment of the structural integrity performance criterion could cause a lower structural limit or limiting burst/collapse condition to be established." For tube integrity evaluations, except for circumferential degradation, axial thermal loads are classified as secondary loads. For circumferential degradation, the classification of axial thermal loads as primary or secondary loads will be evaluated on a case-by-case basis. The division between primary and secondary classifications will be based on detailed analysis and/or testing.

Structural integrity requires that the primary membrane stress intensity in a tube not exceed the yield strength for all ASME Code, Section III, Service Level A (normal operating conditions) and Service Level B (upset or abnormal conditions) transients included in the design specification. This includes safety factors and applicable design basis loads based on ASME Code, Section III, Subsection NB (Ref. 4) and Draft Regulatory Guide 1.121 (Ref. 5).

The accident induced leakage performance criterion ensures that the primary to secondary LEAKAGE caused by a design basis accident, other than a SGTR, is within the accident analysis assumptions. The accident analysis assumes that accident induced leakage does not exceed 0.27 gallons per minute total. The accident induced leakage rate includes any primary to secondary LEAKAGE existing prior to the accident in addition to primary to secondary LEAKAGE induced during the accident.

BASES

LCO (continued)

The operational LEAKAGE performance criterion provides an observable indication of SG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.13, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one SG to 135 gallons per day and 389 gallons per day total through all SGs. This limit is based on the assumption that a single crack leaking this amount would not propagate to a SGTR under the stress conditions of a LOCA or a main steam line break. If this amount of LEAKAGE is due to more than one crack, the cracks are very small, and the above assumption is conservative.

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across SG tubes can only be experienced in MODE 1, 2, 3, or 4.

RCS conditions are far less challenging in MODES 5 and 6 than during MODES 1, 2, 3, and 4. In MODES 5 and 6, primary to secondary differential pressure is low, resulting in lower stresses and reduced potential for LEAKAGE.

ACTIONS

The ACTIONS are modified by a Note clarifying that the Conditions may be entered independently for each SG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected SG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected SG tubes are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Condition A applies if it is discovered that one or more SG tubes examined in an inservice inspection satisfy the tube repair criteria but were not plugged in accordance with the Steam Generator Program as required by SR 3.4.18.2. An evaluation of SG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the SG performance criteria described in the Steam Generator Program. The SG repair criteria define limits on SG tube degradation that allow for flaw growth between inspections while still providing assurance that the SG performance criteria will continue to be met. In order to determine if a SG tube that should have been plugged has tube integrity, an evaluation must be completed that demonstrates that the SG performance criteria will continue to be met until the next refueling outage or SG tube inspection. The tube integrity determination is based on the estimated condition of the tube at the time the situation is discovered and the estimated growth of the degradation prior to the next SG tube inspection. If it is determined that tube integrity is not being maintained, Condition B applies.