April 4, 2008

Mr. Rick A. Muench
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION - ISSUANCE OF AMENDMENT RE: REVISION TO TECHNICAL SPECIFICATION 5.5.9 ON THE STEAM GENERATOR PROGRAM (TAC NO. MD8054)

Dear Mr. Muench:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 178 to Facility Operating License No. NPF-42 for the Wolf Creek Generating Station. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated February 8, 2008 (ET 08-0009), as supplemented by letters dated March 21 and 30, 2008 (ET 08-0016 and 08-0024).

The amendment revises TS 5.5.9, "Steam Generator (SG) Program," and TS 5.6.10, "Steam Generator Tube Inspection Report." For TS 5.5.9, the amendment would replace the existing alternate repair criteria (ARC) in TS 5.5.9.c.1 for SG tube inspections that was approved in Amendment No. 169 issued October 10, 2006, for refueling outage 15 (the outage for the fall of 2006) and the subsequent operating cycle. The new interim ARC would be for the upcoming refueling outage 16 (the outage for the spring of 2008) and the subsequent 18-month operating cycle, and would apply to service-induced crack-like flaws found below 17 inches from the top of the tubesheet. For TS 5.6.10, three new reporting requirements are added to the existing seven requirements.

A copy of our related Safety Evaluation is enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Jack N. Donohew, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosures: 1. Amendment No. 178 to NPF-42
2. Safety Evaluation

cc w/encls: See next page

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cc w/encls: See next page

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ADAMS Accession Nos.: Pkg ML080840003 (Amdt. ML080840004, License/TS Pg ML080840005)
(*) See previous concurrence (**) SE input memo

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	DCI/CSGB/BC	OGC	NRR/LPL4/BC
NAME	JDonohew	JBurkhardt	AHiser	MSmith, NLO w/comments	THiltz, MTM for
DATE	4/2/08	3/26/08	3/28/08	4/2/08	4/4/08

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WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 178
License No. NPF-42

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Wolf Creek Generating Station (the facility) Facility Operating License No. NPF-42 filed by the Wolf Creek Nuclear Operating Corporation (the Corporation), dated February 8, 2008, as supplemented by letters dated March 21 and 30, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and Paragraph 2.C.(2) of Facility Operating License No. NPF-42 is hereby amended to read as follows:

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 178, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated in the license. The Corporation shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The license amendment is effective as of its date of issuance and shall be implemented prior to the entry into Mode 4 during the startup from refueling outage 16 in the spring of 2008.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Thomas G. Hiltz, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Facility
Operating License and
Technical Specifications

Date of Issuance: April 4, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 178

FACILITY OPERATING LICENSE NO. NPF-42

DOCKET NO. 50-482

Replace the following pages of the Facility Operating License No. NPF-42 and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License

REMOVE	INSERT
4	4

Technical Specifications

REMOVE	INSERT
5.0-12	5.0-12
5.0-26	5.0-26

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 178 TO FACILITY OPERATING LICENSE NO. NPF-42

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

1.0 INTRODUCTION

By application dated February 8, 2008, as supplemented by letters dated March 21 and 30, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML080440099, ML080860248, and ML08XXXXXXX (no ADAMS Accession number at this time), respectively), Wolf Creek Nuclear Operating Corporation (the licensee) requested changes to the Technical Specifications (TSs, Appendix A to Facility Operating License No. NPF-42) for the Wolf Creek Generating Station (WCGS).

The proposed amendment would revise TS 5.5.9, "Steam Generator (SG) Program," and TS 5.6.10, "Steam Generator Tube Inspection Report." For TS 5.5.9, the amendment would replace the existing alternate repair criteria (ARC) in TS 5.5.9.c.1 for SG tube inspections that was approved in Amendment No. 169 issued October 10, 2006, for refueling outage 15 (the outage for the fall of 2006) and the subsequent operating cycle. The new interim ARC would be for the upcoming refueling outage 16 (the outage for the spring of 2008) and the subsequent 18-month operating cycle, and would apply to service-induced crack-like flaws found below 17 inches from the top of the tubesheet (TTS). The amendment would also delete a sentence in TS 5.5.9.d that relates solely to previous refueling outages. For TS 5.6.10, three new reporting requirements are proposed to be added to the existing seven requirements.

The supplemental letter dated March 21, 2008, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination published in an individual notice in the *Federal Register* on February 21, 2008 (73 FR 9602).

In its letters dated February 8 and March 21, 2008, the licensee submitted Westinghouse Electric Company (WEC) topical reports, LTR-CDME-08-11-P, "Interim Alternate Repair Criterion (ARC) for Cracks in the Lower Region of the Tubesheet Expansion Zone," dated January 31, 2008, and LTR-CDME-08-43-P, "Response to NRC Request for Additional Information Relating to LTR-CDME-08-11-P - Attachment." The topical reports contained proprietary information and the affidavits, signed by WEC requesting that NRC withhold the proprietary information from the public, were also submitted in the two letters. The NRC letter approving the withholding of the information from the public, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 2.390(b)(5) and Section 103(b) of the Atomic

Energy Act of 1954, as amended, were issued in letters dated February 27, 2008 (ADAMS Accession No. ML080430015, for LTR-CDME-08-43-P) and April 3, 2008 (ADAMS Accession No. ML080860006, for LTR-CDME-08-11-P). There is no proprietary information in this safety evaluation (SE).

2.0 BACKGROUND

WCGS has four Model F SGs designed and fabricated by WEC. There are 5626 tubes in each SG, each with an outside diameter of 0.688 inches and a nominal wall thickness of 0.040 inches. The tubes are thermally-treated alloy 600 and are hydraulically expanded for the full depth of the tubesheet (21.03 inches) at each end and are welded to the tubesheet at the bottom of each expansion.

Until the fall of 2004, no instances of stress-corrosion cracking (SCC) affecting the tubesheet region of thermally-treated alloy 600 tubing had been reported, either at WCGS or other nuclear power plants in the United States. As a result, most plants including WCGS had been using bobbin probes for inspecting the length of tubing within the tubesheet and supplementing these bobbin probe inspections (which are not capable of reliably detecting SCC in the tubesheet region) with rotating coil probes in a region extending from 3 inches above the TTS to 3 inches below the TTS. This zone includes the tube-expansion transition zone located at the TTS. The expansion transition contains significant residual stress and was considered a likely location for SCC should it ever develop.

In the fall of 2004, crack-like indications were found in tubes in the tubesheet region of Catawba Nuclear Station, Unit 2 (Catawba), which has Westinghouse Model D5 SGs. Like WCGS, the Catawba SGs employ thermally-treated alloy 600 tubing that is hydraulically expanded against the tubesheet. Catawba had accumulated 14.7 effective full power years (EFPY) of service, slightly less than the service experience for the SGs at WCGS, with a comparable hot-leg operating temperature. The crack-like indications at Catawba were found in bulges (or over-expansions) in the tubesheet region, in the tack roll region, and at or near the tube-to-tubesheet weld. The tack expansion is an initial 0.7-inch-long expansion at each tube end and is formed prior to the hydraulic expansion over the full tubesheet depth. Its purpose was to facilitate performing the tube-to-tubesheet weld.

As a result of the Catawba findings, the WCGS licensee expanded the scope of previous rotating coil inspections during refueling outage 14 (circa April 2005) to address the potential for SCC to occur in the portion of the tubes located within the thickness of the tubesheet. These inspections were focused from the TTS to 17 inches below the TTS since the licensee believes that any flaws located at elevations more than 17 inches below the TTS (i.e., in the bottom 4 inches of the tube within the tubesheet region, including the tack expansion region and the tubing in the vicinity of the welds) have no potential to impair tube integrity and, thus, do not pose a safety concern. The NRC approved restricting the inspection and repair of flaws to the upper 17 inches of the tube within the tubesheet on the hot-leg side of the SG in Amendment No. 162, dated April 28, 2005. The portion of tubing below 17 inches from the TTS was excluded from these inspection and plugging requirements. At the time that Amendment No. 162 was issued, it applied only to refueling outage 14 and the subsequent 18-month operating cycle.

By letter dated February 21, 2006 (ADAMS Accession No. ML060600456), the licensee requested a separate permanent amendment for WCGS that would further limit the applicability of the TS tube inspection and plugging requirements to the upper 2.7 to 7 inches of the tubesheet thickness depending on the tube location. This amendment, using an analysis approach identified as H*/B*, would replace the then current, one-cycle, SG tube inspection and plugging requirements. The NRC staff requested additional information concerning this amendment request by letter dated June 27, 2006 (ADAMS Accession No. ML061650099). In a telephone call with the NRC, the licensee explained that it would not be able to respond with the requested information before refueling outage 15, which was scheduled for October 2006. Thus, the NRC staff could not complete its review in time to support the upcoming refueling outage 15 inspections and, therefore, the licensee requested a change to TS 5.5.9 to extend the SG tube inspection and plugging requirements to refueling outage 15 and the subsequent operating cycle. The NRC staff approved this request in Amendment No. 169 dated October 10, 2006 (ADAMS Accession No. ML062580016). The licensee provided its response in a letter dated May 3, 2007 (ADAMS Accession No. ML071290104).

Following issuance of Amendment No. 169, the NRC staff continued its review of the February 21, 2006, permanent amendment request. This review included the responses to two separate requests for additional information (RAIs) and several meetings with the licensee. During a phone call on January 16, 2008, the NRC staff informed the licensee that it had not provided sufficient information to allow the staff to complete its review of the license amendment request. For this reason, the licensee has requested, in its application dated February 8, 2008, an amendment to the TSs that would modify the tubesheet inspection and repair requirements applicable to refueling outage 15 and the current operating cycle with a more conservative alternate repair criteria (ARC) approach applicable to refueling outage 16 (scheduled for spring 2008) and the subsequent operating cycle. This amendment request is addressed below.

3.0 REGULATORY EVALUATION

In 10 CFR 50.36, the Commission established its regulatory requirements related to the content of the TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following five specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation (LCOs); (3) surveillance requirements; (4) design features; and (5) administrative controls. The rule does not specify the particular requirements to be included in a plant's TSs. In 10 CFR 50.36(d)(5), administrative controls are stated to be "the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure the operation of the facility in a safe manner." This also includes the programs established by the licensee and listed in the administrative controls section of the TSs for the licensee to operate the facility in a safe manner. The requirements for (1) SG tube inspections and repair, and (2) reporting on these inspections and repair for WCGS are in TS 3.4.17, "Steam Generator (SG) Tube Integrity," and TS 5.5.9, and TS 5.6.10, respectively.

In the improved standard technical specifications (STS) in NUREG-1431 for Westinghouse plants like WCGS, TS 5.5.9 requires that an SG tube program be established and implemented to ensure that SG tube integrity is maintained. SG tube integrity is maintained by meeting specified performance criteria (in TS 5.5.9.b) for structural and leakage integrity, consistent with

the plant design and licensing basis. TS 5.5.9 requires that a condition monitoring assessment be performed during each outage during which the SG tubes are inspected to confirm that the performance criteria are being met. TS 5.5.9 also includes provisions regarding the scope, frequency, and methods of SG tube inspections. Of relevance to the subject amendment request, these provisions require that the number and portions of tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type that may be present along the length of a tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube repair criteria (except as indicated above regarding the one-cycle application of a limited scope of inspection in the tubesheet region). The applicable tube repair criteria, specified in TS 5.5.9.c, are that tubes found by an inservice inspection (ISI) to contain flaws with a depth equal to or exceeding 40 percent of the nominal tube-wall thickness shall be plugged.

The SG tubes function as an integral part of the reactor coolant pressure boundary (RCPB) and, in addition, serve to isolate radiological fission products in the primary reactor coolant from the secondary coolant and the environment. For the purposes of this SE, SG tube integrity means that the tubes are capable of performing these safety functions in accordance with the plant design and licensing basis.

The General Design Criteria (GDC) in Appendix A to 10 CFR Part 50 provide regulatory requirements in the GDC which state that the RCPB shall have “an extremely low probability of abnormal leakage . . . and gross rupture" (GDC 14), "shall be designed with sufficient margin" (GDCs 15 and 31), shall be of "the highest quality standards practical" (GDC 30), and shall be designed to permit "periodic inspection and testing . . . to assess . . . structural and leaktight integrity" (GDC 32). To this end, 10 CFR 50.55a specifies that components which are part of the RCPB must meet the requirements for Class 1 components in Section III of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code).
Section 50.55a further requires, in part, that throughout the service life of a pressurized-water reactor (PWR) facility like WCGS, ASME Code Class 1 components meet the requirements, except design and access provisions and pre-service examination requirements, in Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code, to the extent practical. This requirement includes the inspection and repair criteria of Section XI of the ASME Code. Section XI requirements pertaining to ISI of SG tubing are augmented by additional requirements in the TSs.

As part of the plant licensing basis, applicants for PWR licenses are required to analyze the consequences of postulated design-basis accidents (DBAs) such as an SG tube rupture and main steamline break (MSLB). These analyses consider primary-to-secondary leakage which may occur during these events and must show that the offsite radiological consequences do not exceed the applicable limits of the 10 CFR Part 100 guidelines for offsite doses, GDC 19 criteria for control room operator doses, or some fraction thereof as appropriate to the accident, or the NRC-approved licensing basis (e.g., a small fraction of these limits). No accident analysis for WCGS is being changed because of the proposed amendment and, thus, no radiological consequences of any accident analysis are being changed.

The licensee's proposed changes to TS 5.5.9 are to stay within the GDC requirements for the SG tubes and to maintain the accident analysis and consequences that NRC has reviewed and approved for the postulated DBAs for SG tubes.

WCGS Amendment Nos. 162 and 169 modified the STS wording at WCGS to restrict the required inspection and plugging in the hot-leg tubesheet region to the uppermost 17 inches of the tubesheet region for Refueling Outages 14 and 15 and the operating cycle subsequent to each of these outages. This excluded the lowermost 4 inches of the tubesheet on the hot-leg side from the TS inspection and plugging requirements. These license amendments also added a requirement that all tubes found with flaws in the upper 17 inches of the tubesheet region on the hot-leg side be plugged to provide added assurance that tube-to-tubesheet joint integrity would be maintained.

The proposed amendment is applicable to refueling outage 16 and the subsequent operating cycle. This license amendment differs from Amendment Nos. 162 and 169 in a number of ways. First, the lowermost 4 inches of the tubesheet would no longer be excluded from the TS inspection requirements in TS 5.5.9.d. The lowermost 4 inches would be subject to the same inspection requirements as the rest of the tubing. Second, any flaws in the lowermost 4 inches of the tubesheet would not be excluded from requirements to plug. Under the proposed amendment, flaws found in the lowermost 4 inches of tubing would be subject to a specified alternate repair criterion (ARC) in lieu of the aforementioned 40 percent depth-based criterion; the latter criterion would continue to be applicable outside of the tubesheet region. Third, the proposed amendment applies to both the hot- and cold-leg sides of the tubesheet. Fourth, the proposed amendment would include new reporting requirements to allow the NRC staff to monitor the implementation of the amendment. As with Amendment Nos. 162 and 169 for the hot-leg side, the proposed amendment would require the plugging of all tubes found with flaws in the upper 17 inches of the tubesheet region on both the hot- and cold-leg sides.

4.0 TECHNICAL EVALUATION

4.1 Proposed Changes to the TSs

TS 5.5.9.c currently states, in part:

> The following alternate tube repair criteria may be applied as an alternative to the 40% depth-based criteria:
>
> 1. For Refueling Outage 15 and the subsequent operating cycle, degradation found in the portion of the tube below 17 inches from the top of the hot leg tubesheet does not require plugging. All tubes with degradation identified in the portion of the tube within the region from the top of the hot leg tubesheet to 17 inches below the top of the tubesheet shall be removed from service.

This portion of 5.5.9.c will be revised as follows:

> The following SG tube ARC criteria **shall** be applied as an alternative to the 40% depth-based criteria:
>
> 1. For Refueling Outage **16 and the subsequent operating cycle, tubes with flaws having a circumferential component less than or equal to 203 degrees found in the portion of the tube below 17 inches from the top of the tubesheet and above 1 inch from the bottom of the tubesheet do not**

require plugging. Tubes with flaws having a circumferential component greater than 203 degrees found in the portion of the tube below 17 inches from the top of the tubesheet and above 1 inch from the bottom of the tubesheet shall be removed from service.

Tubes with service-induced flaws located within the region from the top of the tubesheet to 17 inches below the top of the tubesheet shall be removed from service. Tubes with service-induced axial cracks found in the portion of the tube below 17 inches from the top of the tubesheet do not require plugging.

When more than one flaw with circumferential components is found in the portion of the tube below 17 inches from the top of the tubesheet and above 1 inch from the bottom of the tubesheet with the total of the circumferential components greater than 203 degrees and an axial separation distance of less than 1 inch, then the tube shall be removed from service. When the circumferential components of each of the flaws are added, it is acceptable to count the overlapped portions only once in the total of circumferential components.

When one or more flaws with circumferential components are found in the portion of the tube within 1 inch from the bottom of the tubesheet, and the total of the circumferential components found in the tube exceeds 94 degrees, then the tube shall be removed from service. When one or more flaws with circumferential components are found in the portion of the tube within 1 inch from the bottom of the tubesheet and within 1 inch axial separation distance of a flaw above 1 inch from the bottom of the tubesheet, and the total of the circumferential components found in the tube exceeds 94 degrees, then the tube shall be removed from service. When the circumferential components of each of the flaws are added, it is acceptable to count the overlapped portions only once in the total of circumferential components.

The proposed changes to TS 5.5.9.c are shown above in **bold**. The above proposed ARC is an interim ARC because it applies only to refueling outage 16 and the subsequent operating cycle.

TS 5.5.9.d currently states, in part, in the middle of the paragraph, the following:

> For Refueling Outage 15 and the subsequent operating cycle, the portion of the tube below 17 inches from the top of the tubesheet is excluded.

Because this provision will have expired by the spring 2008 refueling outage, the licensee has, therefore, proposed to delete the sentence.

The licensee has also proposed to add the following additional reporting requirements to the SG tube inspection report in TS 5.6.10:

h. Following completion of an inspection performed in Refueling Outage 16 (and any inspections performed in the subsequent operating cycle), the number of indications and location, size, orientation, whether initiated on primary or secondary side for each service-induced flaw within the thickness of the tubesheet, and the total of the circumferential components and any circumferential overlap below 17 inches from the top of the tubesheet as determined in accordance with TS 5.5.9c.1;

i. Following completion of an inspection performed in Refueling Outage 16 (and any inspections performed in the subsequent operating cycle), the primary to secondary LEAKAGE rate observed in each SG (if it is not practical to assign leakage to an individual SG, the entire primary to secondary LEAKAGE should be conservatively assumed to be from one SG) during the cycle preceding the inspection which is the subject of the report; and

j. Following completion of an inspection performed in Refueling Outage 16 (and any inspections performed in the subsequent operating cycle), the calculated accident leakage rate from the portion of the tubes below 17 inches from the top of the tubesheet for the most limiting accident in the most limiting SG.

4.2 Technical Evaluation

The tube-to-tubesheet joint consists of the tube, which is hydraulically expanded against the bore of the tubesheet; the tube-to-tubesheet weld located at the tube end; and the tubesheet. The joint was designed as a welded joint and not as a friction or expansion joint. The weld itself was designed as a pressure boundary element. It was designed to transmit the entire end-cap pressure load during normal and DBA conditions from the tube to the tubesheet with no credit taken for the friction developed between the hydraulically-expanded tube and the tubesheet. In addition, the weld serves to make the joint leak-tight.

The interim TS changes under Amendment Nos. 162 and 169 exempted the lower 4-inch portion of the tube within the 21-inch-deep tubesheet from an inspection and exempted tubes with flaw indications in this region from being removed from service (i.e., plugged). These amendments, in effect, redefined the pressure boundary at the tube-to-tubesheet joint as consisting of a friction or expansion joint with the tube hydraulically expanded against the tubesheet over the top 17 inches of the tubesheet and took no credit for the lower portion of the tube or the tube-to-tubesheet weld as contributing to the structural or leakage integrity of the joint.

The proposed amendment in the current application and supplemental letter, which is the subject of this SE, differs fundamentally from Amendment Nos. 162 and 169 and is a more conservative approach. The proposed amendment treats the tube-to-tubesheet joint as a welded joint in a manner consistent with the original design basis, with no credit taken for the friction developed between the hydraulically-expanded tube and the tubesheet. The proposed amendment is intended to ensure that the aforementioned end-cap loads can be transmitted down the tube to the tube-to-tubesheet weld and through the weld into the tubesheet.

4.2.1 Proposed Change to TS 5.5.9.c, “Provisions for SG tube repair criteria”

The 40 percent depth-based tube repair criterion in TS 5.5.9.c is intended to ensure, in conjunction with other elements of TS 5.5.9, that tubes accepted for continued service (i.e., not plugged) satisfy the performance criteria for structural integrity in TS 5.5.9.b.1 and the performance criteria for accident leakage integrity in TS 5.5.9.b.2. The criterion includes an allowance for eddy-current measurement error and incremental flaw growth prior to the next inspection of the tube. The alternate tube repair criteria in the existing TSs and the proposed ARC in this amendment are alternatives to this 40 percent depth-based criterion.

4.2.1.1 Structural Integrity Considerations

The 40 percent depth-based criterion was developed to be conservative for flaws located anywhere in the SG, including free-span regions. In the tubesheet, however, the tubes are constrained against radial expansion by the tubesheet and, therefore, are constrained against an axial (fish-mouth) rupture failure mode. The only potential structural failure mode within the tubesheet is a circumferential failure mode, leading to tube severance.

The proposed ARC would permit tubes with up to 100 percent through-wall flaws in the portion of the tube from 17 inches below the TTS to 1 inch above the bottom of the tubesheet to remain in service provided the circumferential component of these flaws does not exceed 203 degrees. The 203-degree criterion was determined on the basis of the remaining cross-sectional area of the tube needed to resist the limiting axial end-cap load on the tube and the pressure load on the flaw cross-section, using limit-load analysis, with safety factors consistent with those required by the performance criteria for structural integrity in TS. Because the 203-degree criterion was determined on this basis, the NRC staff finds this approach acceptable.

For the portion of the tube from the bottom of the tubesheet to 1 inch above the bottom of the tubesheet, the proposed ARC would permit tubes with up to 100 percent through-wall flaws to remain in service provided the circumferential component of these flaws does not exceed 94 degrees. This criterion is based on the minimum tube-to-tubesheet weld cross-sectional area needed to resist the limiting axial end-cap load on the tube and the pressure load on the flaw cross-section, using limit-load analysis, with safety factors consistent with those required by the performance criteria for structural integrity in TS. A 203-degree crack in the tube wall immediately above the weld could potentially concentrate the entire end-cap load to a 157-degree segment of the weld, whereas a minimum 266-degree segment (i.e., 360 minus 94 degrees) of weld is needed to resist the end-cap load with adequate safety margin. Thus, the 94-degree criterion for the tube in the lowermost 1-inch region is intended to ensure that the weld is not overstressed. Although the NRC staff did not complete its review of the specific limit-load methodology used to calculate the 94-degree criterion, it reviewed the results of the stress analysis of the weld performed to demonstrate that the weld complied with the stress limits of the ASME Code, Section III. The TS performance criteria for tube structural integrity are intended to ensure safety margins consistent with the ASME Code, Section III stress limits. Based on a comparison of the calculated maximum design stress to the ASME Code-allowable stress, the NRC staff concludes that the proposed 94-degree criterion ensures that the weld can react the end-cap loads with margins to failure consistent with the margins ensured by the ASME stress limits and is, therefore, acceptable.

The 203- and 94-degree criteria include an allowance for incremental flaw growth in the circumferential direction prior to the next inspection. The licensee states that no significant growth rate data exists for the specific case of circumferential cracking in the tubesheet expansion region. The licensee's growth rate estimate is based on a 95 percent upper bound value of available primary water stress-corrosion crack (PWSCC) growth rate data for other tube locations. Given the lack of actual growth rate data for cracks which may potentially initiate in the lowermost 4 inches of the tube, the NRC staff attaches only a low level of confidence in the conservatism of the licensee's growth rate estimate. However, the NRC staff notes that the effect of any lack of conservatism in the licensee's estimate is mitigated somewhat by the fact that the SGs at WCGS will be inspected at refueling outage 17 should any crack indications be found during refueling outage 16. In addition, the 203- and 94-degree criteria conservatively take no credit for the effects of friction between the tube and tubesheet in the upper 17 inches of the tube-to-tubesheet joint in reacting out a portion of the axial end-cap load before it reaches the cracked cross-section. Based on this, the NRC staff concludes that the 203- and 94-degree criteria are conservative, irrespective of growth rate uncertainties.

The 203- and 94-degree criteria do not include an explicit allowance for eddy-current measurement error. The licensee will be utilizing an inspection technique which has been qualified for the detection of circumferential PWSCC in tube expansion transitions and in the tack expansion region just above the tube-to-tubesheet weld. The tack expansion is a 0.7-inch-long hard roll expansion of the tube in the tubesheet which is performed before the hydraulic expansion process is performed along the entire depth of the tubesheet. A fundamental assumption behind the proposed 203- and 94-degree repair criteria is that all detected circumferential flaws in the lowermost 4 inches of the tube are fully 100 percent through wall, irrespective of the actual depth of the flaw. With this assumption, the licensee notes that a study sponsored by the Electric Power Research Institute (EPRI) indicates that the eddy-current measurement of crack arc length is conservative since it results in a conservative estimate of the area of the remaining cross-section. Although the NRC staff has not reviewed the EPRI study in detail, it finds, on the basis of the results of the study, that any uncertainties relating to measured arc length of the flaw are not expected to impair the conservatism of the 203- and 94-degree criteria.

The proposed ARC also includes criteria to account for interaction effects for multiple circumferential flaws that are in close proximity. The proposed criteria treat the multiple circumferential flaws located within 1 inch of one another as all occurring at the same axial location. The total arc length of the combined flaw is the sum of the individual flaw arc lengths with overlapping arc lengths counted only once. The licensee stated that the summation of cracks with both located more than 17 inches from the TTS and more than 1 inch from the bottom of the tube will be compared to the 203-degree criterion. The summation of cracks with one flaw located less than 1 inch from the bottom of the tubesheet and the other within 1 inch of the first (or both flaws within 1 inch of the bottom of the tubesheet) would be compared to the 94-degree criterion. Cracks located more than 1 inch apart from one another are assumed to act independently of each other. This 1-inch criterion was determined using a fracture mechanics approach to determine the axial distance from an individual crack tip at which the stress distribution reverts to a nominal stress distribution for an uncracked section. The 1-inch criterion is twice the calculated distance since twice this distance is the necessary separation between two cracks for the cracks to act independently of each other. The NRC staff reviewed the basis for the 1-inch criterion and the fracture mechanics approach to determining the

criterion. Because the criterion is based on a valid fracture mechanics approach, the NRC staff finds it acceptable.

The proposed ARC would permit tubes with axial cracks in the lowermost 4 inches of the tube to remain in service, irrespective of crack depth. The NRC staff finds this acceptable because axial cracks do not impair the ability of the tube or the weld to resist axial load and because the tube is fully constrained by the tubesheet against an axial failure mode.

Finally, the proposed ARC would continue to include the current interim (per Amendment Nos. 162 and 169) requirement to plug all tubes in which flaws were detected in the upper 17-inch portion of the tube within the tubesheet. This adds to the conservatism of the 203- and 94-degree criteria since it would mitigate any loss of tightness and, thus, any loss of friction between the tube and tubesheet due to flaws in the upper 17-inch region of the joint.

4.2.1.2 Accident Leakage Integrity Considerations

If a tube is assumed to contain a 100 percent through-wall flaw some distance into the tubesheet, a potential leak path between the primary and secondary systems is introduced between the hydraulically-expanded tubing and the tubesheet. Operational leakage integrity is assured by monitoring primary-to-secondary leakage relative to the applicable TS LCO limits in TS 3.4.13, "RCS Operational Leakage." However, it must also be demonstrated that the proposed TS changes do not create the potential for leakage during DBAs to exceed the accident leakage performance criteria in TS 5.5.9.b.2, including the leakage values assumed in the plant licensing basis accident analyses. The licensee states that this is ensured for WCGS by limiting primary-to-secondary leakage to 0.25 gallons per minute (gpm) in the faulted SG during an MSLB accident.

The leakage path between the tube and tubesheet has been modeled by the licensee's contractor, Westinghouse, as a crevice consisting of a porous media. Using Darcy's model for flow through a porous media, leak rate is proportional to differential pressure and inversely proportional to flow resistance. Flow resistance is a direct function of viscosity, loss coefficient, and crevice length. Westinghouse performed leak tests of tube-to-tubesheet joint mockups to establish loss coefficient as a function of contact pressure. Westinghouse states that the flow resistance varies as a log normal linear function of joint contact pressure, but due to the large scatter of the flow-resistance test data, it has been assumed to be constant with joint contact pressure at a value which conservatively lower bounds the data.

Using the above model, a "modified B*" approach for calculating accident leakage was initially proposed in the amendment request. The proposed modified B* approach relies to some extent on an assumed constant value of loss coefficient, based on a lower bound of the data. This contrasts with the "nominal B*" approach which, in its latest form, is not directly impacted by the assumed value of loss coefficient since this value is assumed to be constant with increasing contact pressure between the tube and tubesheet. The NRC staff is not able to make a conclusion as to whether the assumed value of loss coefficient in the "modified B*" approach is conservative at this time. However, the NRC staff has performed some evaluations regarding the potential for the normal operating leak rate to increase under steam-line break conditions. Making the conservative assumption that loss coefficient and viscosity are constant under both normal operating and steam-line break conditions, the ratio of steam-line break leakage rate to

normal operating leak rate is equal to the ratio of steam-line break differential pressure to normal operating differential pressure times the ratio of effective crevice length under normal operating conditions (l_{NOP}) to effective crevice length under steam-line break conditions (l_{SLB}). Effective crevice length is the crevice length over which there is contact between the tube and tubesheet. Using various values of (l_{NOP}/ l_{SLB}) determined from the “nominal B*” approach (which does not rely on an assumed value of loss coefficient) and recognizing the issues associated with some of these previous H*/B* analyses, the NRC staff concludes that a factor of 2.5 reasonably bounds the potential increase in leakage from the lowermost 4 inches of tubing that would be realized in going from normal operating to steam-line break conditions.

The licensee stated in its March 21, 2008, response to an NRC staff RAI that it would apply the 2.5 factor in its condition monitoring (CM) and operational assessment (OA) upon implementation of the subject license amendment. Specifically, for the CM assessment, the licensee states that the component of leakage from the lowermost 4 inches for the most limiting SG during the prior cycle of operation will be multiplied by a factor of 2.5 and added to the total leakage from any other source and compared to allowable accident leakage limit. For the OA, the licensee stated that the difference in leakage from the allowable accident leakage limit and the accident leakage from other sources will be divided by 2.5 and compared to the observed (operational) leakage and that an administrative limit (for operational leakage) will be established to not exceed the calculated value. Since this properly addresses the factor of 2.5 that bounds the potential increase in leakage in the lowermost 4 inches of tubing, the NRC staff finds this acceptable.

In its letter dated March 30, 2008, the licensee submitted a regulatory commitment that stated the 2.5 factor will be used in the completion of its CM and OA upon implementation of the ARC in this amendment. This regulatory commitment would apply only to the current refueling outage and the subsequent operating cycle because this amendment would approve the proposed ARC for only this period of plant operation.

In considering the above regulatory commitment. the NRC staff finds that reasonable controls for the licensee's implementation and subsequent evaluation of any changes to the regulatory commitment are provided by the licensee's administrative processes, including its commitment management program. The NRC staff has determined that the commitment does not warrant the creation of regulatory requirements which would require prior NRC approval of subsequent changes. The NRC has agreed that NEI 99-04, Revision 0, provides reasonable guidance for the control of regulatory commitments made to the NRC staff. See Regulatory Issue Summary 2000-17, "Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff," dated September 21, 2000. These commitments will be controlled in accordance with the licensee's commitment management program in accordance with NEI 99-04. Any change to the regulatory commitments is subject to licensee management approval and subject to the procedural controls established at the plant for commitment management in accordance with NEI 99-04, which include notification of the NRC. Also, the NRC staff may choose to verify the implementation and maintenance of these commitments in a future inspection or audit. Based on this, the NRC staff concludes that the regulatory commitment addressed above for this amendment is acceptable.

4.2.2 Proposed Change to TS 5.5.9.d, “Provisions for SG tube inspections”

With the plant entry into refueling outage 16, the sentence added to TS 5.5.9.d in Amendment No. 169 is no longer valid. This is the statement that "[f]or Refueling Outage 15 and the subsequent operating cycle, the portion of the tube below 17 inches from the top of the hot leg tubesheet is excluded." Therefore, in refueling outage 16, the inspection requirements of TS 5.5.9.d apply to the entire length of tubing from the tube-to-tubesheet weld location at the tube inlet to the tube-to-tubesheet weld location at the tube outlet. TS 5.5.9.d further states that the tube-to-tubesheet weld itself is not considered part of the tube. No changes relative to this wording is being proposed as part of the subject amendment request. This is to say that the licensee is proposing to inspect the entire tube in the tubesheet in the proposed amendment, whereas in Amendment No. 169 the licensee had proposed and the NRC accepted that the lower 4 inches of the tube in the tubesheet did not have to be inspected.

4.2.3 Proposed Change to TS 5.6.10, “Steam Generator Tube Inspection Report”

The NRC staff has reviewed the proposed new reporting requirements and finds that they are sufficient to allow the staff to monitor the implementation of the proposed amendment. Based on this conclusion, the NRC staff finds that the proposed new reporting requirements are acceptable.

4.2.4 Considerations Relating to Tube-to-Tubesheet Welds

The STS and the WCGS TSs state specifically that the tube-to-tubesheet welds are not part of the tube. Therefore, in accordance with the TSs, the requirements of TS 5.5.9 do not apply to these welds. However, licensees typically visually inspect the tube ends (including the welds) for evidence of leakage while the SG primary manways are open to permit eddy-current inspection of the tubes.

Eddy-current inspection of the SG tubes at Catawba Unit 2 revealed indications interpreted as cracks at or near the tube-to-tubesheet weld, suggesting the potential for such cracks at similar SGs such as those at WCGS. An industry peer review was recently conducted for the Catawba Unit 2, 2007 cold-leg tube-end indications to determine whether the reported indications are in the tube material or the welds. A consensus was reached that the indications most likely exist within the tube material. However, some of the indications extend close enough to the tube end that the possibility that the flaws extend into the weld could not be ruled out. An NRC staff member and an expert consultant from Argonne National Laboratory also reviewed these indications and concluded that the industry’s position was reasonable. The peer review group and the NRC consultant also reviewed eddy-current signals from a tube to tubesheet mockup which included a circumferential notch in one of the welds, and they concluded that this notch did not produce a detectable signal.

4.3 Conclusion

Based on the above evaluation, the NRC staff finds that the proposed license amendment, which is applicable to only refueling outage 16 and the subsequent operating cycle, ensures that SG tube structural and leakage integrity will be maintained during this period with structural safety margins consistent with the design basis and with leakage integrity within assumptions

employed in the licensing basis accident analyses, and will have no adverse impact on the ability of the tube-to-tubesheet welds to perform their safety-related function. Based on this finding, the NRC staff further concludes that the proposed amendment meets 10 CFR 50.36 and, thus, the proposed amendment is acceptable.
The current TSs and the proposed amendment do not address inspection requirements for the tube-to-tubesheet welds. There are no safety issues with respect to hypothetical cracks in the weld if it can be demonstrated, such as with the H*/B* strategies discussed in Section 2 of this safety evaluation, that the axial end-cap loads in the tube is reacted by frictional forces developed between the tube and tubesheet before any portion of the end-cap load is transmitted to the weld. Although the licensee's request for an H*/B* amendment has been withdrawn (see Section 2), the licensee and the industry are pursuing development of the information needed by the NRC staff to support future amendment requests for H*/B*.

The licensee has concluded that cracking exclusively in the weld is not a potential damage mechanism on the basis of the peer review findings. Should it not be possible for the NRC staff to approve an acceptable H*/B* amendment within a reasonable time period, it is the NRC staff's position that the industry will need to develop inspection techniques (e.g., visual, eddy-current) capable of detecting weld cracks to ensure that the welds are capable of performing their safety related function. It should be noted that the NRC staff observed a demonstration of an available visual inspection technique for inspecting the welds, but raised questions on whether this technique was sufficiently reliable.

5.0 REGULATORY COMMITMENTS

In Attachment II to its supplemental letter dated March 30, 2008, the licensee submitted a regulatory commitment that stated that the ratio of 2.5 will be used in the completion of both the CM and OA upon implementation of this amendment and that a CM report and a preliminary OA would be prepared prior to entry to Mode 4 in the restart from the current refueling outage 16. This regulatory commitment and the NRC staff's acceptance of the commitment for this amendment is addressed at the end of Section 4.2.1.2, on the SG accident leakage considerations, of this SE.

6.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Notice of Consideration of Issuance of Amendment to Facility Operating License and Proposed no Significant Hazards Consideration Determination, and Opportunity for Hearing for this amendment was published in the *Federal Register* on February 21, 2008 (73 FR 9602). Therefore, this amendment is being issued after the 30-day public comment period has expired, but before the 60-day hearing request period has expired.

The Commission may issue the license amendment before the expiration of the 60-day hearing period provided that its final determination is that the amendment involves no significant hazards consideration. Because this amendment is being issued prior to the expiration of the 60-day period, the NRC staff has made a final finding of no significant hazards consideration, which is given below.

In its application, the licensee made a determination that the amendment request involved no significant hazards consideration. Under the Commission's regulations in 10 CFR 50.92, this

determination means that operation of the facility in accordance with the proposed amendment does not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. As required by 10 CFR 50.91(a), the licensee provided its analysis of the issue of no significant hazards consideration in Attachment I (pages 12, 13, and 14) to its application, which is presented below.

(1) Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

Of the various accidents previously evaluated, the proposed changes only affect the SG tube rupture (SGTR) event evaluation and the postulated steam line break (SLB), locked rotor and control rod ejection accident evaluations. Loss-of-coolant accident (LOCA) conditions cause a compressive axial load to act on the tube. Therefore, since the LOCA tends to force the tube into the tubesheet rather than pull it out, it is not a factor in this amendment request. Another faulted load consideration is a safe shutdown earthquake (SSE); however, the seismic analysis of Model F SGs [the SGs at WCGS] has shown that axial loading of the tubes is negligible during an SSE.

At normal operating pressures, leakage from primary water stress corrosion cracking (PWSCC) below 17 inches from the top of the tubesheet is limited by both the tube-to-tubesheet crevice and the limited crack opening permitted by the tubesheet constraint. Consequently, negligible normal operating leakage is expected from cracks within the tubesheet region.

For the SGTR event, the required structural margins of the SG tubes is maintained by limiting the allowable ligament size for a circumferential crack to remain in service to 214 degrees below 17 inches from the top of the tubesheet for the 18-month SG tubing eddy-current inspection interval and to remain in service 183 degrees below 17 inches from the top of the tubesheet for the 36-month SG tubing eddy-current inspection interval. Tube rupture is precluded for cracks in the hydraulic expansion region due to the constraint provided by the tubesheet. The potential for tube pullout is mitigated by limiting the allowable crack size to 214 degrees for the 18-month SG tubing eddy-current inspection interval and to 183 degrees for the 18-month SG tubing eddy-current inspection interval. These allowable crack sizes take into account eddy-current uncertainty and crack growth rate. It has been shown that a circumferential crack with an azimuthal extent of 214 degrees for the 18-month SG tubing eddy-current inspection interval and an azimuthal extent of 183 degrees for the 36-month SG tubing eddy-current inspection interval meet the performance criteria of NEI [Nuclear Energy Institute] 97-06, Rev. 2, “Steam Generator Program Guidelines” and [NRC] Regulatory Guide (RG) 1.121, “Bases for Plugging Degraded PWR Steam Generator Tubes.” Likewise, a visual inspection will be conducted to confirm that a circumferential crack of greater than 294 degrees for the 18-month

SG tubing eddy-current inspection interval and a circumferential crack of greater than 263 degrees for the 36-month SG tubing eddy-current inspection interval do not remain in service in the tube-to-tubesheet weld metal in any tube mitigating the potential for tube pullout. Therefore, the margin against tube burst/pullout is maintained during normal and postulated accident conditions and the proposed change does not result in a significant increase in the probability or consequence of a SGTR.

The probability of a SLB is unaffected by the potential failure of a SG tube as the failure of a tube is not an initiator for a SLB event. SLB leakage is limited by leakage flow restrictions resulting from the leakage path above potential cracks through the tube–to-tubesheet crevice. The leak rate during postulated accident conditions (including locked rotor and control rod ejection) has been shown to remain within the accident analysis assumptions for all axial or circumferentially oriented cracks occurring 17 inches below the top of the tubesheet. Since normal operating leakage is limited to 0.10 gpm (150 gpd), the attendant accident condition leak rate, assuming all leakage to be from indications below 17 inches from the top of the tubesheet would be bounded by 0.25 gpm. This value is within the accident analysis assumptions for the limiting design basis accident for WCGS, which is the postulated SLB event.

Based on the above, the performance criteria of NEI-97-06, Rev. 2 and draft Regulatory Guide (RG) 1.121 continue to be met and the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Does the proposed change create the possibility of a new or different accident from any accident previously evaluated?

Response: No

The proposed change does not introduce any changes or mechanisms that create the possibility of a new or different kind of accident. Tube bundle integrity is expected to be maintained for all plant conditions upon implementation of the interim alternate repair criteria. The proposed change does not introduce any new equipment or any change to existing equipment. No new effects on existing equipment are created nor are any new malfunctions introduced.

Therefore, based on the above evaluation, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The proposed change maintains the required structural margins of the SG tubes for both normal and accident conditions. NEI 97-06, Rev. 2 and RG 1.121 are

used as the basis in the development of the limited tubesheet inspection depth methodology for determining that SG tube integrity considerations are maintained within acceptable limits. RG 1.121 describes a method acceptable to the NRC staff for meeting GDC [General Design Criteria, of Appendix A to 10 CFR Part 50,] 14, 15, 31, and 32 by reducing the probability and consequences of an SGTR. RG 1.121 concludes that by determining the limiting safe conditions of tube wall degradation beyond which tubes with unacceptable cracking, as established by inservice inspection, should be removed from service or repaired, the probability and consequences of a SGTR are reduced. This RG uses safety factors on loads for tube burst that are consistent with the requirements of Section III of the ASME Code.

For axially oriented cracking located within the tubesheet, tube burst is precluded due to the presence of the tubesheet. For circumferentially oriented cracking in a tube or the tube-to- tubesheet weld, Reference 6 [Westinghouse Electric Company proprietary report LTR-CDME-08-11-P submitted in the licensee's application] defines a length of remaining tube ligament that provides the necessary resistance to tube pullout due to the pressure induced forces (with applicable safety factors applied). Additionally, it is shown that application of the limited tubesheet inspection depth criteria will not result in unacceptable primary-to-secondary leakage during all plant conditions.

Based on the above, it is concluded that the proposed changes do not result in any reduction of margin with respect to plant safety as defined in the Updated Safety Analysis Report or bases of the plant Technical Specifications.

The NRC staff has reviewed the licensee's analysis of no significant hazards consideration given above. Although the licensee has revised (1) the allowable ligament sizes for a circumferential crack and (2) removed the reference to a 36-month inspection interval in its supplemental letter dated March 21, 2008, the new proposed maximum ligament sizes for cracks are shorter (i.e., more conservative) than the values proposed in the licensee's application and restricted to refueling outage 16 and the subsequent 18-month operating cycle. Therefore, the new proposed changes do not affect the above no significant hazards consideration analysis because the supplemental letter has a more conservative license amendment request than that submitted in the licensee's application. The licensee also stated in its supplemental letter of March 21, 2008, that the additional information provided in the attachments and enclosures to the letter did not change the conclusions of the no significant hazards consideration in its application, which is given above.

Based on its review of the above analysis, the licensee's letters, and the reduced proposed allowable ligament sizes, the NRC staff concludes that the three standards of 10 CFR 50.92 are satisfied by the above analysis. Therefore, the NRC staff has determined that the amendment involves no significant hazards consideration.

7.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Kansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

8.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has made a final no significant hazards finding with respect to this amendment. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

9.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) the amendment does not (a) involve a significant increase in the probability or consequences of an accident previously evaluated; or (b) create the possibility of a new or different kind of accident from any accident previously evaluated; or (c) involve a significant reduction in a margin of safety; (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (3) such activities will be conducted in compliance with the Commission's regulations; and (4) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Emmett Murphy

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