September 4, 2007

LICENSEE: Wolf Creek Nuclear Operating Corporation

FACILITY: Wolf Creek Generating Station, Unit 1

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALLS HELD ON AUGUST 17 AND AUGUST 31, 2007, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND WOLF CREEK NUCLEAR OPERATING CORPORATION, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE WOLF CREEK GENERATING STATION, UNIT 1, LICENSE RENEWAL APPLICATION

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Wolf Creek Nuclear Operating Corporation held two telephone conference calls on August 17 and August 31, 2007, to discuss and clarify the staff's requests for additional information (RAIs) concerning the Wolf Creek Generating Station, Unit 1, license renewal application. The telephone conference calls were useful in clarifying the intent of the staff's RAIs.

Enclosure 1 provides a listing of the participants and Enclosure 2 contains a listing of the RAIs discussed with the applicant, including a brief description on the status of the items.

The applicant had an opportunity to comment on this summary. A mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-3703 or e-mail vmr1@nrc.gov.

/RA/

Verónica M. Rodríguez, Project Manager
License Renewal Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosures:
1. List of Participants
2. List of Requests for Additional Information

cc w/encls: See next page

September 4, 2007

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Letter to Wolf Creek Nuclear Operating Corp From V. Rodriguez Dated September 4, 2007

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALLS HELD ON AUGUST 17 AND AUGUST 31, 2007, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND WOLF CREEK NUCLEAR OPERATING CORPORATION, CONCERNING REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE WOLF CREEK GENERATING STATION, UNIT 1, LICENSE RENEWAL APPLICATION

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TELEPHONE CONFERENCE CALL
WOLF CREEK GENERATING STATION, UNIT 1
LICENSE RENEWAL APPLICATION

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AUGUST 17, 2007

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Kenneth Chang	NRC
Kaihwa Hsu	NRC
Charles Medenciy	Wolf Creek Nuclear Operating Corporation (WCNOC)
Arthur Turner	WCNOC
Maurice Dingler	WCNOC
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Donald H. Stevens	STARS
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Curtis Carney	SIA
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David A. Gerber	Structural Integrity Associates, Inc. (SIA)
Curtis Carney	SIA

REQUESTS FOR ADDITIONAL INFORMATION
WOLF CREEK GENERATING STATION, UNIT 1
LICENSE RENEWAL APPLICATION

AUGUST 17 AND AUGUST 31, 2007

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Wolf Creek Nuclear Operating Corporation held two telephone conference calls on August 17 and August 31, 2007, as a followup discussion and request for clarification to the applicant's response to the following requests for additional information (RAIs) concerning the Wolf Creek Generating Station (WCGS), Unit 1, license renewal application (LRA). The applicant's response to these RAIs was submitted by letters dated July 26 and August 20, 2007.

RAI 4.3-1

In its response to audit question TLAAA025 dated June 7, 2007, the applicant stated that the transfer function report defines a 1D virtual stress value that is designed to bound the actual stress intensity ranges for all fatigue significant transients and this type of stress value does not have a name in the professional literature.

(1) Since it cannot be found in the professional literature, the staff requests that the applicant describe in detail how the 1D virtual stress is derived.

(2) The staff requests that the applicant demonstrate how the virtual stress bounds the actual stress intensity ranges for any thermal transient. Show that the stress difference between any two thermal transients is also conservative since the fatigue evaluation is based on stress difference of two events.

Discussion: Based on the discussion with the applicant, the staff indicated that the response to this RAI requires clarification. The staff requested that the applicant address the following:

(1) Clearly define 1D thermal (virtual) stresses for different locations on the component (nozzle, nozzle inner radius) and thermal conditions (stratification). In addition, explain how the 1D thermal stress is derived for the surge line hot leg nozzle under stratification.

(2) In its response, the applicant stated that "In a general sense, it is very difficult, if not impossible, to mathematically prove that the 1D thermal (virtual) stress differences will bound the actual stress intensity ranges for all hypothetical transients pairings that could be devised."

   (a) Explain what is the limitation of 1D virtual stress methodology.
   (b) Describe what kind of conditions cannot be mathematically proved to be conservative.

(3) In its response, the applicant stated that the stress range computed using the 1D thermal (virtual) stress methodology is not an upper bound for the stress range

computed using the stress tensor methodology from the ASME Code. Provide justification to demonstrate ASME Code compliance using the 1D thermal (virtual) stress methodology.

RAI 4.3-2

In audit question TLAAA025, the staff requested that the applicant explain how to determine the stress transfer function for pressure and moments by using WCAP-14137 Table E.2-1 as an example to demonstrate the following:

S(pr) = 3.71 (psi/psi pressure)

S(momxz) = 9.4 (psi/applied in-kip bending moment)

S(momy) = 0.0 (psi/applied in-kip torsion)

In its response dated June 7, 2007, the applicant stated that this information was derived from a proprietary stress report rather than computed according to some formula.

The staff notes that WCAP-14137 Table E.2-1 lists a 14 inch schedule 160 pipe stress transfer function. For a standard 14 inch schedule 160 pipe, stress can be calculated with a well known pressure stress equation, bending stress equation, and torsion shear stress equation as shown below:

For axial stress: $S(pr) = pRi^2 / (Ro^2 - Ri^2)$

For maximum hoop stress: $S(pr) = p(Ro^2 + Ri^2) / (Ro^2 - Ri^2)$

$S(bending) = My / I$

$S(torsion\ shear) = My / J$

Therefore, the staff requests that the applicant demonstrate that 1D virtual stress for pressure, bending, and torsion can be benchmarked with close form solutions and that they are within a reasonable percentage of deviation.

Discussion: Based on the discussion with the applicant, the staff indicated that the response to this RAI requires clarification. The staff requested that the applicant address the following:

The applicant evaluated the fatigue cumulative usage factor (CUF) at the top of the pipe for all stratification cases. The top of the pipe may not be the most critical stress location for either bending or stratification. For bending, the maximum stress location is at an angle from top of the pipe. The maximum stratification stress is right above or below the temperature discontinuity.

Justify why these two critical locations were not evaluated. The current evaluation eliminates one of the bending moment components and is not in compliance with the ASME Code.

RAI 4.3-3

By letter dated June 1, 2007, the applicant amended LRA Section 4.3. LRA Section 4.3.1.3 states that all NUREG/CR-6260 sample locations, except for the vessel lower head to shell juncture, were projected from historical and current rates of accumulation of transient cycles and usage factors, using either the cycle-based or the stress-based method of the fatigue management program which is described in LRA Section 4.3.1. In LRA Section 4.3.4, the applicant provided an analysis of these sample locations and stated that the inlet, outlet, and hot leg nozzle predictions used the cycle-based method. The charging, safety injection, and the accumulator-residual heat removal nozzle predictions used the stress-based method.

LRA Section 4.3.1.3 states that cycle-based monitoring assumes the alternating stress range of every cycle of a transient is equal to that of the design basis, worst-case events assumed by the code fatigue analysis.

During the audit, the staff reviewed basis document FP-WOLF-304, which indicates that actual plant transient data (i.e., pressure and temperature) was used for the fatigue usage factor calculation for Period 2 (i.e., from January 13, 1996 through December 31, 2005), and that these values were used to derive backward projected initial CUFs for Period 1 (i.e., from 1984 through 1995), for each of the 28 locations. The projections were based solely on the ratio of heatups and cooldown cycles for most locations; however, it did not consider other significant transients. For example, the transient tracking report indicates that seven loss of offsite power cycles and two loss of load cycles occurred between 1984 and March 1992, and that these two transients did not occur again between March 1992 and December 2005. The staff believes that the validity of these CUF backward-projections using the ratio of heatups and cooldown cycles has to be further justified.

In its response to audit question TLAAA002, the applicant stated that “The basis of the conclusion that data for accumulated fatigue usage factor per heatup/cooldown during Period 2 is realistic for Period 1 is based on the methodology used for the Period 2 calculations, specifically the numbers surge line insurge/outsurge transients assumed to occur during each heatup/cooldown. The numbers of transients used in the Period 2 analyses were based on data collected during Period 1. Therefore, the calculation methodology used for Period 2 calculations were based on transients typical for Period 1. Usage for Period 1 was calculated on the basis that the incremental usage per heatup/cooldown from Period 2 analyses was applicable to Period 1.”

The staff reviewed the surge line stratification evaluation report WCAP-12893 which indicates that there are 26,000 piping insurge and outsurge cycles for 200 heatups and cooldowns that should be considered if a modified operating procedure (MOP) is not implemented. Wolf Creek Generating Station implemented the MOP prior to 1995 to mitigate piping insurge and outsurge transients. However, the staff reviewed the CUF calculation of FP-WOLF-304 and found that the analyses that used actual transient data for Period 2 does not consider significant piping insurge and outsurge cycles from Period 1 to support the validity of the backward projections. On the basis of its review, the staff finds that the CUF calculations does not support the statement that Period 2 calculations are based on transients typical for Period 1.

a) Clarify the discrepancy between design basis events used as stated in LRA 4.3.1 and the actual transient data used in the basis calculation.

b) Demonstrate the validity of the baseline CUF for Period 1 using monitoring data from Period 2.

Discussion: Based on the discussion with the applicant, the staff indicated that the response to this RAI requires clarification. The staff requested that the applicant address the following:

In its response dated August 20, 2007, the applicant stated that fatigue usage for steam generator feedwater nozzles is principally accumulated during heatup and cooldown (e.g., from feedwater flow cycling during standby periods). The applicant concluded that fatigue usage for Period 1 (1984-1995) can be reasonably estimated by multiplying the usage accumulated during Period 2 (1996-2005) by the ratio of the number of heatup and cooldown events during Period 1 to the number of those events during Period 2.

As stated in RAI 4.3-3, the transient tracking report indicates that seven loss of offsite power cycles and two loss of load cycles occurred between 1984 and March 1992, and that these two transients did not occur again between March 1992 and December 2005.

For example, for group 3, steam generator feedwater nozzle, a loss of offsite power and loss of load transients may cause the feedwater temperature to drop significantly. On this basis, the staff believes that the validity of these CUF backward projections using the ratio of heatup and cooldown events may not be conservative.

Also for group 1, normal and alternate charging nozzles, the applicant stated that the Period 2 transients are typical for the Period 1 transients of charging and alternate charging. The applicant's backward projection ignored severity of transients by using only the cycles ratio. For example, the loss of charging transient has three different types. The loss of charging and prompt return to service does not contribute a significant temperature change (around 50 °F). The loss of charging and delay return to service has a significant temperature step change (about 500 °F). The applicant combined different type of transients and used the ratio to determine the baseline fatigue usage factor.

The staff requests that the applicant further justify the validity of these backward projections or consider all transients in addition to the heatup and cooldown events.