February 7, 2007

Mr. Terry J. Garrett
Vice President Engineering
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, KS 66839

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR WOLF CREEK GENERATING STATION (TAC NO. MD3182)

Dear Mr. Garrett:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the Severe Accident Mitigation Alternatives (SAMA) analysis submitted by Wolf Creek Nuclear Operating Corporation, in support of its application for license renewal for the Wolf Creek Generating Station, and has identified areas where additional information is needed to complete its review. Enclosed is the staff's request for additional information (RAI).

We request that you provide your responses to these questions within 60 days of the date of this letter, in accordance with the license renewal review schedule. If you have any questions, please contact me at 301-415-3874 or via email at cjj@nrc.gov.

Sincerely,

/RA/

Christian Jacobs, Project Manager
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosure:
As stated

cc w/encl: See next page

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DATE	1/31/07	2/5/07	2/5/07	2/7/07

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Letter to T. Garrett from C. Jacobs Dated February 7, 2007

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Request for Additional Information (RAI)
Regarding the Analysis of Severe Accident Mitigation Alternatives (SAMAs)
for the Wolf Creek Generating Station (WCGS)

1. Provide the following information regarding the development of the WCGS probabilistic safety analysis (PSA) used for the SAMA analysis, i.e., the 2002 Update:

   a. Sections F.2.3 and F.2.4 of the environmental report (ER) provide a description of the 1998 and 2002 PSA model changes. For each PSA update, identify which changes had the greatest impact on the core damage frequency (CDF) (e.g., the top five changes).

   b. In Table F.2.2 of the ER, several of the facts and observations (F&Os) have outstanding items or improvements that are underway (e.g., L2-1, QU-9, TH-1, TH-6, and TH-7). Describe the impact of each of these remaining items on the SAMA evaluation. Additionally, for F&O TH-1, which addressed the misuse of Modular Accident Analysis Program (MAAP) 3.0B, describe the plant-specific thermal hydraulic analyses that are of concern and the meaning of the phrase "The impact to the WCGS PSA model has been bounded."

   c. Section F.2.7 of the ER states that the Wolf Creek Nuclear Operating Corporation (WCNOC) engineering design process contains procedural screening questions to identify changes with potential impact to the PSA model. List the changes either implemented or pending following the 2002 PSA update, and discuss their impact on the SAMA evaluation.

   d. The internal flood CDF from the individual plant examination (IPE) is 4.5E-6/y, whereas the updated internal flood analysis is said to have a CDF of 2.5E-6/y. Provide the following information regarding the internal flood analysis:

      i. a description of the peer review that was performed on the updated flooding analysis, and

      ii. a description of Scenario 3 (FL3), which was used for screening internal flood related SAMAs from further consideration.

2. Provide the following information relative to the Level 2 analysis:

   a. In its evaluation of the IPE, the U.S. Nuclear Regulatory Commission (NRC) indicated that re-analysis of several steam generator tube rupture (SGTR)-initiated sequences using the MAAP code led to the conclusion that core damage was not possible for these sequences within the 24-hour mission time and that the elimination of these SGTR sequences is a weakness of the IPE submittal. Also, the baseline release category frequency table in Section F.2.8

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of the ER shows a SGTR contribution to large early release frequency (LERF) of 1.65E-7, which is less than 20 percent of the SGTR CDF contribution. Clarify whether this concern has been addressed in the PSA model used for the SAMA analysis. If this observation is still applicable, explain how it impacts the SAMA evaluation.

b. In the August 30, 1995, letter responding to NRC RAIs on the IPE, the response to Question 26 discusses the impact of induced SGTRs. Describe the treatment of induced SGTRs in the 2002 Update PSA, and whether SAMAs to address these sequences were considered.

c. Section F.2.8 of the ER indicates that Release Category A (no containment failure within mission time), was grouped with Release Category S (no containment failure). This treatment is non-conservative since sequences in Release Category A would lead to containment failure after 48 hours. Provide an assessment of the impact on the SAMA analysis if the sequences in Release Category A were alternatively assigned to Release Category K (late containment failure).

d. Justify the assumption in Section F.2.8 of the ER that the conditional probabilities from the original IPE can be used to obtain the non-LERF release categories, and why this approach was used in lieu of rebinning non-LERF sequences using the IPE MAAP runs.

e. Explain why the total release frequency (3.16E-5/y) is higher than the CDF (2.98E-5/y).

3. Provide the following information with regard to the treatment and inclusion of external events in the SAMA analysis:

a. State the version of the PSA that was used to support the initial fire analysis.

b. In Section F.5.1.6.1 of the ER, a list of PSA topics that prevent the effective comparison of the CDF between the internal events PSA and the fire PSA is provided. These topics appeared to be derived from NEI 05-01, and are provided as general statements rather than specific arguments applicable to the WCGS Fire Model. State how these assumptions apply to the WCGS Fire Model.

c. Explain the scope, changes and peer review associated with the fire re-analysis, including the date of the analysis and peer reviews, relative to the fire individual plant examination of eternal events (IPEEE). Provide a comparison between the contributions to CDF for significant fire areas between the fire re-analysis and the fire IPEEE.

d. The potential enhancement identified in the IPEEE to increase seismic ruggedness for the eight electrical cabinets that have a 0.20g peak ground acceleration (PGA) high confidence in low probability of failure (HCLPF) is indicated as “not implemented” on the basis that the HCLPF value is acceptable

for reduced scope plants (Sections F.5.1.5 and F.5.1.6.2.2 of the ER). Provide additional justification as to why SAMAs to address this item would not be cost beneficial.

4. For the MACCS analyses population projection to year 2040, confirm that the growth rates used for the projection assumed a constant growth rate. Additionally, the population sensitivity analysis in Section F.7.3.2 of the ER states that the baseline population was for the year 2045, yet Section F.3.1 of the ER states that the population was projected to the year 2040. Clarify this discrepancy.

5. In Section F.5.1.4 of the ER, six potential improvements are listed from the IPE. The third improvement is listed as “not implemented” and states that the risk reduction worth (RRW) for the related operator action is 1.001. Yet, the IPE safety evaluation report implies that crediting this improvement would decrease the CDF by 19 percent. Describe the PSA model changes since the IPE that have reduced this RRW.

6. Provide the following with regard to the Phase II cost-benefit evaluations:

   a. For SAMA 1, provide the following information:

      i. a characterization of the sequences that were assumed to be impacted by the SAMA (i.e., SBOS02 through SBOS32).

      ii. an explanation why the mitigation of station blackout sequences does not result in the elimination of a larger percentage of early containment failure and containment isolation failure (CIF), since for SAMA 3, the removal of the dual division emergency diesel generator (EDG) and emergency service water failure was assumed to result in removal of all of the cutsets in the CIF release category. Given that a similar concern may apply to SAMA 14, confirm that the explanation provided for SAMA 1 is also relevant to SAMA 14.

   b. For SAMA 2, provide the following information:

      i. an explanation of the difference between the actions taken during extended EDG completion time (CT) and those included in SAMA 2, including the ability to black start under EDG CT conditions without the SAMA 2 modifications.

      ii. a cost-benefit evaluation similar to that of other SAMAs for maintaining the extended EDG CT actions 24/7, as an alternative to SAMA 2.

      iii. a list of the top contributors to the 0.294 failure of the Sharpe Station to deliver power to the WCGS that is used in SAMA 2, and confirmation that there are no cost-beneficial SAMAs that could reduce these contributions.

   c. Provide the basis for the assumed 5E-2 failure probability to cross-connect used in assessing the benefit of SAMA 3.

d. Provide the basis for the values used in the determination of break isolation failure probabilities used in assessing the benefit of SAMA 4.

e. For SAMAs 6 and 7, the ER states that the importance of the associated common cause failure is artificially inflated in the WCGS PSA. The analysis, therefore, gives credit to the ability of operators to manually initiate (SAMA 6) or manually align (SAMA 7) recirculation mode, among other credited operator actions. Clarify whether the credit that is taken in SAMAs 6 and 7 for operator actions are proceduralized, trained upon and/or represent current operational practices (the disposition of the initiating event INIT-VLO in Table F.5-1 of the ER implies that operating procedures and training to initiate injection already exist). If not proceduralized, evaluate the cost-benefit of each of these SAMAs for adding the appropriate procedural guidance.

f. For SAMA 13, the ER states that installation of a portable fuel oil pump was considered, but gaining access to the fuel oil tanks at WCGS requires a crane and about 10 hours of work. Evaluate the cost-benefit associated with installing a manual fuel oil transfer pump in parallel (but valved out) with the current fuel oil transfer pump, or some other alternative that would not require access to the fuel oil tanks.

g. For SAMA 15, provide the following information:

   i. a more detailed description of the modifications for Cases 1 and 2, sufficient to understand what is included in the cost estimate, and

   ii. the basis for the assumption that the fire events comprise 85 percent of the external events risk, since this equates to a fire risk of 2.6E-5 (3E-5 x 0.85) and implies a fire risk much higher than the “conservative” fire CDF of 5.9E-6/y.

h. For SAMA 16, provide the bases for the 0.1 failure probability of the operator to diagnose and realign the component cooling water (CCW) system to take advantage of a CCW cross-tie.

i. The ER states that cost-beneficial SAMAs 4 (Case 2), 5, and 13 should all be considered for implementation, but is vague regarding WCNOC’s intentions for SAMAs 1, 2, 3, and 14. While recommendations are stated for implementing combinations of these remaining SAMAs, Section F.8 of the ER is unclear about specifically which of these SAMAs WCNOC plans to implement and which are planned for continued consideration. Specifically indicate whether each of these SAMAs will be considered for implementation. Note that Section 4.20 of the ER states that only six potentially cost-beneficial SAMAs exist, while the SAMA analysis conclusions identify seven. Clarify this discrepancy.

7. For certain SAMAs considered in the ER, there may be lower-cost alternatives that could achieve much of the risk reduction at a lower cost. In this regard, discuss whether any lower-cost alternatives to those Phase II SAMAs considered in the ER would be viable and potentially cost-beneficial. Evaluate the following SAMAs (previously found to

be potentially cost-beneficial at other plants), or indicate if the particular SAMA has already been considered. If the latter, indicate whether the SAMA has been implemented or has been determined to not be cost-beneficial at WCGS:

a. Use portable generator to extend the coping time in loss of AC power events (to power selected instrumentation and DC power to the turbine-driven auxiliary feedwater pump).

b. Provide alternate DC feeds (using a portable generator) to panels supplied only by DC bus.

c. Add an alternate AC source to the site as an alternative to Sharpe Station.

Wolf Creek Generating Station

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