August 10, 2006

Ms. Nancy B. Parr, Licensing Project Manager
Westinghouse Electric Company
Nuclear Fuel
Columbia Fuel Site
P.O. Drawer R
Columbia, SC 29250

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON LICENSE RENEWAL APPLICATION FOR NUCLEAR CRITICALITY SAFETY (TAC 31911)

Dear Ms. Parr:

We have reviewed your response, dated May 12, 2006 (ML061460118), to our Request For Additional Information (RAI), dated April 14, 2006 (ML061010149), related to your application for renewal of Materials License No. SNM-1107. Our review has determined that the responses to certain questions are insufficient for us to reach a finding of adequate safety in the area of nuclear criticality safety.

Specifically, the response to Question 6-2 of the RAI, related to outage time for the Criticality Accident Alarm System (CAAS), is inadequate to reach a finding of compliance with 10 CFR 70.24. In addition, the responses to Questions 6-3 through 6-6 are not sufficient to complete the technical justification for the requested minimum margin of subcriticality. The enclosure contains evaluations of Westinghouse's responses to these questions, with identification of additional information that is required to justify the requested margin of subcriticality.

10 CFR 70.23(a)(2) states that an application will be approved if the Commission determines that the applicant's facilities and equipment are adequate to protect health and minimize danger to life or property. 10 CFR 70.23(a)(3) states that an application will be approved if the Commission determines that the applicant's procedures to protect health and to minimize danger to life or property are adequate. The CAAS information and the margin of subcriticality information Westinghouse has provided to date, beginning with the October 21, 2004, management meeting, have been insufficient for us to reach this necessary finding of adequacy. Westinghouse needs to provide sufficient information as requested in the enclosed RAI so that we may accomplish our review of the renewal application.

Please provide the additional information as requested within 30 days of the date of this letter. We are available to discuss the review questions by telephone, or a meeting at either the U.S. Nuclear Regulatory Commission (NRC) or at the Columbia facility.

If you have any questions regarding this letter, or would like to schedule a meeting or telephone conference, please contact Mary Adams, Project Manager, at (301) 415-7249 or via e-mail to mta@nrc.gov .

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and the enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-1151
License No.: SNM-1107

Enclosure: Request for Additional Information

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and the enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-1151
License No.: SNM-1107

Enclosure: Request for Additional Information

DISTRIBUTION:

FCFB r/f	JHenson, RII	RGibson, RII	BReilly	C.Hrabal
CTripp	MBaker	MLamastra	MBartlett	PBell

ML062080326

OFC:	FCFB	FCFB	SPB/TSS	SPB	FCFB	FCFB
NAME:	MAdams	VCheney	DMorey	JGiitter	BReilly	GJanosko
DATE:	07/27/06	07/31/06	08/01/06	08/10/06	08/10/06	08/10/06

OFFICIAL RECORD COPY

REQUEST FOR ADDITIONAL INFORMATION
WESTINGHOUSE ELECTRIC COMPANY
NUCLEAR CRITICALITY SAFETY

Criticality Accident Alarm System

6-2 In the Request for Additional Information (RAI) dated April 14, 2006, the U.S. Nuclear Regulatory Commission (NRC) staff asked Westinghouse Electric Corporation (WEC) the following question:

Section 6.1.8, "Criticality Accident Alarm System (CAAS)", paragraph 3, states, in part, "If the CAAS is out of service for more than four hours, all movement and processing of fissile material is prohibited..." Revise Section 6.1.8 to state that should the CAAS be out of service for any amount of time, all movement and processing of fissile material must cease until compensatory measures approved by the nuclear criticality safety function are in place, or the alarm service has been restored. WEC may revise the last sentence in Section 6.1.8, paragraph 3, as follows: "Routine testing, calibration, and/or maintenance of the system for up to four hours is permitted without suspension of fissile material movement or processing." These changes are necessary to determine compliance with 10 CFR 70.24 which states, in part, that a CAAS is required for operations containing greater than 700 g of contained ^{235}U.

The response to this question was inadequate in that it stated, in part:, “If the CAAS is out of service for more than four hours, actions will be initiated to suspend movement and processing of fissile material in the coverage area and continued until the process is brought to a safe shutdown condition.” Revise the response and revise Section 6.1.8 to state that should the CAAS be out of service for any amount of time, all movement and processing of fissile material must cease until compensatory measures approved by the nuclear criticality safety function are in place or the alarm service has been restored. These changes are necessary to determine compliance with 10 CFR 70.24 which states, in part, that a CAAS is required for operations containing greater than 700 g of contained ^{235}U.

Minimum Margin of Subcriticality

6-3. In the RAI dated April 14, 2006, the NRC staff asked WEC the following question:

Summarize the most important factors providing conservatism in your calculations of k_{eff} in each major process area, including, for both controlled and uncontrolled parameters: (1) the nominal value of the parameter, (2) the value of the parameter assumed in the calculation(s), and (3) the difference in k_{eff} resulting from the difference between nominal and as-modeled conditions. The major process areas should include, at a minimum: the wet ammonium diuranate process, the UO_2 powder preparation and handling processes, pellet, rod, and assembly fabrication and handling, and uranium recovery.

Enclosure

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions, including use of an approved margin of subcriticality for safety. As part of the technical basis for the proposed margin of subcriticality of 0.02, WEC submitted a table, by letter dated December 15, 2005, showing the as-modeled conditions for each calc note for the facility. This submittal, however, did not identify the nominal values for these parameters, and did not quantify the amount of conservatism resulting in terms of k_{eff}. This information is necessary to enable the NRC to determine that there is sufficient conservatism to be used as the basis for justifying the margin of subcriticality.

The response to this question was inadequate in that it discussed only calculational conservatism in a general sense, but did not provide any of the requested process-specific details. Therefore, summarize the most important factors providing conservatism in the calculations of k_{eff} for each major process area, including, for both controlled and uncontrolled parameters: (1) the nominal value of the parameter, (2) the value of the parameter assumed in the calculation(s), and (3) the difference in k_{eff} resulting from the difference between nominal and as-modeled conditions, for each of the major process areas mentioned above.

6-4. In the RAI dated April 14, 2006, the NRC staff asked WEC the following question:

Determine the trend in the bias as a function of the thermal, intermediate, and fast fission fractions, similar to what was done for energy of average lethargy causing fission (EALF) in Figures 3 and 6 of the validation report LTR-ESH-05-146, Rev.1. Perform separate calculations for the solid and solution subsets of experiments. Present the results in graphical form and justify whether the existing Upper Subcritical Limit (USL) is still valid.

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions, including use of an approved margin of subcriticality for safety. As part of the technical basis for the proposed margin of subcriticality of 0.02, WEC submitted a study which calculated the thermal, intermediate, and fast fission fractions for each of the benchmark experiments. However, using this analysis as part of the basis for the margin of subcriticality necessitates that the information be used to determine whether there are any additional trends resulting from the neutron spectrum that are not revealed in the analysis of k_{eff} as a function of EALF.

The response is unclear in that it is not evident to what analysis the response refers. If the analysis referred to is the analysis previously submitted to the NRC, the response is inadequate, because we have previously reviewed this analysis and require additional information. If the analysis referred to is a new analysis, provide it to the NRC. Also, explain what “fission fraction weighted incident neutron energy causing fission” is, and describe specifically what trends were analyzed.

6-5. In the RAI dated April 14, 2006, the NRC staff asked WEC the following question:

Justify whether the validated area of applicability (AOA) includes any calculation lying within the H/X-EALF "box" (i.e., any solid case with 17.46 # H/X #972.77 and 0.05 # EALF # 2.369 eV, or any solution case with 453.9 # H/X #1437.51 and 0.0339 # EALF # 0.0592 eV.

If the validated AOA does include all points within the H/X-EALF box, then justify why, given that the benchmark experiments are confined to a narrow band within this box. If part of the justification is that it is not possible for future applications to fall outside this band, then justify why this is the case.*

If the validated AOA does not include all points within the H/X-EALF box, then restrict the AOA to that portion of the H/X-EALF box covered by experiments, or provide additional margin to cover extension of the AOA outside this band.

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions, including use of an approved margin of subcriticality for safety. As part of the technical basis for the proposed margin of subcriticality of 0.02, WEC provided an analysis of the distribution of benchmark experiments in two-dimensional H/X-EALF space. As a result of the strong correlation between moderator content and thermalization, the benchmark experiments only cover a small portion of this box. There is not a high degree of assurance that future applications that do not lie within the narrow band will have the same bias as the benchmark experiments that lie within the band. This information is necessary to ensure that the bias is well-characterized as a function of both H/X and EALF.

(*NOTE: The inverse relationship between H/X and EALF is the reason the benchmarks tend to have either low H/X and high EALF or high H/X and low EALF. Two examples of hypothetical future applications that could deviate from this trend are: (1) low H/X and low EALF, which could occur with a low-moderated UO_2 powder or fuel core surrounded by full reflection, under conditions of sufficiently high neutron leakage, such as in a fully reflected slab of powder or pellets; or (2) high H/X and high EALF, which could occur with an optimally moderated but unreflected solution, under conditions of sufficiently high neutron leakage, such as in an unreflected cylinder or slab of uranium solution with small diameter or thickness.)

The response is inadequate in that it does not provide the technical basis for statements made in the response. Provide an engineering analysis and/or calculations supporting the conclusions with regard to the two examples of calculations that might fall outside the narrow "H/X-EALF" band. Specifically, provide the engineering analysis and/or calculations demonstrating why the "low H/X and low EALF" and "high H/X and high EALF" examples cited above are not expected to occur in future WEC calculations.

` 6-6. In the RAI dated April 14, 2006, the NRC staff asked WEC the following question:

Determine the trend in the bias as a simultaneous function of both H/X and EALF, similar to what was done individually for H/X and EALF in Figures 2, 3, 5, and 6 of the validation report LTR-ESH-05-146, Rev.1. Perform separate calculations for the solid and solution subsets of experiments. Present the results in graphical form and justify whether the existing USL is still valid.

10 CFR 70.61(d) requires that all processes be subcritical under both normal and credible abnormal conditions, including use of an approved margin of subcriticality for safety. As part of the technical basis for the proposed margin of subcriticality of 0.02, WEC provided an analysis of the distribution of benchmark experiments in two-dimensional H/X-EALF space. However, using this analysis as part of the basis for the margin of subcriticality necessitates that this information be used to determine whether there are any trends in the bias as a function of both parameters. There is a strong correlation between H/X and EALF, so that analyzing the bias as a function of each variable independently does not provide full information on the presence of any trends. This trend could be analyzed by using multiple regression analysis of k_{eff} as a function of two variables.

The response is inadequate in that it did not provide all of the information requested. Specifically, present the results of the trend in the bias as a function of H/X and EALF in graphical form, and justify whether the existing USL is still valid. Also, provide the calculations performed to generate the results in the response.