Westinghouse

Westinghouse Electric Company LLC
Nuclear Fuel
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U. S. Nuclear Regulatory Commission
ATTN. Ms. Breeda Reilly, Project Manager
Fuel Manufacturing Branch
Division of Fuel Cycle Safety and Safeguards
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e-mail: alstadcd@westinghouse.com
Your ref:
Our ref: LTR-RAC-08-06

January 8, 2008

SUBJECT: AFFIDAVIT TO WITHHOLD INFORMATION FROM PUBLIC KNOWLEDGE

I, Cary D. Alstadt, do hereby state,

1. I am the Columbia Fuel Fabrication Facility (CFFF) Plant Manager, Westinghouse Electric Company LLC (WEC) and authorized to make and execute this affidavit.
2. On January 8, 2008, WEC provided to representatives of the Nuclear Regulatory Commission a response to your request for additional information regarding a license amendment request per WEC letter number LTR-RAC-08-05. It is our position that the two attachments to this WEC letter should be withheld from public disclosure as confidential commercial information under 2.390(a)(4). Enclosed with this affidavit is a redacted version of the document which may be made publicly available.
3. The information provided is routinely withheld from public disclosure, was submitted to the Commission in confidence and is not available in public sources.
4. Disclosure of the subject information would harm the competitive position of WEC since this report contains substantial sensitive information related to the company's nuclear criticality safety program.

For all the foregoing reasons, WEC requests that the subject information be withheld from public disclosure by virtue of 10 CFR 2.390(a)(4).

Cary D. Alstadt, CFFF Plant Manager
January 8, 2008

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January 8, 2008

SUBJECT: WESTINGHOUSE RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR LICENSE AMENDMENT (TAC 32650)

Westinghouse Electric Company LLC (WEC) hereby provides the following responses to the NRC License Amendment Application - Request for Additional Information dated December 12, 2007.

1. For any new assembly types (or variants of existing assembly types), the existing Columbia Fuel Fabrication Facility (CFFF) license requires that WEC demonstrate subcriticality for all credible abnormal configurations. If a new or revised assembly type were introduced at the CFFF, WEC would perform the same analyses as submitted to the NRC in CN-CRI-06-35, "PWR Fuel Assembly Parametric Calculations" and CN-CRI-07-2, "PWR Fuel Assemblies in Wash Tanks," (or perform a simple analysis to show that the new fuel assembly type was bounded by an existing fuel type). Such analyses would follow all of the existing CFFF SNM-1107 requirements, such as adequate margin of subcriticality, area of applicability, code validation, examination of tolerances, etc. Therefore, WEC believes that the existing license already provides the level of safety assurance necessary to demonstrate subcriticality for future fuel designs.

2. The intent of this bullet is to confirm that all other requirements with respect to demonstrating sufficient subcriticality (i.e., k_{EFF} = 0.98 limit) also apply to fuel assemblies, including the requirements of Section 6.1.4.2. Only the 0.95 criterion for assemblies in the wash pit is being waived.

3. As described in Response #2 above, it is intended that the criteria of Section 6.1.4.2 will apply to normal conditions for completed assemblies in the wash pit.

4. An explanation of the referenced statement follows. The analyses in CN-CRI-06-35 derive the worst-case combination of tolerances for Combustion Engineering (CE) type fuel assemblies and conclude that the fuel assemblies are sufficiently subcritical even when these tolerances are modeled. In addition, CN-CRI-06-35 further concludes that these worst-case tolerances should be applied whenever CE-type assemblies are modeled.

   In CN-CRI-07-2 (which documents the analysis of fuel assemblies in the wash tanks), one of the base assumptions (see Section 3.1) states that tolerances are actively modeled for CE-type fuel assemblies. The baseline k_{EFF}s reported for CE-type fuel assemblies include the worst-case application of these tolerances. Therefore, the analysis of CE fuel designs has been completed, and does not require the use of neutron-absorbing spiders for the proposed license amendment request, even when the worst case combination of tolerances are actively modeled.

5. For each assembly-type, the calculations of CN-CRI-06-35 model twenty-five different permutations of possible combinations of assembly geometrical tolerances in pellet size, rod size, and lattice pitch. For the bounding fuel type (W17OFA), the maximum increase in k_{EFF} was calculated to be 0.003, while the average maximum increase for all Westinghouse-type fuel assemblies was also 0.003.

   As discussed in Section 7.3.2 (W17(3600)) of CN-CRI-06-35, this maximum increase of 0.003 for the bounding fuel assembly was achieved only by applying the worst-case combination of tolerances in pellet outer diameter (OD), rod inner diameter (ID), rod OD, and lattice pitch simultaneously to all 264 fuel positions in an assembly.

   In reality, pitch tolerances are not permitted to accumulate in adjacent lattice cells. In fact, if the pitch tolerances were actually applied to every fuel position in a W17OFA assembly (as modeled), the overall grid dimension would increase by 0.017" to 8.449", which exceeds the maximum grid tolerance dimension of 8.426."

   Therefore, given that a very small reactivity increase (0.003) was calculated for a case with the worst-case combination of tolerances applied simultaneously to 264 fuel positions, in violation of the overall assembly grid tolerances, it is concluded in CN-CRI-06-35, that any credible combination of tolerances in a finite number of rods would result in a much smaller, and thus statistically insignificant, increase in k_{EFF}.

   Similar arguments apply to all other Westinghouse-type fuel assemblies evaluated in CN-CRI-06-35. Therefore, nominal dimensions are normally modeled for these assembly types. For CE-type assemblies, different results were obtained, as documented in CN-CRI-06-35.

6. Partial density water is not credible in the wash tanks for the following reasons: 1) the wash tanks are filled with water prior to any assembly being inserted and 2) if an assembly were lowered into an empty tank and water was subsequently added, the result would be a rising level of full density water.

   Furthermore, as demonstrated in CN-CRI-06-35, the fuel assemblies are all undermoderated (increases in assembly pitch result in increases in reactivity, despite greater leakage). Therefore, any decrease in water density would decrease k_{EFF}. In addition, CN-CRI-07-2 demonstrates that the density effects of temperature (i.e., the elevated temperature of the water in the wash tanks would result in a lowered water density) actually decrease reactivity (see the end of Section 7.3.1 in CN-CRI-07-02).

7. The purpose of the IFBA rod calculations is to support the existing license requirement that normal conditions in the wash tank result in k_{EFF}s below 0.95. For actual manufactured assemblies that will be washed and that could result in k_{EFF}s above 0.95 (assuming maximum enrichment and no IFBA rods), NCS Engineers evaluate the actual configuration of the assemblies to determine if the assemblies have sufficiently low enrichment or a sufficiently high number (and strength) of IFBA rods to meet the 0.95 criterion. If not, an RCCA (i.e., spider) is required to be inserted in the assembly.

   If the requested license amendment application is approved, these calculations will no longer be necessary, except to demonstrate additional margin or conservatism as needed.

8. Due to the large quantity of validation documentation, the information was split into two reports. The first, CN-CRI-06-38, "MCNP 5 Benchmark Calculation for Low Enriched Heterogeneous Systems" documents the criticality benchmark models, the calculation of k_{eff} values and the search for trends. The second, CN-CRI-06-39, "Determination of Bias for Heterogeneous Systems Modeled Using MCNP 5" is attached and documents the data normality evaluation and the bias and bias uncertainty calculation.

9. See Response #8 above.

   a. The H/X value for LEU-COMP-THERM-007-4 is incorrectly stated as 6.97. The correct value is 697. The stated Area of Applicability is that defined by the set of evaluated experiments. No trend in k_{eff} values vs. H/X has been observed. (Note: The same typographical error is contained in document CN-CRI-06-38.)

   b. The LEU-COMP-THERM-039 calculated k_{eff} values are slightly below the average of all calculated k_{eff} values (0.993 vs 0.995). However, this difference is well within one sigma of the average combined experimental and calculational uncertainties (0.0026). Additionally, the bias and bias uncertainty is calculated using the non-parametric technique with the minimum k_{eff} value of 0.9912. Therefore, a lower k_{eff} limit is not needed for this group.

   c. The validation uses the same benchmark experiments as previous validations. Sets LEU-COMP-THERM-015 and LEU-COMP-THERM-070 have zirconium clad fuel rods with H/X values of 250 and 38 respectively. While the LEU-COMP-THERM-070 calculated k_{eff} values over-predict the experimental values, there is no overall trend in k_{eff} values vs. H/X or in k_{eff} values vs. ANECF.

10. Reference 6 of the WEC heterogeneous validation for MCNP 5 is attached. The title of Reference 6 is LTR-EHS-07-32, "Extension of Validation Area of Applicability to Concrete Reflection."

11. The heterogeneous validation information requested is contained within the attached CN-CRI-06-38.

If you have any questions or comments regarding this response, please contact me at (803) 647-2045.

Sincerely,

Gerard F. Couture, Manager
Licensing & Regulatory Programs
Westinghouse Columbia Fuel Fabrication Facility

Docket 70-1151 License SNM-1107

Attachment1: WEC Proprietary CN-CRI-06-38, "MCNP 5 Benchmark Calculation for Low Enriched Heterogeneous Systems"
Attachment 2: WEC Proprietary LTR-EHS-07-32, "Extension of Validation Area of Applicability to Concrete Reflection"

cc w/o att: U. S. Nuclear Regulatory Commission
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