

February 22, 2000

Mr. James F. Mallay  
Director, Nuclear Regulatory Affairs  
Siemens Power Corporation  
2101 Horn Rapids Road  
Richland, WA 99352

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON SIEMENS TOPICAL  
REPORT, EMF-2209(P), REVISION 0, "SPCB CRITICAL POWER  
CORRELATION" (TAC NO. MA6639)

Dear Mr. Mallay:

By letter dated September 24, 1999, the Siemens Power Corporation (SPC) submitted Revision 0 to Topical Report EMF-2209(P), "SPCB Critical Power Correlation" for staff review. The staff has done a preliminary review and requests the following information identified in the enclosure.

The additional information was discussed with your staff and a mutually agreeable target date of 30 days from the date of this letter for your response was established. If circumstances result in the need to revise the target date, please call me at the earliest opportunity at 301-415-1480.

Sincerely,

*/RA/*

N. Kalyanam, Project Manager, Section 1  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Project No. 702

Enclosure: Request for Additional Information

Mr. James F. Mallay  
Director, Nuclear Regulatory Affairs  
Siemens Power Corporation  
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## REQUEST FOR ADDITIONAL INFORMATION

### SIEMENS TOPICAL REPORT, EMF-2209(P)

### "SPEC CRITICAL POWER CORRELATION"

#### SPCB-Correlation Development

1. On page 1-2, second paragraph, it is stated that an additional 316 validation data points were included to the 781 validation data base for the purpose of validating the SPCB correlation. Were the 316 data points obtained for a different fuel assembly? Please clarify.
2. On page 1-2, third paragraph, please explain the need for additional uncertainty required for peaking factors greater than 1.5.
3. On page 2-4, first paragraph, it is stated that two coefficients are used, one for the mass velocity less than or equal to 0.37, and one for mass velocities greater than or equal to 0.42.
  - a. What is the basis for these lower and upper limits?
  - b. Provide the technical justification for the interpolation between these bounds.
4. Tables 2.1 through Table 2.7 provide values for various coefficients, subject lower and upper bounds. Is one to assume that different values for these coefficients are obtained by interpolation as in the case of Table 2.1?
5. Chapter 2, in particular Sections 2.0 to 2.3, contains the mathematical development of the SPCB correlation. As such, it is imperative that one obtains a clear understanding of the various components (variables, parameters, etc.) and their respective use in the formulation of the correlation for the two different fuels. In reviewing Sections 2.0 to 2.3, it became apparent that there are a number of junctions in the road, depending on whether one is addressing the ATRIUM-9B fuel or the ATRIUM-10 fuel. In order to expedite the review of this topical report, please provide a road map (Flow Chart/Event Tree) showing the clear and separate routes taken in developing the two forms of the SPCB correlation for each of the fuels in question.
6. On page 2-23 (item 2, middle of the page), please provide the reasoning for switching from a simple mean to a weighted mean.
7. Please provide additional information for Figure 2.3.
8. On page 2-34, paragraph 2, reference is made to the "ANFB" limits. Should that be the "SPCB" limits?
9. On page 2-35, Section 2.6.2.1, the high and low enthalpy limits are addressed. What are the values of these limits?

10. On page 2-36, second paragraph, it is stated that "corresponding quality distributions are artificially increased." What are "quality distributions"?
11. Is "inlet mass velocity" inter-changeable with "inlet mass flow rate" ?
12. Figure 3.8 on page 3-15. The x-axis is labeled "Active flow". What is "Active Flow"?
13. Does Figure 3.39 on page 3-41 include all the data for the ATRIUM-9B and that for the ATRIUM-10?
14. Page 4-9, Figure 4.7. Please provide justification for the difference in magnitude at high inlet flow.
15. Page 4-9, the last sentence in the second paragraph states that Test 48.1 consists of transient data only. Does that mean that Test 29.5 consist of data other than transient data?
16. In Section 5.3, the third paragraph brings up the subject of peaked rods going into dryout. For both fuel types, what procedure is used in determining which rods are peaked and which rods go into dryout.
17. Page 5-11, last paragraph. Please provide additional discussion regarding as to why only two tests were needed to be performed on the ATRIUM-9B to demonstrate that the ATRIUM-10 additive constant methodology is applicable to the ATRIUM-9B fuel.
18. Page 5-12, the last paragraph refers to "individual case." Is this same as "individual test?"

#### SPCB-Statistical RAIs

1. A general statement: Whenever presenting mean and standard deviation (such as in the bottom sentence of Page 1-1), include the sample size and the associated tolerance limit.
2. Page 1-2, Section 1.1. Provide statistical tests that compare the behavior (mean, variance) of the 1,876 correlation points to the 781 validation points. Also, did the 316 additional validation points differ in behavior from the 781 validation points?
3. Page 1-2, second paragraph. Text states that transient tests are performed on ATRIUM 10 (not mentioning ATRIUM-9B). Page 3-36, second paragraph says that dryout tests were performed on the ATRIUM-9B and ATRIUM-10.
4. Pages 2-4 thru 2-10 (Tables 2.1 thru 2.7). Is "G" in these tables the same as  $G$  bar given in, say, equation (2.7)?
5. Page 2-6, Equation 2.12. The coefficient "f1" in equation 2.12 is not defined.

6. Page 2-13, Equation 2.23. Identify/explain how the coefficients 0.624 and 0.314 were obtained.
7. Page 2-26, Figure 2.3. Symbols (like X, square, and diamond) need a legend.
8. Page 3-1, Table 3.1. Show how Sigma (given as 0.021) for ATRIUM-9B was derived.
9. Page 3-1, Table 3.1:
  - expand the table to include for each test the 95/95 upper tolerance limit for ECPR,
  - maximum value obtained for the test,
  - number of data points in the test that exceed the tolerance limit, and
  - the percent number of points below the tolerance limit.

Provide similar entries, separately for each fuel, and for all tests of the same profile.

Suggestion: Follow the style of Table 4.1 for ANFB 10 that you provided in your May 26, 1998 communication to E.Y. Wang.

10. Page 3-2, Table 3.2. Show a complete table of the analysis of variance (ANOVA). Please provide separate analysis for each fuel type. Did any analysis detect significant test differences? Was the data tested for homogeneity of variances prior to constructing the ANOVA?
11. Pages 3-2 and 3-3, equations for  $m_2$ ,  $m_3$ ,  $m_4$ ,  $\beta_1$ , and  $\beta_2$ : What is the numeric value of "n" in each of these calculations?
12. Page 3-5, paragraph 3.2. Justify the use of 1 percent as a level of significance for testing normality. What is the numerical value of Lillifor's statistic?
13. Pages 3-4 through 3-29, Figures 3.1 through 3.36. Indicate the sample size associated with each figure.
14. Page 3-38, last paragraph. Indicate where the upper 95 percent confidence limits on the additive constants are implemented.
15. Page 4-2, Tables 4.1 and 4.2. Expand the tables as requested for Table 3.1.
16. Page 4-8, Figure 4-6 (and others). What do the different lines represent? Provide the necessary labels. Similarly, provide the necessary labels for Figures 5.7 thru 5.89.
17. Were there any outliers in the evaluation, and if so, what was their disposition?