REQUEST FOR ADDITIONAL INFORMATION

RELATED TO AREVA INC

TOPICAL REPORT ANP-10335P/NP

"ACE/ATRIUM 11 CRITICAL POWER CORRELATION"

RAI-SNPB-1

Please provide references to documents describing the test loop and facility in greater detail, as well as the quality assurance program to be applied.

RAI-SNPB-2

Please provide a description of benchmarks performed with KATHY against other testing facilities, as well as a reference to documents where these benchmarks are described in detail.

RAI-SNPB-3

Only **[ ]** were tested in the development of the ACE/ATRIUM 11 correlation. Please provide a justification for not testing **[ ]**.

RAI-SNPB-4

Please discuss the range of tested transient conditions, specifically including a discussion of **[ ]**.

RAI-SNPB-5

Please provide additional justification for the use of **[ ]** up to **[ ]** when the highest tested **[ ]** is **[ ]**.

RAI-SNPB-6:

Please provide additional details on the method used to develop **[ ]**. Any response should discuss **[ ]**.

RAI-SNPB-7:

As discussed in Section 9.0 of ANP-10335P, the **[ ]** in the test assembly is different from that of the production assembly. Please provide additional justification for why a correlation developed with this difference in the test assembly would be

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applicable to a production assembly. Any justification should specifically address the parameters that could be affected by such a difference and the approximate magnitude of the impact.

RAI-SNPB-8:

Please provide a brief discussion of the procedures for measuring steady-state and transient critical power data points. Also provide references to documents discussing the critical power test procedures in further detail, including the conditions required to ensure stability and the criterion for determining that dryout has occurred.

RAI-SNPB-9:

Please provide additional information about the design of the ACE/ATRIUM 11 critical power tests, including a discussion of how bias was eliminated from the testing program. Page 7-9 of ANP-10335P referenced full map, partial map, and statistical design of experiments tests – please define each of these terms and discuss how the experimental design differs between them. Also, please include a reference for a document discussing procedures for design of experiments for the KATHY loop.

RAI-SNPB-10:

Please provide the values of measurement uncertainties in the KATHY loop, with a focus on the uncertainties in the parameters discussed in Section 6.13 of ANP-10335P. Please also provide a brief discussion of how each value was derived.

RAI-SNPB-11:

Please provide a discussion of the instrumentation provided in the KATHY loop. The information provided should include a brief discussion of how diversity and redundancy of key measurements are ensured.

RAI-SNPB-12:

Please briefly describe the calibration of the instruments at the KATHY facility, including the frequencies of instrument calibration and reasons for those frequencies. Please also include a reference to a document describing the calibration in detail.

RAI-SNPB-13:

Please discuss the uncertainties associated with measurement of critical power in both steady-state and transient testing. Any response should include a quantification of the measurement uncertainty and a description of how the value was obtained.

RAI-SNPB-14:

Please discuss the heat losses from the test section, including how these losses vary depending on key parameters (test section power, flow rate, etc.).

RAI-SNPB-16:

It is not clear how the **[ ]** boundary conditions for the ACE/ATRIUM 11 correlation were chosen. Please explain the **[ ]** boundary conditions for the ACE/ATRIUM 11 correlation in further detail, especially including the **[ ]** discussed in ANP-10335P Section 6.7.

RAI-SNPB-17:

Please provide a discussion of the process used to fit the coefficients detailed in Section 6 of ANP-10335P. Since it is the NRC staff's understanding that **[ ]**, the response should include a discussion of **[ ]**. The response could be a reference to an existing document.

RAI-SNPB-18:

What is the criterion for determining **[ ]** in the second-to-last paragraph of Page 6-22 in ANP-10335P?

RAI-SNPB-19:

What was the purpose of the **[ ]**? What is **[ ]**, and how is it defined?

RAI-SNPB-20:

What is the basis for selecting **[ ]** of the data for correlation and **[ ]** for validation? How does **[ ]** impact the correlation uncertainty? The response should address both the experimental critical power ratio (ECPR) uncertainty and the additive constant uncertainty.

RAI-SNPB-21:

Please discuss in additional detail why it is considered appropriate **[ ]**. Were **[ ]** discussed in Section 7.3 applied to the correlation during the uncertainty assessment?

RAI-SNPB-22:

The topical report states in Section 6.13.1 that there is no lower limit on **[ ]**. Does AREVA plan to use the ACE/ATRIUM 11 correlation **[ ]**? If so, please provide additional justification.

RAI-SNPB-23:

Does AREVA plan to use the ACE/ATRIUM 11 correlation at **[ ]** greater than **[ ]**? If so, will some kind of upper limit on **[ ]** actually be applied?

RAI-SNPB-24:

Please clarify when the **[ ]** will be applied.

RAI-SNPB-25:

Please provide plots of the computational domain. These plots should use pairs of the key parameters (**[ ]**) for the x-axes and y-axes. Separate versions of the plots should be included for the correlation and validation data, as well as the combined dataset. Each plot should also include lines denoting the computational range of each parameter.

For each obvious region that lacks experimental data (especially validation data) lying within the computational domain, please justify why it is not possible to enter this region in an operating reactor. Alternatively, justify the correlation's behavior in the region.

RAI-SNPB-26:

Please provide additional explanation and justification of the trend of increasing ECPR standard deviation as a function of pressure. It is unclear to the NRC staff why this increasing variability should result from **[ ]**, as discussed in Section 7.1.3 of ANP-10335P.

RAI-SNPB-27:

Please justify why the **[ ]** is considered poolable, considering that the mean and standard deviation of the ECPR vary significantly between **[ ]**. Please also discuss why the **[ ]** provided in **[ ]** do not appear to appropriately match the data.

RAI-SNPB-28:

There appears to be a non-conservative subregion between **[ ]** on Figures 7.1 and 7.9. There is another potentially nonconservative region at **[ ]**. Please justify why it is acceptable to use the correlation in these areas. Any discussion should address how the correlation uncertainties presented in the topical report account for the uncertainty in these areas.

RAI-SNPB-29:

Please provide additional justification for why it is appropriate to represent the ACE/ATRIUM 11 uncertainty with the ECPR distribution determined from the **[ ]** rather than the **[ ]**. The response should discuss how the correlation uncertainties will be applied in other methodologies.

RAI-SNPB-30:

Will ACE/ATRIUM 11 be implemented in codes other than XCOBRA-T? If so, please discuss how it will be implemented and provide the criteria that will be used to demonstrate that the implementation was appropriate.

RAI-SNPB-31:

Figures 2.1, 7.1, and 7.9 use units of kW. Were these intended to be MW?