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ESC-007

Mr. Cecil O. Thomas
Standardization and Special Products Branch
Division of Licensing
Office of Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Transmittal of Response to a Question From the NRC on the Report "FOAM2 - Computer Program to Calculate Core Swell Level and Mass Flow Rate During Small Break LOCA" BAW-10155, November 1982.

Dear Mr. Thomas:

Attached is a copy of B&W's response to a question from the NRC on the subject report, which was submitted by B&W on behalf of the B&W Owners Group. The subject report supports their Small Break LOCA Methods Response to NUREG 0565 and NUREG 0737, Item II.K.3.30.

If you have any questions, please contact R. J. Schomaker at 804-385-3705.

Very truly yours,

J. H. Taylor, Manager
Licensing

JHT/mct

cc: W/Attachment

R. B. Borsum
R. J. Schomaker
S. Sun - NRC
N. P. Kadambi - NRC
D. H. Moran - NRC
E. Throm - NRC

W/O Attachment
N. Lauben - NRC
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1/1

Question: Most of the data comparisons given in the FOAM2 topical report were made with the FOAM code, which is an earlier version of FOAM2. The main difference between FOAM and FOAM2 is understood to be in the numerical iteration scheme. To assure that the data comparisons provided in the topical report are relevant and the FOAM2 code is set up correctly, please provide the direct comparisons between FOAM and FOAM2. Identical input parameters should be used in the comparison. The preferred comparison case would be one of the five cases shown in Figures A-1 to A-5 given in the topical report. A range of bundle powers should be analyzed as shown in the topical. Please provide the input parameters in the response.

Response: The FOAM code comparison to the test data is shown in Figure A-1 through A-3 of the FOAM2 Topical Report BAW-10155. The same cases were run using FOAM2 code. The important input parameters for FOAM2 code are given in Tables 1 and 2. The corresponding FOAM input values are not available but are considered to be similar to the FOAM2 values used in this benchmark as discussed below.

Comparison of FOAM2 calculational results with both FOAM predictions and Westinghouse data is shown in Figures 1 through 3. The comparison shows that FOAM2 benchmarks well with the experimental data and closely follows FOAM results. Direct comparisons between FOAM and FOAM2 provide the following:

A. The 100 psia test comparisons in Figures 1 through 3 demonstrate that both inputs, code models, and calculational techniques are similar for both FOAM and FOAM2.

B. Although there is a systematic difference (FOAM2 results are higher) of less than 0.2 ft. between the two code results for all 400 psia predictions, because of Item A above, the difference cannot be attributed to either input differences or model and/or calculational techniques. Furthermore, sensitivity studies were conducted on input differences where pressure was

varied by 5 psia and inlet enthalpy was changed by about 2 BTU/lbm. The resulting difference in the equivalent water level (EWL) was less than 0.02 ft. It is estimated that an inlet enthalpy difference of about 25 BTU/lbm would be needed to decrease the FOAM2 results by 0.2 ft. to FOAM results. This is clearly no longer a small input difference. The conclusion, since digital printout of the FOAM results is unavailable and only the plotted FOAM results in Figures 1 through 3 are available, is that the systematic difference seen for all 400 psia FOAM plots is a graphing discrepancy and not related to either model or calculational techniques or input differences between FOAM and FOAM2.

TABLE 1 - FOAM2 INPUT

Parameter	Value
Heated Perimeter	52.92 Ft
Bundle Flow Area	0.59 Ft^2
Average Heat Flux (Per 1.0 MW of Bundle Power)	5373.11 BTU/Hr-Ft^2
Wetted Perimeter	60.02 Ft
Axial Power Shape	See Table 2
Pressure	Case dependent. Nominal values of 100 psia and 400 psia used.
Inlet Enthalpy	Case dependent. (Based on nominal pressure and inlet subcooling).
Heated Length (per rod)	12 Ft

TABLE 2 - AXIAL POWER SHAPE

LOCATION (FT) Begin	End	AXIAL POWER SHAPE (Normalized to 1.0)
0.0	1.83	0.43
1.831	2.33	0.68
2.331	3.00	0.88
3.001	3.58	1.11
3.581	4.17	1.30
4.171	4.83	1.49
4.831	5.42	1.60
5.421	6.58	1.66
6.581	7.17	1.60
7.171	7.83	1.49
7.831	8.42	1.30
8.421	9.00	1.11
9.001	9.67	0.88
9.671	10.17	0.68
10.171	12.00	0.43

Figure 1. Comparison of FOAM2 to Westinghouse Data for the 10 Foot Elevation

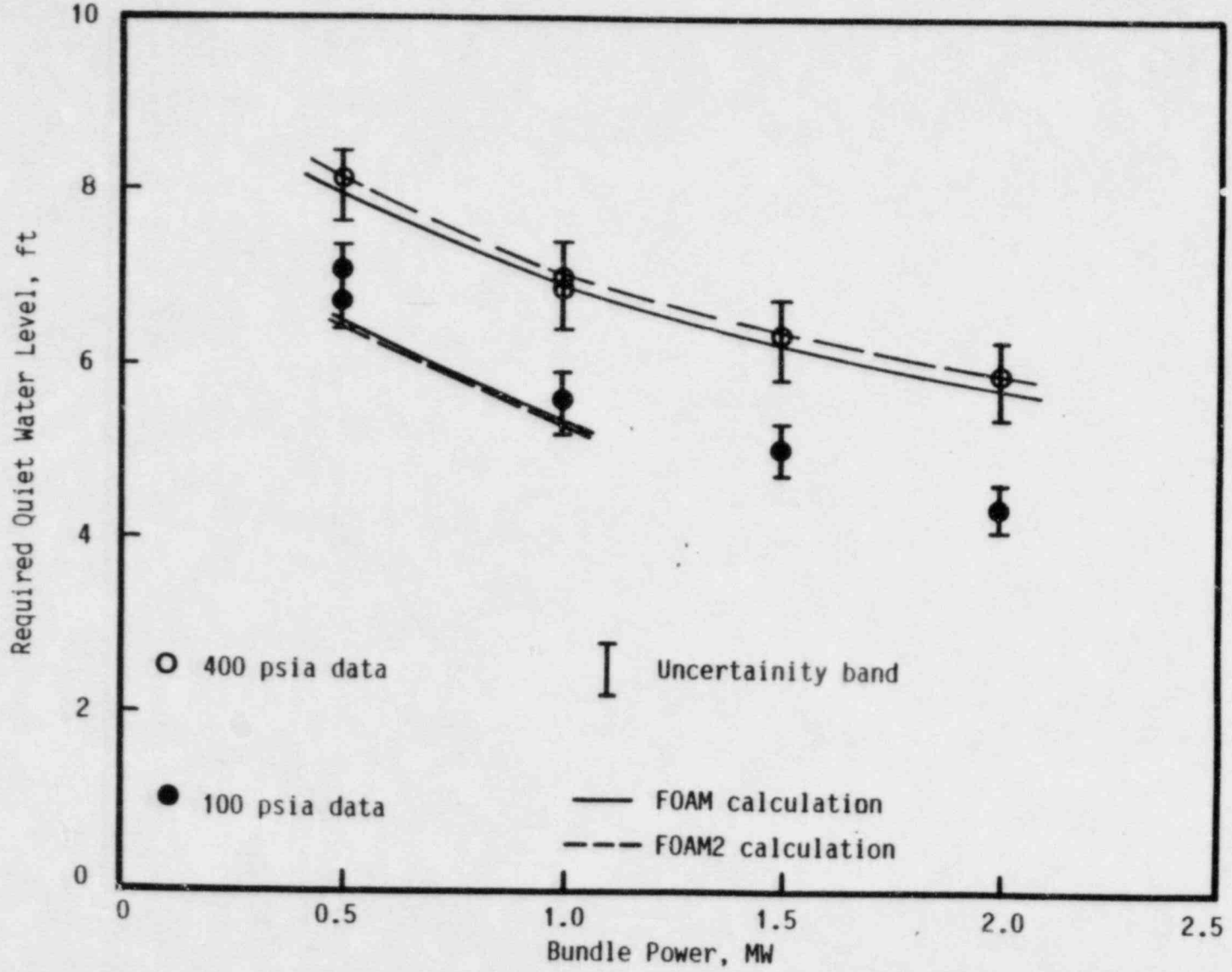

Figure 2. Comparison of FOAM and FOAM2 to Westinghouse Data for the 8 Foot Elevation

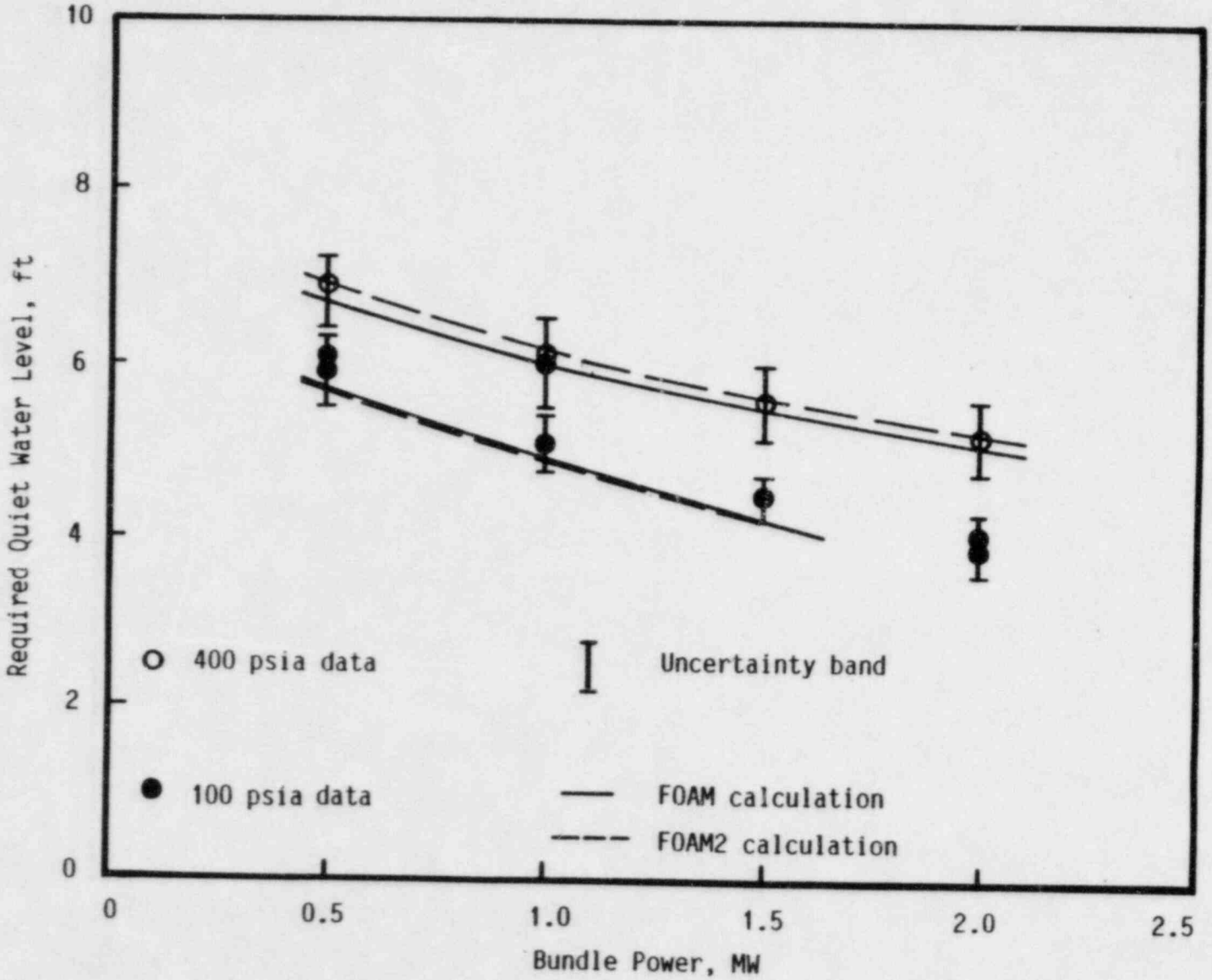

Figure 3. Comparison of FOAM and FOAM2 to Westinghouse Data for the 6 Foot Elevation