FRAMATOME ANP

January 11, 2002
NRC:02:003

Document Control Desk
ATTN: Chief, Planning, Program and Management Support Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

BWR CHF Correlation Bounds Checking

Ref.: 1. Letter, J. F. Mallay (Framatome ANP) to Document Control Desk (NRC), "BWR CHF Correlation Bounds Checking," NRC:01:023, June 12, 2001.

Framatome ANP requested NRC concurrence with clarifications to its methodology for BWR CHF correlation bounds checking in Reference 1. The NRC requested additional information regarding the clarifications in a telephone call on January 2, 2002. The requested information is provided below in the form of questions and responses.

1. Describe the derivation of the equation HNEW and identify the documentation of the equation. Also, provide an explanation for the logic behind the number 0.01 in the equation HNEW.

Response:

The action to be taken when the nodal enthalpy is below the low enthalpy limit is stated in EMF-2209(P)(A), Revision 1, *SPCB Critical Power Correlation*, on page 2-36, in Section 2.6.2.3, for Low Enthalpy Limit, "If the MCHFR nodal enthalpy is below the low enthalpy limit, the enthalpy and quality distributions are artificially increased." This topical report does not present the detail of how the artificial increase occurs. The equation for HNEW in Reference 1 shows this detail. The equation for HNEW is repeated below for convenience.

HNEW = HIN + HRATIO*(HOLD-HIN)

Where: HNEW = new value of enthalpy
HIN = inlet enthalpy
HOLD = prior value of enthalpy

And: HRATIO = (HLIM+ 0.01 – HIN)/(H(limiting node) –HIN)

Where: HLIM = correlation lower bound enthalpy
H(limiting node) = enthalpy of dryout node

The equation for HNEW (the new value of enthalpy) ensures that the enthalpy of the limiting node is always above the correlation lower bound enthalpy limit. This can be illustrated by

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substituting H (limiting node) for HOLD in the equation for HNEW. HNEW is then equal to HLIM+0.01 and thus the limiting node enthalpy is 0.01 larger than the correlation lower bound enthalpy limit.

The enthalpy of the dryout node is less than the correlation lower bound enthalpy for the situation of interest. Adding 0.01 to the correlation lower bound enthalpy limit in the equation for HNEW ensures that the revised enthalpy for the limiting node will be slightly above the correlation lower bound enthalpy limit rather than equal to the correlation lower bound enthalpy limit.

2. It appears that in EMF-2209(P)(A) Revision 1 the approved SPCB range of applicability for inlet mass velocity is much higher than that stated in enthalpy bounds for SPCB. Provide the approach on how to handle the case when the mass velocity is lower than the approved value.

Table 1.1 of EMF-2209(P)(A) Revision 1 presents the limits on mass velocity. If the mass velocity is lower than this limit, then the actions described on pages 2-34 and 2-35 are imposed. Table 1.2 presents the limits on enthalpy as a function of mass velocity. The first entry in Table 1.2 is used in an interpolation process when the inlet mass velocity is greater than or equal to the low mass velocity limit of Table 1.1 but less than the value of the mass velocity for the second entry of Table 1.2.

Very truly yours,

James F. Mallay, Director
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cc: J. Wermeil
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Project 693