HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 819 6192
F 910 362 6192
rick.kingston@ge.com

MFN 08-877

Docket No. 52-010

November 11, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 197 – Related to ESBWR Design Certification Application – RAI Number 21.6-106 Supplement 1**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Number 21.6-106 Supplement 1 is addressed in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 08-493, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, Request For Additional Information Letter No. 197 Related to ESBWR Design Certification Application, dated May 22, 2008.

Enclosure:

1. MFN 08-877 – Response to Portion of NRC Request for Additional Information Letter No. 197 - Related to ESBWR Design Certification Application – RAI Number 21.6-106 S01

cc: AE Cubbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0092-2739

Enclosure 1

MFN 08-877

Response to Portion of NRC Request for

Additional Information Letter No. 197

Related to ESBWR Design Certification Application

RAI Number 21.6-106 S01

NRC RAI 21.6-106 S01

Effect of reduced steam flow rate on the coefficient "K"

In the response to RAI 21.6-106, GEH argued that the 0.9 m submergence (L), accepted by the NRC staff for the initial design, is still valid and bounding despite the increase in the thermal power and number of PCCS vents in the suppression pool (SP). In this regard, GEH used a correlation for steam condensation around the PCCS vent within the SP. It is implicit in the GEH analysis that the coefficient "K" appearing in the correlation is not affected by the 25 percent reduction in the vent discharge steam flow rate. The supplemental information provided in response to RAI 314.1 (pre-application review) does not shed any light on the dependence of "K" on the steam flow rate. Please explain the effect of the reduced steam flow rate on the coefficient "K". Could the reduced mixing and turbulence at the vent discharge lead to a lower K value, say by more than 25%? If yes, would that require a longer L than 0.9 m as a bounding value (without spargers) for the same vent diameter?

GEH Response

The equation presented in the response to RAI 21.6-106 is not a correlation to predict the discharge steam flow rate with respect to the condensation length. It is a simple dimensional analysis to show the dependence of the required condensation length for a given steam mass flux and pipe diameter. Therefore, there is no information regarding the dependence of "K" on the steam flow rate in the supplemental information provided in response to RAI 314.1 (pre-application review).

As mentioned in the RAI 21.6-106 response, the total Passive Containment Cooling System (PCCS) vent steam mass flow rate increases by 12.5% due to the power level change, while the available vent flow area increases by 50% due to the number of vents change. Therefore, the increase in PCCS vent area available reduces the steam mass flow rate (and steam mass flux) through each PCCS vent by 25%. It should be noted that lower steam mass flux requires shorter condensation length.

It was mentioned in the supplemental response to RAI 314.1 that the PCCS vent submergence in the ESBWR is enough to condense the steam in the suppression pool. This is confirmed in the relevant data for condensation efficiency of steam discharged through the PCC vent in the LINX test (Reference 1). The test data showed that the steam was fully condensed in all tests that include various steam flow rates. Full condensation is not a problem for the flow rate range applied in the tests.

With the reduced steam mass flow rate results from the power level and vent number changes, it is concluded that the 0.9 m condensation length remains adequate to condense the steam for the current design as concluded in the RAI 21.6-106 response.

Reference

1. C. De Walsche, F. de Cachard, "Experimental Investigation of Condensation and Mixing during Venting of Steam/Non-condensable Gas Mixture into a Pressure Suppression Pool", ICONE-8565, Proceedings of ICONE 8, 8th International Conference on Nuclear Engineering, April 2-6, 2000, Baltimore, MD, USA.

DCD Impact

No DCD changes will be made in response to this RAI.