HITACHI

GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

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

T 910 675 5057
F 910 362 5057

MFN 08-305

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-29 S02**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification in Reference 2.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 06-113, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 18 Related to ESBWR Design Certification Application*, April 24, 2006
2. MFN 08-138, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application*, February 15, 2008

Enclosure:

1. MFN 08-305 - Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-29 S02

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	GB Stramback	GEH/San Jose (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	eDRF	0000-0082-1091

Enclosure 1

MFN 08-305

Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application

Containment Systems

RAI Number 6.2-29 S02

NRC RAI 6.2-29 S02:

In RAI 6.2-29 Supplement 1, the staff requested GEH to provide code validation information on TRACG evaluation of subcompartment pressurization and comparison to approved methods. In response, in a letter, dated October 24, 2007, GEH stated the following:

Evaluation of the ability of TRACG to calculate subcompartment pressurization is provided in Reference 1. Reference 1 compares TRACG calculations to simulated loss-of-coolant accident (LOCA) conditions in PANTHERS (Reference 1, Section 4.2), PANDA (Reference 1, Section 4.3), GIRAFFE (Reference 1, Sections 5.2 through 5.3), Mark III Containment Response (Reference 1, Section 5.5), 4T/Mark II Containment Response (Reference 1, Section 5.6) and other test facilities. Reference 2 establishes applicability of pressurization analyses to ESBWR.

None of these calculations addresses the phenomena occurring during the time scale that is important for containment subcompartment pressurization. In response to RAI 6.2-24, in a letter, dated June 5, 2006, GEH provided results of containment subcompartment analysis showing the pressure peaked before 5 ms.

In its response, dated October 24, 2007, GEH stated that "TRACG has been approved for ESBWR LOCA containment analysis (Reference 2), making it an approved method for containment calculations. "Comparison to approved methods" is not necessary."

The staff approved Reference 2 for containment LOCA analysis but not specifically for containment subcompartment pressurization analysis.

GEH should either provide comparisons of applicable test data or approved code calculation results to TRACG analysis results to confirm the validity of using TRACG subcompartment pressurization evaluation.

References:

1. *"TRACG Qualification for SBWR," GE Nuclear Energy Report NEDC-32725P, Rev. 1, August 2002.*
2. *"TRACG Application for ESBWR," GE Nuclear Energy Report NEDC-33083P-A, March 2005.*

GEH Response:

The TRACG capabilities of subcompartment pressurization analysis were demonstrated in the subcompartment pressurization due to high energy line break (HELB) analysis for feedwater temperature operating domain project (Reference 6.2-29S02-1). A TRACG model (Reference 6.2-29S02-2) was developed to calculate the pressure response in the Reactor Building (RB) outside the containment due to Reactor Water Cleanup (RWCU) system pipe break accidents. This TRACG model was validated by comparing the pressure response inside the compartment with the results from CONTAIN (Reference 6.2-29S02-3) model used in the Pressurization of Compartments Due to HELB (Reference 6.2-29S02-4).

The development of TRACG model was based on the CONTAIN model from Reference 6.2-29S02-4. Both inputs address the same physical configuration. This physical configuration is modeled in TRACG as a subcompartment pressurization model through 4 PIPEs, 2 TEEs, and 2 BREKs components, while the CONTAIN model utilizes 24 CELLs with 31 FLOWPATHs. For benchmark comparison of the subcompartment pressurization results the TRACG FILL and Control Block components were added to the TRACG model to model the pipe break and break mass flow rate and enthalpy. Table 6.2-29S02-1 shows the mass and energy releases used as input in the TRACG and CONTAIN subcompartment pressurization analyses.

Table 6.2-29S02-1. Mass and Energy Release Rate Used in the Pressurization Analyses

TIME (sec)	MASS FLOW (kg/sec)	ENTHALPY (kJ/kg)	ENERGY (W)
0	782.6	1224.41	9.58E+08
5.14	782.6	1224.41	9.58E+08
5.15	617.2	1224.41	7.55E+08
7.83	617.2	1224.41	7.55E+08
7.84	337.7	976.69	3.29E+08
42.7	337.7	976.69	3.29E+08
42.8	337.7	888.76	3.0E+08
53.61	337.7	888.76	3.0E+08
53.62	225.9	1224.41	2.77E+08
64.05	225.9	1224.41	2.77E+08
76	0	1224.41	0.0

Results for both pressure profiles, where the maximum pressure occurs, are presented in Figure 6.2-29S02-1. Even though it is recognized that the TRACG model pressure response is initially delayed for about two seconds and stays at higher pressures for slightly longer time during the initial part of the event, both show similar high pressure peaks and trends.

References:

6.2-29S02-1 GE-Hitachi Nuclear Energy, "ESBWR Feedwater Temperature Operating Domain Transient and Accident Analysis," NEDO-33338, October 2007.

6.2-29S02-2 GE-Hitachi Nuclear Energy DRF Report, neDRF Section 0000-0074-9602, "Compartment Pressurization due to RWCU Pipe Break," October 2007.

6.2-29S02-3 CONTAIN 2.O Code: A Computer Code for Nuclear Reactor Containment Analysis, NUREG/CR-6533, SAND97-1735.

6.2-29S02-4 EA Report 092-134-F-A-00013, "Pressurization of Compartments due to HELB Results," Issue 1, July 2005.

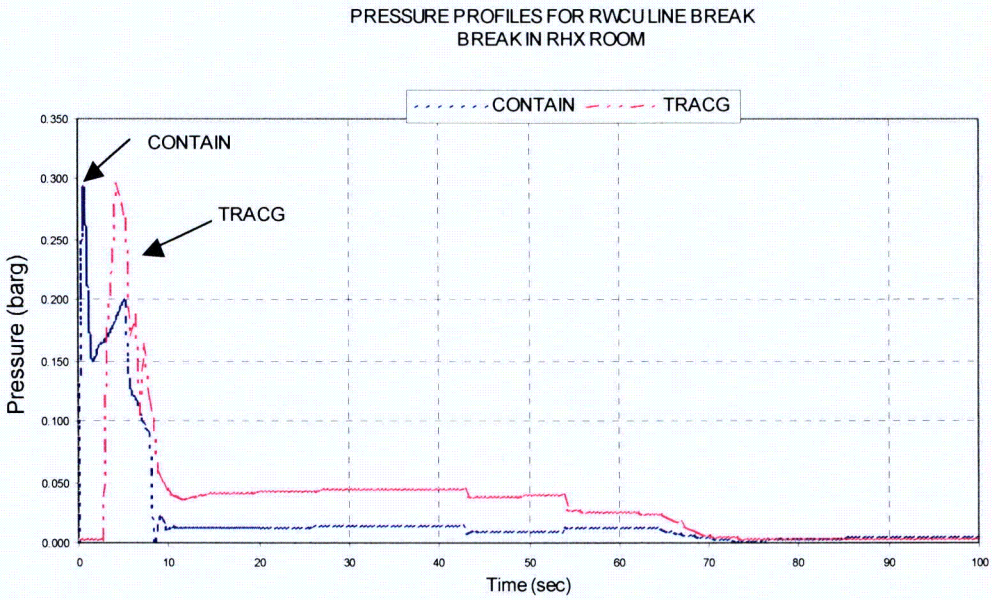

Figure 6.2-29S02-1. Pressure Profile Comparison

DCD Impact:

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