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MFN 08-167 Supplement 1

Docket No. 52-010

April 24, 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. 160 Related to ESBWR Design
Certification Application – Nuclear Boiler System -
RAI Number 5.2-66 S01**

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 NRC request for clarification in Reference 2.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

DO68
NRC

References:

1. MFN 08-029, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 124 Related to ESBWR Design Certification Application*, January 14, 2008
2. MFN 08-221, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 160 Related to ESBWR Design Certification Application*, March 6, 2008

Enclosure:

1. MFN 08-167 Supplement 1- Response to Portion of NRC Request for Additional Information Letter No. 160 Related to ESBWR Design Certification Application – Nuclear Boiler System - RAI Number 5.2-66 S01

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 0000-0083-6371

Enclosure 1

MFN 08-167 Supplement 1

**Response to Portion of NRC Request for
Additional Information Letter No. 160
Related to ESBWR Design Certification Application**

Nuclear Boiler System

RAI Number 5.2-66 S01

For historical purposes, the original text of RAI 5.2-66 with the GEH response is included. These do not include the attachments or DCD mark-up previously transmitted.

NRC RAI 5.2-66:

It seems that the SRV capacities given in Table 5.2.2 and Table 6.3-1 are inconsistent, please verify the correct value.

GEH Response:

The tables noted in this RAI are inconsistent in DCD Tier 2, Revision 4. This inconsistency will be rectified. Table 5.2-2 contains the design minimum discharge capacity values for the safety relief valves (SRVs) and safety valves (SVs), and does not need to be changed. Table 6.3-1 will be revised to include a value range for the SRV collective capacity from 1,380 kg/s to 1,440 kg/s. A note will be added to the table to explain the basis for using these values in the analysis.

DCD Impact:

DCD Tier 2, Table 6.3-1 will be revised as shown in the attached markup.

NRC RAI 5.2-66 S01:

In response to RAI 5.2-66 dated February 26, 2008, GEH provided a revised Table 6.3-1 which showed that the Total Mini. Automatic Depressurization System (ADS) Flow Capacity at Vessel Pressure (1250 psig) is in a range between 1380 to 1440 kg/s. DCD Revision 4, Chapter 5, Table 5.2.2 provided a value of 138 kg/s for each Mini. ADS Flow capacity at Vessel Pressure. Explain and justify the discrepancy for the values provided in DCD Revision 4 and RAI 5.2-66 response. Provide limiting TRACG ECCS/LOCA analysis using ADS flow capacity values at 1380 and 1440 kg/s.

GEH Response:

The total Automatic Depressurization System (ADS) flow capacity of 1440 kg/sec was used in the Emergency Core Cooling Systems (ECCS) - loss-of-coolant accident (LOCA) performance analyses because the scoping analyses at 1440, 1000 and 800 kg/sec indicated a lower minimum water level as safety relief valve (SRV) flow is increased. The bounding case of Gravity-Driven Cooling System (GDCCS) Line Break with Failure of One GDCCS Injection Valve exhibits the lowest minimum water levels among cases summarized in DCD Tier 2, Table 6.3-5. This case has been re-analyzed with a series of ADS flow capacities. The minimum water levels are summarized in Table 5.2-66S01-1.

The results show variations of minimum water levels as the ADS capacity is varied. However, the ranges of variations of chimney and downcomer levels are both less than 0.1 m for ADS capacity between 1440 and 1380 kg/sec. Since the variation of minimum collapsed chimney levels is within the uncertainty of TRACG calculation and the minimum chimneys water levels are well above the Top of Active Fuel (TAF), it is unnecessary to re-analyze other cases listed in Table 6.3-5. However, DCD Tier 2, Table 6.3-5 will be revised to reflect a minimum ADS capacity of 1380 kg/sec (1.095×10^7 lbm/hr).

Table 5.2-66S01-1 Summary of Minimum RPV Water Levels
GDCS Line Break with Failure of One GDCS Injection Valve
(Bounding Case)

ADS SRV Capacity (kg/s)	Minimum Chimney Static Head Level Above Vessel Zero, m (ft)	Minimum Downcomer Collapsed Water Level Above Vessel Zero, m (ft)
1440	8.5024 (27.895)	5.8146 (19.077)
1400	8.4861 (27.846)	5.8942 (19.338)
1380	8.4267 (27.647)	5.8589 (19.222)
1300	8.4738 (27.801)	5.9403 (19.489)
1000	8.5663 (28.105)	6.0285 (19.779)
800	8.5670 (28.107)	6.0028 (19.694)

DCD Impact:

DCD Tier 2, Table 6.3-1 will be revised as noted in the attached markup.

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Design Control Document/Tier 2

Table 6.3-1

Significant Input Variables to the ECCS-LOCA Performance Analysis

B.4 Standby Liquid Control System		
Variable	Units	Value
Initiating Signal	—	DPV actuation (See B.5)
Liquid Volume per Tank	m ³ [ft ³]	7.8 [275.4]
B.5 Automatic Depressurization Subsystem		
Variable	Units	Value
Initiating Signal	—	ECCS-LOCA confirmed initiating signal (See B.1)
Valve Actuation Sequence:		
5 ADS	sec	0
5 ADS	sec	10
3 DPVs	sec	50
2 DPVs	sec	100
2 DPVs	sec	150
1 DPVs	sec	200
Total Number of Safety Relief Valves With ADS Function	—	10
Total Min. ADS Flow Capacity at Vessel Pressure ¹	kg/hr MPa (gauge) [lbm/hr] [psig]	5.18 x 10⁴ 1380 8.618 [1.44 x 10⁴] [1250]
Total Number of Depressurization Valves	—	8
Total min. DPV flow capacity at vessel pressure	kg/hr MPa (gauge) [lbm/hr] [psig]	6.89 x 10 ⁶ 7.481 [15.2 x 10 ⁶] [1085]
Total max. DPV flow capacity at vessel pressure	kg/hr MPa (gauge) [lbm/hr] [psig]	8.47 x 10 ⁶ 7.481 [18.7 x 10 ⁶] [1085]

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Design Control Document/Tier 2

Table 6.3-1

Significant Input Variables to the ECCS-LOCA Performance Analysis

C. Fuel Parameters *		
Variable	Units	Value
Fuel type	—	See Chapter 4
Peak Linear Heat Generation Rate (Bounding)	kW/m [kW/ft]	44 [13.4]
Initial Minimum Critical Power Ratio (Bounding)	—	1.10

1. ECCS/LOCA performance was analyzed with ADS capacity of 1440 kg/s (1.143×10^7 lbm/hr). Sensitivity study has confirmed that the variations of chimney and downcomer minimum levels are both under 0.1 m for ADS capacity between 1440 and 1380 kg/sec. The minimum chimneys water levels are well above the Top of Active Fuel (TAF).