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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. 109 Related to ESBWR Design Certification Application, RAI Number 19.1-144 S01**

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 NRC letter dated October 12, 2007 (Reference 1). The previous RAI and response was transmitted in References 2 and 3. The GEH response to RAI Number 19.1-144 S01 is in Enclosure 1.

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

Sincerely,

James C. Kinsey

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Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN-07-555. Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No.109 Related To ESBWR Design Certification Application.* October 12, 2007.

2. MFN-07-104. Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request For Additional Information Letter No. 91 Related To ESBWR Design Certification Application.* January 31, 2007.

3. MFN 07-423. Response to Portion of NRC Request for Additional Information Letter No. 91 Related to ESBWR Design Certification Application ESBWR Probabilistic Risk Assessment RAI Numbers 19.1-117 through 19.1-133, 19.1-140, 19.1-142,19.1-144, 19.1-148,19.2-69 through 19.2-74 and 19.2-76 through 79. August 13, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application, ESBWR Probabilistic Risk Assessment, RAI Number 19.1-144 S01

cc: AE Cubbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRFSection 0000-0069-4264

Enclosure 1

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Response to Portion of NRC Request for

Additional Information Letter No. 109

Related to ESBWR Design Certification Application

ESBWR Probabilistic Risk Assessment

RAI Number 19.1-144 S01

For historical purposes, the original text of RAI 19.1-144 and its supplements and the GEH responses are included. The attachments (if any) are not included from the original responses to avoid confusion.

NRC RAI 19.1-144

Please provide calculations to demonstrate that short term and long term core cooling can be provided by isolation condenser system operation following an extended loss of the RWCU/SDC function from a cold shutdown condition. This information will assist the staff to address thermal-hydraulic uncertainty in the ESBWR passive design regarding shutdown success criteria.

GEH Response

The Technical Specifications for the ICS system require at least two of the four loops are operational during Mode 5 (Cold Shutdown). Additionally, the ICS instrumentation & actuation logic are required to be operable in Mode 5 (DCD LCO 3.3.5.3 and 3.3.5.4). ICS is only credited for Mode 5 during shutdown. It will not function during Mode 6 with the reactor vessel head removed.

Loss of RWCU/SDC during shutdown would cause RPV pressure and temperature to both increase to near or above Mode 1 conditions. It is assumed that following loss of RWCU/SDC, the ICS would respond just at it would to a transient during power operations. The primary difference is that only two ICS loops are available and both are needed to meet the success criteria.

Two ICS heat exchangers can remove 1.5% of decay heat. This level of decay heat occurs between 2000 and 4000 seconds following shutdown. Mode 5 (Cold Shutdown) will not occur until well after this time. Two functioning Isolation Condensers can meet the long term and short-term core cooling needs during Cold Shutdown.

DCD/NEDO-33201 Impact

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

NEDO-33201 Rev 2 Chapter 16 will be revised as described above.

NRC RAI 19.1-144 S01

The NRC staff has reviewed GEH's response to RAI 19.1-144. This RAI requested GEH to provide calculations that demonstrate short term and long term core cooling using the ICS following an extended loss of the RWCU/SDC function from a cold shutdown condition. GEH did not provide the requested calculation. Instead, GEH responded that following loss of RWCU/SDC that ICS would respond just as it would to a transient during power operations. The staff is aware that the heat removal capability of the ICS is credited in the simulations of an ESBWR LOCA event in which there are non-condensible gases present. The NRC staff noted that comparison of the TRACG results to the PANTHERS data show that TRACG does not adequately model the timing of the noncondensible gas transport in the IC. The NRC staff is concerned about the impact of non-condensible gases given ICS operation from a cold shutdown condition. Also, the NRC staff seeks information on the anticipated RCS pressures and temperatures at which ICS operation can provide sustained core cooling. Therefore, as requested in RAI 19.1-144, please provide a TRACG run that demonstrates short term and long term core cooling using the ICS following an extended loss of the RWCU/SDC function from a cold shutdown condition.

GEH Response

The performance of the ICS system has been evaluated for the initial condition of the reactor in Mode 1. The Mode 1 initial condition is bounding for operation of the ICS system as compared to starting from Mode 5 because the level of decay heat is lower for the Mode 5 condition (e.g. ~ 8 hours after as opposed to very soon after reactor scram). The primary difference between these two initial conditions is the time delay involved with heating and pressurizing the reactor vessel when the initial condition is Mode 5. If non-condensable gases accumulate in the IC such that the heat transfer drops below the decay heat of the reactor, the reactor pressure would increase to the setpoint for opening of the ICS vent line. The ICS venting process is the same irrespective of the initial condition operating mode. No specific calculations have been performed for the ICS system with an initial condition of the reactor in Mode 5 since it is bounded by operation from Mode 1. DCD Table 15.1-5 "NSOA System Event Matrix" identifies the NSOA events in which the ICS operates with Mode 1 initial conditions.

DCD Impact

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