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Subject: **Response to NRC RAI Letter No. 322 Related to ESBWR Design Certification Application, RAI Number 3.9-200 S02**

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) letter number 322 sent by NRC letter dated March 24, 2009 (Reference 1). RAI Number 3.9-200 S02 is addressed in Enclosure 1. Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 09-211 Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 322 Related to ESBWR Design Certification Application* dated March 24, 2009

Enclosure:

1. Response to NRC RAI Letter No. 322 Related to ESBWR Design Certification Application - DCD Tier 2 Section 3.9 – Mechanical Systems and Components; RAI Number 3.9-200 S02

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0095-1458 (RAI 3.9-200 S02)

Enclosure 1

MFN 09-220

Response to NRC Request for

Additional Information Letter No. 322

Related to ESBWR Design Certification Application

RAI Numbers 3.9-200 S02

NRC RAI 3.9-200 S02

In its response to RAI 3.9-200 S01 provided in MFN 08-641 Supplement 1 GEH specified a planned revision to the ESBWR Design Control Document (DCD) to include design attributes related to the Gravity-Driven Cooling System (GDCS) and its check valves. The NRC staff considers the planned revision to the DCD to be sufficient to resolve this RAI with one exception. The applicant is asked to include in the DCD, consideration of potential water hammer effects in the design process for the GDCS and its check valves in the ESBWR plant.

GEH Response

The DCD will be revised as requested to state that potential water hammer effects will be considered in the design process for the GDCS and its check valves.

DCD Impact

DCD Tier 2, Section 6.3.2.7.2 will be revised as noted in the attached markup.

GDCS Check Valve

The GDCS check valves are ~~designed and installed such that the valves are fully open with zero differential pressure across the valve and fully closed with a low reverse differential pressure to prevent back flow. The check valve is a~~ long duration submersible, piston check valves ~~(of suitable pattern such as Y-pattern or axial flow) installed in a horizontal or vertical piping run~~. The valves meet~~s~~ the requirements for minimum fully open flow coefficient in the forward flow direction and maximum fully open flow coefficient in the reverse flow direction. The reverse flow coefficient addresses the case in which a check valve sticks in the fully open position following a LOCA. Type testing is performed to verify the valve meets the reverse flow coefficient requirement. The results of the testing and a comparison of the measured flow coefficient to the maximum value is documented in a report. The check valve is classified as Quality Group A, Seismic Category I, and ASME Section III Class 1.

Remote check valve position indication is provided in the main control room by position-indication instrumentation.

The check valves will either be installed in a horizontal piping run and held normally open by a spring or installed in a vertical piping run and held normally open by gravity. In either case, the net force keeping the valve open will be minimized to a value sufficient to ensure the valve is open with no differential pressure. One possible configuration is a nozzle check valve in a vertical pipe, oriented such that gravity opens the valve. To minimize the reverse flow/differential pressure required to close the valve, valve opening would be resisted by a light spring, sized such that the valve is fully open with no differential pressure (disk weight is equal to the spring force at fully open).

When the GDCS squib valves actuate, reactor pressure is significantly below the normal operating pressure but above the GDCS injection pressure. The GDCS check valves will remain closed until the reactor pressure is just above the GDCS injection pressure. As reactor pressure drops further, GDCS injection will begin at a low flow rate and gradually increase, such that chatter is not expected to occur.

The GDCS check valves are located upstream of the GDCS injection squib valves, which are located at the bottom of a U-shaped pipe loop, and open block valves downstream of the squib valves. During normal operation, the injection line squib valves are closed and pipe legs on both sides of the squib valves are filled with water. The water solid pipe legs from the squib valves to the reactor pressure vessel inlet nozzles prevent non-condensable gases from entering into the injection lines. The GDCS injection lines from the squib valves to the GDCS pools are self-venting back to the pools, which are at the highest elevation of the system. Test lines in the system stay filled with liquid up to the test line isolation valves.

The design process for the GDCS check valves will evaluate the loads on the valve disk during normal and design basis conditions to ensure the valves remain open under normal operating conditions (zero differential pressure) and will close under low reverse differential pressure/flow conditions. The design process will also include an evaluation of the closure loads, including potential water hammer effects, on the valve, piping and other applicable components under design basis conditions and following an inadvertent actuation of the GDCS squib valves, to ensure damage from deceleration of GDCS fluid will not occur. Valve qualification will verify