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Subject: Response to Portion of NRC Request for Additional Information Letter No. 68 - Passive Containment Cooling System - RAI Number 6.3-42 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 an NRC request for clarification in Reference 2.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 06-379, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 68 Related to ESBWR Design Certification Application*, October 10, 2006
2. E-Mail from Shawn Williams, U.S. Nuclear Regulatory Commission, to George Wadkins, GE Hitachi Nuclear Energy, dated May 22, 2007 (ADAMS Accession Number ML071430342)

Enclosure:

1. MFN 07-069 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 68 - Related to ESBWR Design Certification Application - Passive Containment Cooling System - RAI Number 6.3-42 S01

cc:

AE Cubbage	USNRC (with enclosures)
GB Stramback	GEH/San Jose (with enclosures)
RE Brown	GEH/Wilmington (with enclosures)
eDRF	0000-0073-5385

Enclosure 1

MFN 07-069 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 68

Related to ESBWR Design Certification Application

Passive Containment Cooling System

RAI Number 6.3-42 S01

NRC RAI 6.3-42:

During a LOCA, if the passive containment cooling system (PCCS) heat exchanger inlets are within the zone of influence (ZOI), debris ingress is expected. Please provide the maximum steam velocity at the inlet of the PCCS suction line calculated by the TRACG code for all design basis LOCA cases. Discuss the impact of the debris on the heat transfer performance of the heat exchanger.

GEH Response:

PCCS heat exchanger inlet pipe is provided with a debris filter with holes no greater than 25 mm (1 inch) to prevent entrance of missiles into the pipe and protection from fluid jets during a LOCA condition. These holes are smaller than the size of the heat exchanger tubes (50 mm (2 inch) nominal diameter) which have the smallest diameter of the piping components in the PCCS. Therefore, if there is any debris that enters the PCC system it cannot become lodged in the vertical heat exchanger tubes where the heat transfer function is performed. Therefore, the debris will not impact heat exchanger performance. The maximum inlet velocity during a LOCA condition is estimated to be 106 m/s.

NRC RAI 6.3-42 S01:

The information provided in this response is necessary to support the basis for a reasonable assurance finding. Thus, please update DCD Tier 2 to include information provided in response to RAI 6.3-42.

GEH Response:

DCD Tier 2, Subsection 6.2.2.2, will be revised to include the requested information.

DCD Impact:

DCD Tier 2, Subsection 6.2.2.2, will be revised as shown in the attached markup.

6.2.2.2.2 Detailed System Description

The PCCS maintains the containment within its pressure limits for DBAs. The system is designed as a passive system with no components that must actively function, and it is also designed for conditions that equal or exceed the upper limits of containment reference severe accident capability.

The PCCS consists of six, low-pressure, independent sets of two steam condenser modules (Passive Containment Cooling Condensers), as shown Figure 6.2-16. Each PCCS condenser is designed for 11 MWt capacity and is made of two identical modules. Together with the pressure suppression containment (Subsection 6.2.1.1), the PCCS condensers limit containment pressure to less than its design pressure. The Dryer/Separator pool and Reactor Well are designed to have sufficient water volume to provide makeup water to the IC/PCC pools for at least the initial 72 hours after a LOCA without makeup, and beyond 72 hours with pool makeup.

The PCCS condensers are located in a large pool (IC/PCC pool) positioned above the ESBWR drywell.

Each PCCS condenser is configured (see Figure 6.2-16) as follows.

A central steam supply pipe is provided which is open to the drywell airspace at its lower end. The open end of this pipe is provided with a debris filter with holes no greater than 25 mm (1 inch). The maximum inlet velocity during a LOCA is estimated to be no greater than 106 m/s, ~~and it~~The steam supply feeds two horizontal headers through two branch pipes at its upper end. Steam is condensed inside vertical tubes and the condensate is collected in two lower headers.

The vent and drain lines from each lower header are routed through the DW as shown on the diagram.

The condensate drains into an annular duct around the vent pipe and then flows in a line that connects to a large common drain line, which also receives flow from the other header.

The PCCS condensers receive a steam-gas mixture supply directly from the DW. The PCCS condensers are initially driven by the pressure difference created between the DW and the suppression pool during a LOCA and then by gravity drainage of steam condensed in the tubes, so they require no sensing, control, logic or power-actuated devices to function. The PCCS condensers are an integral part of the safety-related containment and do not have isolation valves.

Spectacle flanges are included in the drain line and in the vent line to conduct post-maintenance leakage tests separately from Type A containment leakage tests.

Located on the drain line and submerged in the GDCS pool, just upstream of the discharge point, is a loop seal: it prevents back-flow of steam and gas mixture from the DW to the vent line, which would otherwise short circuit the flow through the PCCS condenser to the vent line. It also provides long-term operational assurance that the PCCS condenser is fed via the steam supply line.