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MFN 08-924

Docket No. 52-010

December 1, 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. 257 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Numbers 9.4-43 and 9.4-44**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission Request for Additional Information (RAI) sent by NRC Letter 257, dated September 14, 2008 (Reference 1). The GEH response to RAIs 9.3-43 and 9.3-44 are addressed in Enclosure 1.

Should you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 08-709, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 257 Related To ESBWR Design Certification Application*, dated September 14, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 236 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-43 and 9.3-44.

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH (with enclosures)
	RE Brown	GEH (with enclosures)
	eDRF	0000-0092-7460

Enclosure 1

MFN 08-924

Response to Portion of NRC Request for

Additional Information Letter No. 257

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Numbers 9.3-43 and 9.3-44

NRC RAI 9.3-43

10 CFR 20.1101 (b) states, in part. that the licensee shall use procedures and engineering controls based on sound radiation protection principles to achieve occupational doses that are as low as is reasonably achievable (ALARA). In DCD Section 9.3.2, the applicant states that ALARA is considered in station layout and design and contains a description of several design features to prevent plateout and minimize the buildup of crud in sampling piping lines. However, Section 9.3.2 does not describe how the design of the Process Sampling System (PSS) sample stations incorporate shielding and other design features described in RG 8.8 to minimize personnel doses and to minimize contamination, in accordance with 10 CFR 20.1406. It is also not clear whether the applicant has estimated the doses associated with taking samples from the PSS sampling stations that are described in Section 9.3.2 and whether these doses have been included in the dose assessment tables in Section 12.4 of the DCD.

1) Verify that the PSS sampling stations have been designed to ensure that doses to personnel who must operate, service, or inspect these sampling stations will be ALARA and describe some of the ALARA design features (e.g., radiation shielding and other ALARA features described in RG 8.8) incorporated in these sample stations to minimize personnel doses.

2) Describe some of the design features of the PSS sampling stations that will minimize contamination of the facility during the taking of samples, in accordance with the requirements of 10 CFR 20.1406.

3) Provide an estimate of the annual personnel collective dose associated with the routine use of the PSS sample stations. Verify that the doses associated with taking samples from the PSS sampling stations described in Section 9.3.2 have been included in the dose assessment tables in Section 12.4 of the DCD.

GEH Response

1. PSS sampling stations have been designed to ensure doses to personnel are ALARA. Subsection 12.1.1.3.1 provides the commitments to compliance with Regulatory Guide 8.8 by stating:

    - "The policy considerations regarding plant operations contained in Regulatory Guide 8.8 will be demonstrated by COL applicant compliance with Regulatory Guide 8.8 (COL 12.1-4-A)."
    - "The ESBWR design meets the guidelines of Regulatory Guide 8.8, Sections C.2 and C.4, which address facility, equipment and instrumentation design

features. Features of the plant that are examples of compliance with Regulatory Guide 8.8 are delineated in Section 12.3."

ALARA design features to minimize personnel doses due to sample stations include;

- Sample stations are located in low radiation areas to reduce the exposure to operating personnel.
- Detailed design will ensure that cleaning and flushing is provided at the sample stations and sample lines are sized to maintain turbulent flow and minimize purge time (and hence dose). Sample piping routing is as short and straight as possible and large radius bends are used to avoid dead legs and traps upstream of the sample stations to minimize crud traps and hot spots. Stainless steel components are used to minimize corrosion and activated crud buildup.

Subsection 12.3.2, Shielding, discusses the ESBWR ALARA design objectives and design guides for determining radiation shield wall thicknesses as well as identifying the computer codes used in the evaluations. Detailed design of the sample stations ensure shielding and piping layout are considered such that sampling controls are conveniently available while sample piping remains shielded as much as practical.

2 Design features of the PSS sampling stations that ensure plant contamination is minimized include the use of polished stainless steel work areas and fume hoods. Grab spouts are located inside the hooded sink to reduce the possibility of spills. Fume hoods draw radioactive gases away from the sample chemist. Subsection 12.3.1.2.6, Contamination Control states, in part, that;

- "Appropriately sloped floor drains are provided in shielded cubicles and other areas where the potential for a spill exists to limit the extent of contamination. Curbs are also provided to limit contamination and simplify washdown operations."
- "Consideration is given in the design of the plant for reducing the effort required for decontamination. Epoxy-type wall and floor coverings have been selected which provide smooth surfaces to ease decontamination. Expanded metal-type floor gratings are minimized in favor of smooth surfaces in areas where radioactive spills could occur. Equipment and floor drain sumps are stainless steel lined to reduce crud buildup and to provide surfaces easily decontaminated."
- "Concrete surfaces, including floor surfaces, which have the potential of being flooded or sprayed with radioactive liquid, are protected with a non-porous coating. Epoxy-type wall and floor coverings provide smooth surfaces for ease of decontamination."

3. Table 12.4-2, Occupational Dose Estimates During Operation and Surveillances does provide estimates of the annual personnel doses associated with routine use of

the PSS sample stations as discussed in subsection 9.3.2. For example, the annual collective dose for operator, chemistry, HP and Security surveillances in the Reactor Building is 1.75 man-rem.

DCD Impact

No DCD changes will be made as a result of this RAI.

NRC RAI 9.3-44

To meet the requirements of GDC 60 and 63, SRP 9.3.2 recommends that samples are taken from the spend fuel pool. DCD Tier 2 Section 9.3.2 states that samples are taken from the Fuel and Auxiliary Pools Cooling System (FAPCS) at the reactor building sample station. DCD Tier 2 Section 9.3.2 also list several pools in the reactor building monitored by FACPS but not the spent fuel pool. DCD Tier 2 Table 9.3-1 identifies the types of process measurements are taken from FAPCS. However, as listed in DCD Tier 2 Table 9.1-1, the spent fuel pool is in the fuel building, which no sample station according to DCD Tier 2 Section 9.3.2. Identify what process sampling is being proposed for the spent fuel pool and other fuel building pools and provide the typical process measurements that will be conducted (continuous and grab). Identify where the process samples will be processed.

GEH Response

The Spent Fuel Pool (SFP) can be sampled either before or after the FAPCS filter demineralizers. Samples are obtained from the Reactor Building sample station and analyzed for the species identified in Table 9.3-1.

One FAPCS Cooling and Cleanup train is continuously operated to cool and clean the water in the Spent Fuel Pool during normal plant operation and during a refueling outage. During this mode of operation, water is drawn from the skimmer surge tanks, pumped through the heat exchanger and water treatment unit to be cooled and cleaned and then returned to the Spent Fuel Pool (SFP). As the SFP level rises, water spills into the weir and flows back to the skimmer surge tanks. The process sampling lines tap off the process downstream of the heat exchangers and again downstream of the filter and demineralizer (F/D) subsystem. Flow returns to FAPCS at the suction of the FAPCS pump. Therefore, the spent fuel pool can be sampled both pre and post F/D. As noted by the NRC, the sample station for FAPCS is in the Reactor Building. This central location allows for sampling from pools in the Containment, Reactor Building and the Fuel Building thus minimizing locations of possible spillage and contamination. Table 9.1-1 shows the various pools served by both subsystems of FAPCS. Table 11.5-5 identifies the Spent Fuel Pool as having provisions for being sampled and Table 9.3-1 identifies the typical process measurements taken from FAPCS.

DCD Impact:

No change to the DCD will be made in response to this RAI.