



GE Energy

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MFN 07-211

Docket No. 52-010

April 19, 2007

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. 77 Related to ESBWR Design Certification Application –
Technical Specifications – RAI Numbers 16.2-95 and 16.2-96**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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

Sincerely,

James C. Kinsey
Project Manager, ESBWR Licensing

Reference:

1. MFN 06-391, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 77 Related to ESBWR Design Certification Application*, October 11, 2006

Enclosure:

1. MFN 07-211 – Response to Portion of NRC Request for Additional Information Letter No. 77 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 16.2-95 and 16.2-96

cc: AE Cabbage USNRC (with enclosures)
DH Hinds GE (with enclosures)
RE Brown GE (w/o enclosures)
eDRF 0000-0062-8193

Enclosure 1

MFN 07-211

**Response to Portion of NRC Request for
Additional Information Letter No. 77
Related to ESBWR Design Certification Application
- Technical Specifications -
RAI Numbers 16.2-95 and 16.2-96**

NRC RAI 16.2-95

TS 3.5.2, GDCS - Operating, Surveillance Requirements: The GDCS SR do not include a system flow performance surveillance test such as was included in the AP1000 TS for each Core Makeup Tank (SR 3.5.2.7) and In-Containment Refueling Water Storage Tank (SR 3.5.6.9) with a frequency of once in 10 years. Include a similar system level operability test program for ESBWR or explain why such a SR is not proposed.

GE Response

Flow testing of the Gravity-Driven Cooling System (GDCS) injection lines and equalizing lines is conducted as part of preoperational testing as stated in Tier 2, DCD 14.2.8.1.65, Gravity-Driven Cooling System Preoperational Test, and DCD 3.1.4.8, "Criterion 37-Testing of Emergency Core Cooling System." The required tests and associated acceptance criteria for these tests are provided in Tier 1, DCD Table 2.4.2-1, "ITAAC for the Gravity-Driven Cooling System." Preoperational testing is required to verify that the GDCS injection subsystem and equalizing subsystem are capable of providing sufficient flow to maintain water level one meter above the top of active fuel (TAF) following a design basis LOCA. As clarified in the response to NRC RAI 6.3-57 (General Electric Letter MFN 06-465, dated December 1, 2006), specific GDCS flow rates are not specified in the ITAAC acceptance criteria because the TRACG code models water tank volumes and a maximum limit for the flow loss coefficient in the injection and equalizing lines. As described in the response to RAI 6.3-18, Supplement 1, Tier 1, DCD Table 2.4.2-1 is being revised to specify the ITAAC as verification that each GDCS line has a flow loss coefficient that is less than that modeled in the TRACG code. Verification that the as-built flow loss coefficient is less than that assumed in the TRACG code provides the required assurance that GDCS system flow, which varies depending on relative levels and pressures, will be sufficient to maintain water level one meter above the TAF following a design basis LOCA.

No mechanism has been identified that could increase the flow loss coefficient of the GDCS injection and equalizing lines during normal operation other than the introduction of debris. Considering the size of the injection and equalizing lines, the simplicity of the design, and the amount of debris required to significantly degrade system performance, cleanliness controls will prevent degradation of GDCS performance due to the accumulation of debris during normal operation and maintenance. These cleanliness controls are required by 10 CFR 50, Appendix B, and implemented in accordance with Regulatory Guide (RG) 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants."

To provide added assurance that GDCS performance is not degraded by the accumulation of debris in the injection and equalizing lines and nozzles, GE will revise Technical Specification (TS) 3.5.2, "GDCS -Operating," to add Surveillance Requirement (SR) 3.5.2.4 that addresses the following:

- Verification that each GDCS injection line flow path, from the GDCS pool to the associated squib valve, is not obstructed;
- Verification that each GDCS equalizing line flow path, from the suppression pool to the associated squib valve, is not obstructed; and,
- Verification that each GDCS injection line and equalizing line RPV nozzle is not obstructed.

These requirements are consistent with Tier 2, DCD Table 6.3-3, GDCS Surveillance Testing.

The TS Bases for this SR will clarify that any combination of flow tests, flushing, visual inspection, or boroscopic inspection may be used to verify that the flow path or nozzle is not obstructed. A Note to the SR will specify that squib valve actuation is not required for the performance of this verification. Verification of the GDCS flow paths will be required at a 10 year frequency, which is based on engineering judgment. This frequency is acceptable because cleanliness controls required by 10 CFR 50, Appendix B, and implemented in accordance with RG 1.39, provide a high degree of assurance that foreign material that could obstruct the lines will not be introduced into the GDCS pools or reactor vessel and no other mechanism that could obstruct the lines has been identified.

DCD Impact

DCD Tier 2, Chapters 16 and 16B, will be revised in Revision 4 to include the following SR and supporting Bases:

SURVEILLANCE	FREQUENCY
SR 3.5.2.4 ----- <p style="text-align: center;">- NOTE -</p> Squib valve actuation may be excluded. ----- Verify the flow path for each GDCS injection branch line and equalizing line is not obstructed.	10 years

SR 3.5.2.4

This SR requires verification every 10 years that the flow path for each GDCS injection branch line, from the GDCS pool to the associated squib valve and the associated RPV injection nozzle, is not obstructed. This SR also requires verification every 10 years that the flow path for each GDCS equalizing line, from the suppression pool to the associated squib valve and the associated RPV injection nozzle, is not obstructed. Verification that the GDCS lines and RPV nozzles are not obstructed can be performed using the GDCS line test connections and any combination of flow tests, flushing, visual inspection, or boroscopic inspection.

This SR is modified by a Note that excludes squib valve actuation as a requirement for this SR to be met. This is acceptable because test connections allow access to both sides of the squib-actuated valves, allowing verification that the flow path is free of obstructions without actuating the squib valve.

The 10 year Frequency for performing this SR is based on engineering judgment. This Frequency is acceptable because cleanliness controls provide a high degree of assurance that foreign material that could obstruct the GDCS lines will not be introduced into the GDCS pools, the suppression pool, or reactor vessel.

NRC RAI 16.2-96

TS 3.5.2, GDCS - Operating, Surveillance Requirements: DCD Tier 2, Revision 1, Table 6.3-3 lists GDCS components which require surveillance testing. Add the check valves, flushing of injection line, venturi within GDC-RPV injection nozzles and deluge line flushing items from this table to the TS 3.5.2 SR or explain why such a SR is not proposed.

GE Response

Tier 2, Design Control Document (DCD) 6.3.2.7.4, "Testing and Inspection Requirements," describes testing requirements for the Gravity-Driven Cooling System (GDCS). These requirements reference DCD Table 6.3-3, which requires: 1) functional testing of GDCS check valves, 2) explosive testing for GDCS squib valve initiators, 3) flushing of GDCS injection lines to remove possible plugging, 4) flushing of the GDCS injection nozzles, and 5) flushing of the deluge lines.

Items 1 and 2, functional testing of GDCS check valves and explosive testing for GDCS squib valve initiators, are not explicit Technical Specification (TS) Surveillance Requirements (SRs) because these components are subject to the requirements of 10 CFR 50.55a, Codes and Standards. 10 CFR 50.55a requires that these valves be subject to an Inservice Testing (IST) Program, which must be implemented in accordance with the latest approved version of the ASME/ANSI Operations and Maintenance Standards, Part 10 (OM-10), "Inservice Testing of Valves in Light-Water Reactor Power Plants." Tier 2, DCD 3.9.6.1 and Table 3.9-8, Inservice Testing, provide details for implementation of the Inservice Testing Program for the GDCS squib valves and check valves. The IST Program ensures that GDCS squib and check valves are subject to testing that encompasses the requirements described in DCD Table 6.3-3. As stated in DCD 3.9.9.3, preparation and submittal to the NRC staff of the IST Program is the responsibility of the combined operating license (COL) applicant.

Items 3 and 4, flushing of GDCS injection lines and injection nozzles to remove possible plugging, are addressed in the response to RAI 16.2-95, which addresses requirements for periodic verification that the GDCS injection lines are not obstructed. Requirements for system flushing, unless used explicitly for removing obstructions that could interfere with system performance, are cleanliness controls. Cleanliness controls are not TS SRs because they are not required for verification of system operability. Cleanliness controls are required by 10 CFR 50, Appendix B, and are implemented in accordance with Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants." The cleanliness programs, which are developed by the COL applicant, are intended to prevent the introduction and ensure the removal of debris that could prevent systems from performing their safety function.

Item 5, flushing of the deluge lines, is not included as a TS SR because, as explained in the response to RAI 16.0-1 (General Electric Letter MFN 06-263, dated August 8, 2006), the GDCS deluge subsystem did not meet the criteria for inclusion in the Technical Specifications. Requirements for the GDCS deluge subsystem are included in programs controlled by the COL applicant.

GE will revise the title of DCD Table 6.3-3 to "Table 6.3-3 Inservice Testing and Maintenance" to eliminate the description of these requirements as surveillance testing.

DCD Impact

DCD Tier 2, Table 6.3-3, GDCS Surveillance Testing, will be revised in Revision 4 as described above.