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MFN 06-178 Supplement 1

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U.S. Nuclear Regulatory Commission
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Subject: **Response to Portion of NRC Request for Additional Information
Letter No. 29 – Overpressure Protection Analysis and Safety Relief
Valves - RAI Numbers 5.2-18 S01, 5.2-20 S01, and 5.2-22 S01**

Enclosure 1 contains GE's response to the subject NRC RAIs originally transmitted via the Reference 1 letter and supplemented by NRC requests for clarification.

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

Sincerely,

James C. Kinsey
Project Manager, ESBWR Licensing

References:

1. MFN 06-156, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 29 Related to ESBWR Design Certification Application*, May 17, 2006

Enclosure:

1. MFN 06-178 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 29 - Related to ESBWR Design Certification Application - Overpressure Protection Analysis and Safety Relief Valves - RAI Numbers 5.2-18 S01, 5.2-20 S01, and 5.2-22 S01

cc: AE Cubbage USNRC (with enclosures)
BE Brown GE/Wilmington (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0000-0065-8590 for RAI 5.2-18 S01
0000-0066-7250 for RAIs 5.2-20 S01 and 5.2-22 S01

Enclosure 1

MFN 06-178 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 29

Related to ESBWR Design Certification Application

Overpressure Protection Analysis and Safety Relief Valves

RAI Numbers 5.2-18 S01, 5.2-20 S01, and 5.2-22 S01

NRC RAI 5.2-18 S01:

GE's response to RAI 5.2-18 (MFN 06-178) stated that:

TRACG04 is the version used for the overpressure protection analysis. DCD Section 5.2.7 will be revised in the next update to include the appropriate reference as noted below:

5.2-9 General Electric Company, "TRACG Application for Anticipated Operational Occurrences (AOO) Transient Analysis" NEDE-32906P, Revision 1, April 2003."

This reference was only approved for operating reactors. Please justify the use of this reference or provide appropriate reference applicable to ESBWR.

GE Response:

The NRC has not explicitly approved TRACG for ESBWR Anticipated Operational Occurrence (AOO) transient analyses. However, the justification for using TRACG for this application is documented in NEDC-33083P, "TRACG Application for ESBWR". The means for NRC approval of using TRACG for this application will be through the Design Control Document (DCD) Safety Evaluation Report (SER). All of the AOO calculations in DCD Tier 2, Chapter 15 (Section 15.2), were also performed using TRACG based on this reasoning.

Therefore, DCD Tier 2, Section 5.2.7, Reference 5.2-9, will be revised in DCD Tier 2, Revision 4, to replace NEDE-32906P with NEDC-33083P.

DCD Impact:

DCD Tier 2, Section 5.2.7, Reference 5.2-9, will be revised in DCD Tier 2, Revision 4, as shown in the attached markup.

5.2.7 References

- 5.2-9 ~~GE Nuclear Energy, "TRACG Application for Anticipated Operational Occurrences Transient Analysis", NEDE-32906P-A, Class III (Proprietary), Revision 1, April 2003, and NEDO-32906-A, Class I (non-proprietary), Revision 1, June 2003.~~ GE Nuclear Energy, "TRACG Application for ESBWR," NEDC-33083P-A, Class III (Proprietary), March 2005, and NEDO-33083-A, Class I (Non-proprietary), October 2005.

NRC RAI 5.2-20 S01:

In response to RAI 5.2-20 provided in MFN 06-178 (June 16, 2006), GE stated that the detailed design and selection of the ESBWR safety/relief valves (SRVs) have not been finalized. In response to RAI 5.2-22 in MFN 06-178, GE states that a purchase specification, which uses the GE Environmental Qualification experience base, will be prepared for the SRVs. The SRVs will be subject to the Environmental and Dynamic Qualification program. The NRC staff is requesting that GE specify its acceptance criteria for the design and qualification of the SRVs to be used in the ESBWR, including appropriate ITAACs. While reviewing DCD 5.2.2, I found out that GE included ASME NB-7520, Pilot operated pressure relief valves and NB-7540 Pilot operated pressure relief valves with auxiliary device. In response to our RAI 5.2-20, GE told us that the pilot operated SRVs had lot of problems and they implied that they will be using only direct acting SRVs. Then why GE is including NB-7520 AND 7540? I see a contradiction "

GE Response:

To address the supplemental request, it is beneficial to address the last item first. ASME Boiler and Pressure Vessel (B&PV) Code Section III, Subsubarticle NB-7540, "Safety Valves and Pilot Operated Pressure Relief Valves With Auxiliary Actuating Devices," applies to the safety relief valve (SRV) design used in current GE designed Advanced Boiling Water Reactor (ABWR) units that are operating or under construction, and that also serve as a reference for the ESBWR design. That is, these SRVs are direct-acting spring-closed safety valves with external pneumatic actuating mechanisms for performing auxiliary pressure relief functions. ASME B&PV Code Section III, Subsubarticle NB-7510, "Safety, Safety Relief and Relief Valves," are the rules applicable to the overpressure protection system valves, and particularly to the ESBWR safety valves (SVs) that provide additional overpressure protection capacity as described in DCD Tier 2, Subsection 5.2.2. ASME B&PV Code Section III, Subsubarticle NB-7520, "Pilot Operated Pressure Relief Valves," are the applicable rules for an alternative SRV design, using a small mechanical SV as a pilot mechanism to control the actuation of the main valve that has a disk operated by a fluid-driven piston.

There are a few possible configurations for pilot operated SRVs. Pilot operated SRVs may be built with steam under the main disk seat that isolates the steam inlet, similar to the direct-acting SRV, but with steam pressure applied to a larger piston surface to hold the valve shut in place of a large spring. Alternately, pilot operated SRVs may be built with steam pressure over the main disk to hold it closed and isolate the steam outlet, with steam pressure applied to both sides of an actuating piston. Both of these configurations rely on pilot valve lift to exhaust steam so that it depressurizes the piston steam chamber on the side holding the main disk closed to allow the main disk to open. The third approach to pilot operated SRV design is a configuration with pressure over the main disk that isolates the steam inlet, with no steam pressure on the disk piston and the piston chamber normally evacuated with the pilot valve closed. The third pilot operated SRV configuration operates by pilot valve lift to pressurize the piston chamber and drive the main disk open.

The pilot operated SRV configuration in some previously licensed BWRs that has proven to be less reliable than comparable plants with direct-acting SRVs uses a configuration with steam pressure over the main disk isolating the valve outlet and a depressurize-to-open actuation

method. These earlier domestic BWR pilot operated SRVs are mostly of a single manufacturer and product design series. Direct extension of the experience with this SRV design to currently offered design types, makes and models of pilot operated SRVs is not appropriate. Lessons learned from the experience history with this SRV design are considered in the selection of overpressure protection valves for the ESBWR. Thus, the ESBWR project continues to evaluate potential suppliers and models of valves to serve each the ESBWR SRV functions and ESBWR SV function.

Both this request and RAI 5.2-22 ask "that GE specify its acceptance criteria for the design and qualification of the SRVs to be used in the ESBWR" and the Inspections, Test, Analyses, and Acceptance Criteria (ITAAC) applicable to these valves. As noted in the previous reply to RAI 5.2-22, purchase specification(s) will be prepared for the ESBWR SRVs and SVs that invoke(s) the necessary environmental qualification requirements. A specification has yet to be written, but will use the cumulative experience available from previous GE BWR projects and programs developed to address environmental qualification. As identified in DCD Tier 1, Subsection 1.2.2.1, equipment qualification of components is part of the ITAAC verifications for basic configuration for systems. Correspondingly, DCD Tier 1, Table 2.1.2-2, Item 1, contains an ITAAC to confirm the basis configuration for the Nuclear Boiler System. Therefore, this ITAAC includes programmatic reviews of SRV design and environmental qualifications.

DCD Impact:

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

NRC RAI 5.2-22 S01:

In response to RAI 5.2-20 provided in MFN 06-178 (June 16, 2006), GE stated that the detailed design and selection of the ESBWR safety/relief valves (SRVs) have not been finalized. In response to RAI 5.2-22 in MFN 06-178, GE states that a purchase specification, which uses the GE Environmental Qualification experience base, will be prepared for the SRVs. The SRVs will be subject to the Environmental and Dynamic Qualification program. The NRC staff is requesting that GE specify its acceptance criteria for the design and qualification of the SRVs to be used in the ESBWR, including appropriate ITAACs.

GE Response:

Response to this supplemental request is provided with the response to RAI 5.2-20 S01 that addresses the same issues.

DCD Impact:

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