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Subject: Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application, RAI Numbers 19.1-93S01 and 19.1-94S01

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) sent by NRC letter dated October 12, 2007 (Reference 1). Previous RAIs and responses were transmitted in References 2 and 3. The GEH response to RAI Numbers 19.1-93S01 and 19.1-94S01 are in Enclosure 1.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

DOB
NRW

Reference:

1. MFN 07-555, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application*, October 12, 2007.
2. MFN 07-422, *Response to Portion of NRC Request for Additional Information Letter No. 88 Related to ESBWR Design Certification Application ESBWR Probabilistic Risk Assessment RAI Numbers 19.1-81 through 19.1-95 and 19.1-97 through 19.1-101*. August 8, 2007.
3. MFN 06-551, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 88 for the ESBWR Design Certification Application*, December 26, 2006.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application Regulatory ESBWR Probabilistic Risk Assessment, Regulatory Treatment of Non-Safety Systems (RTNSS) RAI Numbers 19.1-93S01 and 19.1-94S01

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Enclosure 1
MFN 07-422, Supplement 2

**Response to Portion of NRC Request for
Additional Information Letter No. 109
Related to ESBWR Design Certification Application
ESBWR Probabilistic Risk Assessment
Regulatory Treatment of Non-Safety Systems (RTNSS)
RAI Numbers 19.1-93S01 and 19.1-94S01**

NRC RAI 19.1-93(original)

In section 16.4 of the PRA, alternate decay heat removal using the Safety Relief Valves (SRVs) is credited in many shutdown success paths. However, operability of the SRVs is not covered in Technical Specifications (dated 2/28/06) in Modes 5 and 6 when the reactor vessel head is on. Please clarify and/or revise the PRA to reflect that the SRVs may not be available for decay heat removal.

GEH Response

SRVs are credited in the Mode 5 event trees for depressurization to allow low pressure feed (FPS& FAPCS). This function requires manual action. ADS actuation on RPV Level 1 is also modeled. This actuation is assumed to be automatic (with manual initiation as a backup). The explicit availability of the automatic actuation function is not currently covered in ESBWR Technical Specifications. RAI 16.2-74 S01 committed to revising DCD, Tier 2, Revision 3, Chapters 16 and 16B LCO 3.5.3 "Gravity Driven Cooling System (GDCS) – Shutdown", to include a Surveillance Requirement (SR) for Reactor Pressure Vessel (RPV) venting capability. This SR will require verification that the RPV has venting capacity capable of maintaining the RPV sufficiently depressurized to allow GDCS injection following loss of decay heat removal capability.

Since these valves can't be tested until Mode 6, NEDO-33201 assumes the automatic ADS function of these valves on RPV L1 is available as long as the vessel head is in place. There appears no credible reason to remove the function from service.

DCD/NEDO-033201 Impact

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

No NEDO-33201 Rev 2 changes will be made in response to this RAI.

NRC RAI 19.1-93 S01

As requested, in RAI 19.1-143, please provide the following: (1) specify in the TS bases for GDCS operability at shutdown the vent size necessary for GDCS to function properly and (2) calculations that support the specified RCS vent size. The staff has reviewed GEH's responses to RAIs: 19.1-93, 19.1-94, 19.1-95, and 19.1-143. The staff has also reviewed GEH's response to RAI 16.2-74 supplement 1 regarding the requirements for GDCS venting at shutdown. The staff also reviewed GEH's RTNSS evaluation as described in MFN 07-373 Enclosure 1. In the RTNSS evaluation, it states, "'Insights from the shutdown model results indicate that the dominant risk contributor is a LOCA in an instrument or drain line connected to the vessel below the top of active fuel. LOCAs during shutdown are mitigated by passive GDCS injection.'" Based on the information provided up to date, it appears GEH's proposed surveillance to monitor GDCS vent path size is inadequate. LOCAs and failure of the GDCS dominate the RTNSS shutdown model. Adequate GDCS vent path size and vent path elevation are not specified in TS, and the SRVs are not required to be operable. Therefore, the operator could make the risk significant error of not selecting the proper GDCS vent path which would fail the GDCS function. In addition, the staff could not find any information on the adequate shutdown GDCS vent path size or vent path location in the DCD or the PRA. Specifying GDCS vent path size and vent path location meets Criterion 4 in 10CFR 50.36 for items requiring establishment of a technical specification limiting condition for operation when risk assessment has shown to be significant to public health and safety. GEH will address their response towards resolution of RAI 19.1-93, 19.1-94, 19.1-95 and 19.1-143.

GEH Response

In supplemental RAI 16.2-74, (MFN 07-630, dated 11/20/07) the staff recommended providing a specification addressing the need to maintain a vent path for GDCS operability, when shutdown.

RAI 16.2-74, Supplement No.2, November 1, 2007, ML072990309

In its response, GEH proposed a new SR for TS 3.5.3, GDC - Shutdown, to once per 24 hours "Verify availability of RPV venting capacity sufficient to allow GDCS injection following loss of decay heat removal capability."

In a teleconference between the NRC staff and the applicant on September 6, 2007, a Tech Spec Surveillance Requirement was discussed. The staff suggested that the SR was actually an indirect expansion of the Applicability of the ADS from Modes 1 and 2, to add Mode 5, in order to support GDCS operability in the event of a loss of decay heat removal, because meeting the SR in Mode 5 would require making the ADS operable to provide the necessary vent path. The staff prefers revising the applicability of the ADS specification to the applicant's proposal to add a SR to the shutdown GDCS specification, recognizing that there may be other associated changes, such as to ECCS instrumentation function applicability. Pending revision of

the applicability for TS 3.5.1 to include Mode 5, and other appropriate TS changes, this is designated Open Item 16.2-74.

GEH recognizes the need to maintain ADS (both the valves and actuation signals) operability to support GDCS venting during shutdown and is developing an update to the ESBWR Tech Specs to address the issue.

DCD/NEDO-33201 Impact

An update to the ESBWR Tech Specs to address the issue is being developed. DCD Chapter 16 is being updated to resolve the above issue.

No changes will be made to NEDO 33201 as a result of this RAI.

NRC RAI 19.1-94 (original)

In section 16.4 of the PRA, the opening of the SRVs is credited for enabling low pressure makeup using the Fuel and Auxiliary Pool Cooling System (FAPCS) or the Fire Protection System (FPS). Additionally, the opening of the Depressurization Valves (DPVs) is credited for enabling GDCS.

Please revise the PRA to address whether operator action is needed to open the SRVs and/or DPVs.

GEH Response

The current (Revision 2) shutdown PRA model has three separate event tree nodes for depressurization. Two of the three are assumed to be automatic. The 'at least 2 SRVs open' node is fully dependant on operators. The opening of one SRV for overpressure protection is assumed to be automatic. ADS on RPV Level L1 is also assumed to be automatic (with operator action available if auto fails). The manual opening of 2 SRVs to allow low pressure feed (FAPCS/FPS) before reaching automatic depressurization requires operator action.

The three event tree nodes are:

MS-TOP18-At Least 1 SRV Open

If the Isolation Condenser (IC) function fails, the RPV pressure will increase up to the SRVs setpoint. The success criterion for this function is the automatic operation of at least 1 SRV.

Failure of this function is conservatively assumed to lead to core damage.

The possibility of a stuck open relief valve is not modeled. As no credit is given for the IC function after the opening of an SRV, it is not necessary to assume that all SRVs are closed.

MS-TOP2-At Least 2 SRVs Open

If no high pressure injection system is available, it is necessary to depressurize the RPV to allow FAPCS or FPS injection to the RPV.

Success of this function requires the operator to manually open at least 2 SRVs.

The time available to the operator to manually initiate RPV depressurization is defined by the time when RPV level falls below L2 to the time when the ADS system will automatically initiate (i.e., at RPV Level 1).

XD-TOPDPV-ADS-At Least 4 DPVs Open Automatically

If the RPV water level falls below Level 1, the ADS system automatically initiates. The success criterion for this function is that at least 4 DPVs automatically open.

DCD/NEDO-033201 Impact

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

NEDO-33201 Rev 2 Chapter 16 will be revised as noted above.

NRC RAI 19.1-94 S01

The staff reviewed revision 2 of the Shutdown PRA. The staff learned that following IC failure after a loss of DHR, the RPV pressure will increase up to the SRVs setpoint. However, the SRVs are not required to be operable by TS in Modes 5 and 6. Please revise the PRA to address that RCS overpressure protection may not be available in Modes 5 and 6.

GEH Response

The SRV setpoint is a mechanical spring setpoint rather than one controlled by the I&C. The only way to disable this function is by gagging the valve. Operability of the power operation of these valves is not relevant to the mechanical relief function.

Additionally, as stated in response to NRC RAI 19.1-93 S01, ESBWR Tech Specs are being updated to specifically address SRV & DPV availability during shutdown. The update will require that ADS (both the valves and actuation signals) remain fully operable to support GDCS venting. This will ensure adequate GDCS venting capability during shutdown (Mode 5 and part of Mode 6) up until the vessel head is removed.

DCD/NEDO-33201 Impact

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

No NEDO-33201 changes will be made in response to this RAI.