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MFN 07-024 Supplement 4

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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. 77 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-33 S01**

Enclosure 1 contains the subject supplemental RAI response resulting from a June 6, 2007 e-mail from the NRC. The GE Hitachi Nuclear Energy (GEH) response to the original RAI was provided in the Reference 1 letter.

If 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

D068
NRO

Reference:

1. MFN 07-024, Letter from James Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 77 Related to ESBWR Design Certification Application - Technical Specifications - RAI Numbers **16.2-33**, 16.2-52, 16.2-75, 16.2-90 through 16.2-94, and 16.2- 97 through 16.2-109*, January 18, 2007

Enclosure:

1. MFN 07-024 Supplement 4 - Response to Portion of NRC Request for Additional Information Letter No. 77 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-33 S01

cc:

AE Cubbage	USNRC (with enclosure)
DH Hinds	GEH (with enclosure)
RE Brown	GEH (with enclosure)
eDRF	85-7231/1

Enclosure 1

MFN 07-024 Supplement 4

Response to Portion of NRC Request for

Additional Information Letter No. 77

Related to ESBWR Design Certification Application

- Technical Specifications -

RAI Number 16.2-33 S01

NRC RAI 16.2-33 S01:

With regard to the feedwater control system (FWCS), GE's response to RAI 16.2-33 states that "The responses to RAI 15.0-2 and RAI 16.0-1 indicated that this system is not in the primary success path for mitigating transients and accidents because operation of this nonsafety-related system provides protection of the turbine and provides only additional margin to the acceptance criteria for applicable events." However this does not accurately represent the content of the response to RAI 15.0-2 which states that "function of this system is modeled or assumed in several AOO and Infrequent Events to control water level by controlling feedwater flow and therefore mitigates the severity of the events."

(A) Please address this discrepancy.

(B) If the FWCS is credited in the analysis and needed to mitigate a transient, infrequent event or accident, it should be included in the TS in accordance with 10 CFR 50.36(c) Criterion 3.

(C) If the FWCS is not needed to mitigate any transient, infrequent event or accident, then clearly document this conclusion in the DCD and provide supporting analysis.

GEH Response:

(A) The language in the response to RAI 15.0-2 (MFN 06-331, dated September 25, 2006) is general, simply stating that the Feedwater Control System (FWCS) "mitigates the severity of the events." This is in agreement with the response to RAI 16.2-33 (MFN 07-024, dated January 18, 2007) that states: "...provides only additional margin to the acceptance criteria for applicable events." The FWCS is a normally-operating, nonsafety-related system that is assumed to continue functioning after Anticipated Operational Occurrences (AOOs) and Infrequent Events (IEs), except where the failure of the FWCS is the initiator of an AOO or IE. Therefore, the FWCS is not required in the primary success path of the applicable AOOs and IEs. In addition, the FWCS is not credited for mitigating the consequences of any Design Basis Accident (DBA). Providing additional margin is consistent with the use of the term mitigation in RAI 15.0-2. The discussion response to RAI 15.0-2 is intended to provide background for the assumed functioning of the nonsafety-related systems listed during and following an AOO, IE, or DBA, not to make judgment regarding the primary success path for mitigating the consequences of those events.

(B) Considering the AOO and IE analyses described in DCD Tier 2, Sections 15.2 and 15.3, the automatic response of the FWCS (reactor water level control function) following the Inadvertent Isolation Condenser Initiation (IICI) event is the only AOO or IE event where failure of the FWCS to automatically control feedwater flow and reactor pressure vessel (RPV) water level subsequent to the initiating event may have an impact on meeting the applicable acceptance criteria depending on initial plant operating conditions (primarily minimum critical power ratio (MCPR)). As the cold Isolation Condenser (IC) water increases RPV water level, the FWCS automatically reduces feedwater flow. This reduction in feedwater flow limits the

decrease in the inlet temperature resulting from IICI and mitigates the change in MCPR during the event. This is a relatively slow event with respect to FWCS flow response, as shown in DCD Tier 2, Figure 15.2-11a, such that the FWCS is capable of responding as required to mitigate the IICI event. Also, for AOOs and IEs, there is no requirement to assume the failure of the normally-operating, nonsafety-related systems and components coincident with or after initiation of the AOO or IE event.

As discussed in DCD Tier 2, Subsection 7.7.3.2.2, three-element feedwater flow control is used during normal operation in the design of the FWCS. If there is a failure in the triplicated FWCS, either in the direction of increasing feedwater flow above the required demand point or decreasing feedwater flow below the required demand point, a scram on high or low RPV water level would most likely occur, respectively. The last paragraph of DCD Tier 2, Subsection 7.7.3.2.1 states that the Fault-Tolerant Digital Controller (FTDC) in the FWCS constantly checks for a discrepancy between the FTDC output and the field voter output. If a discrepancy is detected a "lock-up" signal is sent to a "lock-up" voter and an alarm is sent to the Main Control Room. If this occurs for all reactor feedwater pumps, the FWCS can no longer increase or decrease feedwater flow to respond to any perturbations in RPV water level and feedwater system flow and pressure conditions. With a very small steam flow/feedwater mismatch, the resulting inventory change will quickly result in a scram unless the operator is successful in establishing and maintaining manual feedwater flow control. There is no consequential failure of the FWCS due to an IICI event that can be postulated. Therefore, failure of FWCS simultaneously with an IICI event is a detectable and non-consequential random, independent failure, and the automatic function of the FWCS is thus not in the primary success path for the mitigation of the consequences of an IICI event.

Since failure of FWCS to automatically control feedwater flow simultaneously with an IICI event is not deemed credible, only operation of the FWCS in manual control would prevent the automatic feedwater control that is assumed in response to an IICI event. In this case, the operator could not be relied on to respond to the IICI event by manually reducing feedwater flow to ensure that the MCPR acceptance criteria would be met, even though the operator would be required to continuously monitor RPV water level and feedwater flow to ensure maintaining RPV water level within normal operating limits. In this case, if an IICI event were to occur, it would be assumed that feedwater flow remains constant possibly impacting the MCPR resulting from the event. Technical Specification 3.2.2 requires all MCPRs to be greater than the operating limit minimum critical power ratio (OLMCPR) specified in the Core Operating Limits Report (COLR). Since a basic assumption in the safety analysis for the IICI event is that the FWCS is in automatic control, as shown in DCD Tier 2, Table 15.1-5 and Figure 15.1-12, and as described in DCD Tier 2, Subsection 15.2.4.1, the COLR will be required to include the assumption for FWCS flow control to be in automatic in the calculation of the OLMCPR. Therefore, operation of FWCS in manual mode would result in violating the requirements of Technical Specification 3.2.2, since the basic assumption of the OLMCPR as defined in the COLR would not be met. In this case, Technical

Specification 3.2.2 includes appropriate actions requiring restoration of automatic control of the FWCS or to reduce thermal power of the unit to less than 25% of rated thermal power, as necessary.

(C) See response to (B) above.

DCD Impact:

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