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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 3 Related to ESBWR Design Certification Application – PRA – RAI Numbers 19.1.0-7 and 19.3.0-1**

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

If you have any questions about the information provided here, please let me know.

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 05-156, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 3 for the ESBWR Design Certification Application,* December 8, 2005

Enclosure:

1. MFN 06-217 – Response to Portion of NRC Request for Additional Information Letter No. 3 Related to ESBWR Design Certification Application – PRA – RAI Numbers 19.1.0-7 and 19.3.0-1

cc: WD Beckner USNRC (w/o enclosures)
AE Cubbage USNRC (with enclosures)
LA Dudes USNRC (w/o enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0000-0055-4750

ENCLOSURE 1

MFN 06-217

Response to Portion of NRC Request for

Additional Information Letter No. 3

Related to ESBWR Design Certification Application

PRA – RAI Numbers 19.1.0-7 and 19.3.0-1

NRC RAI 19.1.0-7

The fire-induced vulnerability evaluation (FIVE) methodology and data for fire ignition frequency estimates were used in the fire risk analyses. The submitted ESBWR PRA does not provide adequate details on the screening out of non-risk significant fire areas/zones, nor the thresholds used in the screening process. In addition, no fire and smoke propagation into a second (adjacent) fire area is considered, even though there is a probability that penetrations in a fire barrier will fail and allow the fire to grow in adjacent areas. The assumption of no fire growth to an adjacent area, together with smoke propagation and the issue of fire induced hot shorts of squib valves, need to be addressed in the fire PRA. Furthermore, the fire PRA should provide input, as necessary, to the RTNSS process. Addressing these issues may result in a significant revision of the submitted fire PRA.

GE Response

Non-risk significant fire areas or zones are screened out if a worst-case damaging fire does not cause an initiating event, or does not damage equipment within the zone that provides safe shutdown of the plant. In cases where important equipment is affected, some fire areas and equipment are conservatively grouped together in the Fire PRA to simplify the analysis instead of screening them out. Therefore, quantitative screening thresholds are not necessary.

According to the FIVE methodology, the existence of fire detection and suppression systems, fire barriers, and adequate monitoring and supervision means that it can be assumed that fire propagation to neighboring zones separated by those barriers is a relatively negligible contribution to risk. Nevertheless, the potential propagation of a fire started in one of the divisions of the building and propagating to another area is considered in the Fire PRA. The analysis assumes that the fire ignition does not self-extinguish, but rather grows to a fully developed fire, with no credit given for fire suppression. These fire scenarios assume that the fire fails two complete divisions. Two such scenarios are analyzed, one failing divisions I and III, and one failing divisions II and IV. This analysis is included in NEDO-33201, Revision 1, (i.e., MFN 06-971, NEDO-33201, Revision 1, "ESBWR Probabilistic Risk Assessment," Sections 12 and 13).

Because the squib valves used in ADS, GDCS, and SLCS are located inside the primary containment, their firing mechanisms are not vulnerable to direct contact with a fire during at-power operations. Each squib valve requires 2 independent signals to actuate; therefore, inadvertent actuation is highly unlikely from a fire-induced hot short because of physical separation. Furthermore, the sensing and actuation circuitry is primarily digital with fiber-optic connections, and they are immune to the hot-shorting phenomena. A relatively minor amount of copper wiring exists from the Remote Multiplexing Units in the Reactor Building to the firing circuits inside the primary containment such that concurrent hot-shorts due to a fire are considered to be negligible.

Insights from the Fire PRA will be considered in the response to RAI 19.1.0-2, which describes the ESBWR plan for addressing the Regulatory Treatment of Non-Safety Systems.

NRC RAI 19.3.0-1

The fire and flood risk assessment for shutdown is missing from the PRA. Please provide a risk assessment for fires and floods at shutdown. The fire PRA used the Electric Power Research Institute FIVE methodology which only considers full power internal event risk. The very low ESBWR fire CDF was based on physical and electrical separation that may be breached at shutdown. The very low ESBWR flood CDF was based in part on the use of flood detection and the use of water tight doors. The water tight doors could be breached at shutdown and the flood detection equipment may not be available.

GE Response

NEDO-33201 Revision 1, "ESBWR Probabilistic Risk Assessment," Section 12 analyzes fire risk during shutdown conditions.

Section 13 of NEDO-33201, Revision 1, i.e., the Flood PRA, does not take credit for watertight doors that separate rooms within the Reactor Building. However, it assumes that the doors that connect the Control and Reactor Buildings with the Electrical Building galleries are watertight for flooding of the galleries up to the ground level elevation. Opening these normally closed doors generates an alarm in the Control Room, which administratively controls door closure. It also assumes that this function would not be disabled during shutdown conditions.

It is assumed that the opening of the hatches, which communicate the Containment with other buildings, would be carried out in Mode 6-Flooded (i.e., with the reactor cavity flooded). However, the time interval in this configuration is sufficiently short such that low probability Containment flood scenarios involving an open Containment are non-significant.

The Flood PRA also assumes that administrative controls will be in place to compensate for short time periods when flood detection equipment is unavailable due to maintenance activities that affect individual detectors. In these cases, maintenance personnel would likely be in the vicinity of the break location and thus would be able to promptly detect flooding conditions.