From: Joe Birmingham
To: Riley, Jim
Date: 11/18/05 9:22AM
Subject: Questions Pursuant to Sept. 29, 2005 Mtg on BMI Safety Assessment

Jim

Attached is a set of questions from the NRC staff pursuant to the Sept. 29, 2005, meeting on BMI Safety Assessment. At the meeting, the staff indicated that it was likely to have some followon questions and the MRP agreed to provide a response.

Please arrange for the questions to be provided to the MRP and particularly the WOG representatives for preparation of a response. In the interest of being expeditious, please email the response to me at jlb4@nrc.gov. It would be helpful to place Mr. Ted Sullivan and Mr. Steve Long on cc for the email. Their email addresses are EJS@nrc.gov and SML@nrc.gov respectively. I will place the response in our ADAMS document repository for public availability after receipt.

Also, would you determine their planned turnaround time for the response and reply? The staff would like to ensure that they don't make too many contingent decisions (e.g., on inspection plans) prior to this interaction.

If you have any questions regarding this request I can be reached by phone at 301-415-2829.

Joseph Birmingham

CC: Long, Steven; Sullivan, Edmund

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Subject:	Questions Pursuant to Sept. 29, 2005 Mtg on BMI Safety Assessment
Creation Date:	11/18/05 9:22AM
From:	Joe Birmingham
Created By:	JLB4@nrc.gov

Recipients	Action	Date & Time
nei.org	Transferred	11/18/05 9:23 AM
jhr (Jim Riley)		
nrc.gov		
OWGWPO01.HQGWDO01	Delivered	11/18/05 9:22 AM
JLB4 BC (Joe Birmingham)	Opened	11/18/05 9:29 AM
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TWGWPO01.HQGWDO01	Delivered	11/18/05 9:22 AM
SML CC (Steven Long)		
nrc.gov		
TWGWPO02.HQGWDO01	Delivered	11/18/05 9:22 AM
EJS CC (Edmund Sullivan)	Opened	11/18/05 10:25 AM

Post Office	Delivered	Route
		nei.org
OWGWPO01.HQGWDO01	11/18/05 9:22 AM	nrc.gov
TWGWPO01.HQGWDO01	11/18/05 9:22 AM	nrc.gov
TWGWPO02.HQGWDO01	11/18/05 9:22 AM	nrc.gov

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MESSAGE	1962	11/18/05 09:22AM
Questions for WOG on Risk Assessment for BMI rev1_1.wpd	10414	11/15/05 10:30AM

Options

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Questions for WOG on Risk Assessment for BMI Nozzle Degradation

On September 29, 2005, MRP representatives presented the results of some risk assessments to demonstrate that the risk associated with degradation of bottom mounted instrument (BMI) nozzles would remain in an acceptable range if the nozzles are inspected according to the schedules proposed by the owners group. Because current risk assessments typically do not consider loss-of-coolant accidents (LOCAs) caused by reactor coolant system (RCS) pressure boundary integrity failures in the lower pressure vessel head, the staff needs to review the risk model and its underlying analyses and assumptions.

1. There are several classes of plants that have BMI nozzles. The MRP presented results of risk assessments for 5 “plants” in 5 different classes (“Westinghouse Generic 2-Loop,” “Westinghouse Generic 3-Loop,” Westinghouse Generic 4-Loop,” “CE - Palo Verde,” and “B&W”). Although plants in these classes share some important distinctions in design characteristics, there are also some important plant-specific differences within these classes, including variations in emergency core cooling systems (ECCSs) and other relevant equipment, such as power-operated relief valve capacities, different containment compartmentalizations, and variations in emergency operating procedures.

a. Please describe the plant that was modeled in each class, including all parameters that are relevant to the modeling of accident sequences involving pressure boundary failures in the lower reactor pressure vessel head.

b. Is each example bounding for its class? If so, explain how it bounds the relevant parameters.

c. Are there other classes of plants or individual plants with BMI nozzles that are not bounded by these examples?

2. Please describe the dominant accident sequences for each of the plant classes.

3. Unlike similar size LOCAs caused by loss of integrity at locations in the major piping of the RCS, ejections of BMI nozzles require timely operator actions in addition to normal automatic actuations of ECCS to prevent severe core damage. How is this represented in the logic for the various risk models presented?

4. The MRP presented the results of some thermal-hydraulic analyses of LOCAs, but it was not clear from the slides if these explicitly located the break in the lower vessel head, or if arguments were made that available analyses of breaks in the cold leg are applicable on the basis that normal operator actions would preclude the break from passing steam at either location. Normal operator actions modeled appear to include initiation of cooldown at a rate of approximately 100°F/hour, beginning 45 minutes after the nozzle is ejected. It is not clear how the risk assessments treat sequences where cooldown in this manner was not possible or not initiated in a timely manner due to equipment failures or other complicating factors.

a. For BMI ejection sequences where normal cooldown is precluded by equipment malfunctions, what other operator actions are modeled and what is their timing?

b. What values do these risk assessment use for the probability that the operators will fail to take the actions necessary to respond to this LOCA in a manner sufficient to prevent core damage? Please provide the formula, input values and the means of deriving those inputs sufficient for the staff to review the adequacy of the basis for this value. Please provide copies of the relevant emergency operating procedures.

c. Are there any sequences initiated by BMI nozzle ejection that do not result in a “core damage endstate ” in the PRA, but the thermal-hydraulic analyses indicate some fuel damage with release of radionuclides to the RCS at levels acceptable under design-basis accident conditions? If so, please identify the sequences and specify what fraction of the fuel is calculated to become damaged, and how much radioactivity is calculated to be released into the reactor coolant.

5. For LOCAs in the reactor cavity, how is the amount of water available to the ECCS sump estimated to determine whether there will be sufficient water to support the recirculation mode of ECCS? What are the applicable values for refueling water storage tank capacity, reactor cavity free volume to the elevation that would spill to the ECCS sump, additional holdup volumes between the reactor cavity and the ECCS sump, and inventory in the ECCS sump necessary to support recirculation?

6. What failure probabilities were used for failure of the recirculation mode of the emergency core cooling system (ECCS) in these risk analyses? In particular, what probabilities were used for ECCS sump clogging phenomena during long-term recirculation.

7. In sequences where the ECCS has functioned sufficiently to prevent severe core damage, it is expected that the plant will enter a state where the ECCS remains in recirculation mode for an extended period, until either the hole in the lower head can be plugged or the fuel can be off-loaded from the reactor core.

a. Do these risk assessment address the potential for failures and/or operator errors to cause core damage while the plant is in this long-term ECCS recirculation mode?

b. What actions do these analyses assume will be taken to terminate the need for continuous replenishment of the reactor coolant to prevent core damage?

c. Do these actions take into account the radiation level that would be created in the vicinity of the lower head by the ejection of the irradiated instrument and instrument tube that were inserted through the nozzle that ejected?

d. How would these actions be affected by the radiation levels that would result from fuel damage that would not be classified as severe enough to constitute “core damage” in the context of a risk assessment, but would constitute “fuel damage” at levels allowable under design-basis accident conditions?

e. Do these risk assessment address the potential for failures to cause core damage while these actions are being conducted? If so, please provide the analysis. If not, please provide your basis for not addressing the associated risk.