From: Steven Long
To: Sonia Burgess
Date: 4/15/02 4:42PM
Subject: Fwd: Questions to Region 3 SRA on Davis Besse

Sonia,

here are Jin's proposed questions on the licensee's "probabilistic safety assessment" for the Davis Besse RPV head cavity. My proposed questions are in a separate e-mail.

Can we discuss these soon? Should Mike be involved?

Steve

B115

From: Steven Long
To: Jin Chung; Sonia Burgess
Date: 4/15/02 4:40PM
Subject: Re: Questions to Region 3 SRA on Davis Besse

Jin,

I have attached the questions that I want to pose to Davis Besse concerning their "probabilistic safety assessment" and I am forwarding your questions to Sonia

Let's try to discuss them among the three of us, tomorrow.

Note that my question 4 addresses the discrepancy between their medium-to-large break size threshold and the value used by other B&W plants. Combining what they said in their IPE submittal with what they said in their recent PSA submittal on the head cavity, it appears that their "medium LOCA" CCDP is really applicable to the break size from 0.1 to 0.5 square feet, not to the range from 0.02 to 0.1 square feet that the other B&W plants define to be their "medium LOCA" size. That is why I didn't want to say that the Davis Besse "medium LOCA" and its corresponding CCDP applied to breaks from 0.02 to 0.1 square feet like the other B&W plants It's really "apples vs oranges" between Davis Besse and the other B&Ws

Steve

>>> Jin Chung 04/15/02 03:36PM >>>
I have three questions for Region 3 SRA on Davis Besse CRDM issues Please incorporate the attached questions with yours if you have any additional questions.

CC: Beth Wetzel, F. Mark Reinhart, Michael Johnson

Request for Additional Information
Concerning the FENOC "Probabilistic Safety Assessment" for the
Void in the RPV Head at Davis Besse

1. The probabilistic safety assessment does not address the probabilities that the cavity could have become larger before being detected or that the void could have formed at a location in the RPV head that had thinner cladding material. Quantitative assessment of these possibilities is necessary to estimation of the risk associated with the cavity formation event Please provide the following information to support the staff's estimation of the risk:

a All records of the clad thickness on the RPV head that were produced in the fabrication, quality control, and acceptance testing processes The staff expects that some thickness measurements were made to verify that the cladding is within the design specifications of 1/16" to 3/8" in thickness

b All UT measurements that show clad thickness on the RPV head, including the head location coordinates for each of the measurements

c. The estimated rate of growth of the cavity at the time just prior to the plant shutdown on February 16, 2002. The average growth rate for the entire period of cavity development is not an appropriate response unless it is also demonstrated with appropriate evidence that the growth rate was constant over the period Any discussion of assumed rates of cavity growth should address the difference between the aspect ratios of the cavities found at nozzles 2 and 3. Please provide growth rate estimates in terms of linear rate of cavity expansion in the directions perpendicular to the cavity walls Volumetric estimates for growth rates are not useful for the intended analyses

d The estimated areas of exposed clad material that would cause the cladding to fail at normal operating pressure for clad thicknesses of 0.297" and 0.125."

2. The probabilistic safety assessment uses a log-normal equation to repersent the probability distribution for the strength of the clad material. Please provide the following information·

a The value of the constant, β_c, used to represent the randomness of the material strength parameter.

b. Any data on the strength properties of stainless steel alloy 308 that demonstrate the degree of randomness exhibited by that material

c. The mathematical relationship between the data and the value of β_c used in the safety assessment

3. In Table 2 in Section B 3.2, the probabilistic safety assessment provides a set of RCS pressure ranges and the corresponding values for the number of events experienced in those ranges at Davis Besse and the estimated frequency for experiencing events in those ranges Please clarify the following information:

a. The pressure ranges are all shown as greater than a specific numerical value, indicating

a cumulative distribution, but the number of events experienced at ">2300 psig" is larger than the number shown as ">2250 psig," which indicates that the distribution is not cumulative with respect to the number of events experienced. Is the distribution for the number of events cumulative, or should the table indicate pressure ranges? For the last pressure, ">2500 psig," is the frequency value intended to be cumulative for all pressures above 2500, or does it apply to a pressure interval limited by an upper bound? If an upper bound is applicable, what is it?

b. The text states that the frequency column entries for RCS pressures above 2405 psig were based on "a Bayesian update with a non-informative prior..." Please describe the shape of the prior as a function of pressure, including any limits used on the pressures to which the prior distribution is assumed to be applicable. Please provide the other statistical information used to perform the update, in sufficient detail for the staff to duplicate the computation.

4. In section B.4, on page12 of 19 in the safety assessment, it is stated that "A LOCA of 0 1 ft^2 represents the upper range of the LOCAs that require high pressure injection..." However, in the Davis Besse IPE submittal dated February, 1993, it is stated in the description of a large LOCA:

> "A large LOCA is, by definition, sufficient to depressurize the RCS to the point at which reflooding of the core would be required by the core flood tanks, with makeup in the longer term by the decay heat removal (DHR) system operating in the low pressure injection (LPI) mode ... It is assumed that rate of loss from the RCS would be large enough that the high pressure injection (HPI) and makeup pumps would not be capable of providing sufficient flow to keep the core covered without running out ... The break size that defines the large LOCA therefore ranges from the smallest break that could be accommodated solely by the LPI and the core flood tanks, up to a double ended rupture of a reactor coolant hot or cold leg The large LOCA . is therefore any break whose equivalent flow area exceeds 0.5 ft^2."

The description of a medium LOCA in the IPE submittal includes·

> "It should be noted that, at the lower end of this range (approximately 0 02 to 0 1 ft^2), the success criteria ... only HPI is needed to provide adequate makeup to the RCS. ... As a practical matter, the frequency of a medium LOCA is estimated in part that there have been no initiating breaks in this range. Hence, it is reasonable to define one event that covers the full range to simplify the analysis.. "

This seems to indicate that the medium LOCA category should be considered to be two classes of LOCAs, which we will designate "big-medium" and "little medium" to avoid nomenclature confusion. The "big-medium LOCA" appears to be break sizes between 0.1 ft^2 and 0.5 ft^2, and require success of only core flood tanks and LPI (injection and recirculation modes) to prevent core damage. The "little-medium LOCA" appears to be break sizes between 0.02 ft^2 and 0.01 ft^2, and require success of at least HPI (injection mode) to prevent core damage. Please provide the following information·

a What other systems/modes of operation are required to perform successfully to prevent core damage for the "little-medium" LOCAs? Can the need for ECCS recirculation mode be avoided? If ECCS recirculation mode is not avoided, is recirculation required in the high, low or both pressure ranges?

b. The conditional core damage probability for medium LOCAs that is calculated in the Davis Besse IPE/PSA appears to be applicable to "big-medium LOCAs " It appears that the success criteria for the "little-medium LOCAs" are less restrictive than the success criteria for both the "big-medium LOCAs" and the small LOCAs. What is an appropriate CCDP for little-medium LOCAs?"