June 19, 2002

Mr. Paul M. Blanch
135 Hyde Rd.
West Hartford, CT 06117

Dear Mr. Blanch:

Thank you for your E-mail correspondence to the Nuclear Regulatory Commission (NRC) dated May 9, 2002. Your letter indicated that you had reviewed the recently issued NRC augmented inspection team (AIT) report and the Davis-Besse root cause analysis (RCA) report. From these documents and comments made during the public meeting of May 7, 2002, you detailed six questions in your e-mail message and requested these be considered as formal questions from the meeting. Your questions have been evaluated by the staff and the responses to your specific concerns as they relate to Davis-Besse, are discussed below:

Question 1:

According to the RCA and the AIT, the cracking on Nozzle #3 was only axial. If this is true, then why did this nozzle fall over. In order to do this, it had to have circumferential cracking? Am I missing something? I think one of the enclosed photos clearly shows the circumferential crack around the "J" weld.

Response 1:

The cracking in Nozzle #3 at Davis-Besse was only axially-oriented according to the non-destructive examinations performed by the licensee. The nozzle “fell over” during the repair process when the nozzle was machined to a location above the J-groove weld and the nozzle lost the support of the J-groove weld. None of the photographs available to the NRC staff support the presence of a circumferential crack in Nozzle #3.

Question 2:

If the control rod drive mechanism had not fallen over, was Davis-Besse planning to clean the head, or as in the past, restart with a significant boron remaining on the vessel head?

Response 2:

Although the licensee for Davis-Besse did not have a regulatory commitment to clean the reactor pressure vessel (RPV) head, the licensee had stated a plan to clean the head during the most recent refueling outage to facilitate visual examination of the head at the next refueling outage. The RPV head cleaning was a contingency in case the planned new replacement head was not available at the next refueling outage.

Question 3:

The AIT and the RCA are consistent in the discussions about circumferential cracking. That is, the circumferential crack initiates from the outside diameter (OD) to the inside diameter. If this is the case, then how is it that circumferential cracking is considered primary water stress-corrosion cracking (PWSSC)? Can I assume that the circumferential cracking is the result of axial cracking?

Response 3:

Circumferential cracking initiated from the OD of the nozzle has been identified at plants both above and below the J-groove weld. For cracks initiated below the J-groove weld, the environment for these cracks is strictly primary water, and hence PWSCC is the mechanism of interest. For OD cracking above the J-groove weld, the water that initially fills the annulus between the nozzle and the reactor pressure vessel head comes from through-wall axial cracking and it has a composition similar to that of the primary water. As additional leakage occurs, the composition of the water in the annulus should become more concentrated due to the evaporation of the water itself. The description of this mechanism as PWSCC is intended to highlight that the source is primary water as opposed to secondary or raw water.

Question 4:

During the meeting there were many discussions about axial crack growth rate, but I did not hear any discussions about circumferential crack growth rates. It is my assumption that the circumferential cracks present the greater risk from possible rod ejection accidents than the axial cracks.

Response 4:

In general, circumferential cracks do present the greater safety risk from possible rod ejection events. For the conditions identified at Davis-Besse, the safety implications of the RPV head wastage outweighed those of the circumferential cracking identified. Because the licensee's root cause summary report attributes the RPV head degradation to boric acid leakage from axial through-wall cracking, the focus of the May 7, 2002, public meeting was the growth rate of the axially oriented cracking in Nozzle #3.

Question 5:

Is it possible that a through wall axial crack may occur and remain visually undetected due to a tight interference fit at the top of the head and then cause undetected circumferential cracking during an operating cycle?

Response 5:

The possibility of initiation of a circumferential crack from an undetected axial through-wall crack is a concern that the NRC has addressed in Bulletin 2001-01. Specifically, the Bulletin describes a “qualified visual examination” which includes a demonstration of a leak path from the annulus between the nozzle and the reactor pressure vessel head spanning from the J-groove weld to the outside surface of the reactor pressure vessel head. If a licensee cannot conclude that a leak path exists for any particular nozzle at a high susceptibility plant, then Bulletin 2001-01 would indicate the need to perform volumetric examination capable of detecting OD-initiated circumferential cracking. In addition, a circumferential crack that develops during an operating cycle would not be expected to have sufficient growth during that cycle to raise a safety concern.

Question 6:

The following statement is made on page #3 of the NRC AIT report: "The cracks in these five nozzles initiated from the outside diameter of the nozzle near the J-groove weld." Again, a crack initiating from the OD does not appear to be PWSCC unless the crack was below the J-groove weld.

Response 6:

The OD-initiated cracks in four of the five nozzles described on page 3 of the AIT report are located on the nozzle below the J-groove weld, and hence, in this case, the cracking is due to PWSCC. The OD circumferential crack in Nozzle #2 is above the weld, and as described in Response 3, the conditions for this crack are not true PWSCC, but primary water is the source of the environment.

In conclusion, I would like to thank you for your correspondence and sincerely hope this has answered your questions. The NRC is closely monitoring the Davis-Besse issue and that the rules and regulations that provide for safe operation of nuclear power plants are followed, and thus public health and safety is maintained.

Sincerely,

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Response 5:

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/RA/
Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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