

Dr. Mario V. Bonaca, Chairman  
Advisory Committee on Reactor Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

July 7, 2003

SUBJECT: NUREG/CR-6813 "ISSUES AND RECOMMENDATIONS FOR ADVANCEMENT  
OF PRA TECHNOLOGY IN RISK-INFORMED DECISION-MAKING"

Dear Dr. Bonaca:

Thank you for your letter, dated April 29, 2003, which forwarded NUREG/CR-6813, "Issues and Recommendations for Advancement of PRA Technology in Risk-Informed Decision Making." We also received your letter dated May 16, 2003, which provides the ACRS's perspectives and recommendations on improving the quality of risk information for regulatory decision making including a consideration of your contractor's report. The May 16<sup>th</sup> letter addresses several important issues and we look forward to interacting with ACRS on them. We appreciate the ACRS's insights and will be providing a response to that letter in separate correspondence.

The author of NUREG/CR-6813 identified some key issues that should be addressed to enhance the use of PRA for risk-informed decision making. While the NRC staff is aware of and is addressing these key issues, the staff would like to note that it is not in full agreement with all of the characterizations of the current state of PRA technology and its use. In particular, the staff is not in full agreement with some of the author's views expressed in the report regarding the Davis-Besse vessel head degradation issue. The comments relative to this issue are included in the enclosure to this letter.

We value input on our programs and will be considering this report, as appropriate, in our ongoing efforts to risk-inform NRC regulations. We expect to identify and discuss specific areas of concern, as they become relevant, in future interactions with the ACRS.

Sincerely,

**/RA/**

William D. Travers  
Executive Director  
for Operations

Enclosure: Staff Comments on Davis Besse Vessel Head Degradation Discussion in  
NUREG/CR-6813

cc: Chairman Diaz

Commissioner McGaffigan  
Commissioner Merrifield  
SECY

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## **Staff Comments on Davis-Besse Vessel Head Degradation Discussion in NUREG/CR-6813**

In April 2003, the Advisory Committee on Reactor Safeguards (ACRS) issued NUREG/CR-6813 which presents the views of the author, Karl Fleming, including specific insights he drew from the risk-informed evaluation of the Davis Besse vessel head degradation. Section 3.1 of the report describes the staff's decision to allow the licensee to delay the vessel inspection from the December 31, 2001, goal until a planned outage to commence by March 31, 2002. Mr. Fleming uses the evaluation conducted by the licensee to illustrate his views on the implications of knowledge and modeling uncertainties. While we agree that it is important to consider uncertainties in safety decisions, we disagree with the characterization of the Davis-Besse decision. This characterization does not accurately describe the basis for the staff's decision to permit continued plant operation.

At the time of the Davis-Besse decision, the staff was well aware of the corrosive effects of boric acid on carbon steel. The Oconee plant first reported through-wall leakage from a control rod drive mechanism (CRDM) in early 2001, and the related accumulation of boron crystals on the vessel head. No corrosion was found on the Oconee vessel head. The Davis-Besse licensee stated that they had cleaned the vessel head prior to entering into the last operating cycle. Based on this experience, the staff concluded that, because the vessel head is operated at very high temperatures, coolant leakage through any CRDM cracks would evaporate, leaving dry boron crystals on the vessel head. Other plants have found similar evidence of CRDM leakage and dry boron crystals. There has been no evidence that the presence of the dry boron crystals has caused any corrosive wastage. These licensees informed us that, where the dry boron crystals have been found, the vessel heads had been cleaned prior to entering the next operating cycle.

In the fall of 2001 the licensee for Davis-Besse responded to Bulletin 2001-01 and informed the staff of their intent to operate beyond the December 31, 2001, targeted completion date for vessel inspections. In that submittal, the licensee initially presented a variety of technical information to support their plans to perform the inspection during an outage scheduled to begin on March 31, 2002. During subsequent questioning by the staff, the licensee informed the NRC that they had revised the outage schedule to begin on February 16, 2002. In their response to the bulletin, the licensee stated that "[t]he RPV head area was cleaned with demineralized water to the greatest extent possible while maintaining the principles of As-Low-As-Reasonably-Achievable (ALARA) regarding the dose."

On this basis, the staff evaluation focused on the potential for CRDM cracking and the increased likelihood that such cracking would result in a loss-of-coolant accident during the period between December 2001 and February 2002. As described in the detailed safety evaluation dated November 5, 2002, the staff concluded that the licensee provided sufficient justification to support the extended period of operation, as follows:

"The staff concluded that the small increase in LOCA probability, the low conditional core damage probability and the low conditional containment failure probability meant that defense in depth was preserved, although leakage from the reactor coolant pressure boundary was likely. The staff further concluded that, while the structural margin of some CRDM nozzles was believed to be

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significantly reduced, sufficient margin remained to maintain safety and prevent a LOCA. The staff concluded that the change in core damage frequency due to the potential for CRDM nozzle ejection was consistent with the guidelines of R.G. 1.174. On December 4, 2001, the staff issued a letter to the licensee approving the proposed nozzle inspection plan submitted in their response to Bulletin 2001-01."

When the licensee shutdown on February 16, 2002 and examined the vessel head for CRDM cracking, their findings were consistent with the staff's evaluation of the safety margins associated with the cracking. The licensee's discovery of the extensive corrosion on the vessel head, resulting from accumulated boron on the vessel head over a period of years, was unexpected. The staff evaluation specifically points out that ... "[h]ad the NRC been aware of this degradation, we would have reached a very different conclusion in November."

The Fleming report characterizes the basis for the staff's decisions in terms of "the same naive modeling assumptions" that were used in the previous evaluations of the susceptibility to CRDM cracking, and goes on to state that "[t]he validity of all previous evaluations ... of Alloy 600 nozzles is now open to question." For the reasons stated above, we do not believe that this is a fair representation of the staff evaluation, both deterministic and probabilistic, used in support of the regulatory decision-making associated with the licensee's request to delay the timing of the Davis Besse inspection. In fact, Mr. Fleming points out a risk evaluation that included the potential for vessel head corrosion would likely reach the same conclusion regarding the risk of continued operation. On this basis, we respectfully disagree with the characterization of the Davis-Besse decision making process in NUREG/CR-6813.