

**From:** William Cullen / RES  
**To:** koc@nei.org  
**Date:** 10/30/02 11:07AM  
**Subject:** Industry cooperation phone call

Good morning, Kurt.

Here is what I have put together as prep for our Nov. 5/1:00 pm phone call. It turns out that Mike Mayfield will participate from Germany.

The numbers are either 1-800-638-8081 or 301-231-5539, and the passcode is 5006# (we always remind people to punch up the "#" key). At this moment, I've reserved ten lines, and we/NRC will need four of them. If industry will clearly need more than five, let me know, and I'll arrange that.

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Please call if/when you or your colleagues have any questions, additions, or modifications. As you said, we want to name names and assign dates to as many initiatives as we can during this phone call. As much as I can, I've tried to put our cards face up on the table so that you can see where we need to go. Brian Sheron has not minced words in his presentations, nor in his letter to Alex last week about his feelings on the industry's need to focus harder on Alloy 690 testing (or inspection frequency alternatives), boric acid corrosion processes, continued inspection processes for existing heads, and the transfer of those processes to replacement heads. With these incentives, I think we ought to be able to find plenty of areas in which to work together.

I've not included several materials-related items that are already a part of EPRI/MRP/NEI and NRC/RES cooperation - things that are discussed during the infrequent phone calls held between our Office or Research management and EPRI management (typically Ashok Thadani & Ted Marston plus supporting staffs). As far as I know there is a loosely forming plan to schedule such a phone call fairly soon. Perhaps, since Ted is at the NSRC meeting this week, he and Ashok will set a date - I don't know. However, such things as the two questionnaires - on thermal fatigue and component aging - that I forwarded to Alex about a month ago, should be dealt with in the NEI-EPRI/NRC context, and not in this phone call, since they do not spring directly from CRDM or Davis-Besse issues.

Regards,

Bill

William H. Cullen, Jr., Sr. Materials Engineer  
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(for mailing, abbreviate as "RES/DET/MEB")  
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**CC:** Allen Hiser; Carol Moyer; Deborah Jackson; Keith Wichman; Michael Marshall;  
Michael Mayfield; Michael Switzer; Nilesh Chokshi; Robert Tregoning; Stephanie Coffin; Terence Chan;  
Wallace Norris

H-39

### Topical Areas for Possible, Cooperative Research Between NRC and Industry Related to Davis-Besse Incident

#### Where RES/DET/MEB stands, and where industry stands on CRDM inspection-relevant research

Item	Topic	What RES/DET/MEB is doing, or plans to do	What EPRI/MRP is doing, or plans
1	Crack Growth Rate	ANL testing Alloy 600 & 182, will include Alloy 690 Neural network proposal awarded	Westinghouse is testing Alloy 600, 690, 182/82 & 152/52. No growth in 690, yet
2	Boric Acid Corrosion	Program in place at ANL, Expts begun Corrosion Rates, aqueous & molten H <sub>3</sub> BO <sub>3</sub> Flowing & near - static Range of temps & concentrations Galvanic (E <sub>ap</sub> ) measurements Possible mockup of leaking CRDM	Re-visiting SwRI program, getting a final report, Dominion Engrg continues on literature search, D-B timeline and plausibility studies EPRI has proposal for new research (new vendor)
3	PRM & PRA	Wilkowski on probabilistic leak rates Shack on prob. approach to inspection intervals Stress analysis seems to be very important	Whatever SIA and DEI (or others??) are doing
4	D-B Head Degradation	Testing Alloy 600 and 182 removed from head MEB letter report collecting/correlating boric acid properties and corrosion	Tensile, hardness, surface microphotography (SEM), metallography, on clad and low-alloy steel (LAS), all done by FENOC

#### Where we might go with industry cooperation in those four areas

Item	Topic	Areas of potential coordination/cooperation
1	Crack Growth Rate	Agree that we need more emphasis on 690/152/52, get materials, get programs underway
2	Boric Acid Corrosion	Coordinate SOW's for forthcoming programs
3	PRM & PRA	Comparison of results, calibration of databases (everyone using the same starting points?, data?). Otherwise should be NRC work that is independent of industry's calculations. Stress analysis, residual stress determination in mockups, old heads, B&W-Canada test welds, FEA, etc.
4	D-B Head Degradation	Relatively short term programs aimed at better definition of the root cause, ORNL safety assessment program needs BWXT/Framatome/FENOC input from BWXT testing & exams

I have begun to try to think ahead to the availability of the Oconee heads when they are replaced. There is a high likelihood that there will be several CRDM housings with cracks, if not a few leakers going into the RFO during which they will be replaced. These heads represent a test bed *par excellence*. We could conceptualize some terrific inspection programs, materials testing programs, fractography surface film analysis, metallography, residual stress analysis, etc., with the materials from these heads. They would need to be deconned, and will be slightly activated, but I think those hurdles would not prevent substantial testing from being done. It would seem prudent to use non-activated head elements (e.g., Midland, Jamesport, other mockups) as developmental testbeds before incurring personal dose through work on the Oconee heads.

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Content of New, Flawed Cladding Failure Criterion Research Program

■ **Analytical Calculations**

- **Thermal- and process-induced strains in the cladding**
- **Actual cavity dimensions, flawed cladding, biaxial stress**
  - Flaw geometries: 5%, 25% & 50% thru thickness, 3/8", 1" & 2" length
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■ **Experimental Program**

- **Parallels analytical program, includes materials properties tests**
- **Burst tests on simple, circular or elliptical cavity geometries**
  - Flat, clad plates, 600°F, with flaws, strain monitoring
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- **2. Computational Model, Based on Probabilistic Assessment of:**
  - **Probability of Detection & Accuracy of Sizing**
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- **Mockup to Simulate Cavity Growth in Davis-Besse**
  - **Simulate Initial, Intermediate and Final Stages of Cavity Development**
  - **Examine Nozzle #2 cavity from Davis-Besse Head**

**From:** Robert Tregoning  
**To:** Jeannette Torres  
**Date:** 11/27/02 8:18AM  
**Subject:** Fwd: Industry cooperation phone call

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