

September 18, 2002

MEMORANDUM TO: William H. Bateman, Chief  
Materials and Chemical Engineering Branch  
Division of Engineering

FROM: Meena Khanna, Project Manager /RA/  
Structural Integrity and Metallurgy Section  
Materials and Chemical Engineering Branch  
Division of Engineering

SUBJECT: SUMMARY OF JUNE 12 AND 13, 2002, MEETING WITH BWRVIP  
AND GENERAL ELECTRIC TO DISCUSS TECHNICAL ISSUES  
INVOLVED IN STAFF REVIEW OF BWR CRACK GROWTH RATE  
AND FRACTURE TOUGHNESS SUBMITTALS

The staff and its contractor, Argonne National Laboratory (ANL), met with members of the BWR Vessel and Internals Project (BWRVIP), the Electric Power Research Institute (EPRI) and General Electric Nuclear Energy (GE-NE) on June 12 and 13, 2002, to discuss irradiated crack growth rates (BWRVIP-99), fracture toughness of irradiated stainless steels (BWRVIP-100), crack growth in nickel base austenitic alloys (BWRVIP-59), and the technical basis for inspection relief with hydrogen water chemistry (BWRVIP-62). The meeting attendees are listed in the Attachment. The BWRVIP's handouts contain information that the staff has found to be proprietary and will be withheld from public distribution. The following provides an overview of the topics that were discussed.

#### Irradiated Crack Growth Rates (BWRVIP-99)

A representative of EPRI provided an overview of the report on irradiated crack growth rates (BWRVIP-99) that was submitted to the NRC in December 2001. Corrections were identified that will be made to the BWRVIP-99 document and submitted to the NRC. Following the BWRVIP presentation and caucus, the staff indicated that a Request for Additional Information (RAI) would be issued to request the following information in regards to BWRVIP-99:

1. Provide additional detail describing the data in Figures 8-1 and 8-2 of the BWRVIP-99 report, such as the fluence for each data point. For example, data points could be grouped, "binned" into ranges of fluence or tabulated.
2. Describe how the transition from the crack growth rates proposed for fluences  $< 5 \times 10^{20}$  n/cm<sup>2</sup> in BWRVIP-14 and those for fluences  $\geq 5 \times 10^{20}$  n/cm<sup>2</sup> in BWRVIP-99 will be addressed.
3. Show how field data compares to predictions in Figure 9-2 of BWRVIP-99.

4. Provide crack growth rates vs. normalized depth comparison using the “average” crack depth rather than the “initial” crack depth.
5. Provide the technical basis for the disposition curves in Figures 8-1 and 8-2 in BWRVIP-99,

#### Fracture Toughness of Irradiated Stainless Steels (BWRVIP-100)

Representatives of EPRI and Sartrex described the updated assessment of fracture toughness of irradiated stainless steels contained in the BWRVIP-100 document that was submitted to the NRC in December 2001. The staff indicated that additional fracture toughness data was contained in recently issued Volume 31 of the Argonne annual report provided in NUREG-4667. The staff also suggested that the planned BWRVIP work in 2003 to identify long term plans for addressing crack growth and fracture toughness in high fluence BWR materials should be considered for discussion during the July 25, 2002, BWRVIP Executive Oversight Committee meeting with NRC management.

The staff indicated that the following RAI would be issued in regards to BWRVIP-100:

Perform a sensitivity analysis using several values of the exponent “n” in the relationship  $J_{\text{material}} = C(\Delta a)^n$  to try to bound the fracture toughness data. Also include the new data in Volume 31 of the Argonne annual report.

#### Crack Growth in Nickel Base Austenitic Alloys (BWRVIP-59)

A representative of EPRI provided a brief update on the status of the BWRVIP response to the issues identified in the NRC Safety Evaluation (SE) of the BWRVIP-59 report. The chronology of events on this subject and the BWRVIP Action Plan to address the issues in the NRC SE were discussed. In addition, it was indicated that the BWRVIP response to the SE would be transmitted to the NRC in approximately one month.

#### Technical Basis for Inspection Relief with Hydrogen Water Chemistry (BWRVIP-62)

A representative of Exelon provided an update on the BWRVIP response to open items in the NRC SE on the BWRVIP-62 report. The additional plant data included in the electrochemical corrosion potential (ECP) vs. feedwater hydrogen response plot was discussed. It was indicated that GE Nuclear Energy is now recommending a  $\text{H}_2:\text{O}_2$  molar ratio of 3:1 be maintained to provide adequate margin for protection against cracking. Also, the staff was advised that the “Measured  $\text{H}_2:\text{O}_2$  Molar Ratio” has been added as a “Secondary Parameter” for Category 3a plants in the revised Table 3-5 of the report. It was stated that the BWRVIP has yet to determine how to apply the Factor of Improvement (FOI) approach to recommendations for inspection scope and frequency for plants that have implemented the noble metal chemical application (NMCA) or moderate hydrogen water chemistry (HWC). The staff requested that the BWRVIP provide the following information in regards to BWRVIP-62:

1. Provide a hydrogen to oxygen molar ratio calculation by the BWRVIP radiolysis ECP model for Quad Cities 2, Susquehanna and for a BWR/6.
2. Provide any additional plant data for the ECP vs. feedwater hydrogen response for NMCA treated BWRs.

Distribution:

EMCB RF  
SDuraiswamy  
WCullin

MEMayfield  
NCChokshi  
CEMoyer

Meeting Attendees  
(Attachment 1)

ADAMS Accession #ML022620475

INDICATE IN BOX: "C"=COPY W/O ATTACHMENT/ENCLOSURE, "E"=COPY W/ATT/ENCL, "N"=NO COPY

DE:EMCB	E	DE:EMCB	E
MKhanna		SCoffin	
09/ 18 /2002		09/ 18 /2002	

OFFICIAL RECORD COPY

Meeting with BWRVIP and General Electric List of Meeting Attendees - June 12, 2002

Shiu-Wing Tam, ANL  
Yung Liu, ANL  
Omesh Chopra, ANL  
Vik Shah, ANL  
Bill Shack, ANL  
Guy Deboo, Exelon  
Robert Carter, EPRI  
Raj Pathania, EPRI  
Larry Steinert, EPRI  
Ron Gamble, Sartrex  
Robin Dyle, Southern Nuclear  
Peter Andresen, GE  
Ron Horn, GE  
Stephanie Coffin, NRC  
Gene Carpenter, NRC  
Meena Khanna, NRC

Meeting with BWRVIP and General Electric List of Meeting Attendees - June 13, 2002

Shiu-Wing Tam, ANL  
Yung Liu, ANL  
Omesh Chopra, ANL  
Bill Shack, ANL  
Guy Deboo, Exelon  
John Wilson, Exelon  
Robert Carter, EPRI  
Raj Pathania, EPRI  
Larry Steinert, EPRI  
Robin Dyle, Southern Nuclear  
Peter Andresen, GE  
Ron Horn, GE  
Stephanie Coffin, NRC  
Meena Khanna, NRC

ATTACHMENT