

December 19, 2003

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

FROM: Meena Khanna, Materials Engineer */RA/*
Materials and Chemical Engineering Branch
Division of Engineering

SUBJECT: SUMMARY OF NOVEMBER 5, 2003, MEETING WITH THE BOILING
WATER REACTOR VESSEL AND INTERNALS PROJECT (BWRVIP)
EXECUTIVES AND NRC MANAGEMENT TO DISCUSS VARIOUS
ISSUES RELATED TO BWRVIP ACTIVITIES

On November 5, 2003, the Division of Engineering management met with the Boiling Water Reactor Vessel and Internals Project (BWRVIP) executives to discuss various BWRVIP activities, including the status of noble metal chemical addition, integrated surveillance program license amendment submittals, planned steam dryer inspection activities, cracking in low carbon stainless steel in Japanese BWR internals and piping, and the fiscal year 2004 NRC budget and resources for BWRVIP reviews.

Richard Barrett, Director of the Division of Engineering, provided an introductory comment in which he stated that the NRC's general view of the BWRVIP program is that it is a successful program. In addition, Mr. Barrett stressed the importance of the steam dryer inspection activities and the staff's concerns with respect to the potential of the steam dryer cracking effecting power uprates.

The meeting was then turned over to Mr. Eaton, the BWRVIP Vice-Chairman, who provided a discussion of the status of the BWRVIP activities. Mr. Eaton indicated that 9 BWRVIP topical reports had been transmitted to the NRC in 2003. The reports addressed issues such as reactor pressure vessel and internals examination guidelines, evaluation of SCC growth in low alloy steel vessel materials in the BWR environment, RAMA fluence methodology, etc. Ongoing 2003 BWRVIP major tasks, were also discussed, which included crack growth and fracture toughness in high fluence BWR materials, evaluation of cracking in jet pump beams, and the integrated surveillance program. Mr. Eaton also listed the high priority BWRVIP issues for NRC review which included non-destructive examination (NDE) uncertainty, RAMA fluence methodology, crack growth and fracture toughness in irradiated stainless steels, revised GL 88-01 piping inspection schedules, and revised shroud support inspection guidelines. Mr. Eaton also indicated that the BWRVIP has an action item to revisit materials issues, particularly in non-safety related components. He also noted that the charters of the BWRVIP and the Boiling Water Reactor Owners Group (BWROG) had been revised. Noteworthy changes are that the BWRVIP has been assigned the lead organization to address BWR materials issues and that a process has been developed for improved coordination of activities between the BWRVIP and the BWROG.

A BWRVIP representative then presented an update of noble metal chemical addition (NMCA). It was stated that 70% of US BWRs have implemented NMCA. The BWRVIP representative indicated that the BWRVIP had evaluated its inspection data with respect to NMCA. The BWRVIP representative provided charts and inspection data that displayed the general trends of noble metal durability following NMCA. In addition, the BWRVIP representative provided data related to the NMCA effectiveness. The BWRVIP representative stated that adequate hydrogen availability is essential to ensure NMCA effectiveness with respect to stress corrosion cracking mitigation.

In continuing with the discussion of the NMCA, the BWRVIP representative presented data of crack growth rates calculated from each inspection to the most current inspection. The summary of the results of the BWRVIP's evaluation indicated the following: (1) for normal water chemistry, the study validated the use of bounding rates of 5×10^{-5} inches/hour for the length direction and 2.2×10^{-5} inches/hour in the depth direction, (2) additional inspection data is needed to confirm crack growth rates for hydrogen water chemistry (HWC) and NMCA plants, and (3) additional information is needed to establish the relationship of fluence to crack growth. The BWRVIP representative concluded its discussion by indicating that the BWRVIP would continue to evaluate the effectiveness of mitigation with NMCA and moderate HWC by the analysis of core shroud reinspection data from various BWR plants, and would provide periodic updates on reinspection results to the staff.

Stephanie Coffin, Section Chief of the Vessels and Internals Integrity and Welding Section, then provided a brief discussion of the integrated surveillance program (ISP) license amendment submittals. Ms. Coffin stated that the staff is waiting for 6 submittals from the BWRVIP ISP plants. She indicated the importance of having all of the BWRVIP ISP plant amendments submitted to the staff, so that there is a complete program in place, which could play an important role in license renewal space. The BWRVIP representatives understood the staff's concerns and will request the remaining 6 ISP plants to submit their ISP license amendments.

The next topic that was discussed was IGSCC of low carbon (316NG) stainless steel piping in Japan. The BWRVIP representative described the characteristics of cracking and the suspected causes for crack initiation in the Japanese BWRs of 316NG stainless steel piping. Some of these suspected causes include excessive cold work during fabrication and chemical composition of the piping. The BWRVIP representative concluded his presentation by indicating that the inspection experience in the U.S. demonstrates exceptional performance of 316NG pipe replacements, and that, currently, no changes to the inspection programs have been recommended. However, the BWRVIP indicated that they would continue to monitor Japanese developments and evaluate the applicability to the U.S. plants.

A representative of the BWRVIP then presented a discussion regarding the update of the BWR steam dryers. The BWRVIP representative began the discussion by addressing SIL 644 which described the steam dryer failures at Quad Cities and recommended additional monitoring and inspections for all BWR plants operating at power levels greater than the operator licensed thermal power. The BWRVIP then discussed the relative susceptibility of the steam dryers and the various types of General Electric steam dryer hoods. It was emphasized that the steam flow is the forcing function for the pressure loads during normal operation and that the stress on

the dryer structures was controlled by the dryer design. The representative of the BWRVIP indicated that the BWRVIP is in the process of developing the inspection guidelines and flaw evaluation guidelines for the various configurations.

The BWRVIP representative also indicated that the Boiling Water Reactor Owner's Group (BWROG) Steam Dryer Committee was formed to review recent steam dryer failures and develop an action plan. Short and long term plans were developed to address the steam dryer integrity concerns which included: develop BWRVIP inspection and evaluation guidelines, revisit BWRVIP safety assessment (BWRVIP-06), and address broad reliability and performance issues of the steam dryers.

An overview of the results of the recent steam dryer inspections was also provided for various plants. In addition, the results from the BWRVIP/BWROG survey were discussed. The BWRVIP representative indicated that 19 units have uprated power or are planning future power uprates and that most of the units will be monitoring moisture carryover.

The BWRVIP representative indicated that the BWRVIP program and I&E development is intended to address the steam dryer issues such as preventing failures versus monitoring, inspection methods guidance, inspection timing, and fabrication. The BWRVIP's overall recommendation is that the BWRVIP program be used as the regulatory oversight for maintaining the steam dryer integrity.

Following the BWRVIP's presentation of the steam dryer inspections, members from the Mechanical Engineering Branch provided feedback from its earlier meeting with members of the BWR Owners Group. The staff indicated that the BWRVIP committed to provide a breakdown of the plants by steam dryer type, power uprate, and actions taken in accordance with SIL No. 644, Supplement 1. The staff also indicated its concern that the BWRVIP's emphasis was on the designs of the BWR3s with the square dryers with internal braces, only; therefore, the staff questioned what was being done to ensure the integrity of the other designs, especially since the failures occurred only after uprates causing higher steam flows. It was indicated that the staff must assume that the higher flow rates caused the failures by increasing the loads to cause new cracks or exacerbate the failure of existing cracks. Therefore, the staff questioned that when flow is increased in the other steam dryer designs, how can the staff ensure that this same phenomena will not happen. The BWRVIP indicated that plants with proposed uprates are performing more detailed structural analyses. In addition, the BWRVIP stated that it has evaluated and will perform additional analyses to evaluate the effects of a power uprate on other reactor internals in the steam and feed flow path. Lastly, the BWRVIP indicated that it would address proactive measures with respect to the steam dryers for all plants, and that the guidance for this would be completed in the Summer of 2004.

A brief discussion was held with regards to the fiscal year (FY) 2004 NRC budget and the resources for BWRVIP reviews. It was indicated that the FY2004 NRC resources for BWRVIP reviews may be reduced from the FY2003 resources, because of other higher priorities such as license renewal. The BWRVIP stated that they are open to exploring ways to ensure NRC resources remain available.

W. H. Bateman

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The NRC staff expressed its appreciation to the BWRVIP executives for the presentations. In closing, Mr. Barrett reiterated that the BWRVIP is a highly successful industry program.

An attendance list is provided in the enclosure. The slides used during the meeting are available in ADAMS under accession number ML033520378.

Enclosure: Meeting Attendees

cc w/att: See next page

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DATE	12/18/03	12/18/03	12/19/03

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MEETING ATTENDEES

MEETING WITH THE BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT

NOVEMBER 5, 2003

NRC

Richard Barrett
Bill Bateman
Gene Imbro
Stephanie Coffin
David Terao
Kamal Manoly
Francis Akstulewicz
Meena Khanna
Kris Parczewski
Alan Wang
Thomas Scarbrough
Alex Velazquez
Carol Moyer

BWRVIP

Bill Eaton
Lewis Sumner
Robin Dyle
Tom Mulford
Robert Carter
Raj Pathania
Ron Horn
Dan Pappone
Ken Putnam
Jeffrey Goldstein
Larry Steinert
Jim Meister
Bruce Swouer
David Berko

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cc:

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