

December 18, 2003

MEMORANDUM TO: Cathy Haney, Program Director  
Policy and Rulemaking Program  
Division of Regulatory Improvement Programs, NRR

FROM: Joseph L. Birmingham, Project Manager /RA/  
Policy and Rulemaking Program  
Division of Regulatory Improvement Programs, NRR

SUBJECT: SUMMARY OF NOVEMBER 25, 2003, MEETING WITH INDUSTRY  
AND THE MATERIALS RELIABILITY PROJECT ON LONG-TERM  
INSPECTION PLANS FOR BOTTOM MOUNTED NOZZLES

On November 25, 2003, Nuclear Regulatory Commission (NRC) staff met with representatives of the Nuclear Energy Institute (NEI), the Electrical Power Research Institute (EPRI) Material Reliability Project (MRP), and industry in a public meeting at NRC headquarters in Rockville, Maryland. Additional public and industry representatives participated via teleconference. At this meeting, industry presented its long-term strategic plan for detection and control of leakage and corrosion of bottom mounted nozzles (BMN). This concern arose after boric acid residue was detected on the reactor vessel bottom at the South Texas Project Unit 1. Attachment 1 provides a list of those in attendance at the meeting. Attachment 2 provides the information presented by industry at the meeting and it is available in the NRC Agencywide Document Access and Management System (ADAMS) under Accession number ML033350012. Attachment 3 is a list of questions and comments from the NRC staff on the strategic plan that were made during the meeting.

After introductions, Richard Barrett, of the NRC, expressed the staff's interest in hearing the details of the strategic plan and the importance of having a comprehensive approach to the concern for potential leaks or corrosion of the reactor vessel bottom and the bottom mounted nozzles. He indicated that the staff needed a better understanding of the initiating causes, crack growth rates, and methods of detection in order to assess the effectiveness of any proposed inspection plans.

Jim Riley responded that industry agreed and believed that the strategic plan for BMN and the vessel bottom addressed these issues. He then introduced Garry Randolph from Ameren UE, Larry Matthews from Southern Nuclear, and Mel Arey from Duke Energy who presented the various parts of the strategic plan.

Industry first presented the short-term evaluations of the concern by reactor vessel design. For Babcock and Wilcox (B&W) designed vessels, industry had performed loss-of-coolant analyses for two scenarios. One scenario was a break area of the inside diameter of the nozzle with the incore detector ejected (0.0021 ft<sup>2</sup>) but with the nozzle obstructing the flow area. The other scenario was a break area with the incore detector ejected and the nozzle not obstructing the break flow area (0.0060 ft<sup>2</sup>). Industry determined that, for either of these breaks, the 10 CFR

50.46 criteria for peak clad temperature would not be exceeded. Therefore, any break of a single bottom mounted nozzle at a B&W operating plant would be mitigated by the emergency core cooling system (ECCS) and allow for safe shutdown without fuel damage.

Industry then presented the evaluation of the Westinghouse Owners Group (WOG). The WOG evaluation had determined that, for either axial or circumferential cracking, leakage would be detected by inspection before failure would occur. The WOG also determined that ejection of the BMN penetration tube was not credible. The WOG assessment concluded that a BMN inside diameter failure would be mitigated by the ECCS without crediting operator action.

The MRP presented its current recommendations for BMN inspection. In a June 2003 letter to all pressurized water reactor (PWR) owners, the MRP had recommended that a bare metal examination be performed of any Alloy 600 nozzles on the bottom vessel head and that non-visual examination may ultimately be a prudent or necessary component of a comprehensive inspection plan. Further, the MRP provided a White Paper to the MRP members containing cautions, recommendations, and experiences from various plants on BMN inspections. The White Paper also described methods for visual examination of deposits, sampling techniques, types of analyses that may be useful, typical aging equations, and other information on boric acid sampling and analyses. The MRP is currently evaluating the need for a formal document.

The MRP then presented the long-range bottom mounted nozzle strategic plan which consists of four parts:

- NDE Demonstration Program
- BMN Assessment Plan
- Integrated Industry Inspection Plan
- BMN Repairs

The NDE demonstration program would demonstrate NDE technologies and techniques for use by industry to inspect reactor vessel BMN. The BMN assessment plan would demonstrate safety of operation, continued compliance with regulatory requirements, define inspection requirements, and develop inspection and evaluation guidelines to assure safe and reliable operation. The integrated industry inspection plan would perform selected volumetric inspections to aid in determining long-term inspection and monitoring strategies, gather additional data on the extent of the problem, and develop a proactive industry management program that assures safe and reliable operation. The BMN repair part of the plan would define the attributes of an ideal repair, evaluate current repair options versus the ideal attributes, develop new repair technology if necessary, and provide resources for repair technique development as needed. Details of the portions of the strategic plan are in Attachment 2 to this memorandum.

In summary, industry stated that there is no immediate safety concern, bare metal visual examinations are ongoing, multiple volumetric examinations of a sample of plants will be completed over the next four outage seasons, NDE demonstrations are underway, and BMN assessment is in progress. Industry proposed and the staff agreed that a meeting should be planned for March of 2004 to review the project status and any preliminary results. Industry

said the strategic plan was part of an industry initiative to be proactive on materials issues and was being administered under the guidelines of NEI 03-08, "Guideline for the Management of Materials Issues," (ADAMS Accession No. ML032190048).

During the meeting, the staff asked questions and made comments on details of the strategic plan. Attachment 3 summarizes those questions and comments. The MRP acknowledged the questions and comments and agreed that the specifics of their plan would address them. It was proposed that these technical issues be discussed further at the March 2004 meeting.

Rich Barrett summarized the staff's impression of the plan. He said that it was good to see the industry being proactive on this and other Alloy 600 issues, that the NRC considered the use of NEI 03-08 to be a benefit to the management of materials issues, and that the staff recognized the importance of obtaining information from volumetric examinations. He said that the staff would continue its own review of the concern but would closely follow the implementation of and results from the industry's strategic plan.

Having concluded the discussion, the meeting was adjourned.

Project No. 689

Attachments: As stated

cc: w/att: See list

**List of Attendees for November 25, 2003 Meeting with  
Material Reliability Program on RV Bottom Nozzle Penetrations**

<b>NAME</b>	<b>ORGANIZATION</b>
Jim Riley	NEI
Garry Randolph	Ameren UE
Christine King	EPRI
Larry Matthews	Southern Nuclear
Chris Morgan	Westinghouse
Mel Arey	Duke Power
*John Klingenfus	Framatome ANP
Mike Schoppman	Framatome ANP
Dave Bajumma	Dominion Nuclear/WOG
Altheia Wyche	SERCH Licensing Bechtel
Deann Raleigh	LIS SCIENTECH
Richard Barrett	NRC/NRR/DE
William Bateman	NRC/NRR/EMCB
Edmund Sullivan	NRC/NRR/EMCB
Stephanie Coffin	NRC/NRR/EMCB
Neil Ray	NRC/NRR/EMCB
James Medoff	NRC/NRR/EMCB
Eric Reichelt	NRC/NRR/EMCB
John Hancharik	NRC/NRR/EMCB
Barry Elliot	NRC/NRR/EMCB
Ganesh Cheruvenki	NRC/NRR/EMCB
Andrea Lee	NRC/NRR/EMCB
Robert Davis	NRC/NRR/EMCB
Ed Hackett	NRC/NRR/DLPM
Steven Monarque	NRC/NRR/DLPM
Leslie Spain	NRC/NRR/DLPM
Joseph Birmingham	NRC/NRR/RPRP
Allen Hiser	NRC/RES/DE/MEB
Jessie Quichocho	NRC/NRR/IEPB
* Via teleconference	

**NRC Staff Questions and Comments about the  
Bottom Mounted Nozzle Strategic Plan  
From a November 25, 2003 Meeting with the EPRI/MRP**

- LOCA/Appendix K analysis results for W plants would be beneficial
- WOG assertion that ejection of a BMN not credible deserves detailed discussion
- LOCA results for both B&W and W plants for multiple BMN failures would be beneficial
- industry recommendations for when visual inspections are compromised (e.g., due to access restrictions or other obstructions)
- discussion of when a VT-1 type of inspection (or volumetric type inspection) would be appropriate (versus a VT-2)
- what the process would be for formalizing, promulgating industry recommendations
- guidance on boron residue sampling, testing, methodology would be beneficial
- would like to keep involved with NDE demonstration project
- NDE of welds continues to be a challenge; how is this being addressed
- gain understanding of NDE technique and personnel qualification process
- obtain fabrication details from manufacturers
- gain understanding of key assumptions such as stress analyses, crack growth rates, NDE detection capability, etc.
- repair/replacement plans for A600/82/182 materials
- voluntary volumetric inspections of BMNs: outstanding recommendation. Staff would like to gain understanding of extent, plants, schedules, etc.
- Overall comment: gain understanding of specific inspection guidelines issued by industry and technical basis for such

Nuclear Energy Institute

Project No. 689

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**Distribution:** Mtg w/NEI&EPRI RPV head and penetrations inspection plan Dated 7/ /02  
ADAMS/PUBLIC OGC ACRS

DISTRIBUTION: MTG. SUMMARY w/NEI &EPRI Re Hot-Leg Weld Crack Dated 01/02/01

E-Mail

SCollins/RZimmerman

JJohnson

WBorchardt

BSheron

DMatthews

CGrimes

SWest

CCasto

WBateman

KWichman

MSatorius, OEDO

OPA

JBirmingham

Debbie Jackson

SBloom

BWetzel

MMarshall

SLong

TChan

ALee

GLongo

CLong

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ADAMS Accession #: ML0

DOCUMENT: G:\RPRP\JBirmingham\Msum-new\MRP Plan BMN 11-25-03.WPD

OFFICE	RPRP	EMCB	RPRP
NAME	JBirmingham	WBateman	RDudley (Acting)
DATE	12/18 /2003	12/16/2003	12/18/2003

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