

March 28, 2008

MEMORANDUM TO: Terence L. Chan, Chief
Piping and NDE Branch
Division of Component Integrity
Office of Nuclear Reactor Regulation

FROM: Donald G. Naujock, Materials Engineer */RA/*
Piping and NDE Branch
Division of Component Integrity
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING HELD DECEMBER 5 AND 6, 2007 WITH
THE ELECTRIC POWER RESEARCH INSTITUTE PERFORMANCE
DEMONSTRATION INITIATIVE REPRESENTATIVES
(TAC NO.: MD6546)

On December 5 and 6, 2007, the staff participated in a public meeting with representatives from the Electric Power Research Institute (EPRI) – Performance Demonstration Initiative (PDI) program at the EPRI Non-Destructive Examination Center, 1300 W. T. Harris Boulevard, Charlotte, NC. EPRI provides PDI's business operations and technical support. PDI is a nuclear power industry initiative established to develop and administer the qualifications requirements of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," Section XI of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code) and to develop and administer the demonstrations and qualifications of ultrasonic examinations of butt welds that are associated with other EPRI programs.

The purpose of the meeting was to discuss PDI's approach for implementing selected aspects of Appendix VII and associated items. The subjects discussed were the status of reactor pressure vessel and piping performance demonstrations, the variables in the performance demonstration data base, the proposed ASME Code actions affecting ultrasonic examinations, the inspectibility of cast austenitic piping, dissimilar metal welds, weld overlays, and austenitic welds from the far side, and the regulatory action affecting ultrasonic testing (UT) examinations. These meetings are a continuation of formal dialog between Nuclear Regulatory Commission (NRC) and the industry on PDI's implementation of Appendix VIII and other nondestructive testing issues of mutual interest. The dialog provides opportunities to discuss testing difficulties, review PDI's program methodology for the selected supplements, and address issues regarding the ASME Code. The meeting participants and agenda are listed in Enclosures 1 and 2 respectively. Handouts provided at the meeting are included as Enclosures 3 through 13.

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OPEN ITEMS FROM THE MAY 2 THROUGH 4, 2007

PDI presented the status of open items from the May 2 through 4, 2007 meeting in Enclosure 3, "Open Items." The NRC met with PDI on July 24 and 25, 2007 to discuss the data contained in PDI's databases (NRC meeting minutes are in ADAMS ML072960057). Items not listed as completed in the enclosure were discussed in the presentations made during this meeting.

The EPRI Material Reliability Program (MRP) program manager presented an update on program activities. The presentation handout is Enclosure 4, "MRP Inspection ITG Report." There was a reiteration of MRP's comments to the proposed 10 CFR 50.55a draft rulemaking (72FR16731) and Code Case N-729, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds." MRP is working to grandfather existing control rod drive mechanism (CRDM) mockups, to demonstrate j-groove weld leak paths, to apply technical justification qualification, and to developing guidance for inspection of bottom mounted nozzles using visual testing and UT methods. MRP is striving to have procedures, equipment and personnel qualified for CRDM inspections by September 2009.

The EPRI-MRP program manager also provided an update on the development of weld inlay examination capability. The development is following the PDI approach in administering equivalency testing. No action items.

Boiling Water Reactor Vessel and Internals (BWRVIP)

PDI presented the status on BWRVIP examination work in Enclosure 5, "BWR Vessel and Internals Project." BWRVIP held a symposium on inspection activities in December 2007, will offer internal vessel visual inspection training courses in 2008, sent a response to NRC's request for additional information on BWRVIP-03, Revision 6, completed Revision 10 to BWRVIP-03, and supported related inspection activities. The changes in BWRVIP-3, Revision 10 were in response to some of the conclusions published in NUREG/CR-6860, "An Assessment of Visual Testing." EPRI's technical bases for the changes are supported by a report which was not available for viewing by meeting participants. Action item: PDI will search for a way to share EPRI's technical bases with meeting participants.

REACTOR PRESSURE VESSEL DEMONSTRATION PROGRAM

PDI presented the reactor pressure vessel (RPV) program status in Enclosure 6, "PDI RPV Update." The RPV program covers ASME Section XI, Appendix VIII, Supplements 4, 5, 6, and 7. The presentation summarizes the performance demonstration pass rate for manual and automated examinations performed from inside and outside surfaces. PDI qualified a phased array manual generic RPV procedure for examination of plates from the outside surface. The generic Supplement 4 and 6 procedure is qualified for detection, length, and depth sizing. PDI stated that they are experiencing an increase in RPV performance demonstration requests due to international participation, upgrading equipment, and expanding qualifications. No action items.

ASME CODE UPDATE

PDI presented ASME Code activities associated with nondestructive examinations (NDE) in Enclosure 7, "ASME Section XI Development." There are nineteen ASME Code action items at various stages of the consensus process. On Code Case N-526 there is an unanswered

question on the measurement accuracy associated with a flaw tip-to-RPV surface ligament. Currently, UT examiners are not qualified for ligament measurements. During the July 2007 meeting with the NRC, PDI analyzed RPV ligament error from the Supplement 6 performance demonstration data stored in PDI's RPV database. The analysis showed a root mean square (RMS) ligament error of 0.162-inch which was calculated using 60 observations. No conclusions or proposals were made on addressing ligament error or ligament measurement qualifications in Code. Open item:

WELD INLAY DEVELOPMENT PROGRAM

PDI presented the weld inlay program status in Enclosure 8, "Weld Inlay Examination Capability." Weld inlays are being developed to address surface flaws originating from the inside diameter (ID) of a pipe or weld made of stress corrosion cracking susceptible material. The approach is to acquire representative samples and document the capabilities of qualified personnel and procedures to effectively examine the inlay and adjacent base material. If the ID examinations are successful, Supplements 10 and 14 will be expanded to include corrosion resistance cladding which is basically an ID applied inlay. Action item: PDI is continuing development.

Piping Performance Demonstration Program

PDI presented the piping program status in Enclosure 9, "PDI Piping & Bolting Program Update." To address gaps in test specimen configurations, PDI has added new dissimilar metal weld and weld overlay mockups to the testing inventory. A summary of the number of personnel with different qualification combinations can be easily misinterpreted as a large pool of qualified personnel. Currently, most of the personnel have multiple qualifications, and these personnel are predominately working in the utilities overseeing inspections and not in the field performing inspections. The implication is that there is a large concentration of qualifications in a small personnel pool. The nuclear power industry is concerned with a potential shortage of qualified UT personnel. The more difficult to master phased array UT technique is quickly becoming the industry's primary inspection tool which is adding to the challenge of training new personnel. No action items.

The industry's approach to difficult to examine dissimilar metal (DM) weld configurations has been to use weld overlays to change the configurations. The increase in use of weld overlays has increased demand for Supplement 11 procedure and personnel qualifications. The increase in demand for qualifications is exceeding PDI's testing capacity. A participant suggested that the industry could do away with the three year requalification requirement, thus easing the strain on PDI's capacity. The participant believed that performance demonstration pass rates are high; therefore, requalification is unnecessary. The suggestion needs a technical justification. The data in the PDI database may provide answers to the perceived high pass rates, and if the perception is correct, the cause for high pass rates. This is an open item for the next NRC/PDI meeting.

WELD OVERLAY PROGRAM STATUS

PDI presented flaw measurements in weld overlays in Enclosure 10, "Technical Basis of Weld Overlay Indication Evaluation and Disposition Based on Advanced Technology Assessments." The presentation discussed measuring accuracy for flaw width and depth. The current UT techniques cannot accurately size embedded planar flaws in weld overlays with through-wall thickness less than 1/2-inch. PDI is in the process of fabricating additional mockups with planar

flaws embedded in weld overlays 0.6 through 1.4-inch thick. PDI is developing guidelines to address enhanced sizing techniques which should be available in December 2007. Action Item: PDI is continuing development of these guidelines.

ALLOY 82/182 WELDS

PDI presented inspection progress of Alloy 82/182 butt welds in Enclosure 11, "Inspection & Mitigation of Alloy 82/182 Butt Welds." The presentation summarized projects on detecting and sizing cracks in cast and wrought austenitic (Alloy 600) components. For thin-wall cast austenitic components, PDI used several low frequency transducers and obtained good performance with a 500 kHz transducer. PDI is in the process of procuring thick-wall cast austenitic mockups. For wrought austenitic components, PDI had good performance using a 1.5 kHz transducer. PDI is using electrical discharge machined notches stuffed with tungsten mesh and compressed with a hot isostatic pressing process to simulate cracks. The development work is to improve UT detection and sizing in the WOL and below the outer 25% through-wall base metal. In conjunction with the equipment and flaw measuring development, PDI is providing input for ASME Code activities. An EPRI report, "Proposed Code Case Criteria for Technical Basis on Advanced Technology Assessments, 1015148," addresses characterizing embedded planar and laminar flaws. The EPRI report is to provide a technical basis for ASME Code activities. Open Items: PDI will continue developing UT techniques for detecting cracks in cast austenitic components.

SUPPLEMENT 2 SINGLE SIDE EXAMINATIONS

PDI presented an overview of the difficulties with single side qualifications in Enclosure 12, "Single Side Access Capability." PDI explained that the impediments to single side qualifications are dissimilar component alignment, weld surface condition, design through-wall limits, and counter-bore. PDI provided examples of weld configuration to show the impediments to UT examinations. The industry's solution to the impediments is to limit austenitic-to-austenitic (Supplement 2) weld examination coverage to the same side as the transducer. The industry self imposed the 50% maximum limitation per weld side restriction in the mid 1990's. The industry does not have the same limitation on dissimilar metal welds (Supplement 10, austenitic-to-ferritic and austenitic-to-austenitic welds) which was developed in early 2003. The NRC used weld configurations (in Enclosure 12) similar to PDI's configurations to show the UT progress toward achieving single side qualification for austenitic welds. Since the mid 1990s, weld surface condition requirements have changed to accommodate risk-informed examinations, UT techniques have evolved, and minimum wall thickness requirements supporting Section XI weld overlay Code cases suggest some latitude with Section III wall thickness criteria. Action Item: PDI will present a request to the steering committee to review the self-imposed 50% maximum limitation criterion and to provide specimens and procedures for Supplement 2 (Supplement 10) single side examination qualifications.

NEW ISSUES OF MUTUAL INTEREST

PDI presented the concept of using technical justification to establish UT instrument equivalency in lieu of a performance demonstration, Enclosure 13, "Ultrasonic Equivalency Demonstration through Technical Justification." UT equipment is required to be qualified for Appendix VIII applications with a performance demonstration. Changes to equipment that affect the sound

responses require a new performance demonstration qualification. Some UT equipment is becoming obsolete and being replaced by the manufacturer with newer designs. PDI is looking for an efficient way to validate the equipment equivalency using a process similar to Appendix VIII, Supplement 1. Action Item, PDI will continue with the program development.

NEXT MEETING

The next semi-annual NRC/PDI meeting is tentative scheduled for May 2008. The exact date and location will be announced at a later date.

Enclosures:

1. Public Meeting with EPRI-PDI Attendance
2. Agenda for Meeting with EPRI-PDI
3. Open Items
4. MRP Inspection ITG Report
5. BWR Vessel and Internals Project
6. PDI RPV Update
7. ASME Section XI Development
8. Weld Inlay Examination Capability
9. PDI Piping & Bolting Program Update
10. Technical Basis of Weld Overlay Indication Evaluation
11. Inspection & Mitigation of Alloy 82/182 Butt Weld
12. Single Side Access Capability
13. Ultrasonic Instrument Equivalency Demonstration through Technical Justification

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12. Single Side Access Capability
13. Ultrasonic Instrument Equivalency Demonstration through Technical Justification

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Attendance for public meeting with EPRI-PDI, December 5 and 6, 2007

NAME	ORGANIZATION
Don Naujock	NRC
Tim Lupold	NRC
Steve Doctor	Pacific Northwest National Laboratory
Carl Latiolais	EPRI
Brad Thigpen	EPRI
Mike Gothard	EPRI
Jack Spanner	EPRI
Gary Lofthus	Nuclear Management Company
Dan Nowakowski	Florida Power & Light Company
Carlos Barrera	IHI Southwest Technologies
James McArdle	Duke Energy
Adam Conti	AREVA
John Hayden	Structural Integrity Associates
Mike Meldon	Nuclear Energy Institute
Terry McAlister	SCANA
Richard Fuller	Dominion-Virginia Power

AGENDA FOR MEETING WITH THE
Electric Power Research Institute – Performance Demonstration Initiative
At
EPRI NDE Center, 1300 W. T. Harris Blvd
Charlotte, North Carolina
December 5, 2007

1. Open Items from Last Meeting (May 2 through 4, 2007).
2. Status of PDI Reactor Pressure Vessel Demonstration Program.
3. Status of ASME Code Nondestructive Examination Activities.
4. Status of Dissimilar Metal Weld Program.
5. Status of Weld Overlay Program.
6. Status of single side Supplement 2 examinations.
7. Public Comment.
8. Adjourn.

December 6, 2007

1. Status of Weld Inlay Program.
2. Status of Rulemaking.
3. Non-Appendix VIII issues.
4. Review of EPRI PDI Projects for 2008.
5. Discuss New Issues of Mutual Interest.
6. New Action Items and Meeting Summary.
7. Public Comments.