

August 3, 2006

MEMORANDUM TO: Terence L. Chan, Chief  
Piping & Nondestructive Examination Branch  
Division of Components Integrity  
Office of Nuclear Reactor Regulation

FROM: Donald G. Naujock, Materials Engineer /RA/  
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SUBJECT: SUMMARY OF PUBLIC MEETING HELD MAY 23, 2006, WITH  
ELECTRIC POWER RESEARCH INSTITUTE-PERFORMANCE  
DEMONSTRATION INITIATIVE REPRESENTATIVES  
(TAC NO. MD0571)

On May 23, 2006, the staff participated in a public meeting with representatives from the Electric Power Research Institute (EPRI) - Performance Demonstration Initiative (PDI) program at the Brunswick Steam Electric Plant, Media Center, Highway 87 North, Southport, North Carolina. EPRI provides PDI's business operations and technical support. PDI is a nuclear power industry initiative established to develop and administer the qualification 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 VIII and associated items. The subjects discussed were the status of reactor pressure vessel and piping performance demonstrations, proposed ASME Code actions affecting ultrasonic examinations, and the inspectability of cast austenitic piping and dissimilar metal welds. 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 10.

10 CFR 50.55a

Two draft regulatory guides addressing ASME Code cases are awaiting publication: Regulatory Guide (RG) 1.84, Revision 34, "Design, Fabrication, and Materials Code Case Acceptability" and RG 1.147, Revision 15, "Inservice Inspection Code Case Acceptability." These two draft RGs are scheduled for issuance for public comment in the third quarter of 2006. Draft Regulatory Guide DG-1135 with proposed Revision 2 to RG 1.193, "ASME Code Cases Not Approved for Use," was published for comment June 7, 2006.

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The NRC staff discussed items pertaining to nondestructive examinations that are being considered for future rulemaking. These changes were informally presented at a public meeting held during the ASME Code meeting in Phoenix, Arizona on May 23, 2006. Specifically, NRC is considering conditions to Code Cases N-722 and N-729 which would impose performance demonstration requirements for flaw characterization.

#### Status of Reactor Pressure Vessel

PDI presented an update of their reactor pressure vessel (RPV) program which is summarized in Enclosure 3, "PDI RPV Program Update." The RPV performance demonstration schedule is booked through August, 2006. The RPV program is a mature program for qualifications with single and dual transducer techniques. New procedure and personnel qualifications are occurring with the phased array ultrasonic testing (UT) technique: one manual phased array system and three automatic phased array systems are qualified for Supplements 4 and 6. The manual qualifications rely on real time observations and loses some of the advantages of phased array that are available with post-processing of recorded data, such as enhancing images, analyzing individual angles, and adjusting focal depths. No action items.

#### Status of Piping and Bolting

PDI presented an update of the their Piping and Bolting Program which is summarized in Enclosure 4, "PDI Piping & Bolting Program Update." The summer sessions are at or near maximum testing capacity for the next three months. The industry's demand for testing time to qualify personnel, equipment and procedures has prompted PDI to reorganize their facility to accommodate a 25% increase in performance testing capability. The increase in demand is attributed, in part, to increases in foreign participation, improvements to equipment, and bring research developments main stream. Many equipment and procedure developments were solutions to limitations identified by the performance demonstration process and cost/benefit analyses. The industry and PDI are working to develop tools for creating and verifying scan plans for dissimilar metal (DM) welds and weld overlays.

The PDI database containing the equipment and specimen identifications, testing criteria, and test results for each DM qualification is operational and available for data evaluations. The pipe database is in the final testing stage of development. Because the pipe database is structured after the DM database, the same queries can be used on both databases. The NRC is interested in obtaining a list of database variables with the associated descriptions so that queries on selected testing aspects of the program can be developed and requested. PDI suggested that the NRC request this information through the chairman of PDI. This item is detailed in the NRC/PDI meeting minutes dated September 8, 2005. Action item for NRC.

#### Changes to Generic Procedures PDI-UT-8 and PDI-UT-10

PDI revised generic procedure PDI-UT-8, Revision E, "Generic Procedure for the Ultrasonic Examination of Weld Overlaid Austenitic Pipe Welds." The new Revision F changes are presented in Enclosure 5, "PDI UT-8 Revision F and PDI UT-10 Revision C." Revision F provides: clarifications to tables and text, illustrations for calculating angle of impingement on a given diameter, calculations for contoured search units, new reference block designs, and guidance for selecting search units.

PDI revised generic procedure PDI-UT-10, Revision B, "Generic Procedure for the Examination of Dissimilar Metal Welds." The new Revision C changes are similar to those for PDI-UT-8, with an additional criterion for selecting the best calibration block reflectors. The criterion stipulates using a side drilled hole reflector in lieu of a notch for ID impingement angles greater than 52 degrees. PDI provided test data to support the switch from a notch to a side drilled hole which is included at the end of Enclosure 5. PDI is developing a separate generic procedure for depth sizing DMW.

#### Status of Weld Overlay

Supplement 11 qualifications only address the structural weld overlay and 25% through-wall of the wrought austenitic base material. Supplement 11 will have to be updated to accommodate the changing applications of weld overlays. Currently, ASME Code is discussing the application of pre-emptive weld overlay for configuring pipe/pipe fitting surfaces that would allow for more effective UT examinations. The discussion includes expanding the examination volume to include the weld overlay and the adjacent 50% or more through-wall base material. As long as ASME Code is contemplating such a volume change, there is a need to determine the inspectability of this volume. PDI has not evaluated the inspectability of greater than 25% through-wall depths in the base material beneath the weld overlay. Action item: PDI will assess the inspectability of through-wall depths greater than 25% beneath the weld overlay.

PDI presented an update of the weld overlays of butt welds to cast material which is summarized in Enclosure 6, "Weld Overlay of Cast Material." PDI Piping & Bolting Program Update." PDI identified the locations in reactor cooling piping that have butt welds to cast austenitic materials. PDI has funding for evaluating the inspectability of weld overlays applied on thin-wall cast austenitic materials, such as safety relief piping/valves, pressurizer surge line, and shut down cooling lines. Based on the success of the thin-wall inspection, PDI will present to the steering committee a request for evaluating thicker cast austenitic materials. Action item: PDI will evaluate the inspectibility of weld overlays on thin wall cast austenitic materials.

#### Status of ASME Code Work

PDI presented a brief discussion on the status of fourteen changes proposed to the ASME Code, Enclosure 7, "Code Status." Eight changes have been approved by the Pressure Technology Codes and Standards Board, five changes have been approved by the Boiler & Pressure Vessel Committee, and one for the elimination of UT examination of flange-to-threads is working its way through the subcommittees. One new item proposed for action relates to inner nozzle radius examination requirements for non-standard designs. These actions will bring Appendix VIII in agreement with the limitations and modifications of 10 CFR 50.55a.

One topic that receives periodic attention is limited inspection coverage. A proposal going through ASME Code Section XI is to standardize the process for calculating coverage, and another proposal is to accept the limited coverage for currently installed configurations. A third coverage item is the inservice inspection 90% minimum coverage requirement (essentially 100%) and repair and replacement 100% mandatory coverage. The repair and replacement coverage is from ASME Code Section III coverage requirements for radiographic testing (RT) examinations and recent ASME Code actions have been to provide UT as an alternative for RT.

Part of the coverage issue for austenitic weldments are restrictions that hinder UT scanning both sides of weld. The NRC questioned the ability of the PDI program to qualify personnel and procedures for single sided DM weld examinations, while unable to do the same for austenitic-to-austenitic examinations. PDI identified the differences between the two kinds of qualifications as being surface condition related. DM welds have machined/smooth surfaces without any interferences from joint alignment, weld crown/root, taper, and counterbores and ferritic base material on the far side. Also, because of the high potential for Alloy 600 cracking which is normally associated with DM welds, the industry has expended the effort to address the conditions that hinder single-side examination qualifications for DM welds. The conditions necessary for DM single-side examinations are not common for austenitic weldments. The surface conditions of PDI's test specimens do not support single-side performance demonstrations of austenitic weldments. This is an NRC and PDI item for future discussions.

#### Status of Dissimilar Metal Welds

PDI provided an update of their DM weld program which is summarized in Enclosure 8, "Dissimilar Metal Weld Configuration Database Program Update." The database is for data gathering as part of the Material Reliability Program (MRP-139). Of the 104 plants, 56 have reported some configuration data. PDI is evaluating utility supplied as-welded DM configurations with the configurations of their test mock-ups to verify the representativeness of the test mock-ups and the need for site specific mock-ups. As a result of the evaluation, PDI has purchased 21 additional DM weld test mock-ups and is in the process of acquiring more DM mock-ups. Another 19 mock-ups were identified for site specific applications. PDI is also providing recommendations to utilities on achieving the most coverage for site specific configurations.

#### Status of Control Rod Drive Mechanisms

The Materials Reliability Project representative presented a proposed qualification program for the examination of control rod drive mechanisms (CRDM) and a status of the bottom mounted nozzles (BMN) which is summarized in Enclosure 9, "Proposed CRDM Performance Demonstration Program and BMNs." The program is similar to PDI's program and protocol for piping welds but uses ASME Section V, Article 14, intermediate rigor blind performance demonstration criteria. Personnel and procedure qualifications will be based on performance demonstrations that satisfy a statistically based screening criterion. The qualifications are projected to occur in 2007.

#### Discussion on Primary Water Stress Corrosion Cracking in Leak Before Break Systems

NRC presented the topic of managing primary water stress corrosion cracking (PWSCC) in leak before break (LBB) piping systems which is contained in a letter to PDI dated May 12, 2006, Enclosure 10. The letter states that PWSCC was not considered in the NRC's analyses of LBB since this degradation mechanism had not been experienced at the time the LBB applications were approved. NRC's Office of Nuclear Regulatory Research (RES) has initiated a program to update the NRC staff's position on LBB given the occurrence of PWSCC. It is envisioned that the revised position will involve some combination of inspection and monitoring. As part of the updating process, the reliability of qualified UT PWSCC inspections must first be determined. The PDI database is an information source that can be used to establish UT reliability. The RES letter requests assistance from PDI in providing as-built data of DM welds, limitations

to qualifications, and the probability of detection of cracks using UT. PDI advised the NRC that the request should be separated, with the request for as-built information addressed to the MRP and the request for testing data addressed to the PDI program. NRC sent separate letters to the chairmen of these two programs on May 31, 2006.

#### Other Items of Interest

Several of PDI's presentations used the terms gaps, limitations, add-on, site specific, and requalification to address the level of effort necessary to demonstrate proficiency and skill in detecting flaws. These terms implied a degree of additional demonstration effort for procedures, equipment, and personnel qualifications. Exactly how these terms interrelate and the kinds of demonstrations required are unclear. The only term defined in ASME Code is requalification. The NRC staff requested that PDI provide a definition and application of the terms and explain how the terms apply with respect to existing qualifications and ASME Code requirements. Action item: PDI will provide this information at a future meeting.

The NRC questioned the applicability of Supplement 4 and Supplement 6 qualifications to determine the length and position of ligaments needed for ASME Code Case N-526, "Alternative Requirements for Successive Inspections of Class 1 and 2 Vessels." The application of this Code case is dependent on the location accuracy of the remaining ligament from a flaw to the inside diameter of the component. The PDI vessel performance demonstration database does record the ligament from the vessel outside surface to the top of the flaw and may also contain information that can be used to assess the location accuracy of ligaments. PDI will review the vessel database to determine location accuracy of ligaments, data permitting.

#### Next Meeting

The next semi-annual NRC/PDI meeting is tentatively scheduled for mid November 2006. The exact date and location will be announced at a later date.

#### Enclosures:

1. Public Meeting With EPRI-PDI, May 23, 2006
2. Agenda For Meeting With EPRI-PDI
3. PDI RPV Program Update
4. PDI Piping & Bolting Program Update
5. PDI UT-8 Revision F and PDI UT-10 Revision C
6. Weld Overlay of Cast Material
7. Code Status
8. Dissimilar Metal Weld Configuration Database Program Update
9. Proposed CRDM Performance Demonstration Program and BMNs
10. Letter to Mr. Lofthus/Electric Power Research Institute-regarding the leak-before-break

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PUBLIC MEETING WITH EPRI-PDI, MAY 23, 2006

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Ted Sullivan	NRC
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Greg Selby	EPRI - NDE Center
Ray Acomb	HSB Globe Standard
Brad Thigpen	EPRI - NDE Center
Carl Latiolais	EPRI - NDE Center
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Gary Lofthus	Nuclear Management Company
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Dustin Irlbeck	Progress Energy
Dana Covill	Progress Energy
Dave Anthony	Amergen Energy
Bob Cline	Progress Energy
Ed Black	Progress Energy
Mike Briley	Entergy

## **AGENDA FOR MEETING WITH EPRI - PDI**

**Brunswick Steam Electric Plant, Media Center, Southport, NC**

**May 23, 2006**

1. Open items from last meeting (November 8 & 9, 2005).
2. Status of PDI Reactor Pressure Vessel Demonstration Program.
3. Status of PDI Piping Demonstration Program.
4. Review of Changes to PDI-UT-8 and PDI-UT-10.
5. Discuss Weld Overlays of Cast Austenitic Material.
6. Status of Code Activities.
7. Status of Dissimilar Metal Weld Site Specific Configuration Data Collection.
8. Status of Material Reliability Program - Control Rod Drive Mechanism Qualifications.
9. Discuss Rule Changes to 10 CFR 50.55a.
10. New issues of mutual interest.
11. Public Comment.
12. Adjourn