June 23, 2009

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

FROM: Robert O. Hardies, Senior Level Advisor
Division of Component Integrity ***/RA/***
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING HELD MAY 27-28, 2009 WITH THE ELECTRIC POWER RESEARCH INSTITUTE PERFORMANCE DEMONSTRATION INITIATIVE REPRESENTATIVES
(TAC NO.: MD0773)

On May 27-28, 2009, the staff participated in a public meeting with representatives from the Electric Power Research Institute (EPRI) - Performance Demonstration Initiative (PDI) program at the Dominion Millstone Power Station in Waterford, Connecticut. 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," to 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 testing (UT) 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 (RPV) and piping performance demonstrations, the proposed ASME Code actions affecting ultrasonic examinations, and status of weld overlays/inlays/onlays. These meetings are a continuation of formal dialog between the 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. Open items are described in Enclosure 3. Handouts and presentations provided at the meeting are listed in Enclosure 4.

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PDI ACTIVITIES ON ASME CODE ISSUES

PDI discussed draft Code Case N-780 that is being developed to address issues related to the upgrading, substitution, or reconfiguration of NDE equipment. Equipment manufacturers occasionally improve or modify their products, sometimes revising or creating new models or model numbers. The newer models or model numbers may perform as well as or better than earlier models, but since the model name and number is an essential variable for performance demonstration its use with previously qualified procedures requires full requalification of the procedure. This code case would provide rules for substitution or replacement of qualified inspection equipment listed in previously qualified procedures. The approach involves showing equivalency for two pieces of equipment (qualified equipment vs. equivalent equipment) by development of a technical basis document followed by an independent evaluation by a performance demonstration administrator. If the new equipment is shown to have the same ISI performance it could be used with a previously qualified procedure without constituting a change in an essential variable. The overall effect of the code case is to provide rules that would make it less onerous to use equivalent, but upgraded, NDE equipment with existing procedures.

PDI discussed Section XI, Appendix VIII, Supplement 11 which was developed for overlays for intergranular stress corrosion cracking (SCC) in boiling water reactors (BWRs). They described potential changes to this supplement to cover overlays in pressurized water reactors (PWRs) and to extend applicability to primary water stress corrosion cracking (PWSCC) in dissimilar metal welds.

Participants discussed an inquiry for Appendix VIII, Supplement 10 where there was an issue regarding how to interpret the thickness tolerance. PDI processes permit use of procedures demonstrated at a particular wall thickness range to be use for field applications on piping that has thickness between 0.75 times the minimum up to 1.25 times the maximum thicknesses of the mockups used in the demonstration.

The Task Group on Cast Stainless Steel was discussed, and it was noted that the task group will be developing a road map to creating an Appendix VIII, Supplement 9.

PDI PIPING PERFORMANCE DEMONSTRATION PROGRAM UPDATE

PDI presented the status of their piping program. All of the new procedure qualifications and four out of five procedure expansions are for phased array examinations. A number of new overlay samples are being fabricated for training and testing. PDI has implemented a formal inquiry process to systematically resolve and clarify issues and frequently asked questions.

PDI provided an overview of a study assessing the effects of guided practice on PDI testing pass rates. This study was conducted using a very small set of two groups with six persons in each group. One group was given special training that included hands-on practice, mock-up testing, and feedback on the mock-up test before taking the qualification test. The other group received no training and only showed up to take the final test. The small number of participants in the study limits the ability to make conclusions that are statistically defensible. However, for the first attempt at the test, those who received training had twice as high a pass rate compared to those who did not receive training. All of those who did not have training passed during the second or third attempt. None of those who were trained and failed the first attempt attempted a retest. The industry is considering offering the guided practice training with the objective of

achieving higher pass rates and reducing the overall training expense.

PDI REACTOR PRESSURE VESSEL DEMONSTRATION PROGRAM UPDATE

PDI presented the reactor pressure vessel (RPV) program status. The pass rate for manual plate qualifications is lower than that for piping. The performance standard in Appendix VIII that has to be met is higher for RPV applications than it is for piping, and this gets reflected in the lower initial pass rate. Because in order to pass the test for other RPV supplements one must first pass Supplement 4, it has a lower pass rate while the others have a pass rate that is more consistent with those for piping (Supplement 4 effectively weeds out less talented examiners). The pass rate for length sizing is quite high, but the depth sizing is more challenging and the pass rate is lower. Most of the requests for RPV qualifications are from international participants for personnel and equipment qualifications, from manufacturers qualifying equipment upgrades, and from personnel expanding their qualifications. All of the scheduled RPV performance demonstrations are using phased array techniques.

PDI DISSIMILAR METAL WELD INSPECTIONS UPDATE

Nine Mile Point Unit 1 found some indications in a 316 stainless steel safe-end. These were not in the weld and upon review were found in 1999 inservice inspection data with identical characteristics. They concluded the indications did not have SCC properties but evaluated them as flaws according to IWB-3500. Representative ultrasonic test data was presented showing the indications and their properties.

At Hatch Unit 2, an axial indication was detected in a 12-inch-diameter inlet nozzle dissimilar metal (DM) weld that was sized to be about 0.5 inches long with a depth of 0.26 inches. The flaw was located in the 182 butter and was evaluated to be acceptable for at least one more operating cycle. It was noted that because of requirements to use qualified procedures which require smooth and flat DMW surfaces, there are new indications being found that had never been detected previously. A number of these indications have been reported to be embedded fabrication flaws and have required Code evaluations. It was postulated that as inspections continue using qualified techniques and improved examination surfaces, more of these types of flaws will be detected and require evaluation.

NDE RESEARCH AND DEVELOPMENT PROGRAMS

PDI described the NDE projects that are currently being funded through a variety of EPRI programs. These projects are funded by the NDE Center, the Materials Reliability Program, Boiling Water Reactor Vessels and Internals Program, Technical Innovation, Steam Generator Management Program, and the Advanced Nuclear Technology program (which is addressing new plants). Both funded and proposed projects were identified. The title and the name of the NDE Center project manager was identified for each project. There are currently 99 active projects and 52 proposed projects. NRC participants requested an expanded description of each of the funded projects.

PNNL then made a presentation on the NRC-funded NDE work at PNNL.

NDE CONSIDERATIONS FOR MITIGATION OF DM WELDS

PDI discussed the activities related to NDE associated with Alloy 600 mitigation methods including mechanical stress improvement process, weld overlay, inlay, and onlay methods. NDE studies are being conducted to determine the effectiveness of NDE for inspection before and after the application of the mitigation methods. An example of the challenges includes inspection of optimized weld overlays that require the detection of all flaws in the outer 50% of the original piping wall. The detection of axial flaws seems to be the most challenging flaw orientation. It was noted that there is a planned application of the inlay technology in the spring of 2010 and the onlay technology has already been placed into service.

INSIDE DIAMETER DEPTH SIZING ERROR

PDI discussed the current industry depth-sizing capability for dissimilar metal welds. For inspection from the outside surface automated and manual phased-array procedures have successfully been qualified for depth sizing, but conventional manual procedures have not. No procedure has been successfully qualified from the inside surface. There are significant differences between the condition of the surfaces on the outside and those on the inside, which creates the depth sizing performance difference. The issue is exaggerated when trying to depth size for very thick components (thicknesses in excess of two inches). PDI has come up with a series of sizing values that has a matched root-mean-squared percentage value. Because the sizing exceeds the RMSE criterion in the Code, when a flaw is found, the reported flaw size is the estimated size, and then the documented oversizing value from the performance demonstration is added to the estimated flaw size. This causes any detected flaw to require Code flaw evaluation, regardless of its size. The issue is that small flaws near the surface can be sized accurately and can meet the 0.125-inch RMSE, but for deeper flaws the long path lengths limit the ability to size appropriately. To resolve this issue EPRI proposes to develop two different criteria with one applying to smaller flaws and the other for the larger flaws. The exact acceptance criteria would be determined by evaluating PDI data to build a case for the limits of current technology. This program has not yet received funding.

OPEN ITEMS

PDI presented the status of open items from the March 2009 meeting. Seven open items were completed since the March 2009 meeting. Four new open items were recorded. Enclosure 3 describes the open items.

NEXT MEETING

The next semi-annual NRC/PDI meeting is tentatively scheduled for December, 2009.

Enclosures:
1. Attendance List
2. Agenda
3. Open Items
4. List of Handouts and Presentations

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Attendance for public EPRI-PDI/NRC Meeting, May 2008

NAME:	ORGANIZATION:
Don Naujock	NRC
Terence Chan	NRC
Carol Nove	NRC
Steve Doctor	Pacific Northwest National Laboratory
Carl Latiolais	EPRI
Lawrence Perry	Dominion-Millstone
Terry McAlister	SCANA
Dale Murdoch	ITI
Annette Frost	ITI
Nicholas Shearer	ITI
Damon Priestly	Progress Energy
Mike Briley	Entergy
Jeff Stevenson	Entergy
Scott Hamel	Nextera Energy
Ronald Swain	EPRI
Sherrie Whiddon	EPRI
Richard Fuller	Dominion-Millstone
William Jenson	Nextera Energy
Bob Hardies	NRC
Ali Rezai	NRC
Ray West	Dominion-Millstone
Michael Canny	Constellation Energy
Michael Brehler	Dominion-Millstone
Harvey Beeman	Dominion-Millstone
Rick Zieber	Dominion-Millstone
Todd Bohninkamper	Dominion-Millstone

ENCLOSURE 1

AGENDA FOR PUBLIC MEETING WITH THE ELECTRIC POWER RESEARCH INSTITUTE - PERFORMANCE DEMONSTRATION INITIATIVE
Millstone Power Station, Route 156, Rope Ferry Road, Waterford Connecticut
May 27 & 28, 2009

May 27, 2009

1. Introductions.
2. Status of ASME Code Nondestructive Examination Activities
3. Status of PDI Piping Program.
4. Status of PDI Reactor Pressure Vessel Demonstration Program.
5. Operating Experience from Spring 2008.
6. Status on PNNL Work on Single Side Austenitic Piping.
7. EPRI Summary of Existing Approved Work Plan Items.
8. PNNL Summary of Existing Work Items for NRC
9. Status of Weld Overlay, Inlay, Onlay.
10. NRC Comments/Open Discussion.

May 28, 2009

1. Continuation of May 27 Open Discussion
2. Review Old Action Items.
3. Summary of New Action Items.
4. Subjects of Mutual Interest.
5. Public Comment.
6. Adjourn

ENCLOSURE 2

Open Items

Open Item	Description	Status
1	PDI will provide information on the effectiveness that specific training (Guided Practice) has on performance demonstrations pass/fail rates	Complete
2	PDI will initiate action to bring ligament qualifications into the ASME Code	Ongoing
3	PDI will propose to EPRI Integration Committee a new project to procure test specimens with smooth surface conditions for single side austenitic pipe performance demonstrations	Complete
4	PDI will continue developing the technical basis for the UT examination of optimized WOL	Ongoing
5	PDI will continue developing a relief request template for application of optimized WOL	Ongoing
6	PDI will continue collecting inspection data of WOLs on centrifugally cast stainless steel installations to support a WOL sizing tolerance Code case	Ongoing
7	PDI will consider developing performance demonstrations for qualifying cast stainless steel pipe. (ASME Task Group on Cast Stainless Steel)	Ongoing
8	PDI will ask the corrosion resistant cladding (CRC) task group to evaluate the ASME Code Cases on WOL/onlays/inlays for performance demonstration criteria applicable to CRC welds	Ongoing
9	PDI will consider developing sizing RMSE criterion for weld inlay flaws that is more restrictive than current RMSE in the ASME Code	Closed - This is not a PDI item
10	PDI will write a letter to the EPRI Action Plan Working Group requesting guidance on addressing NRC concern with the inability for the industry to meet the 0.125-inch root mean square depth sizing from the inside pipe surface	Closed to new open item 18
11	PDI will consider assembling test specimens containing the appropriate surface conditions to support a limited depth sizing qualification from the inside pipe surface	Closed to new open item 18
12	Although the PDI program does not address high density polyethylene pipe, this action item will remain open while ASME Code continues development of nondestructive examination criteria	Closed - This is not a PDI action
13	NRC will visit PDI to review the representativeness of as-built mockups and finger print data for optimized WOL specimens	Closed

14	PDI to draft a guideline on the administration responsibilities for PDI sponsored ASME Code cases and changes	Ongoing
15	PDI provide to NRC the "Guideline for DMW Inspection"	Closed to open item 17
16	PDI will provide the NRC a list of funded projects with brief summaries of each project	New
17	PDI will provide the NRC with copies of the EPRI reports "Ultrasonic Equivalency Testing of Weld Inlaid and Onlaid Components" (1016655), "Ultrasonic Equivalency Testing of Weld Inlaid Components" (1016543), and "New Plant Guidelines" and "Guidelines for DMW Inspection" when the latter two guidelines become publically available	New
18	PDI will propose a project to analyze the DMW and austenitic-to-austenitic piping PDI database for RMSE performed from the inside diameter as a function of the flaw size and metal path. PDI will coordinate the project with NRC/PNNL participation	New
19	PDI will take an action for reviewing the proposed ASME alternative rules (proposed Code Case N-780) and other associated Code changes regarding alternative rules for equipment substitution when using PDI qualified techniques	New

List of Handouts and Presentations

PDI RPV Update

Action Item Review

Current Industry Depth Sizing Capability for Dissimilar Metal Welds

ASME Section XI Update

PDI Piping Program Update

NDE Considerations Associated with Alloy 600 Mitigation Methods

Overview of NDE Projects

Overview of Nondestructive Examination (NDE) Projects Funded by NRC at PNNL

Overview of Results of Focused Study on the Effects of Guided Practice on PDI Pass Rates

Spring Industry Dissimilar Metal Weld Examination Update

Article British Magazine Insight Vol. 51, No. 3 - Inspection Qualification

ENCLOSURE 4