

May 20, 2004

MEMORANDUM TO: Terence L. Chan, Chief  
Piping Integrity & NDE Section  
Materials and Chemical Engineering Branch  
Division of Engineering

FROM: Donald G. Naujock, Materials Engineer */RA/*  
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Division of Engineering

SUBJECT: SUMMARY OF PUBLIC MEETING HELD FEBRUARY 4 & 5, 2004,  
WITH EPRI- PDI REPRESENTATIVES (TAC NO. MC1602)

On February 4 & 5, 2004, the staff participated in a public meeting with representatives from the Electric Power Research Institute (EPRI) - Performance Demonstration Initiative (PDI) program at the Entergy Office Building, 639 Loyola Avenue, New Orleans, Louisiana. EPRI provides PDI's business operations and technical support. PDI is a nuclear power industry initiative that is 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, *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 Appendix VIII and associated items. The subjects discussed were the status of Supplements 5 and 7 specimens, qualifications, and coverage; status of Supplement 10 specimens and qualifications; expansion of Supplement 10 for site specific configurations; discussions on the proposed rule (69FR879); and expansion of the Appendix VIII concept for other applications. These meetings are a continuation of formal dialog between NRC and the industry on PDI's implementation of Appendix VIII and other ultrasonic testing aspect 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 Attachments 1 and 2 respectively. Handouts provided by PDI for selected items in the agenda are provided in Attachments 3 through 6.

I. Expansion of the PDI Charter

Since the June 2003 meeting, EPRI realigned PDI from an independent organization to one which EPRI administratively supports as a standing committee under the direct supervision of the EPRI Nondestructive Examination Center (NDEC). As part of the realignment, PDI's

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charter may be expanded to include ultrasonic testing (UT) issues associated with demonstrations, qualifications, and examinations of butt welds for other EPRI programs and other UT activities as assigned by the NDEC Steering Committee. The realignment is discussed in Attachment 3. The expanded PDI responsibilities create new challenges and increase the importance of continuing the dialog with the NRC.

## II. Status of Supplement 10 Specimens and Qualifications

PDI presented a brief discussion on Supplement 10 test specimens and personnel qualifications for examinations of dissimilar metal welds (DMWs). The discussion is summarized in Attachment 4, "PDI Dissimilar Metal Weld Program Status." The attachment shows that personnel are qualified for detection and length sizing with limitations using manual and automatic UT equipment for examinations performed from the outside surface. For depth sizing, personnel are qualified with automatic UT equipment with limitations. No one has yet qualified for depth sizing using manual UT from the outside surface. The specific limitations for detection, length sizing, and depth sizing from the outside surface are listed in Attachment 5, "PDI Dissimilar Metal Weld Program Limitations."

For examinations performed from the inside surface, personnel are qualified with automatic UT equipment for detection and length sizing with limitations. The specific limitations for detection, length sizing, and depth sizing from the inside surface are also listed in Attachment 5. No one has yet qualified for depth sizing from the inside surface. PDI has noted that performance demonstrations using profilometry measurements have succeeded in reducing the depth sizing error but not enough to satisfy the 0.125 RMS Code-requirement. Currently, profilometry is performed using ultrasonic techniques to measure surface irregularities. The inside surface irregularities in the test set used for DMW may represent conditions at several locations for a small number of plants and may not represent the majority of situations common at most plants. This will not be known until more licensees take profilometry measurements, and criteria are developed for evaluating UT examination difficulties. As more inside surface profilometry becomes known, a less challenging test set may be sufficient to represent the conditions existing at a majority of plant locations. However, depth sizing for the more challenging conditions must still be addressed. The NRC suggested that PDI assess the difficulties with assembling a performance demonstration test set for depth sizing with less challenging surface irregularities. Action Item: PDI will look at the possibility of assembling a performance demonstrations Supplement 10 test set for licensees with less challenging DMW inside surface irregularities.

PDI will continue searching for solutions to the limitations associated with examinations performed from the outside and inside surfaces using manual and/or automated techniques. Although Attachments 4 and 5 summarizes the limitations, pairing the examination technique with the associated limitations is not easily visualized. The visualization can be improved with a matrix of examination technique (outside surface, inside surface, manual, automated) versus limitations. Action Item: PDI will develop a matrix of examination technique (outside surface, inside surface, manual, automated) versus limitations.

PDI discussed essential variables that are not explicitly addressed in Appendix VIII, VIII-2100, such as, the use of profilometry to improve UT performance for examinations performed from the inside surface. In this case, profilometry is a procedure-specific essential variable. The existence of procedure-specific essential variables are not clearly recognized in the ASME Code. The absence of this recognition has the potential of creating unnecessary differing opinions in the performance demonstration process and ASME Code-requirements. Action Item: PDI will champion a clarification or change to Code that addresses essential variables not specifically mentioned in Appendix VIII, VIII-2100 but are essential for the successful qualification of a procedure and personnel.

### III. Site Specific Expansion of Supplement 10

PDI presented a brief discussion on site specific expansion of Supplement 10 for unique DMW components. The discussion is summarized in Attachment 3, "Expansion Criteria Utilizing Plant Specific Mock-ups." In the quest for site-specific adaptability of Supplement 10, PDI is gathering plant-specific DMW information, such as counterbores, weld root and crown conditions, cladding, weld buttering, remnant welds, adjacent welds, and weld repairs. The data will provide the necessary information to address the NRC concerns of whether a configuration is unique to a particular plant or occurs multiple times across several plants, the extensiveness and quantity of site specific applications, and the non-uniform application of site specific criteria. After PDI gathers the data, the NRC will have an opportunity to study the proposed solutions. Action Item: PDI will continue gathering the necessary information and address the NRC's concerns.

For DMWs that can not be effectively examined with UT, PDI is considering supplementing the UT with other NDE methods. This raises the issue of using a non performance-based NDE method to supplement or replace a performance-based UT qualified examination. The Pacific Northwest National Laboratory (PNNL) is developing a white paper, under contract with the NRC, that will address the performance demonstration requirements for combinations of UT, eddy current testing (ET), and visual testing (VT) examinations necessary to achieve the same level of effectiveness as a complete UT examination. This concept of using multiple NDE methods may have applicability for other difficult to UT examine situations. The use of multiple NDE methods to achieve the necessary examination coverage is an open item for future PDI/NRC dialog.

### IV. Status of Code Work

PDI presented a brief discussion on the status of proposed changes to the ASME Code. The discussion is summarized in Attachment 6, "PDI - Reactor Pressure Vessel Project." One PDI effort is to merge nozzle-to-vessel weld and nozzle inner radius section qualifications in to a single supplement for examinations performed from the inside surface and a second supplement for examinations performed from the outside surface. Examination from the inside surface will be a revised Supplement 7 and from the outside surface a revised Supplement 5. The NRC staff devoted time after the meeting to discuss these two rewrites and provided comments. PDI will consider NRC comments and present the revised supplements to the Task Group on Appendix VIII at the February 2004 meeting of the ASME Code.

PDI is developing a proposed code case that would permit the use of Appendix VIII qualified procedures and personnel for non-Appendix VIII UT applications as an alternative to current Code-requirements. A drawback to the proposed code case is the restriction placed on Appendix I, Article I-3000 in the proposed rule published in the *Federal Register* January 7, 2004. If the proposed restriction is carried through into the final rule, the restriction would prohibit the use of Appendix I, Article I-3000 in the 2002 and 2003 Addenda of Section XI of the ASME Code. Article I-3000 contains criteria for performing piping, vessel, and nozzle-to-vessel weld examinations. PDI will present details in their comment to the proposed rule.

The NRC encourages the use of Appendix VIII qualified procedures and personnel where applicable. NRC suggested that PDI evaluate the effects to their program if Appendix VIII requirements are expanded to include all Section XI UT examinations. PDI will present this suggestion to the NDEC Steering Committee. The expansion of Appendix VIII to all Section XI UT examinations is an open item for future discussions.

Because of the similarities between intergranular stress corrosion cracking (IGSCC) and primary water stress corrosion cracking (PWSCC), the NRC expressed concerns that examiner skill may diminish with time and is considering the need for PWSCC re-qualifications. The question is how similar are the acoustic responses and crack morphology of the two stress corrosion cracking mechanisms. IGSCC is located in the heat affected zone of austenitic welds and near surface irregularities producing competing signals. The challenge with detecting IGSCC is being able to discriminate the crack signal from all of the signals such as counterbores, root shape, and metallurgical conditions. PWSCC is normally located in Inconel Alloy 82/182 weld material or Inconel Alloy 600 base material. The challenge with detecting PWSCC is using the correct technique to insonify the region where PWSCC may be located and getting a response back. UT experience with PWSCC is limited and no conclusions were reached on the discrimination and morphology aspects of PWSCC. This is an open item for future discussions.

#### V. Other Items of Interest

The NRC asked PDI to explain a perceived inconsistency in generic procedure PDI-UT-10, Paragraph 4.2.6 which states that calibration shall be performed after completion of all contouring. The perception is to use contoured wedges on flat calibration blocks. PDI explained that the wedge contouring is for trimming and reshaping the wedge edge dimension in order to increase the examination coverage. If these wedges are flat, they would be calibrated with flat calibration blocks. Wedges that are reshaped with a curved surface are for improving the acoustic characteristics which are normally used for small diameter piping. Wedges for curved surfaces are covered in Paragraph 6.7 of the generic procedure, and they would be calibrated on similarly curved calibration blocks described in Paragraph 4.5. This item is complete.

At the June 2003 meeting, PDI introduced the concept of root mean square percent (RMSP). For RMSP to be valid, the error should increase proportionally with increasing through-wall thickness. In a review of selected performance demonstration data, the NRC was unable to

establish any correlation between test error and through-wall thickness. As a result of NRC's observation, PDI will only use the RMSP concept for internal purposes. This item is complete.

At the June 2003 meeting, the NRC asked for PDI's position on the application of Appendix VIII, VIII-1100(c) and (d) which pertain to the skill level of personnel performing different aspects of an Appendix VIII examination. Specifically, the NRC asked for a description of the skill level for an individual holding the transducer on the pipe. Since Code does not specifically address this situation in VIII-1100(c) or (d), the individual holding the transducer could be a variable which is not addressed in the Code. PDI's representative stated that any task not specifically mentioned in the Code may be performed using a certified Level I, II, or III examiner. The use of the term "certified" shows that the person performing the task in activities which are not specifically identified in the Code is in a formal UT program, and the Level I, II, and III show that the examiner possesses knowledge about UT. The certified Level I, II, and III are under the direct supervision of an Appendix VIII qualified Level III. NRC suggested that PDI take the initiative and get their position accepted by the Code. PDI will initiate the appropriate action.

PDI asked the NRC to provide guidance on the type of request a licensee would submit to the NRC in the event the licensee is unable to achieve the nozzle-to-vessel weld coverage stipulated in the 10 CFR 50.55a(b)(2)(xv)(K). The question is whether the request is for relief from the Code or an exemption from the rule. Action Item: NRC will provide an answer.

PDI asked the NRC if the proposed rule published in the *Federal Register* of January 7, 2004, prohibited the use of UT as an alternative to surface examinations. The proposed rule prohibited the use of Code Case N-615, "Ultrasonic Examination as a Surface Examination Method for Category B-F and B-J Piping Welds," because its demonstration was not based on a statistical evaluation of the results. Code Case N-615 was incorporated in the 2002 Addenda of the ASME Code. PDI will submit a response to the proposed rule with their concerns.

PNNL presented a summary of examinations performed on the inside surface of cast stainless steel components. The examinations included components on loan from EPRI. The findings showed promise; however, PNNL had some concerns that the specimens were not representative of field conditions, such as closure weld line-up and root shrinkage. PNNL will be purchasing a cast stainless steel weldment later this year with representative field conditions. To characterize the field conditions, PNNL requested that the meeting participants provide input on inside surface contours of actual plants closure welds. Action Item for participants at the meeting to provide PNNL weld surface contour data, if available.

A subject of interest to the NRC and PDI is using UT as an alternative for RT in Section III and selected repair/replacement activities in Section XI. This is a current Code activity. PDI is involved with the Code activities for developing a performance-based criteria that contain representative fabrication and construction flaws. The challenge is selecting the type, number, and distribution of flaws that would provide an effective screening criteria. PDI and NRC representatives will work within the appropriate Code committees to achieve an effective screening criteria.

VI. Next Meeting

The next semi-annual NRC/PDI meeting is tentatively scheduled for early October 2004 at the EPRI-NDEC, Charlotte, North Carolina.

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PUBLIC MEETING WITH EPRI-PDI, February 4 & 5, 2004

NAME	ORGANIZATION
Donald Naujock	NRC
Steven Doctor	Pacific Northwest National Lab
Steven Sabo	WesDyne
Richard Fuller	Dominion Nuclear Connecticut
Carl Latiolais	EPRI
Mike Gothard	EPRI
Randy Linden	PPL Susquehanna
Teresa Donaldson	EPRI
Gary Lofthus	Southern Nuclear Comp.
Mike Bratton	Entergy
Tim Oldfield	Constellation Energy
Dan Nowakowski	Florida Power & Light

**AGENDA FOR MEETING WITH EPRI**  
**ENTERGY OFFICE, NEW ORLEANS, LOUISIANA**  
**FEBRUARY 4 & 5, 2004**

1. Status of PDI Piping Demonstration Program:
  - Supplements 10 and 14.
  - Supplement 10 qualification limitations.
2. Status of PDI RPV Demonstration Program:
  - Supplement 5 and 7 demonstrations.
  - Supplement 5 and 7 Code actions.
3. Open Items from Last Meeting:
4. NRC position on examination coverage of nozzle-to-vessel welds.
5. Site-specific mock-ups to expand Supplement 10 qualifications.
6. Discuss the proposed rule changes to 10CFR50.55a.
7. New issues of interest:
  - Expansion of Appendix VIII to include qualification with fabrication flaws.
  - Expansion of Appendix I to reference Appendix VIII to include all volumetric examinations for Class 1, 2, and 3 vessel welds.
  - Items of mutual interest.
8. Public Comment
9. Adjourn