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Robert Walpole
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March 9, 2009

Re: Indian Point Unit 3
Docket No. 50-286

NL-09-034

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to Request For Information Regarding Request For Relief 3-48 Supporting the Unit 3 Refuel Outage 15 Inservice Inspection Program

REFERENCE:
1. Entergy Nuclear Operations letter to U.S. Nuclear Regulatory Commission, "Requests For Relief 3-45, 3-46, 3-47(I) and 3-48 to Support the Unit 3 Refuel Outage 15 Inservice Inspection Program," dated January 22, 2009
2. Entergy Nuclear Operations letter to U.S. Nuclear Regulatory Commission, "Supplement to Request For Relief 3-48 and 3-47(I) to Support the Unit 3 Refuel Outage 15 Inservice Inspection Problem," dated February 6, 2009
3. U.S. Nuclear Regulatory Commission letter to Entergy Nuclear Operations, "Indian Point Nuclear Generating Unit No. 3 – Request for Additional Information Regarding Relief Request RR-3-48 (TAC N0. ME0414), dated February 23, 2009

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. (Entergy) submitted Relief Request No. 3-48 (RR-3-48) for Indian Point Unit No. 3 (IP3) in Reference 1 and supplemented this request in Reference 2. The relief request is for the Third 10-year Inservice Inspection (ISI) Interval which ends this July. The request is intended to allow an EPRI demonstrated volumetric NDE technique to be used instead of an Appendix VIII examination to inspect the lower vessel head penetrations while the reactor vessel internals are removed for the 10 year inservice inspection to obtain better characterization of the penetration base metal as well as the attaching partial penetration weld to base metal interface while eliminating radiation exposure required for bare meta visual examinations. This letter is in response to the NRC request for additional information in reference 3. The response is in Attachment 1.

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NRR

There are no new commitments identified in this submittal. If you have any questions or require additional information, please contact Mr. Robert Walpole, Licensing Manager at 914-734-6710.

Very truly yours,

per telecon

Robert Walpole
Licensing Manager
Indian Point Energy Center

Attachment: 1. Relief Request 3-48 Response to Request For Additional Information

cc: Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. Samuel J. Collins, Regional Administrator, NRC Region I
NRC Resident Inspector's Office Indian Point
Mr. Paul Eddy, New York State Department of Public Service
Mr. Robert Callender, Vice President NYSERDA

There is no page 3, the previous page was misnumbered in the upper right corner.

ATTACHMENT 1 TO NL-09-034

RELIEF REQUEST 3-48

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR RELIEF REQUEST 3-48 PROPOSED ALTERNATIVE EXAMINATIONS OF RPV BOTTOM MOUNTED INSTRUMENTATION PENETRATIONS

Entergy letters dated January 22, 2009 and February 6, 2009 submitted Request For Relief 3-48 to Support the Unit 3 Refuel Outage 15 Inservice Inspection Program. The NRC raised some questions in their letter of February 23, 2009. The following are the questions and the Entergy response.

A. The following questions relate to the Electric Power Research Instititute's Technical Report MRP-166, "Demonstration of Equipment and Procedures for the Inspection of Alloy 600 Bottom Mounted Instrumentation (BMI) Head Penetrations," dated March 2006

Question 1

What are the critical flaw locations and orientations? How have these critical flaws been incorporated in the demonstration?

Response

The critical flaw locations and orientations are above, below, and over the partial penetration weld in the circumferential orientation. From MRP-166 page A-4: Axial / radial and circumferential / radial flaws are located in the tube above, below, and/or over the attachment weld area (a circumferential flaw is defined as the weld-to-vessel intersection line). Radial and circumferential flaws are also located on the wetted surface of the attachment weld.

Question 2

Relief Request 3-48 indicates that the "proposed alternative of performing automated ultrasonic examinations ... from the inside surface using procedures, personnel, and equipment that have been demonstrated and qualified in accordance with MRP-166 ... as supplemented by technical justification WDI-TJ-1014 ..." MRP-166 is a capability demonstration for equipment and procedures not a qualification report on BMI examinations. In light of this, please clarify your use of MRP-166 in RR-3-48.

Response

Relief is requested for IPEC to examine the RPV bottom mounted instrument penetrations using ultrasonic (volumetric) and eddy current (surface) techniques in lieu of an external visual examination. Code Case 722-1 Table 1 Footnote (5) accepts an ultrasonic exam performed from the component's inside surface provided that the examination is in accordance with the requirements of ASME Section XI Table IWB-2500-1 and Appendix VIII. Relief Request 3-48 references MRP-166 for demonstrating the capability of the ultrasonic (volumetric) and eddy current (surface) techniques. Neither technique is qualified to Appendix VIII.

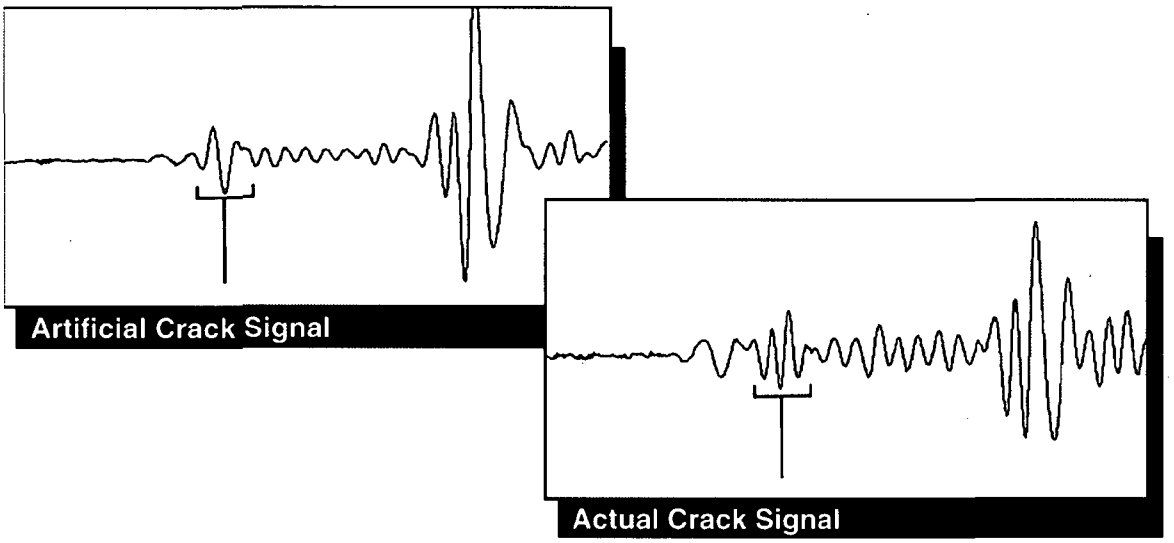
The bottom mounted nozzle (BMN) demonstration results documented in MRP-166 were conducted without using a pass/fail criteria. Entergy has reviewed the results and determined that the performance of the procedures and equipment are acceptable for implementation at Indian Point.

Question 3

For the Westinghouse 3 and 4 loop design:
(a) Please characterize the flaw population distribution for the mockups (i.e., range of flaw length and depth, orientation, and types)?
(b) What types of implants were used to generate flaws?
(c) Do the mockups include a LOF at the weld/tube interface?

Response

a. Typically the radius of the squeezed CIP notch tips used in CRDM and BMN flawed mockups are 10 microns, which is smaller than that required by Section XI, Appendix VIII. Additionally, the ultrasonic notch responses have been compared to a PWSCC flaw from Bugey as shown in the figure below and documented in a publicly available report; "Demonstration of Inspection Technology for Alloy 600 CRDM Head Penetrations", EPRI TR-106260, October 1996, Palo Alto, CA.



b. As discussed above, the implants are cold isostatic pressure (CIP) squeezed EDM notches in the tube. Fabrication defects were not intentionally introduced into the mockups. The vendors' ultrasonic procedures include instructions for differentiating service induced flaws from fabrication defects. See answer 5. Material shared with the vendors to assist them with their procedure improvements and differentiation between fabrication flaws and cracking is located in Chapter 6 of an EPRI report; "Nondestructive Evaluation: Comparison of Field and Manufactured Flaw Data in Austenitic Materials", EPRI, Palo Alto, CA: 2007. 1015143.

c. No, the LOF at the end of the weld / tube interface were intentionally placed because the ET J-groove equipment was not fully operational and its use was not demonstrated. When MRP-166 mentioned that all flaws were detected it was only referring to the tube flaws. The radial and circumferential flaws located on the wetted surface area of the weld were only designed to be used for detection with ET, not UT.

Question 4

What is the tolerance for false calls?

Response

This was a capability study conducted in a blind fashion so no pass / fail criteria was used. The results are documented in MRP-166. The utilities decided if the NDE performance met their needs.

The mockups used for the capability study have more than 30 realistic flaws implanted in them, as documented in report; "Demonstration of Inspection Technology for Alloy 600 CRDM Head Penetrations", EPRI TR-106260, October 1996, Palo Alto, CA. and in report; "Nondestructive Evaluation: Comparison of Field and Manufactured Flaw Data in Austenitic Materials", EPRI, Palo Alto, CA: 2007. 1015143. The mockups are full-scale with as-built weld geometries and have realistic distortion as caused by the J-groove weld. WesDyne has examined approximately 700 BMNs at various plants and have not detected cracking except for STP. The STP leak was confirmed by detection with both the visual and non-visual techniques and this occurred prior to the EPRI BMN demonstrations . The examination results are a favorable affirmation of the reliability of the NDE procedures and effectiveness of the demonstration process. See the responses to Question 5 on differentiating between service induced indications and fabrication induced indications. See also the response to Question 9 regarding procedural changes to reduce false calls.

Question 5

Has acceptance criteria been developed? Has criteria for determining the need for corrective action (i.e., repair) been developed? Please provide more information, including the criteria that will be used to determine what is a recordable indication.

Response

Service induced flaws are typically planar in nature whereas fabrication indications appear as volumetric responses. Flaws to be reported using the UT process would be planar and/or SCC flaws in the Penetration Tube. Flaws that can be seen by circ and axial TOFD and the 0° transducer are volumetric in nature and are fabrication defects by procedure.

It should be noted that the MRP-166 mockups contained several actual fabrication defects. Since these defects were "unintentional" they were considered False Calls for the MRP-166 Demonstration. The WesDyne analysis procedure addressed these defects as noted above.

Note: The majority of BMI tubes in service have shown some type of fabrication defect.

The ASME, Section XI IWB-3000 will be used as the acceptance criteria to determine the need for corrective action (i.e. repairs). Flaws which are predicted to exceed the acceptance criteria of IWB-3000 prior to the next inspection will be repaired prior to returning the penetration to service.

Question 6

What are the criteria for addressing sizing error in any flaw evaluation?

Response

Typically there is no sizing (instrumentation) error included in the WesDyne flaw evaluation. When a flaw is detected, the sizing information provided is directly used in the IWB-3000 evaluation. This is consistent with the best estimate philosophy of ASME, Section XI.

Question 7

In general, is there any particular flaw type/orientation/size/location that may be missed? More specifically, time-of-flight diffraction (TOFD) ultrasonic examination (UT) has a known limitation for near surface inspection in that the presence of the lateral wave may obscure the detection of small flaws near the scan surface. Is this a concern for these inspections? Why/why not?

Response

The Westinghouse 3 and 4 loop demonstration missed no flaws from the ID or OD (paragraph 3.1.2.1 of MRP-166). The TOFD UT limitation is not a concern since the disruption of the lateral wave is an indication of an ID connected flaw that is generally seen. A supplemental Eddy Current examination is performed. While a deep OD initiated flaw may not have a resolvable tip from the ID, TOFD can find this by looking for shadowing of the backwall / weld interface.

Question 8

MRP-166 notes that the vendor's procedure will identify responsibilities and qualification requirements for personnel carrying out several functions including documenting minimum personnel training requirements and qualifications for acquisition and analysis. In light of the fact that a high degree of operator skill is required to correctly interpret TOFD UT inspection results, what are the training and qualification requirements for personnel carry out the TOFD UT data acquisition and analysis? Where is this documented?

Response

The WesDyne written practice meets the requirements of ASME Section XI, IWA-2300 and Appendix VII for Ultrasonic Examiner Certification. Additional training for the BMI specific application is as follows:

- For BMI Acquisition – The requirement is for 80 Hours of Paragon Operator Training for Reactor Vessel Exams. Included in this course is training on the Basic TOFD theory, BMI Acquisition Procedure Review, Paragon TOFD display setup, and acquisition responses from BMI tubes.

- For BMI Analysis – The Basic Paragon Operator Training is a pre-requisite for BMI analysis. The requirement for a BMI analyst is for a 40 hour BMI specific course. The course covers additional BMI Theory, TOFD Calibration, Data Quality, Acquisition and Analysis Procedure Reviews and Hands on with Recent Field Inspection data.

Question 9

MRP-166 is dated March 2006; however, most of the information it contains dates back to 2004. Is the same equipment being used today as that used in 2004? If not, what has been done since 2004? Has this equipment been demonstrated on mockups?

Response

During the MRP demonstration, both a 0 degree transducer and a 45 degree transducer were used. Following the demonstration, the 0 degree and 45 degree transducers were modified to obtain a better signal to noise ratio. The size and frequency of each transducer was optimized, and the material of the 0 degree transducer was switched to a composite.

The MRP demo in early 2004 used both Paragon and IntraSpect systems. In the fall of 2004 the data was reanalyzed using the Paragon system with an analysis procedure that had been revised to incorporate lessons learned from the initial demonstration and field application of this procedure. The reanalysis reduced false calls and Paragon was considered acceptable for field use

Question 10

The equipment from two vendors were evaluated in MRP-166. The regression analyses presented in MRP-166 seem to indicate that the Vendor A system significantly out-performed the Vendor B system for length and depth measurements for the Westinghouse 3- and 4-Loop Design. Why is that? Can the Vendor B system today perform as well as the Vendor A system?

Response

In 2007, the IntraSpect Analysis procedure was revised to incorporate improvements that had been learned through 3 years of field use with the Paragon procedure. The latest revision of the IntraSpect Analysis procedure was recently demonstrated for planned usage at the Koeberg site.

The improvements made to the IntraSpect system in 2007 were based on the improvements to the Paragon system in 2004 and the false calls were reduced. The improvements made to the Paragon system in 2004 eliminated the false calls that were originally reported by the Paragon system. Since a new demonstration has not been completed since these improvements were implemented, it can not be established whether one vendor can perform better than the other.

Question 11

What is the implication of the Vendor B system's significant undersizing of length and depth measurements as shown in the regression analyses in MRP-166?

Response

The implications are unknown. If a crack is found in a bottom mounted nozzle (BMN) the flaw will be evaluated to establish its acceptability for continued service. The accuracy of the sizing technique will be assessed to ensure that the size of the flaw evaluated accurately reflects the size of the detected flaw.

Question 12

MRP-166 notes in Attachment 1 that it is possible that inspection vendors will be provided confidential information on the flaw characteristics of a limited set of flaws contained in the mockups in cases where vendor weaknesses were identified. Per this statement, confirm whether the examinations used to demonstrate this technique were conducted only on the blind mockups.

Response

Blind mockups were used and if weaknesses were identified in their procedure they were guided to improve their analysis to better characterize flaws, but were not given any flaw truth information.

Question 13

Per the introduction section of MRP-166, it is noted that both Vendor A and Vendor B are still developing eddy current (ET) equipment for inspecting the wetted surface of the attachment weld. Additionally, there is little information in MRP-166 reporting on the ET portion of the examination. Please clarify what criteria were or are being used to qualify the ET examination technique? Please elaborate on the results, limitations, status, etc. of the ET examinations. Do the regression analyses include results obtained via ET examination?

Response

The wetted surface ET tool for the attaching weld is still in the development stage. Therefore elaboration on criteria is premature. For the ET examinations of the base material, Vendor A included an ET sensor in their UT probe when scanning from the ID of the tube. No specific limitations were noted during the demonstration. For regression analysis, Vendor A used ET data from the base material in conjunction with the UT data in detection and length sizing of flaws located on the ID surface of the tube.

ET of the base material is primarily a tool for length sizing and orientation of ID indications. UT is for flaw characterization information and thru-wall sizing. All base metal ID detection and sizing is a result of the two complimentary exams used in this demonstration.

Question 14

In section 3.1 of MRP-166, the discussion of the Vendor B Demonstration, a statement is made that the J-groove ET exam had an issue with being unable to examine the entire area of interest. Has this been addressed? What is the status of Vendor B's upgrade of their examination tool? Please address whether a new tool has been successfully demonstrated?

Response

The wetted surface ET tool for the J-groove weld is still in the development stage and has not been demonstrated with MRP.

Question 15

The NRC has accepted the qualification / demonstration of similar techniques for the inspection of control rod drive mechanism penetrations in the initial licensee responses to NRC order EA-03-009. Provide a detailed comparison of the demonstration for the lower head penetrations with the demonstration industry used to justify the UT and ET techniques for the CRDM inspections. Please provide the protocol or criteria used to qualify the UT/ET for the BMI inspections and how it compares to the protocol or criteria used for CRDMs. Please provide the MRP-89 report on the demonstration program for CRDM inspections.

Response

The demonstrations were done in a very similar fashion and protocol with similar flaw types. Due to the smaller size of the BMNs, fewer flaws were able to be placed in them and fewer flaws were available for the demo. The required CRDM inspection volume was from the bottom of the tube to 2" above the weld. There was no required inspection volume for the BMNs, but in the 4-loop mockup, flaws were placed within 1" above and below the weld as the weld causes distortion in the tube and this would be the most challenging to examine in the field. The CRDM demo was done from below the dry mockup while the BMN demo was done from above the submerged mockup (similar to how they would be inspected in the field). MRP-89 is not being used as a basis for the bottom mounted instrument (BMI) penetration inspection program.

B. The following questions relate to WesDyne's Technical Report WSI-TJ-1014, Revision 2, "BMI Examination of Indian Point Penetrations," dated April 18, 2006

Question 1

Though an eddy current probe is shown in the figure associated with Table 1 for the Westinghouse 3/4 Loop Probe, there is no descriptive information provided for this probe. Please provide this information along with a description of the flaws that this probe is sensitive to and how this was demonstrated.

Response

The Eddy Current Probe used for this inspection is an "X" point probe. It is similar to the "+" point probe used for the steam generator inspections. The probe used was a cross wound driver pickup design capable of operating at frequencies between 75 and 500 KHz. Primary Test Frequency of 400 KHz and a diameter of 0.1". The probes were used for surface flaw detection, length sizing, and axial and circumferential flaw locations and orientations in the ID of the tube. The sensitivity is documented in MRP-166.

Question 2

On page 13 of 17, a statement is made that "WesDyne has satisfactorily demonstrated techniques..." To what criteria were the WesDyne demonstrations evaluated against (i.e., what determines a "satisfactory" demonstration).

Response

The results of the 3/4 loop Westinghouse were very good with all flaws > 10% detected. The results of blind testing at EPRI on 2 mockups of the Westinghouse 3 / 4 loop style BMI are:
Flaw Detection
a) 10% to 100% TWE detected
b) All ID connected flaws detected
c) All OD connected flaws detected

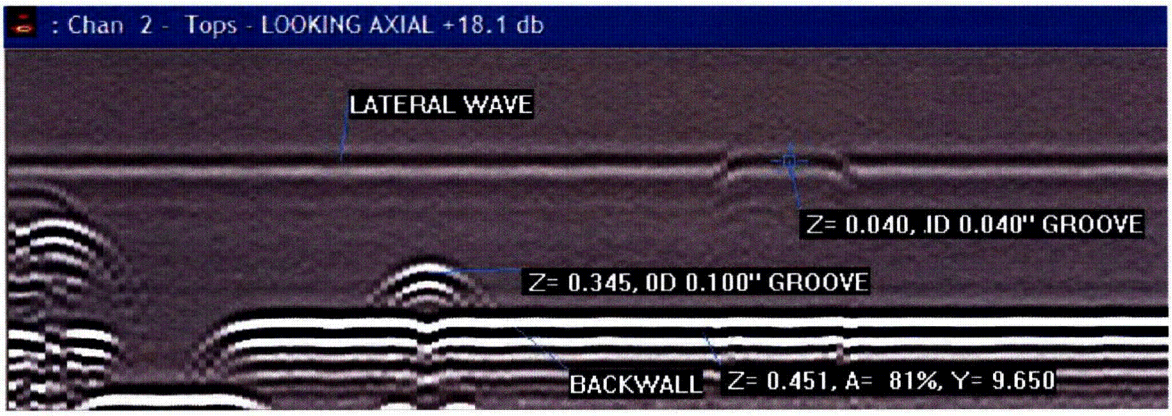
Question 3

The WesDyne report presents 3 examples of calibration scans using the Westinghouse 3/4 loop standard with only labels provided as explanations (and these labels are not clear as to what they are referring to). Please provide a more detailed description of what the scans are showing with each feature of the TOFD scan clearly labeled. Additionally, please provide examples of TOFD scan from the mockup flaws with the features of the scans clearly labeled.

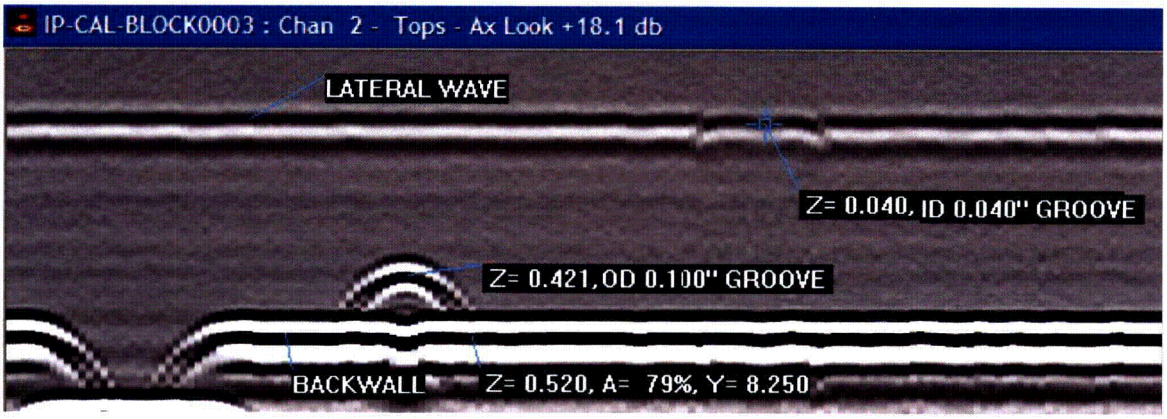
Response

The following are the examples of Calibrations using different size probes and calibration blocks. Each Axial looking TOFD calibration shows the ID surface (Lateral Wave), the 0.040" ID Groove, the 0.100" OD Groove, and the OD (Backwall response). In the following pictures the "Z" value shows depth.

#1 Westinghouse 3/4 loop calibration block with 0.600" BMI Probe.



#2 Westinghouse Indian Point Unit 2 calibration block with 0.460" BMI Probe.



#3 Westinghouse 2 loop calibration block with 0.375" BMI Probe.