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Robert J. Murillo
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Waterford 3

W3F1-2009-0059

November 2, 2009

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

SUBJECT: Response to NRC Request for Additional Information Regarding Request for Alternative W3-ISI-015, Inspection of Reactor Vessel Head In-Core Instrument Nozzles during Third Ten-Year Inservice Inspection Interval
Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

REFERENCES: 1. Entergy Letter to the NRC dated October 19, 2009, Request for Alternative W3-ISI-015, Inspection of Reactor Vessel Head In-Core Instrument Nozzles during Third Ten-Year Inservice Inspection Interval, Waterford Steam Electric Station, Unit 3 (W3F1-2009-0056) (ML092940241)

Dear Sir or Madam:

As discussed in Reference 1, Entergy Operations, Inc (Entergy) requested relief from the inspection requirements of American Society of Mechanical Engineers (ASME) Code Case N-729-1, as conditioned by 10CFR50.55a(g)(6)(ii)(D), for Waterford 3 Steam Electric Station, Unit 3 (Waterford 3) for the third 10-year inservice inspection (ISI) interval pursuant to 10CFR50.55a(a)(3)(ii). Specifically, inspection of the reactor pressure vessel (RPV) head In-Core Instrumentation (ICI) penetrations in accordance with the revised rule for performing surface examinations would constitute a hardship. On October 21, 2009, the NRC staff requested additional information be provided in support of continued NRC staff review of Entergy's request.

Please find attached (Attachment 1), Entergy's response to the NRC October 21, 2009, request for additional information. Attachment 2 provides additional information in response to NRC Question 2. Attachment 3 contains Revision 1 of Request for Alternative WF3-ISI-015 based on a change identified as a result of Entergy's response.

The NRC requested that Entergy provide a complete copy of the Westinghouse Topical Report, WCAP-15815, Revision 1. This report is classified as proprietary to Westinghouse Electric Corporation and is being provided under separate letter.

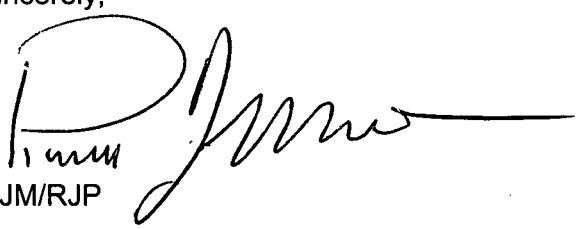
A047
NRR

This letter modifies one of the commitments provided in Reference 1. The commitments associated with Alternative W3-ISI-015 are modified and reproduced in Attachment 4.

As a result of changes to both the Request for Alternative W3-ISI-015 and the associated commitments provided in Reference 1, this letter supersedes Reference 1.

If you have any questions or require additional information, please contact me at 504-739-6715.

Sincerely,



RJM/RJP

Attachments:

1. Response to NRC Request for Additional Information Regarding Request for Alternative W3-ISI-015, Inspection of Reactor Vessel Head In-Core Instrument Nozzles during Third Ten-Year Inservice Inspection Interval
2. Wesdyne ICI Nozzle Extension Measurement Data from Waterford 3RF15 Outage
3. Request for Alternative W3-ISI-015, Revision 1, Inspection of Reactor Vessel Head In-Core Instrument Nozzles during Third Ten-Year Inservice Inspection Interval
4. List of Regulatory Commitments

cc: Mr. Elmo E. Collins, Jr.
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Attachment 1 to W3F1-2009-0059

Response to NRC Request for Additional Information Regarding Request for Alternative W3-ISI-015, Inspection of Reactor Vessel Head In-Core Instrument Nozzles During Third Ten-Year Inservice Inspection Interval

Entergy Operations, Inc.

Waterford Steam Electric Station, Unit 3

Response to NRC Request for Additional Information Regarding Request for Alternative W3-ISI-015, Inspection of Reactor Vessel Head In-Core Instrument Nozzles During Third Ten-Year Inservice Inspection Interval

By letter dated October 19, 2009, Entergy Operations Inc. (Entergy, the licensee) submitted a "Request for Alternative W3-1SI-01 5, Inspection of Reactor Vessel Head In-Core Instrument Nozzles during Third Ten-Year Inservice Inspection Interval." The staff has reviewed the submittal and determined that additional information is required for the review to proceed.

1. Please specify the manufacturer, heat and heat treatment of the in-core instrumentation (ICI) penetration tubes. Has this specific material shown an industry history of primary water stress corrosion cracking?

   Response:

   The heat of material for the ICI nozzles is NX4309. The material specification was SB-167 and it was manufactured by Huntington Alloy. Based on a review of these heats of material, NX4309 is unique to Waterford and is not known to have had a history of Primary Water Stress corrosion cracking. Additionally, the Waterford 3 reactor vessel head inspections have not found primary water stress corrosion cracking on the ICI nozzles.

2. Please specify the penetration nozzle length below the lowest point of the J-groove weld toe, and the distance that can be examined on the inside diameter (ID) by eddy current examination (ECT) and ultra-sonic testing (UT) for each of the ICI nozzles.

   Response:

   Based on UT data taken in previous outages, the nozzle length below the fillet cap J-groove weld toe has been recorded for each of the ICI nozzles at 30° increments around the nozzles. A complete listing of the ICI outer diameter (OD) nozzle tube extents provided by Wesdyne is contained in Attachment 2. On the lower hillside, the nozzle extent below the weld ranged from 0 inches to approximately 0.5 inches. The upper hillside nozzle extent below the weld ranged from approximately 1.3 inches to 2 inches. The data provided was primarily developed with the circumferential Time of Flight Diffraction (TOFD) ultrasonic probes. However, when the circumferential TOFD data did not represent a measurable point the zero degree and axial TOFD was reviewed to select the measure point. The ID ECT can be examined to at least 1.5 inches above the root of the weld and down to the nozzle end. Additionally, the face of the ICI nozzles will be examined with ECT. For the UT examination, the lower extent includes the nozzle tube material down to approximately 0.2 at 0 and 180 degrees to 0.7 inches at 90 and 270 degrees above the point where the ID surface intersects with the bottom face surface. This blind zone occurs due to loss of coupling as the transducers traverse across the bottom end of the nozzle. This loss of coupling is discussed in Entergy letter dated September 24, 2003 [ML032740394]. Figures 3, 4, and 5 of this letter show the various conditions where loss of coupling occurs.

3. Please specify the extent of the ECT to be performed on the penetration tube ID above the J-groove weld root and below the J-groove weld toe. If the proposed extent is not equal to the distance "a" specified in ASME Code Case N-729-1, please justify the change.

   Response:

   Entergy used the value of one inch as the distance "a" because the ICI nozzles have an incidence angle that is greater than 30 degrees. Upon further review, Entergy has concluded that use of 1.5 inches as the distance "a" is appropriate since the OD of the ICI nozzle is greater than 4.5 inches. The Request for Relief in Attachment 3 has been revised to reflect the additional required examination length. The surface and volumetric examinations from the ID of the ICI nozzle will be implemented from a minimum of 1.5 inches above the highest point of the J-groove weld, down to the lowest extent possible for the applicable NDE technology. For the eddy current (ECT) surface examination, the lower detection extent includes the entire ID surface area down to the bottom of the nozzle where the ID surface intersects with the bottom face surface, and also includes the entire bottom face surface. As discussed above, the lower UT extent includes the nozzle tube material down to approximately 0.2 to 0.7 inches above the point where the ID surface intersects with the bottom face surface.

4. The first paragraph of the proposed alternative states that the UT will be performed "1 inch above the J-groove weld." The second paragraph of the proposed alternative states that the UT will be performed "from the J-groove weld root to one inch below the J-groove weld root."

   a. Please justify the deviation from the 1.5 inch "a" dimension specified in ASME Code Case N-729-1 for penetration tubes with outside diameter (OD) greater than 4.5 inches.

      Response:

      As discussed above, Entergy will perform examinations for the ICI nozzles to 1.5 inches above the highest point of the J-groove weld, down to the lowest extent possible below the J-groove weld.

   b. Please justify any deviation from the ASME Code Case N-729-1, requirement of examination a distance "a" below the J-groove weld toe, or to the end of the tube, whichever is less.

      Response:

      The volumetric examinations from the ID of the ICI nozzle will be performed from a minimum of 1.5 inches above the highest point of the J-groove weld, down to the lowest extent possible. As discussed above, the lower extent of the UT examination includes the nozzle tube material down to a point from approximately 0.2 to 0.7 inches above the point where the ID surface intersects with the bottom face surface. Due to the short length of nozzle that extends below the J-groove weld, the UT

examination volume will not provide coverage of the nozzle tube below the weld in accordance with the specified examination volume in Code Case N-729-1.

The UT procedure for ICI nozzles could not be qualified in accordance with 10CFR50.55a(g)(6)(ii)(D)(4), and is being employed to supplement the surface examinations that will be performed on the ICI nozzle ID and bottom face surfaces. Because the surface exam cannot be remotely employed to the OD surface of the ICI nozzles, the potential concern would be a crack on the OD surface of the nozzle below the J-groove weld. The UT leak path assessment and the TOFD examinations will provide additional confidence that the pressure boundary integrity of the nozzle tube will not be compromised by a potential crack on the OD surface of the ICI nozzles. As discussed above, the UT examination has limited extent on the lower end of the nozzle; therefore, it is necessary to establish the extent of the UT examination below the top of the J-groove weld needed to ensure that the pressure boundary integrity of the nozzle tube will not be compromised by a potential crack on the OD surface of the ICI nozzles. The fracture mechanics analysis documented in WCAP-15815, Revision 1 and shown in Figure 6-10A demonstrates that the pressure boundary integrity of the nozzle tube will not be compromised in one fuel cycle if the UT examination confirms that there are no axial crack indications in the nozzle tube for a distance of approximately one inch below the top of the J-groove weld. Based on this, the UT examination is focused on the nozzle tube volume from the top (root) of the J-groove weld down to one inch below the top of the J-groove weld. While the UT examination will be performed on the entire volume achievable (from a minimum of 1.5 inches above the highest point of the J-groove weld, down to the lowest extent possible below the J-groove weld), the criteria for implementing manual ECT surface examination on the OD surface of the ICI nozzle below the J-groove weld is based on data quality in the nozzle tube volume from the top (root) of the J-groove weld down to one inch below the root (top) of the J-groove weld. All quality UT data will be analyzed for potential indications and compared to previous UT examination data.

c. Please justify any deviation from ASME Code Case N-729-1, requirement of examination a distance "a" above the J-groove weld root.

Response:

The relief request has been revised to reflect a value of 1.5 inches for the distance "a" above the J-groove weld root.

5. The second paragraph of the proposed alternative states the "If the TOFD data is determined to have unacceptable quality from the root of the J-groove weld to 1 inch below the root of the J-groove weld, than a manually delivered ECT of the ICI penetration tube OD will be performed."

a. Who will make the determination of the "unacceptable quality?"

Response:

Entergy uses Wesdyne for performing the Waterford 3 RPV head examinations in accordance with Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D). The evaluation of data quality is determined by Wesdyne Level II or Level III analysts.

Wesdyne has qualified their analysts being deployed to Waterford 3 in accordance with Wesdyne procedures. These data analysts have been certified to the EPRI PDQS testing program for the Control Element Drive Mechanism (CEDM) nozzles which met the performance demonstration requirements of 10CFR50.55a(g)(6)(ii)(D)(4).

b. What criteria are used for the "unacceptable quality?"

Response:

The data quality criteria are provided by Wesdyne's UT examination procedure and as determined by EPRI CEDM qualified analysts. Data loss could occur due to inadequate TOFD head coupling. Electrical noise could also affect data quality. Additionally, current cycle examination data is compared against historical data to support coverage and quality.

c. If the "unacceptable quality" of the TOFD data is determined, what is the extent of manually delivered ECT?

Response:

If any ICI nozzle UT examinations are identified to have unacceptable data quality in the area of concern, that nozzle will receive ECT coverage of essentially 100% of the combined nozzle tube ID, OD, and nozzle end face based on the coverage requirements provided in Figure 2 of Code Case N-729-1 as conditioned by 10CFR50.55a.

d. If the "unacceptable quality" of the TOFD data above the J-groove weld toe is determined, what further examination will be performed since ECT on the OD is not possible?

Response:

As stated in relief request W3-ISI-015, the nozzle tube volume extending downward from the J-groove weld root to one inch below the J-groove weld root will be confirmed to have acceptable data quality. If additional weld material exists below the 1 inch criteria and the data quality is unacceptable, no further examinations are required based on the proposed relief alternative. The pressure boundary integrity of the nozzle above the J-groove weld is ensured by the ECT surface examination of the nozzle ID surface. The TOFD examination of the nozzle tube volume above the J-groove weld is being performed to supplement the surface examination for an added level of confirmation. If any of the supplemental TOFD data has unacceptable quality, the examination will rely on the results of the primary examination method, which is the ECT examination of the ID surface in that area. A leak path assessment performed in accordance with 10CFR50.55a(g)(6)(ii)(D)(3) will establish J-groove weld integrity. No additional examinations would be required.

6. Please provide a complete copy of the Westinghouse Topical Report, WCAP-15815-P, Revision 1.

Response:

WCAP-15815, Revision 1, is classified as proprietary and is being provided to the NRC under separate letter.

Attachment 2 to W3F1-2009-0059

Wesdyne ICI Nozzle Extension Measurement Data
From the Waterford 3 RF15 Outage

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 92
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.72	1.48	4.20	5.4	7.6	8.96	9.44	8.76	7	5.44	4.2	2.32

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.20	.88	3.68	4.8	5.8	7.12	7.76	7	5.68	4.92	3.6	1.44

Delta

.52	**.60**	**.52**	**.60**	**1.8**	**1.84**	**1.68**	**1.86**	**1.32**	**.52**	**.6**	**.88**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 93
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.12	1.48	3.92	5.2	7.48	8.88	9	8.64	7	4.8	3.24	1.2

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.12	.8	3.32	4.12	5.72	7.16	7.4	6.92	5.52	3.92	2.76	.8

Delta

0	**.40**	**.6**	**1.08**	**1.76**	**1.72**	**1.6**	**1.72**	**1.48**	**.88**	**.48**	**.4**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 94
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.4	1.60	3.80	6.04	6.9	8.6	8.92	8.76	7.04	4.96	3.72	.84

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.24	1.32	3.48	5.4	5.64	7.04	7.48	7.64	5.52	4.96	3.72	.84

Delta

.16	**.28**	**.32**	**.64**	**1.26**	**1.56**	**1.44**	**1.12**	**1.52**	**0**	**0**	**0**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 95
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.08	1.52	3.88	5.96	6.96	8.32	9.16	8.64	7.24	6.36	4.08	.8

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.08	1.28	3.72	5.6	6	7.16	7.84	7.88	5.56	5.96	4.08	.8

Delta

0	**.24**	**.16**	**.36**	**.96**	**1.16**	**1.32**	**.76**	**1.68**	**.4**	**0**	**0**

Name ___Norman P. Siniaho_____ Date ___9/18/09_____

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 96
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.04	.68	2.84	4.88	7	8.56	9.28	8.88	7.4	5.56	3.72	.1.9

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.04	.68	2	3.76	5.48	6.88	7.4	7.04	5.76	4.56	3.72	1.9

Delta

0	**0**	**.84**	**1.14**	**1.52**	**1.68**	**1.88**	**1.84**	**1.64**	**1**	**0**	**0**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 97
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.16	.84	2.52	5.4	7.24	8.8	9.24	8.72	7.4	5.36	3.44	1

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.00	.64	2.16	3.96	5.48	6.88	7.4	7.24	5.56	4	3.2	.84

Delta

.16	**.2**	**.36**	**1.44**	**1.76**	**1.92**	**1.84**	**1.48**	**1.84**	**1.36**	**.24**	**.16**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 98
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.2	.52	3.32	5.6	7.36	8.92	9.24	8.64	7.12	5.08	3.56	2.12

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.00	.4	3.08	4.08	5.68	7.04	7.52	6.88	5.52	4.8	3.36	1.76

Delta

.2	**.12**	**.24**	**1.52**	**1.68**	**1.88**	**1.72**	**1.72**	**1.60**	**.28**	**.20**	**.36**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 99
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.08	1.2	3.92	5.4	6.92	8.68	9.32	8.92	7.52	5.48	4	2.24

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
-.08	.96	3.64	4.88	5.4	6.72	7.4	6.96	5.6	5.52	3.96	2.24

Delta

.16	**.24**	**.28**	**1.52**	**1.52**	**1.96**	**1.92**	**1.96**	**1.92**	**.32**	**.04**	**0**

Name ___Norman P. Siniaho_____ Date ___9/18/09_____

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 100
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.2	.92	2.76	5	7.12	8.88	9.32	8.68	6.72	5.6	3.72	1.56

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
-.04	.56	2.52	4.20	5.56	7.52	7.6	7.04	5.64	5.6	3.72	1.56

Delta

.24	**.36**	**.24**	**.8**	**1.56**	**1.36**	**1.72**	**1.64**	**1.28**	**.32**	**0**	**0**

Name Norman P. Siniaho Date 9/18/09

WESDYNE
A Westinghouse NDE Company

ICI PENETRATION # 101
RF15 data Waterford 3 2008
TUBE MEASUREMENTS

Toe of Weld (lower)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.4	1.36	3.64	5.12	7.28	8.6	8.8	8.48	6.84	4.88	3.92	1.24

End of Tube

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
.4	1.12	3.28	3.92	5.56	6.96	7.4	6.84	5.48	4.08	3.72	.96

Delta

0	**.24**	**.36**	**1.2**	**1.72**	**1.64**	**1.4**	**1.64**	**1.36**	**.8**	**.2**	**.28**

Name Norman P. Siniaho Date 9/18/09

Attachment 3 to W3F1-2009-0059

Request for Alternative W3-ISI-015, Revision 1
Inspection of Reactor Vessel Head In-Core Instrument Nozzles
During Third Ten-Year Inservice Inspection Interval

Request for Alternative W3-ISI-015, Revision 1
Inspection of Reactor Vessel Head In-Core Instrument Nozzles
During Third Ten-Year Inservice Inspection Interval

I. ASME CODE COMPONENT AFFECTED

Waterford Steam Electric Station, Unit 3 (Waterford 3) has one hundred-two (102) ASME Class 1 reactor pressure vessel (RPV) head penetration nozzles comprised of ninety-one (91) Control Element Drive Mechanism (CEDM) nozzles, ten (10) In-Core Instrument (ICI) nozzles, and one (1) vent line nozzle. This request pertains to the ICI nozzles only.

Component Numbers:	Ten (10) RPV Head ICI Nozzles [02-T-92 through 02-T-101]
Code References:	(1) ASME Section XI 2001 Edition through 2003 Addenda (2) ASME Code Case N-729-1, as conditioned by 10CFR50.55a(g)(6)(ii)(D)
Examination Category:	Code Case N-729-1 in lieu of Table IWB-2500-1 Exam Category B--P
Item Number:	B4.20
Description:	Proposed Alternative to Table 1 of ASME Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D)
Unit/Inspection Interval Applicability:	Waterford 3 / Third (3^{rd}) 10-year inspection interval May 31, 2008 thru July 2017

II. APPLICABLE CODE REQUIREMENT

The Code of Federal Regulations (Rule) 10CFR50.55a(g)(6)(ii)(D)(3) requires:

> *Instead of the specified 'examination method' requirements for volumetric and surface examinations in Note 6 of Table 1 of Code Case N–729–1, the licensee shall perform volumetric and/or surface examination of essentially 100 percent of the required volume or equivalent surfaces of the nozzle tube, as identified by Figure 2 of ASME Code Case N–729–1. A demonstrated volumetric or surface leak path assessment through all J-groove welds shall be performed. If a surface examination is being substituted for a volumetric examination on a portion of a penetration nozzle that is below the toe of the J-groove weld [Point E on Figure 2 of ASME Code Case N-729-1], the surface examination shall be of the inside and outside wetted surface of the penetration nozzle not examined volumetrically.*

Code Case N-729-1 (Reference 1) requires that components shall be examined as specified in Table 1 of the code case.

III. REASON FOR REQUEST

Pursuant to 10CFR50.55a(a)(3)(ii), Entergy Operations, Inc (Entergy) requests an alternative to the requirements of Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D) for the fall 2009 Waterford 3 refueling outage.

Prior to the Rule change, Entergy Operations, Inc. (Entergy) performed volumetric examination of the ICI nozzle tube and a leak path assessment of the J-groove welds in accordance with NRC First Revised Order EA-03-009 (Reference 2). These examinations were not qualified to requirements of paragraph 10CFR50.55a(g)(6)(ii)(D). In addition, Entergy supplemented these base examinations with automated eddy current examination (ECT) of the inside diameter (ID) and lower nozzle end penetration surfaces.

Volumetric examination of the CEDM nozzles and J-groove weld leak path assessment techniques have been successfully demonstrated at the Electric Power Research Institute (EPRI). However, qualification of volumetric examination techniques in accordance with 10CFR50.55a(g)(6)(ii)(D)(4) for inspection of ICI nozzle tubes was not successful. As a result, compliance with current regulations requires leak path assessment of the ICI J-groove weld and surface examination of the required exam volume on the ICI nozzle tube inside and outside wetted surfaces.

Entergy will perform a demonstrated leak path assessment of all ICI J-groove welds and remote ECT examination of the ICI penetration inside and lower end surfaces. Entergy will also perform a bare metal visual (BMV) inspection of the RPV head surface in accordance with Code Case N-729-1 during RF16. However, examination of the ICI nozzle tube outer surface below the J-groove weld cannot be performed remotely, which introduces a radiological hardship. In order to maintain radiological dose as low as reasonably achievable, Entergy proposes to perform an alternative examination such that examination of the ICI nozzle tube OD wetted surface would not provide a compensating increase in the level of component quality and public safety.

The ICI penetration tube OD wetted surface is formed by a short extension of the tube below the J-groove weld. The length of this extension varies azimuthally around the penetration and from one penetration to another. These variations were introduced by tolerances in allowable J-groove weld reinforcement during original fabrication. Dimensional variations and the elliptical cross-section which results from conforming the lower end to the spherical head surface has impeded development of remotely controlled examinations.

Manually delivered ECT examination of the nozzle tube outside diameter (OD) would have to be performed using a hand held transducer. The estimated extension of Waterford 3 nozzle tubes below the ICI J-groove weld is approximately 1-inch. Surface coverage in accordance with Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D) would require under head manual delivery for the ICI nozzle penetrations not receiving essentially 100% coverage. New ECT tooling is being developed by Wesdyne which contains a larger probe head that, if required, would be used to perform manual scanning of the ICI nozzle OD. However, Entergy does not have historical experience with its use in the field and its confirmed effectiveness to limit the number of nozzle scans. Additionally, the Waterford 3 head stand is elevated such that manual delivery would require additional time for accessing the ICI nozzle OD. Entergy has estimated the total personnel dose for performing these manual OD nozzle scans to be between 1.0 to 3.0 Rem. Liquid penetrant examination of the same surfaces would be expected to result in significantly larger personnel exposures.

IV. PROPOSED ALTERNATIVE AND BASIS FOR USE

Proposed Alternative

Entergy proposes to remotely perform a demonstrated volumetric ICI J-groove weld leak path assessment, ECT surface examination of the interior diameter (ID) and bottom face surface of each ICI nozzle, and a BMV inspection of the RPV head in accordance with Code Case N-729-1. The required examination of the ICI penetration tube OD surface will not be performed. Entergy proposes to supplement the ECT examinations by performance of a volumetric examination of the ICI nozzle tube using UT equipment and techniques demonstrated under the NRC First-Revised Order EA-03-009 from 1.5 inches above the J-groove weld to the detectable extent of the nozzle tube below the J-groove weld. Improvements in data acquisition and analysis that were developed during qualification of Control Element Drive Mechanism (CEDM) volumetric examinations will be incorporated in the proposed ICI examinations.

The proposed alternate volumetric examination will include Time-of-Flight-Diffraction (TOFD) examination from the ID surface and from the lower end surface similar to the areas previously examined under NRC First-Revised Order EA-03-009. As described in the Basis below, examination of essentially 100% of the penetration tube volume extending downward from the J-groove weld root to one inch below the J-groove weld root is necessary for ensuring quality and the reactor coolant system (RCS) pressure boundary are not compromised. Therefore, UT TOFD data collected will be reviewed for consistency with current data quality standards to ensure exam quality. If the TOFD data is determined to have unacceptable quality from the root of the J-groove weld to 1 inch below the root of the J-groove weld, then a manually delivered ECT examination of the ICI penetration tube OD surface will be performed. As a result, this will comply with Code Case N-729-1, as conditioned by 10CFR50.55a(g)(6)(ii)(D).

UT technology and tooling for examination of CEDMs and ICI penetration tubes are essentially the same. A significant difference between successful qualification of CEDM and ICI volumetric examination techniques appears to be due to misalignment of the open housing probe as a result of insufficient guide cone engagement and not applying the laser alignment process used by the Waterford 3 vendor. Additionally, penetration geometry and the effects of weld induced distortion in low restraint areas of the lower end of the ICI penetrations likely contributed to the failure to gain examination qualification. Tooling used at Waterford uses complete alignment techniques and the Waterford ICI nozzles have not experienced significant data quality concerns as a result of nozzle tube weld induced distortion. Therefore, UT data obtained during RF16 is expected to compare favorably with previous outage data. Despite the inability to qualify volumetric examination of ICI penetrations in support of Waterford 3's fall 2009 refueling outage examinations, those techniques remain capable of detecting defects when quality UT data is obtained.

Basis for Proposed Alternate Examination Coverage

The short extension of the ICI penetration below the J-groove weld has no structural function and cracks that are confined to this volume have no significance to quality or pressure boundary integrity. For PWSCC to develop into a RCS pressure boundary

defect, a crack must grow upward through the penetration volume adjacent to the J-groove weld and extend above it, or it must grow through the J-groove weld itself. The risk of PWSCC within the J-groove weld is managed at Waterford 3 by using demonstrated leak path assessment examinations in accordance with 10CFR50.55(a).

The time required for a throughwall, axial crack to grow from the bottom of an ICI penetration tube upward to reach the root of the J-groove weld has been calculated using finite element flaw tolerance methodologies documented in WCAP-15815, Revision 1 (Reference 3). This report has not been provided to the NRC; however, the approach of this report is similar to that provided in WCAP-15819 for the San Onofre Nuclear Generating Station (Reference 4). Based on this report, the limiting case for an axial flaw, located in the nozzle tube at the toe of the J-groove weld, to grow to the root of the weld (approximately 1 inch) would take in excess of one operating cycle. Surface examinations of the ID and bottom end of the penetration preclude the possibility of throughwall cracks. Therefore, the throughwall crack growth rates assumed in this analysis conservatively bound potential crack growth. Circumferentially oriented PWSCC cracking below the J-groove weld does not pose an RCS pressure boundary concern since they are not projected to grow into the J-groove weld. A complete severance of the nozzle tube would have to occur for a loose part to be displaced. The ID ECT scan will be able to detect any throughwall flaws.

Although EPRI qualification of the volumetric examination techniques proposed for ICI penetrations were unsuccessful, previous exam data quality for ICI J-groove welds has proven to be effective for the Waterford 3 ICI nozzle examinations. The qualifications performed at EPRI for CEDM volumetric examinations identified improvements to the previous examination techniques. Entergy proposes to perform volumetric examination of ICI penetrations incorporating technique improvements developed for CEDMs. These examinations will reduce the possibility of undetected PWSCC. All acceptable UT data produced during the proposed supplemental examinations will be analyzed for indication of defects.

The proposed alternatives will minimize the radiological consequence of examinations at Waterford 3 to as low as reasonably achievable while providing confirmation that the structural integrity of the ICI nozzle tube is acceptable.

In addition to the proposed alternate and compensatory examinations, Waterford 3 has implemented a program for enhanced monitoring of RCS leakage consistent with the September 2006 Pressurized Water Reactor Owners Group industry initiatives. This leakage monitoring program is designed to detect and respond to increased RCS leakage at levels well below Technical Specification limits.

Therefore, use of manual surface examination of the OD to determine the pressure boundary integrity of the Waterford 3 ICI nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), Entergy requests an alternative to the requirements of Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D) for the fall 2009 Waterford 3 refueling outage.

V. DURATION OF PROPOSED ALTERNATIVE

The proposed alternative will apply to the existing RPV head for the fall 2009 (RF16) Waterford 3 refueling outage ICI examinations. Entergy will be replacing the RPV head during the spring 2011 refueling outage.

VI. PRECEDENT

A similar alternative was requested by Southern California Edison for San Onofre Nuclear Generating Station, Units 2 and 3 on October 2, 2009 (Reference 4).

VII. REFERENCES

1. ASME Code Case N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds, Section XI, Division 1", Approved March 28, 2006.

2. First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors, issued on February 20, 2004 [ML040220181]

3. WCAP-15815, Revision 1, "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operation: Waterford Unit 3 and ANO Unit 2" dated March 2002

4. Southern California Edison letter to the NRC dated October 2, 2009, "Third Ten-Year Inservice Inspection (ISI) Interval Relief Request ISI-3-30, Inspection of Reactor Vessel Head Incore Instrument Nozzles, San Onofre Nuclear Generating Station, Units 2 and 3."

Attachment 4 to W3F1-2009-0059

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will perform eddy current examinations of the inside diameter and the nozzle tube lower face in accordance with Code Case N-729-1 as conditioned by 10CFR50.55a(g)(6)(ii)(D). Entergy will also acquire and analyze ICI ultrasonic data from a minimum of 1.5 inches above the J-groove weld to the detectable extent of the nozzle tube below the J-groove weld. (Improvements in data acquisition and analysis that were developed during qualification of CEDM volumetric examinations will be incorporated in the proposed ICI examinations).	X		Fall 2009 Refueling Outage
If ultrasonic (TOFD) data is determined to have unacceptable quality in the nozzle tube from the root of the J-groove weld to 1 inch below the root of the J-groove weld, then a manually delivered eddy current examination of the ICI penetration tube OD surface will be performed.	X		Fall 2009 Refueling Outage