FPL

OCT 2 1 2003

L-2003-272
EA-03-09(IV)(F)(2)

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: Turkey Point Unit 4
Docket No. 50-251
Order (EA-03-009) Relaxation Request
Examination Coverage of Reactor Pressure Vessel Head
Penetration Nozzles

On February 11, 2003 the NRC issued Order (EA-03-009) requiring specific inspections of the reactor pressure vessel (RPV) head and associated penetration nozzles at pressurized water reactors. Pursuant to the procedure specified in Section IV, paragraph F of the Order, Florida Power & Light (FPL) hereby requests relaxation from the requirements specified in Section IV, paragraph C.(1)(b)(i) for Turkey Point Unit 4 for the Reactor Vessel Head (RPVH) penetration nozzles for which ultrasonic testing requirements could not be completed as required.

The first part of the relaxation request is related to the incomplete UT examination of RPV penetration nozzle #11 due to a configuration issue in the nozzle. The second part of the relaxation request is related to the incomplete UT examinations due to the blade probe UT design and is applicable for all 53 RPV head penetrations inspected with this UT probe.

As demonstrated in the attachment hereto, the requested relaxation meets item IV.F.(2) of the Order, as compliance with this Order for the specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

FPL requests approval of the subject relaxation by October 24, 2003, the currently scheduled date for Turkey Point Unit 4 reactor re-assembly. The refueling outage completion is currently scheduled for October 29, 2003.

Please contact Walter Parker at (305) 246-6632 if there are any questions about the relaxation.

Very truly yours,

Terry Jones

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

Attachment

A101

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Florida Department of Health and Rehabilitative Services

TURKEY POINT UNIT 4 RELAXATION REQUEST FROM US NRC Order EA-03-009

"Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety"

1. ASME COMPONENTS AFFECTED

Turkey Point (PTN) Unit 4 has 66 ASME Class 1 reactor pressure vessel (RPV) head penetrations (including the vent).

The Turkey Point Unit 4 Order Inspection Category in accordance with Section (IV.A.) is currently determined as "high" based on 18.6 EDY at this refueling outage[1] (RFO).

FPL Drawing No. 5610-M-400-57, Sheet 3, Rev. 0 (PTN-4)

2. US NRC ORDER EA-03-009 APPLICABLE EXAMINATION REQUIREMENTS:

The NRC issued an Order[2] on February 11, 2003 establishing interim inspection requirements for reactor pressure vessel heads of pressurized water reactors. Section IV.C. of the Order states the following:

All Licensees shall perform inspections of the RPV head using the following techniques and frequencies :
(1) For those plants in the High category, RPV head and head penetration nozzle inspections shall be performed using the following techniques every refueling outage.

- (a) Bare metal visual examination of 100% of the RPV head surface (including 360° around each RPV head penetration nozzle), AND
- (b) Either:
  - (i) Ultrasonic testing of each RPV head penetration nozzle (i.e., nozzle base material) from two (2) inches above the J-groove weld to the bottom of the nozzle and an assessment to determine if leakage has occurred into the interference fit zone, OR

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[1] FPL letter L-2002-185, "St. Lucie Units 1 and 2, Docket Nos. 50-335, 50-389, Turkey Point Units 3 and 4, Docket Nos. 50-250 and 50-251, Response to NRC Bulletin 2002-02, Reactor Pressure Vessel Head Penetration Nozzle Inspection Programs," R. S. Kundalkar to NRC, September 11, 2002.

[2] US NRC Letter EA-03-009, "Issuance Of Order Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors," from Samuel J. Collins (NRC) to all Pressurized Water Reactor Licensees, Dated February 11, 2003.

(ii) Eddy current testing or dye penetrant testing of the wetted surface of each J-Groove weld and RPV head penetration nozzle base material to at least two (2) inches above the J-groove weld.

Relaxation is requested from part IV.C.(1)(b)(i) of the Order to perform ultrasonic testing (UT) of the RPV head penetration inside the nozzle from 2 inches above the J-groove weld to the bottom of the penetration at Turkey Point Unit 4.

The first part of the relaxation is related to UT examination of a limited area of the non-pressure boundary portion of the RPV penetration nozzle at the bottom of the nozzle, due to a configuration issue in nozzle # 11.

The second part of the relaxation is related to the blade probe UT design that limits the UT examination area at the bottom of the non-pressure boundary portion of the RPV penetration nozzle. This limitation is applicable to the 53 penetrations inspected with the UT blade probe. The 53 penetrations are identified in Table 1 as being inspected with the "blade" probe.

3. REASON FOR REQUEST:

Pursuant to Order Section IV.F.(2) "Compliance with the Order for specific nozzles would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety," FPL is requesting this relaxation for Turkey Point Unit 4.

RPV head penetration # 11 contains an area of coverage less than that required by the NRC Order. The Order requires examination from 2 inches above the J-groove weld to the "bottom of the nozzle." The coverage below the weld, in the non-pressure boundary portion of the RPV head penetration nozzle, did not extend to the "bottom of the nozzle" for the full circumference. The actual area of missed coverage is a 32° arc, starting 0.76 inches below the bottom of the weld. A presentation of the UT coverage area, with the area of missed coverage identified, is shown in Figure 1.

All RPV head penetrations inspected with the UT blade probe contain an area of coverage less than that required by the NRC Order, due to the probe design. The Order requires examination from 2 inches above the J-groove weld to the "bottom of the nozzle." The circumferential blade UT probe used at Turkey Point Unit 4 has been demonstrated for detection of circumferential, off-axis, and axial flaws. This probe has separate transducers (50° longitudinal time of flight diffraction, L-TOFD) for sending and receiving the UT signal. The transducers are arranged vertically approximately 0.787 inches apart. The scanning process requires both transducers to be in contact with the ID surface of the nozzle.

Based on the nominal arrangement of the transducers, the portion that can not be scanned is a triangular portion extending from the bottom of the nozzle upward for a distance of approximately 0.39 inches (half the transducer separation) measured on the nozzle OD. The nozzle ID surface is fully interrogated by the UT transducer to the end of the nozzle.

The hardship is based on the following points:

- The available circumferential UT blade probe inspection technique is not capable of interrogating the bottom triangular segment of the nozzle. This probe design was selected based on its ability to detect and size axial, off-axis, and circumferential flaws. It was also selected for its robustness and ability to obtain more consistent surface contact. The deployment of the axial UT blade probes in addition to the currently deployed circumferential blade probe does not significantly increase coverage. The axial probe also has limitations, due to element size, that prohibit interrogation to the bottom of the nozzle. Deployment of both probes provides little additional information and no commensurate increase in safety.

- To employ a rotating UT probe, capable of interrogating all the material to the bottom of the nozzles in penetrations that were not open (thermal guide sleeves, part length drive rods or other permanently installed equipment), would require hardware changes to cut, remove, and replace interfering equipment in the RV head penetrations. The modifications required would be time and dose intensive.

- Manual PTs of the missed OD areas of the penetration base material would be time and dose intensive without a compensating increase in safety. Access to the OD of the nozzles is limited by a "forest" of 45 thermal sleeves and 6 permanently installed part length CRDM drive rods that extend well below the nozzle ends. The dose estimate to perform manual PTsurface examination of the 53 RPV nozzle ends examined by blade probe UT would be approximately 15 man Rem. This estimate is based on the dose rates of the Turkey Point Unit 4 head compared to dose rates and actual surface examinations of the vent line at Turkey Point Units 3 and 4 and portions of 9 RPV nozzles ends at St. Lucie Unit 2. The PT examination of the remaining 53 penetration base material OD would result in excessive dose without a resultant commensurate increase in safety.

Accordingly, FPL is requesting a reduction of the examination coverage area based on a flaw tolerance analysis approach. As discussed below, this approach will provide an acceptable level of quality and safety since any flaw in the uninspected area of the nozzle material would not be a challenge to reactor vessel structural integrity or leak integrity.

4. PROPOSED ALTERNATIVE AND BASIS FOR USE:

The proposed alternative is to perform the UT examination to the lowest elevation that can be practically inspected. This is defined as "the examination shall be performed to include 2 inches above the weld to the lowest elevation possible or $\geq$ 0.62 inches below the weld, whichever is greater." This relaxation request documents and submits to the NRC, deviations from the NRC Order required inspection coverage area along with a justification as to their acceptability.

BASIS FOR RELAXATION:

Additional efforts to achieve the Order required examination area (below the weld) will result in a hardship due to unusual difficulty without a compensating increase in the level of quality and safety.

The scope of the examination was to perform a 360° volumetric examination from 2 inches above the J-groove weld down to the bottom of the RPV penetration nozzles. The 66 Turkey Point Unit 4 RPV penetration nozzles are used for a variety of functions and present a variety of examination conditions. The 45 RPV penetration nozzles that are attached to active control rod drive mechanisms (CRDMs) have funnel-ended guide sleeves permanently attached inside the nozzles, leaving only a narrow annulus available for inspection. The 6 RPV penetration nozzles attached to part length CRDMs have threaded drive rods permanently retracted and pinned inside the RPV penetration nozzles that hang down below the nozzle end and create an obstruction. The two RPV penetration nozzles modified for the reactor vessel level measurement system (RVLMS) have a guide sleeve installed and a welded end plate (that required removal for inspection). These 53 locations all require inspection with a UT blade probe. The other 13 RPV penetration nozzles (8 spares, 4 instrument penetrations, and 1 small bore vent line) are open locations and are fully interrogated to the bottom of the nozzle using a rotating probe design. These various design conditions, and the normal distortion of the RPV penetration nozzles caused by the welding into the sloped hemispherical head, result in a variety of examination conditions. The UT blade probes are optimized for these examination conditions. The UT examination technology, currently available for the Turkey Point Unit 4 RPV penetration nozzle inspections, has resulted in some areas of missed inspection $\geq$ 0.62 inches below the weld.

To evaluate the significance of the lack of UT inspection coverage caused by the UT probe design a summary table of the PTN-4 inspection result is provided in Table 1. The table shows the 53 RPV penetrations that were inspected with the blade probe UT method. The minimum distance below the toe of the weld is measured on the OD portion of the penetration at the downhill location. The ID is inspected approximately 0.39 inches farther at the downhill location (half the distance of the transducer separation) in all blade probe inspections. This is due to the 50° angle of the UT signal and performance of the examination from the ID surface. Only in nozzle # 11 is the minimum distance below the weld a function of both UT probe design and the small region of missed coverage shown in Figure 1. However, the minimum distance below the weld for nozzle #11, identified in Table 1, is bounded by the minimum distance below the weld for other nozzles affected by the blade probe design issue. It is also noted that no recordable indications were identified in any of the UT examinations performed.

The significance of the lack of UT examination coverage below the minimum inspection coverage area is evaluated below.

Greater than 0.62 inches below the weld to the bottom of the nozzle: Axial flaws in the area of non-coverage in the non-pressure boundary nozzle base material below the weld are of no structural significance, however, a postulated flaw could grow above the weld to the point of leakage followed by wastage and/or potential initiation of an OD circumferential flaw.

To determine the significance of an axial flaw that is contained in the non-pressure boundary nozzle material in the un-inspected region greater than 0.62 inches below the weld, a flaw tolerance approach is used. A flaw evaluation was performed postulating an axial flaw in the area of missed coverage below the weld using WCAP-16027-P.[3] A through wall flaw is postulated in the nozzle material from the bottom of the penetration to 0.62 inches from the bottom of the weld. This is a conservative assumption since the inspected region extends 0.39 inches farther below the weld on the ID surface of the nozzle. The flaw evaluation in WCAP-16027-P is based on Turkey Point Unit 3 and 4 specific stresses in the nozzle penetrations. Since the stresses in the region greater than 0.62 inches below the weld are too low to propagate an axial flaw, the WCAP-16027-P flaw evaluations start at ½ inch below the weld, and evaluate the time to propagate the flaw in the nozzle to the bottom of the weld (start of the pressure boundary portion of the nozzle material or toe of the J-groove weld). Assuming a through wall flaw below the weld, with the flaw end located at ½ inch below the weld (which is in the area of complete UT examination coverage), an axial flaw would take greater than 5 years of operation (Figures 6-12 through 6-20 in WCAP-16027-P) in any nozzle location to grow to the point of contact with the weld. This time period is significantly greater than the current inspection frequency of every refueling cycle (18 months for Turkey Point Unit 4) identified in NRC Order EA-03-009. As an added conservatism, this evaluation does not attempt to evaluate the time for the axial flaw to grow from the bottom of the weld through the pressure boundary. Figure 2 provides a graphical presentation of the

[3] "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operation: Turkey Point Units 3 & 4," Westinghouse Electric Co. LLC, WCAP-16027-P Revision 0, March 2003.

above flaw evaluation discussion for the outer most penetration location (most limiting case).

Figures E-1 through E11 in WCAP-16027-P show the Turkey Point Unit 3 and 4 specific hoop stress for the individual nozzle angles. These figures were submitted to the NRC in support of a similar NRC Order relaxation for Turkey Point Unit 3 (submitted as Figures 1 through 11 [4]). These figures show how the stress levels rapidly decrease as a function of distance from the weld toe. The NRC approved this relaxation approach. [5]

Therefore, there are no concerns with the structural integrity of the Turkey Point Unit 4 RPV penetration nozzles that could be caused by axial cracking in the missed coverage areas in the non-pressure boundary portion of the nozzle material greater than 0.62 inches below the weld for a period of greater than 5 years of operation.

This conclusion is based on the following results:

- UT inspection results of no indications in the nozzle areas examined from a minimum of 0.62 inches below the weld to 2 inches above the weld (100% coverage obtained in this region);
- Acceptable assessment of no "leak path" present into interference fit zone (100% coverage obtained as indicated in Table 1);
- Acceptable bare metal visual examination results of no leakage since the last RFO bare metal RPV head inspection and;
- Circumferential cracks in this portion of the penetration are of no safety significance and would be identified by the full ID inspection before a loose part could develop.

5. DURATION OF PROPOSED ALTERNATIVE:

This relaxation is applicable to the October 2003 refueling outage for PTN-4 and any re-inspections in which NRC Order EA-03-009 is in effect. The PTN-4 RPV head is scheduled for replacement at the next refueling outage.

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[4] FPL Letter L-2003-068, "Turkey Point Unit 3 Docket No. 50-250, Order (EA-03-009) Relaxation Request Examination Coverage of Reactor Pressure Vessel Head Penetration Nozzles - Supplemental Data," William Jefferson to NRC, March 14, 2003.

[5] NRC SER for Turkey Point Unit 3 — Relaxation of the Requirements of Order (EA-03-009) Regarding Reactor Pressure Vessel Head Inspections (Tac No. MB7990 dated March 20, 2003).

6. PRECEDENTS:

1) Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 –Relaxation of the Requirements of Order (EA-03-009), Regarding Reactor Pressure Vessel Head Inspections (Tac Nos. MB7752 And MB7753 Dated April 18, 2003)

2) Turkey Point Unit 3 — Relaxation of the Requirements of Order (EA-03-009) Regarding Reactor Pressure Vessel Head Inspections (Tac No. MB7990 dated March 20, 2003)

3) Donald C. Cook Unit 2— Relaxation of the Requirements of Order (EA-03-009) Regarding Reactor Pressure Vessel Head Inspections (Tac No. MB8205 and MB8206 dated June 17, 2003)

4) Palo Verde Nuclear Generating Station Unit 3— Relaxation From Order Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads (Tac No. MB7855 dated April 25, 2003)

5) Saint Lucie Nuclear Plant, Unit 2 — Order EA-03-009 Relaxation Requests Nos. 1 and 2 Regarding Examination Coverage of the Reactor Pressure Vessel Head Penetration Nozzles (Tac Nos. MB8165 and MB8166 dated May 29, 2003)

Table 1: Turkey Point Unit 4 Cycle 21 UT Data Coverage Matrix for RPV Nozzles

ID	Turkey Point Unit 4 Cycle 21 UT Examination Data								Leak Path Data	
Nozzle #	Min. Distance Above Weld Root (in)	Coverage Above Weld Root (Theta)	Coverage @ Weld Root (Theta)	Weld Region Coverage (Theta)	Below Weld Coverage (Theta)	Min distance below weld toe to nozzle bottom (inches)	Exam Results	Probe Used	Determination Possible?	Leak Path Results
1	5.43"	360°	360°	360°	360°	1.22	NRI	Blade	Yes	NLP
2	3.41"	360°	360°	360°	360°	1.21	NRI	Rotating	Yes	NLP
3	3.68"	360°	360°	360°	360°	1.45	NRI	Rotating	Yes	NLP
4	5.23"	360°	360°	360°	360°	1.39	NRI	Rotating	Yes	NLP
5	4.70"	360°	360°	360°	360°	1.22	NRI	Rotating	Yes	NLP
6	4.87"	360°	360°	360°	360°	0.62	NRI	Blade	Yes	NLP
7	5.45"	360°	360°	360°	360°	0.86	NRI	Blade	Yes	NLP
8	2.94"	360°	360°	360°	360°	1.02	NRI	Blade	Yes	NLP
9	2.33"	360°	360°	360°	360°	0.97	NRI	Blade	Yes	NLP
10	5.76"	360°	360°	360°	360°	0.65	NRI	Blade	Yes	NLP
11	3.67"	360°	360°	360°	328.19°	0.76" (see exam results)	NRI Incomplete coverage below the weld for 31.81°	Blade	Yes	NLP
12	5.05"	360°	360°	360°	360°	0.93	NRI	Blade	Yes	NLP
13	5.66"	360°	360°	360°	360°	0.65	NRI	Blade	Yes	NLP
14	6.27"	360°	360°	360°	360°	0.79	NRI	Blade	Yes	NLP
15	4.82"	360°	360°	360°	360°	0.83	NRI	Blade	Yes	NLP
16	2.85"	360°	360°	360°	360°	0.75	NRI	Blade	Yes	NLP
17	5.90"	360°	360°	360°	360°	1.13	NRI	Blade	Yes	NLP
18	2.84"	360°	360°	360°	360°	0.95	NRI	Blade	Yes	NLP
19	5.44"	360°	360°	360°	360°	1.08	NRI	Blade	Yes	NLP
20	5.98"	360°	360°	360°	360°	0.99	NRI	Blade	Yes	NLP
21	5.15"	360°	360°	360°	360°	0.78	NRI	Blade	Yes	NLP
22	4.52"	360°	360°	360°	360°	0.85	NRI	Blade	Yes	NLP
23	5.37"	360°	360°	360°	360°	0.77	NRI	Blade	Yes	NLP
24	5.00"	360°	360°	360°	360°	1.28	NRI	Blade	Yes	NLP
25	5.34"	360°	360°	360°	360°	1.02	NRI	Blade	Yes	NLP
26	6.44"	360°	360°	360°	360°	1.06	NRI	Blade	Yes	NLP
27	2.63"	360°	360°	360°	360°	1.01	NRI	Blade	Yes	NLP
28	5.07"	360°	360°	360°	360°	1.11	NRI	Blade	Yes	NLP
29	5.37"	360°	360°	360°	360°	0.71	NRI	Blade	Yes	NLP
30	4.67"	360°	360°	360°	360°	0.74	NRI	Blade	Yes	NLP
31	5.54"	360°	360°	360°	360°	1.22	NRI	Blade	Yes	NLP
32	2.81"	360°	360°	360°	360°	0.95	NRI	Blade	Yes	NLP
33	4.85"	360°	360°	360°	360°	1.39	NRI	Blade	Yes	NLP
34	4.93"	360°	360°	360°	360°	1.25	NRI	Blade	Yes	NLP

35	4.71"	360°	360°	360°	360°	1.13	NRI	Blade	Yes	NLP
36	5.61"	360°	360°	360°	360°	0.74	NRI	Blade	Yes	NLP
37	5.41"	360°	360°	360°	360°	0.68	NRI	Blade	Yes	NLP
38	2.75"	360°	360°	360°	360°	0.77	NRI	Blade	Yes	NLP
39	4.65"	360°	360°	360°	360°	1.41	NRI	Blade	Yes	NLP
40	3.29"	360°	360°	360°	360°	1.07	NRI	Blade	Yes	NLP
41	4.56"	360°	360°	360°	360°	1.39	NRI	Blade	Yes	NLP
42	4.68"	360°	360°	360°	360°	1.10	NRI	Blade	Yes	NLP
43	4.10"	360°	360°	360°	360°	1.46	NRI	Blade	Yes	NLP
44	4.31"	360°	360°	360°	360°	1.09	NRI	Blade	Yes	NLP
45	3.51"	360°	360°	360°	360°	0.76	NRI	Blade	Yes	NLP
46	4.92"	360°	360°	360°	360°	2.56	NRI	Rotating	Yes	NLP
47	5.20"	360°	360°	360°	360°	2.09	NRI	Rotating	Yes	NLP
48	4.92"	360°	360°	360°	360°	2.26	NRI	Rotating	Yes	NLP
49	5.65"	360°	360°	360°	360°	2.43	NRI	Rotating	Yes	NLP
51	4.61"	360°	360°	360°	360°	2.53	NRI	Rotating	Yes	NLP
53	4.73"	360°	360°	360°	360°	2.02	NRI	Rotating	Yes	NLP
55	4.71"	360°	360°	360°	360°	2.36	NRI	Rotating	Yes	NLP
57	5.31"	360°	360°	360°	360°	1.31	NRI	Rotating	Yes	NLP
58	3.22"	360°	360°	360°	360°	0.93	NRI	Blade	Yes	NLP
59	3.27"	360°	360°	360°	360°	1.85	NRI - RVLIS	Blade	Yes	NLP
60	3.42"	360°	360°	360°	360°	1.90	NRI - RVLIS	Blade	Yes	NLP
61	2.25"	360°	360°	360°	360°	1.30	NRI	Blade	Yes	NLP
62	3.49"	360°	360°	360°	360°	1.36	NRI	Blade	Yes	NLP
63	2.01"	360°	360°	360°	360°	2.54	NRI	Blade	Yes	NLP
64	2.78"	360°	360°	360°	360°	1.60	NRI	Blade	Yes	NLP
65	2.52"	360°	360°	360°	360°	2.16	NRI	Blade	Yes	NLP
66	2.48"	360°	360°	360°	360°	2.03	NRI	Blade	Yes	NLP
67	2.95"	360°	360°	360°	360°	1.98	NRI	Blade	Yes	NLP
68	2.96"	360°	360°	360°	360°	1.30	NRI	Blade	Yes	NLP
69	3.29"	360°	360°	360°	360°	1.16	NRI	Blade	Yes	NLP
Vent	2.00"	360°	360°	360°	N/A	N/A	NRI	Rotating	N/A	N/A

Notes: 1) NRI - no recordable indications.
2) NLP – no leak path identified
3) Leak path determination is not applicable to the vent line, because it has a clearance fit. Leak path for the vent was determined by a surface ECT of the vent weld.

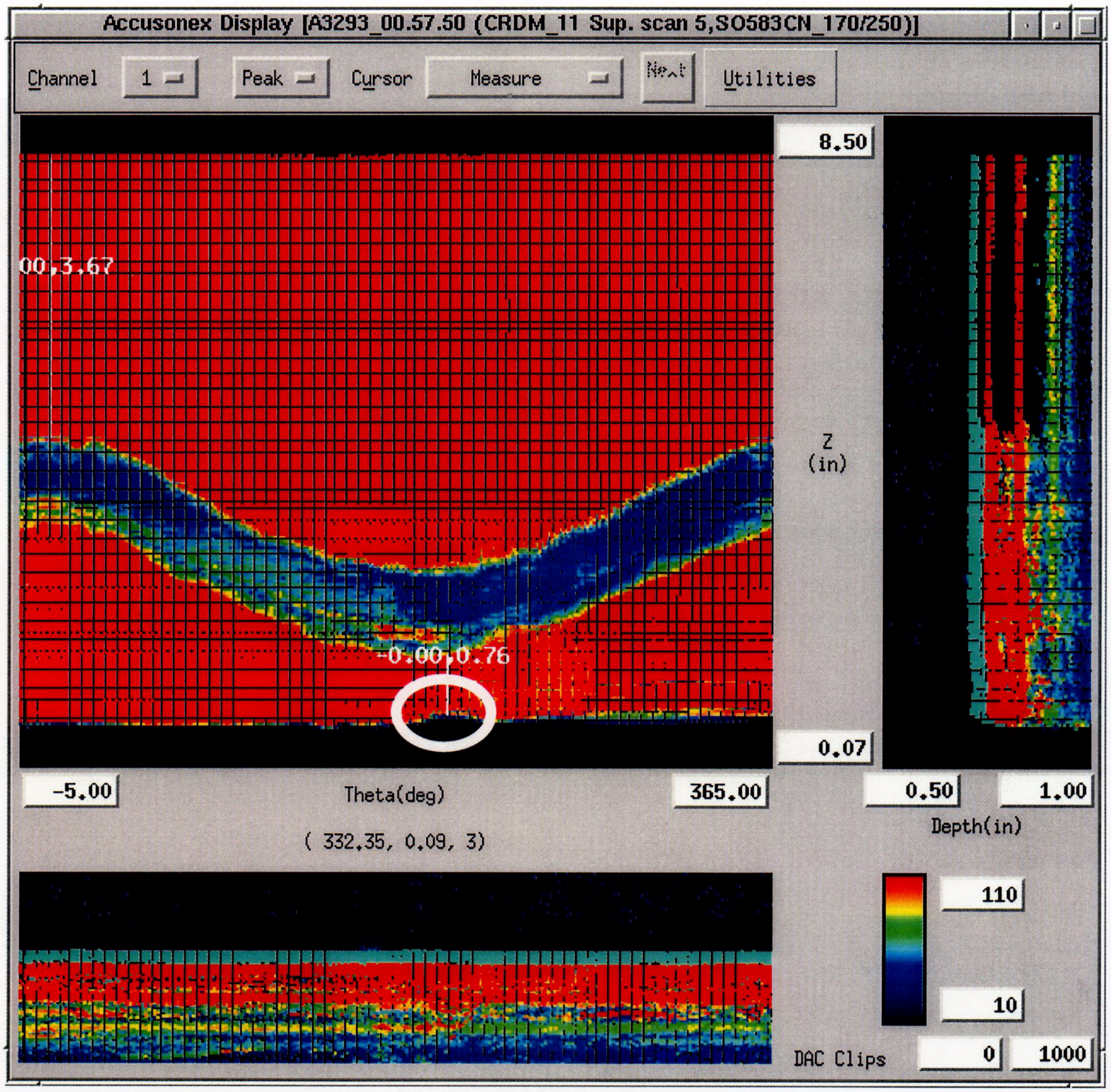

Figure 1: RPV Nozzle # 11 UT Inspection "C" Scan with area of missed coverage identified the white oval at the low point of the weld.

c01

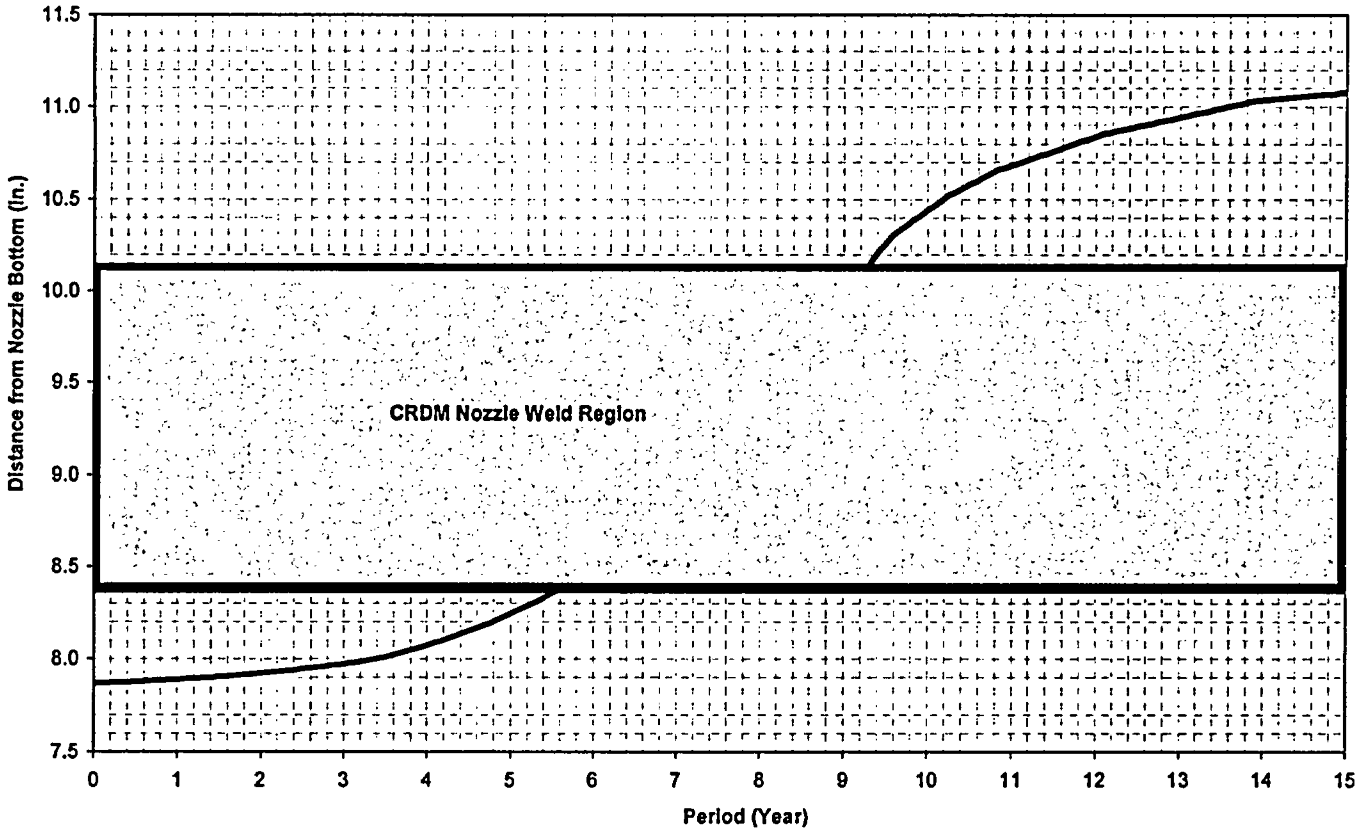

Figure 2: Through-Wall Axial Flaws Located in the 42.6 Degree Row of Penetrations, Uphill Side - Crack Growth Predictions (From Figure 6-19, WCAP-16027-P)