FPL Energy Duane Arnold, LLC
3277 DAEC Road
Palo, Iowa 52324

FPL Energy.

Duane Arnold Energy Center

February 28, 2008

NG-08-0135
10 CFR 50.55a

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Alternative to Nozzle to Vessel Weld and Inner Radius Examinations

Pursuant to 10 CFR 50.55a(a)(3)(i), FPL Energy Duane Arnold, LLC, (hereafter, FPL Energy Duane Arnold) hereby requests NRC approval of the enclosed alternative from IWB-2500 to allow reduced percentage requirements for Nozzle to Vessel Weld and Inner Radius Examinations. This alternative is requested for the Fourth Ten year Interval of the Inservice Inspection Program for the Duane Arnold Energy Center (DAEC), which began on November 1, 2006.

FPL Energy Duane Arnold requests approval of this request by the end of February 2009.

This letter contains no new commitments nor revises any previous commitments.

If you have any questions, please contact Steve Catron at (319) 851-7234.

Richard L. Anderson
Vice President, Duane Arnold Energy Center
FPL Energy Duane Arnold, LLC

Enclosures

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Senior Resident Inspector, DAEC, USNRC

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Enclosure 1

10 CFR 50.55a Request Number NDE-R013
Alternative to Nozzle to Vessel Weld and Inner Radius Examinations

10 CFR 50.55a Request Number NDE-R013
Alternative to Nozzle to Vessel Weld and Inner Radius Examinations

Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(i)
which provides an acceptable level of quality and safety

ASME Code Component(s) Affected

Code Class:	1
Component Numbers:	N1, N2, N3, N5, N6, N7, N8, N11, N12, and N16 Nozzles (see Enclosure 2 for specific nozzle identifications)
Examination Category:	B-D
Item Number:	B3.90 and B3.100
Description:	Alternative to Table IWB-2500-1 (Inspection Program B)

Applicable Code Edition and Addenda

The DAEC is currently in its fourth 10-year interval and is committed to the ASME Code Section XI, 2001 Edition, 2003 Addenda. Additionally, for ultrasonic examinations, Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the 2001 Edition is implemented as required (and modified) by 10 CFR 50.55a(b)(2)(xv).

Applicable Code Requirement

Table IWB-2500-1 "Examination Category B-D, Full Penetration Welded Nozzle in Vessels – Inspection Program B"

Class 1 nozzle-to-vessel weld and nozzle inner radii examination requirements are given in Item Number B3.90 "Nozzle-to-Vessel Welds" and B3.100 "Nozzle Inside Radius Section." The method of examination is volumetric. All nozzles with full penetration welds to the vessel shell (or head) and integrally cast nozzles are examined each interval. All of the nozzle assemblies identified in Enclosure 2 are full penetration welds.

Reason for Request

The identified nozzles (see Enclosure 2) are scheduled for examination prior to the end of the current inspection interval for the Duane Arnold Energy Center (DAEC). The proposed alternative provides an acceptable level of quality and safety, and the reduction in scope could provide a dose savings of as much as 25.2 Rem over the remainder of the interval.

Proposed Alternative and Basis for Use

Proposed Alternative:

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested from performing the required examinations on 100% of the identified nozzle assemblies (see Enclosure 2). As an alternative, for all welds and inner radii except for the Recirculation Outlet welds, DAEC proposes to examine a minimum of 25% of the nozzle-to-vessel welds and inner radius sections, including at least one nozzle from each system and nominal pipe size, in accordance with Code Case N-702. For the nozzle assemblies identified in Enclosure 2, this would mean one from each of the groups identified below:

Group	Total Number	Number to be examined	Comments
Recirculation Outlet (N1)	2	2	This group does not meet Criteria 4 of the NRC Safety Evaluation Report (SER)[1]
Recirculation Inlet (N2)	8	2	Four completed in Refueling Outage (RFO) 20 (2007)
Vessel Instrumentation (N11, N12, N16)	6	2	One scheduled in RFO 22 (2010) and one scheduled in RFO 23 (2012)
Core Spray (N5)	2	1	One completed in RFO 20 (2007)
Nozzles on Vessel Top Head (N6, N7)	3	1	One scheduled in RFO 21 (2009)
Jet Pump (N8)	2	1	One completed in RFO 20 (2007)
Main Steam (N3)	4	1	One scheduled in RFO 23 (2012)

Footnote 1 – the RPV wall thickness was taken from the Form N-1 Data Sheet.

Code Case N-702 stipulates that VT-1 examination may be used in lieu of the volumetric examination for the inner radii (Item No. B3.100). Note that the DAEC is not currently using Code Case N-648-1 on enhanced magnification visual examination and has no plans of using Code Case N-648-1 in the future. Volumetric examinations of all inner radii will be completed.

Basis for Use:

Electric Power Research Institute (EPRI) Technical Report 1003557, "BWRVIP-108: Boiling Water Reactor Vessel and Internals Project Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," provides the basis for Code Case N-702. The evaluation found that failure probabilities at the nozzle blend radius region and nozzle-to-vessel shell weld due to a Low Temperature Overpressure event are very low (i.e., $<1 \times 10^{-6}$ for 40 years) with or without inservice inspection. The report concludes that inspection of 25% of each nozzle type is technically justified.

This EPRI report received an NRC SER dated December 19, 2007. In the SER, Section 5.0 "Plant Specific Applicability" indicates that each licensee who plans to request relief from the ASME Code, Section XI requirements for RPV nozzle-to-vessel shell welds and nozzle inner radius sections may reference BWRVIP-108 report as the technical basis for the use of ASME Code Case N-702 as an alternative. However, each licensee should demonstrate the plant-specific applicability for the BWRVIP-108 report to its units in the relief request by showing that all the general and nozzle-specific criteria addressed below are satisfied (reference Enclosure 3):

(1) the maximum Reactor Pressure Vessel (RPV) heatup/cooldown rate is limited to less than 115°F per hour. The DAEC surveillance that monitors reactor vessel heatup/cooldown (Surveillance Test Procedure (STP) 3.4.9-01) limits the rate to less than or equal to 100°F/hr for Curve B and less than or equal to 20°F/hr for Curve A.
(2) For the Recirculation Inlet Nozzles the following criteria must be met:
    a. $(pr/t)/C_{RPV}<1.15$, the calculation for the DAEC N2 Nozzle results in 0.9748 which is less than 1.15
    b. $[p(ro^2+ri^2)/(ro^2-ri^2)]/C_{NOZZLE}<1.15$, the calculation for the DAEC N2 Nozzle results in 1.0923 which is less than 1.15.
(3) For the Recirculation Outlet Nozzles the following criteria must be met:
    a. $(pr/t)/C_{RPV}<1.15$, the calculation for the DAEC N1 Nozzle results in 1.17 which is higher than 1.15.
    b. $[p(ro^2+ri^2)/(ro^2-ri^2)]/C_{NOZZLE}<1.15$, the calculation for the DAEC N1 Nozzle results in 0.87 which is less than 1.15.

Based upon the above information, all RPV nozzle-to-vessel shell welds and nozzle inner radii sections, with the exception of the Recirculation Outlet Nozzles, meet the criteria and therefore Code Case N-702 is applicable. However, the Recirculation Outlet Nozzles do not meet all of the criteria and Code Case N-702 would not be applied. See Enclosure 3 for details.

Therefore, use of Code Case N-702 provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for all RPV nozzle-to-vessel shell welds and nozzle inner radii sections, with the exception of the Recirculation Outlet Nozzles.

Duration of Proposed Alternative

The proposed alternative will be used for the remaining portion of the fourth ten-year interval of the Inservice Inspection Program for DAEC.

Precedents

None

Enclosure 2

Applicable Nozzles

Cat	Item No.	Summary No.	Component ID	Nozzle ID	Dwg/ISO No.	System	Nominal Pipe Size	Comments Dose Estimates
B-D	B3.90	9700	RRA-D001	N2A	1.2-22 SHT-01	RR	10"	5000 (PDI Exam 2007)
B-D	B3.100	9800	RRA-D001-INNER RAD		1.2-22 SHT-01	RR	10"	
B-D	B3.90	9900	RRB-D001	N2B	1.2-22 SHT-01	RR	10"	5000
B-D	B3.100	10000	RRB-D001-INNER RAD		1.2-22 SHT-01	RR	10"	
B-D	B3.90	10100	RRC-D001	N2C	1.2-22 SHT-01	RR	10"	5000 (PDI Exam 2007)
B-D	B3.100	10200	RRC-D001-INNER RAD		1.2-22 SHT-01	RR	10"	
B-D	B3.90	10300	RRD-D001	N2D	1.2-22 SHT-01	RR	10"	5000
B-D	B3.100	10400	RRD-D001-INNER RAD		1.2-22 SHT-01	RR	10"	
B-D	B3.90	10500	RRE-D001	N2E	1.2-20 SHT-01	RR	10"	5000 (PDI Exam 2007)
B-D	B3.100	10600	RRE-D001-INNER RAD		1.2-20 SHT-01	RR	10"	
B-D	B3.90	10700	RRF-D001	N2F	1.2-20 SHT-01	RR	10"	5000
B-D	B3.100	10800	RRF-D001-INNER RAD		1.2-20 SHT-01	RR	10"	
B-D	B3.90	10900	RRG-D001	N2G	1.2-20 SHT-01	RR	10"	5000 (PDI Exam 2007)
B-D	B3.100	11000	RRG-D001-INNER RAD		1.2-20 SHT-01	RR	10"	
B-D	B3.90	11100	RRH-D001	N2H	1.2-20 SHT-01	RR	10"	5000 (PDI Exam 2007)
B-D	B3.100	11200	RRH-D001-INNER RAD		1.2-20 SHT-01	RR	10"	
B-D	B3.90	11300	VIA-D001	N11A	1.2-28 SHT-01	VI	2.5"	300
B-D	B3.100	11400	VIA-D001-INNER RAD		1.2-28 SHT-01	VI	2.5"	
B-D	B3.90	11500	VIB-D001	N11B	1.2-29 SHT-01	VI	2.5"	300 (PDI Exam 2005)
B-D	B3.100	11600	VIB-D001-INNER RAD		1.2-29 SHT-01	VI	2.5"	
B-D	B3.90	11700	VIC-D001	N12A	1.2-30 SHT-01	VI	2.5"	400
B-D	B3.100	11800	VIC-D001-INNER RAD		1.2-30 SHT-01	VI	2.5"	
B-D	B3.90	11900	VID-D001	N12B	1.2-31 SHT-01	VI	2.5"	400
B-D	B3.100	12000	VID-D001-INNER RAD		1.2-31 SHT-01	VI	2.5"	
B-D	B3.90	12100	VIE-D001	N16A	1.2-33 SHT-01	VI	2.5"	1000
B-D	B3.100	12200	VIE-D001-INNER RAD		1.2-33 SHT-01	VI	2.5"	

Cat	Item No.	Summary No.	Component ID	Nozzle ID	Dwg/ISO No.	System	Nominal Pipe Size	Comments Dose Estimates
B-D	B3.90	12300	VIF-D001	N16B	1.2-34 SHT-01	VI	2.5"	1000
B-D	B3.100	12400	VIF-D001-INNER RAD		1.2-34 SHT-01	VI	2.5"	
B-D	B3.90	4600	CRA-D001	N9	1.2-12A SHT-01	CR	2.5"	Cannot use for Code Case N-702
B-D	B3.100	4700	CRA-D001-INNER RAD		1.2-12A SHT-01	CR	2.5"	Cannot use for Code Case N-702
B-D	B3.90	4800	CSA-D001	N5A	1.2-07 SHT-01	CS	8"	900
B-D	B3.100	4900	CSA-D001-INNER RAD		1.2-07 SHT-01	CS	8"	
B-D	B3.90	5000	CSB-D001	N5B	1.2-08 SHT-01	CS	8"	900 (PDI Exam 2007)
B-D	B3.100	5100	CSB-D001-INNER RAD		1.2-08 SHT-01	CS	8"	
B-D	B3.90	5300	FWA-D001	N4A	1.2-05 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.100	5400	FWA-D001-INNER RAD		1.2-05 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.90	5800	FWB-D001	N4B	1.2-05 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.100	5900	FWB-D001-INNER RAD		1.2-05 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.90	6300	FWC-D001	N4C	1.2-06 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.100	6400	FWC-D001-INNER RAD		1.2-06 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.90	6800	FWD-D001	N4D	1.2-06 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.100	6900	FWD-D001-INNER RAD		1.2-06 SHT-01	FW	10"	Cannot use for Code Case N-702
B-D	B3.90	7200	HDA-D001	N15	1.2-32 SHT-01	HD	2"	Exempt by IWB-1220(c)
B-D	B3.100	7250	HDA-D001-INNER RAD		1.2-32 SHT-01	HD	2"	Exempt by IWB-1220(c)
B-D	B3.90	7300	HSB-D001	N6B	1.2-23 SHT-01	HS	6"	
B-D	B3.100	7400	HSB-D001-INNER RAD		1.2-23 SHT-01	HS	6"	
B-D	B3.90	7500	HVA-D001	N7	1.2-24 SHT-01	HV	4"	
B-D	B3.100	7600	HVA-D001-INNER RAD		1.2-24 SHT-01	HV	4"	
B-D	B3.90	9500	RHA-D001	N6A	1.2-13 SHT-01	RH	6"	
B-D	B3.100	9600	RHA-D001-INNER RAD		1.2-13 SHT-01	RH	6"	

Cat	Item No.	Summary No.	Component ID	Nozzle ID	Dwg/ISO No.	System	Nominal Pipe Size	Comments Dose Estimates
B-D	B3.90	7700	JPA-D001	N8A	1.2-25 SHT-01	JP	4"	1200 (PDI Exam 2007)
B-D	B3.100	7800	JPA-D001-INNER RAD		1.2-25 SHT-01	JP	4"	
B-D	B3.90	7900	JPB-D001	N8B	1.2-26 SHT-01	JP	4"	1200 (PDI Exam 2005)
B-D	B3.100	8000	JPB-D001-INNER RAD		1.2-26 SHT-01	JP	4"	
B-D	B3.90	8100	LCA-D001	N10	1.2-27 SHT-01	LC	2"	400 (PDI Exam 2005)
B-D	B3.100	8200	LCA-D001-INNER RAD		1.2-27 SHT-01	LC	2"	
B-D	B3.90	8300	MSA-D001	N3A	1.2-01 SHT-01	MS	20"	100
B-D	B3.100	8400	MSA-D001-INNER RAD		1.2-01 SHT-01	MS	20"	
B-D	B3.90	8500	MSB-D001	N3B	1.2-02 SHT-01	MS	20"	100
B-D	B3.100	8600	MSB-D001-INNER RAD		1.2-02 SHT-01	MS	20"	
B-D	B3.90	8700	MSC-D001	N3C	1.2-03 SHT-01	MS	20"	100 (PDI Exam 2005)
B-D	B3.100	8800	MSC-D001-INNER RAD		1.2-03 SHT-01	MS	20"	
B-D	B3.90	8900	MSD-D001	N3D	1.2-04 SHT-01	MS	20"	100 (PDI Exam 2005)
B-D	B3.100	9000	MSD-D001-INNER RAD		1.2-04 SHT-01	MS	20"	
B-D	B3.90	9100	RCA-D001	N1A	1.2-19A SHT-01	RC	22"	Does not meet Criteria 4 of the NRC SER
B-D	B3.100	9200	RCA-D001-INNER RAD		1.2-19A SHT-01	RC	22"	Does not meet Criteria 4 of the NRC SER
B-D	B3.90	9300	RCB-D001	N1B	1.2-21A SHT-01	RC	22"	Does not meet Criteria 4 of the NRC SER
B-D	B3.100	9400	RCB-D001-INNER RAD		1.2-21A SHT-01	RC	22"	Does not meet Criteria 4 of the NRC SER

Enclosure 3

Responses to NRC Plant Specific Applicability

Responses to NRC Plant Specific Applicability

1 The maximum Reactor Pressure Vessel (RPV) heatup/cooldown rate is limited to less than 115°F/hour

Response STP 3.4.9-01 limits the RPV heatup/cooldown to ≤100°F for Curve B and ≤20°F for Curve A

Recirculation Inlet Nozzles

2 $(pr/t)/C_{RPV}<1.15$

p=RPV Normal Operating Pressure	1025
r=RPV inner radius	92.5
t=RPV wall thickness	5.031
C_{RPV}=	19332

0.9748 <1.15

3 $[p(ro^2+ri^2)/(ro^2-ri^2)]/C_{NOZZLE}<1.15$

p=RPV Normal Operating Pressure	1025
r_o=nozzle outer radius	10.56
r_i=nozzle inner radius	5.5
C_{NOZZLE}	1637

1.0923 <1.15

Recirculation Outlet Nozzles

4 $(pr/t)/C_{RPV}<1.15$

p=RPV Normal Operating Pressure	1025
r=RPV inner radius	92.5
t=RPV wall thickness	5.031
C_{RPV}=	16171

1.17 <1.15

5 $[p(ro^2+ri^2)/(ro^2-ri^2)]/C_{NOZZLE}<1.15$

p=RPV Normal Operating Pressure	1025
r_o=nozzle outer radius	19.628
r_i=nozzle inner radius	9.875
C_{NOZZLE}	1977

0.87 <1.15