

September 22, 2008

Mr. Richard L. Anderson  
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SUBJECT: DUANE ARNOLD ENERGY CENTER – SAFETY EVALUATION FOR RELIEF  
REQUESTS MC-R001 AND MC-P001 FOR SECOND CONTAINMENT  
INSERVICE INSPECTION INTERVAL (TAC NOS. MD7421 AND MD7422)

Dear Mr. Anderson:

In a letter to the U.S. Nuclear Regulatory Commission (NRC) dated November 16, 2007, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML073320185), as supplemented by a letter dated May 5, 2008, (ADAMS No. ML081370604), FPL Energy Duane Arnold, LLC (FPL Energy) requested relief from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements at Duane Arnold Energy Center (DAEC). FPL Energy requested relief from specified requirements of the ASME Code, Section XI, Subsection IWE (2001 Edition, 2003 Addenda), in support of the containment inspection plan for the second containment inservice inspection (CISI) interval at DAEC, which began on May 22, 2008.

Based on the information provided in the relief request and the response to the NRC staff's request for additional information, the NRC staff concludes that: (i) with regard to MC-R001, the licensee proposed alternative provides an acceptable level of quality and safety; and (ii) with regard to MC-P001, compliance with the specified code requirement would result in hardship without a compensating increase in the level of quality and safety and the licensee proposed alternative provides reasonable assurance of structural and leak-tight integrity of the affected components. Therefore, relief requests MC-R001 and MC-P001 are authorized pursuant to 10CFR 50.55a(a)(3)(i) and 10 CFR 50.55a(a)(3)(ii), respectively, for the second CISI interval at DAEC, which began May 22, 2008, and ends February 21, 2014.

If you have any questions regarding this matter, please contact Karl Feintuch at (301) 415-3079.

Sincerely,

**/RA/**

Lois James, Chief  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure: Safety Evaluation

cc w/encl: See next page

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Last revised July 2, 2008

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS MC-R001 AND MC-P001 FROM

ASME CODE, SECTION XI, SUBSECTION IWE REQUIREMENTS

DUANE ARNOLD ENERGY CENTER,

DOCKET NO. 50-331

1.0 INTRODUCTION

By letter NG-07-0878 dated November 16, 2007 (Reference 1), and as supplemented by letter NG-08-0278 dated May 5, 2008 (Reference 2), FPL Energy Duane Arnold, LLC (the licensee), submitted relief requests (RRs) MC-R001 and MC-P001 for relief from certain requirements of the ASME Code, Section XI, Subsection IWE for the second containment inservice inspection (CISI) interval at Duane Arnold Energy Center (DAEC). In RR MC-R001, the licensee requests relief for the suppression chamber (torus) examination from the requirement of Table IWE-2500-1, for performing detailed (VT-1) visual examinations of 100 percent of the surface areas identified for augmented examination for each period of the inspection interval. In RR MC-P002, the licensee requests relief, for minor repair/replacement activities only, from performing the VT-1 visual examination, required by IWE-5240 during the post-repair leakage test, of areas affected by repair/replacement activities.

This safety evaluation addresses the merits of the requests for relief from code requirements proposed by the licensee pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3).

2.0 REGULATORY EVALUATION

According to 10 CFR 50.55a(a)(3) proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g) and (h) of the section (i.e., 10 CFR 50.55a "Code and Standards") or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation provided the applicant demonstrates that: (i) The proposed alternatives would provide an acceptable level of quality and safety, or (ii) Compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee has requested RR MC-R001 pursuant to 10 CFR 50.55a(3)(i) and RR MC-P001 pursuant to 10 CFR 50.55a(a)(3)(ii).

### 3.0 TECHNICAL EVALUATION

#### 3.1 Relief Request MC-R001

The licensee requested relief, pursuant to 10 CFR 50.55a(a)(3)(i), for the suppression chamber (torus) from the requirement of Table IWE-2500-1, Examination Category E-C, Item E4.11, for performing detailed (VT-1) visual examinations of 100 percent of the surface areas identified for augmented examination for each inspection period of the second inspection interval.

##### 3.1.1 Component Identification

Code Class:	MC
Code Reference:	ASME Code, Section XI, Subarticle IWE-1240
Examination Category:	E-C
Item Number:	E4.11
Description:	Augmented Examination of Suppression Chamber (Torus)

##### 3.1.2 Applicable Code Edition and Addenda:

ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition, 2003 Addenda

##### 3.1.3 Applicable Code Requirement from which Relief is Requested:

Per Subarticle IWE-1240 of the ASME Code, Section XI (2001 Edition, 2003 Addenda), surface areas likely to experience accelerated degradation and aging require the augmented examinations identified in Table IWE-2500-1, Examination Category E-C, and shall be identified in the Owner's Inspection Program. Table IWE-2500-1, Examination Category E-C, Item E4.11, requires a detailed visual (VT-1 as required by the modification in 10 CFR 50.55a(b)(2)(ix)(G)) examination every inspection period of 100 percent of the visible surface areas of the containment identified for augmented examination by IWE-1242. The examination is required during every inspection period of successive intervals until the areas examined remain essentially unchanged for the next inspection period. Such essentially unchanged areas no longer require augmented examination in accordance with IWE-2420(c). However, it is noted that DAEC has proactively identified the submerged region of the torus for permanent augmented examination.

##### 3.1.4 Licensee's Reason for Request

The licensee stated that DAEC torus was initially coated in 1973 with an inorganic zinc protective coating with a four foot wide band epoxy coating at the waterline. The licensee stated that DAEC has a very proactive inspection program for the torus interior. The licensee substantiated that the torus has been inspected and coating repairs performed in 1977, 1980, 1981, and 1983. Further in 1985, all internal surfaces of the torus shell and external surfaces of the vent system were recoated. Additional inspections and repairs to the coating were performed in 1987, 1988, 1990, 1992, and 1993. The licensee stated that during the 1993 inspection, a quantitative inspection was performed on a one square foot evaluation area representative of the worst case corrosion observed during the qualitative inspections. A grid was established and the coordinates of each pit in the evaluation area was recorded so that the rate of corrosion (pit depth) could be monitored and trended in the future. Repairs to the coating

were made as necessary. The licensee stated that subsequent inspections performed on the torus immersion zones during 1995, 1996, 1998, 2001 and 2005 found numerous areas of zinc depletion and minor pitting. These areas were repaired with an epoxy coating. A total of 14,229 repairs have been performed to the torus shell since 1995.

The licensee stated that the inspection results of the one square foot area evaluation grid established in 1993 indicated the torus shell corrosion rate to be less than 0.001 inches per year. In 1998, due to excessive zinc depletion and surface rusting, pit identification numbers were unattainable; therefore the grid area was repaired with epoxy coating. Repeated inspections have shown that there is no sign of disbanding or delamination of the torus internal coating. Integrity of the repairs was also not degraded. The licensee emphasized that, due to frequent desludging and coating repairs, a longer life out of inorganic zinc coating is expected than the normal 15 to 20 years. The licensee stated that to achieve further life extension through license renewal, continued desludging and repairs will be completed every other outage to prevent growth of rust nodules.

### 3.1.5 Proposed Alternative and Duration

DAEC will continue to perform a general visual examination on 100 percent of the torus exterior and interior surface (above the water line) each period (Item E1.11). In addition, a VT-1 visual examination on 100 percent of the torus exterior and interior surfaces below the water line (Item E4. 11) will be performed twice during the second CISI interval (i.e., every other refueling outage). Since both sides are accessible (IWE- 2500(b)(1)) for visual examination, no ultrasonic thickness measurement (Item E4.12) is required. The VT-1 examination provides an acceptable way to monitor the coating on the interior surface of the torus. Areas which are detected to have a "corrosion cell" (small area of uncoated metal, greater than 0.053 inch in depth and/or greater than 0.25 inch in diameter) will be repaired. Performing a general visual of 100 percent of the exterior and interior surfaces (above the water line) each period and VT-1 of 100 percent of the interior surfaces (below the water line) twice during the 6-year second CISI interval (i.e., every other refueling outage) provides an assurance that the structural integrity of the torus will be maintained in an acceptable manner. Repairs to the coating are performed when necessary.

The relief is requested for the second 10-year interval of the Containment Inspection Program for the DAEC, which began on May 22, 2008 and ends February 21, 2014 (the interval end date corresponds to the end of the current operating license and, therefore, the interval is slightly less than six years).

### 3.1.6 Staff Evaluation

Due to lack of clarity in the RR MC-R001, in request for additional information (RAI) 1, the U.S. Nuclear Regulatory Commission (NRC) staff noted that the purpose of performing the detailed visual (VT-1) examination for the examination category E-C, Item E4.11, is to assess the condition of surfaces requiring augmented examinations and to determine whether continued re-examination of an area that was identified for augmented examination is required or not in the next inspection period. The NRC staff also noted that the description in the RR should address the requirements for augmented examination rather than periodic examination (as stated in the relief request) of the suppression chamber. Therefore, in RAI 1, the NRC staff requested the licensee to clarify and justify the request for relief in the context of the code requirements relating to the magnitude and extent of deterioration and distress (observed corrosion rate,

actual depth/extent of corrosion/pitting, etc.) of the specific areas of the torus identified for augmented examination for the second CISI interval for DAEC and the acceptance criteria for these examinations.

In its response dated May 5, 2008, to RAI 1, the licensee stated that based on the selection criteria of IWE-1241 and the examination results as described in the relief request, the submerged portion of the DAEC suppression pool is considered as a permanent augmented inspection area and subject to the requirements of IWE-2500-1 Examination Category E-C, Item E4.11. The licensee stated that, in 1994, DAEC developed a "Long-Term Strategy for Primary Containment Suppression Chamber (Torus)." This strategy included performing underwater cleaning, inspection, and repairs on an every other refueling outage frequency using underwater divers. During the other refueling outages, cleaning is performed as practical without using divers. The licensee stated that this strategy was discussed in DAEC's submittal dated November 11, 1998, in response to Generic Letter 98-04, and is summarized below.

The licensee stated that the second ten-year interval, for which the relief is requested, only covers the period from May 22, 2008 to February 21, 2014. The end date corresponds with date of expiry of the current operating license. This second interval is, therefore, less than six years and encompasses three refueling outages. In essence, this schedule establishes a single refueling outage in each IWE inspection period. The licensee highlighted that during a typical 10-year interval, there would be at least five refueling outages and the present strategy of an inspection every other refueling outage satisfies the VT-1 visual examination requirement of 100 percent of the identified areas every period (of 3 to 4 year duration) of the interval. The licensee stated that the adopted strategy is also consistent with the recommendation in EPRI Report 1003102, "Guidelines on Nuclear Safety-Related Coatings," November 2001; which recommends that inspections be performed every three to five years.

DAEC has, therefore, requested relief from the IWE-2500-1, category E-C requirement for a detailed visual (VT-1) every period on 100 percent of the surface areas identified for augmented examination by IWE-1242. DAEC proposes to perform the required inspection on an every other refueling outage frequency due to the short interval, and to maintain consistency with the established inspection strategy and industry recommendations. The licensee also summarized the acceptance and repair criteria used for the torus submerged region in the established strategy. The licensee stated that the repair criterion requires that pits with a depth greater than 0.053 inch and/or greater than 0.25 inch in diameter must be repaired. The licensee stated that in the last examination in 2005, there was only one area of pitting that exceeded the criteria (measured depth of 0.056"). However, 1,292 localized coating repairs were performed on areas of zinc depletion, tiger striping, mechanical damage, and failures of previous repairs. The licensee stated that lack of a significant amount of pitting is indicative that the adopted strategy is effective in maintaining the structural integrity of the containment by ensuring the protective coating remains intact.

The NRC staff finds that the duration of the second CISI interval (May 2008 to February 2014) at DAEC, being the last one in which its current 40 year operating license expires, is less than six years duration. There are three refueling outages scheduled during this interval. The duration of each period for this interval would be approximately two years. Due to the history of degradation in the torus, the licensee has proactively committed in its CISI program to perform permanent augmented examination of 100 percent of the submerged area of the torus during each period of the 10-year CISI interval. The normal 10-year CISI interval has at least five

scheduled refueling outages. The licensee has been implementing this commitment by performing the detailed (VT-1) visual examination of the torus areas identified by IWE-1241 using underwater divers every alternate outage of the 10-year interval. The duration of a period for a 10-year interval is typically between three and four years. The licensee's proposed alternative for the less than six year duration of the second CISI interval will continue to perform these VT-1 examinations every alternate outage. Since the duration of a period for DAEC is approximately two years, the examination will be performed only for two of the three periods of the interval. However, the duration between examinations will be four years which is consistent with the licensee's implementation of the program during a 10-year interval. The NRC staff also finds that the licensee's inspection strategy, acceptance and repair criteria for the submerged region of the torus are reasonable and has been implemented effectively to ensure that structural integrity of the torus is maintained.

Based on the above, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety. Therefore, relief request MC-R001 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the second CISI interval at DAEC.

### 3.2 Relief Request MC-P001

Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee is requesting relief, for only the minor repair/replacement activities identified in IWE-5222, from performing the detailed (VT-1) visual examination required by IWE-5240 of areas affected by repair/replacement activities during the pressure test required by IWE-5220.

#### 3.2.1 Component Identification

Code Class:	MC
Code Reference:	ASME Code, Section XI, Subarticle IWE-5240
Examination Category:	All examination categories
Item Number:	All item numbers
Description:	Detailed (VT-1) visual examination during pressure test following minor Repairs/Replacements/Modifications
Component Numbers:	All pressure-retaining boundary components

#### 3.2.2 Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition, 2003 Addenda

#### 3.2.3 Applicable Code Requirement from which Relief is Requested

ASME Code, Section XI (2001 Edition, 2003 Addenda), Subarticle IWE-5240, requires a detailed visual examination (IWE-2310) to be performed on areas affected by repair/replacement activities during the post-repair/replacement pressure test required by IWE-5220. IWE-2310 states that detailed visual examinations shall be performed in accordance with IWE-2500 and Table IWE-2500-1, Examination Category E-C. The modification in 10 CFR 50.55a(b)(2)(ix)(G) requires this detailed visual examination to be a VT-1 examination. IWE-5222 allows leakage tests following the minor repair/replacement activities defined in IWE-5222(a), (b) and (c) to be deferred until the next scheduled test, provided nondestructive examination is performed in accordance with the repair/replacement program and plan.



### 3.2.4 Licensee's Basis for Request

The licensee stated that performing a detailed visual examination (VT-1 as required by 10 CFR 50.55a(b)(2)(ix)(G)) required by IWE-5240 on areas affected by minor repair/replacement activities would be a duplication of the requirement in IWE-5222 which, in part, states that leakage tests for the minor repair/replacement activities defined therein may be deferred until the next scheduled leakage test, provided nondestructive examination is performed in accordance with the repair/replacement program and plan. The licensee stated that the above nondestructive examination performed in accordance with the construction code would meet the requirement of IWE-2310 in assessing the structural condition of the area affected by the repair/replacement activity.

The licensee stated that IWE-5220 requires that repair/replacement activities on the pressure-retaining boundary of Class MC components shall be subjected to a pneumatic leakage test in accordance with the provisions of 10 CFR Part 50, Appendix J, Paragraph IV.A. The licensee stated that 10 CFR Part 50, Appendix J provides requirements for the leakage testing as well as leakage acceptance criteria. These tests are performed by Appendix J test personnel and utilize calibrated equipment to determine acceptability.

The licensee further stated that a detailed visual examination (VT-1) for minor repairs will not provide additional assurance of safety beyond that of current Appendix J practices. The presence of a VT-1 examiner in addition to Appendix J test personnel for minor repairs could result in unnecessary additional dose exposure and duplication not consistent with good "ALARA" practices and would not achieve any substantial increase in safety. The licensee emphasized that all minor repairs will be examined (surface or visual) per the applicable construction code requirements.

The licensee has, therefore, requested the relief pursuant to 10 CFR 50.55a(a)(3)(ii) since compliance with the specified code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

### 3.2.5 Proposed Alternative Examination and Duration

The IWE-5240 requirement for detailed visual examination (VT-1) during the pressure test will be completely met for repair/replacement activities on the containment pressure boundary except for the minor repair/replacement activities specifically identified in IWE-5222(a), (b) and (c). For the minor repair/replacement activities specifically identified in IWE-5222(a), (b) and (c), in lieu of the IWE-5240 requirement, nondestructive examination (such as RT, MT, etc.) of the affected area will be performed per the construction code or repair/replacement program and plan, immediately following these minor repair/replacement activities for which relief is sought. Further, applicable leakage testing of the affected area will be performed in accordance with 10 CFR Part 50, Appendix J. The above statement on the proposed alternate examination is based on information provided in the licensee's RR dated November 16, 2007 and the licensee's response to RAI 2, dated May 5, 2008.

The relief is requested for the second 10-year interval of the Containment Inspection Program for DAEC, which began on May 22, 2008 and ends February 21, 2014 (the interval end date corresponds to the end of the current operating license and, therefore, the interval is slightly less than six years).

### 3.2.6 Staff Evaluation

Per IWE 2310(d), the purpose of the detailed visual examination (VT-1) required by IWE-5240 is to assess the structural condition of areas affected by repair/replacement activities. Subarticle IWE-5222 allows the leakage tests following the minor repair/replacement activities specifically identified in IWE-5222(a), (b) and (c) to be deferred until the next scheduled leakage test, provided nondestructive examination is performed in accordance with the repair/replacement program and plan.

As alternate examination to that in IWE-5240, for minor repair/replacement activities, the licensee will perform the applicable leakage test in accordance with Appendix J of 10 CFR Part 50. Further, in its response dated May 5, 2008 to RAI 2, the licensee confirmed that: (i) the minor repair/replacement activities for which relief is sought are those specifically defined in paragraph IWE- 5222 of the ASME Code, Section XI, 2001 Edition through 2003 Addenda; and (ii) non-destructive examination (such as RT, MT, etc.) of the affected area will be performed per the construction code or repair/replacement program, immediately following these minor repair/replacement activities for which the relief is sought.

The NRC staff finds that the post-repair nondestructive examination of the affected area would satisfy the intent stated in IWE-2310(d) of the detailed (VT-1) visual examination required by IWE-5240 in assessing the structural condition of the area affected by minor repair/replacement activities. Further, the applicable leakage test performed on the area affected by the minor repair/replacement, in accordance with the requirements and criteria in Appendix J of 10 CFR Part 50, would provide an acceptable measure of the structural and leak-tight integrity of the affected area. The NRC staff agrees that for minor repair/replacement activities, the VT-1 examination will not provide any additional assurance of safety than that ensured by the nondestructive examination and leakage test. The NRC staff agrees that the presence of VT-1 examiner in addition to the Appendix J test personnel would result in unnecessary additional dose exposure.

Based on the above, the NRC staff concludes that DAEC complying with the specified requirement of IWE-5240 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff concludes that the proposed alternative provides reasonable assurance of structural and leak-tight integrity of the areas affected by minor repair/replacement activities. Therefore, relief request MC-P001 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the second CISI interval at DAEC.

## 4.0 CONCLUSION

Based on the information provided in the licensee's application, the licensee's responses to the NRC staff's RAI, and the NRC staff evaluation above, RRs MC-R001 and MC-P001 are authorized pursuant to 10 CFR 50.55a(a)(3)(i) and 10 CFR 50.55a (a)(3)(ii), respectively, for the second CISI interval at DAEC which began May 22, 2008, and ends February 21, 2014.

5. REFERENCES

1. Letter No. NG-07-0878 dated November 16, 2007, from Richard L. Anderson, FPL Energy Duane Arnold, LLC, to USNRC regarding Relief Request MC-R001 and MC-P001 for the Second 10-Year Containment Inspection Plan (ML073320185)
2. Letter No. NG-08-0278 dated May 5, 2008, from Richard L. Anderson, FPL Energy Duane Arnold, LLC, to USNRC with regard to Response to Request for Additional Information Related to the Relief Requests MC-R001 and MC-P001, Duane Arnold Energy Center (ML081370604)

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Date: September 22, 2008