NMC
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DAEC Plant Support Center
Operated by Nuclear Management Company, LLC

January 24, 2003
NG-03-0055

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, DC 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Request for Additional Information Regarding Technical Specification Change Request (TSCR-055): Deferral of Type A Containment Integrated Leak Rate Test (ILRT)

Reference: NG-02-0232, dated March 29, 2002, G. Van Middlesworth (NMC) to NRC, Technical Specification Change Request (TSCR-055): Deferral of Type A Containment Integrated Leak Rate Test (ILRT)

File: A-117

By the referenced letter, Nuclear Management Company, LLC (NMC) requested a revision to the Technical Specifications (TS) for the Duane Arnold Energy Center (DAEC). This proposed change revises TS Section 5.5.12 ("Primary Containment Leakage Rate Testing Program") to reflect a one-time deferral of the Type A Containment Integrated Leak Rate Test (ILRT).

A conference call was held between the Staff, the DAEC, and the DAEC's consultant, on January 15, 2003 to discuss draft Requests for Additional Information (RAIs) transmitted electronically to NMC on August 20, 2002 and October 29, 2002. As a result of this discussion, part of one request was withdrawn. The remaining NRC requests, along with the DAEC's responses, are provided in the attachment.

Please contact this office should you require additional information regarding this matter.

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This letter is true and accurate to the best of my knowledge and belief.

NUCLEAR MANAGEMENT COMPANY, LLC

By ______________________
Mark Peifer
DAEC Site Vice-President

State of Iowa
(County) of Linn

Signed and sworn to before me on this 24th day of January, 2003,

by Mark A. Peifer.

NANCY S. FRANCK
Commission Number 011041
MY COMMISSION EXPIRES
9-28-04

Nancy S. Franck
Notary Public in and for the State of Iowa

9-28-04
Commission Expires

Attachment
cc: C. Rushworth
D. Hood (NRC-NRR)
J. Dyer (Region III)
D. McGhee (State of Iowa)
NRC Resident Office
IRMS

Response to Requests for Additional Information (RAIs)
Regarding a One-Time Deferral of Containment Integrated Leak Rate Test
Duane Arnold Energy Center

The NRC staff is reviewing Nuclear Management Company's (NMC's) letter dated March 29, 2002, requesting a license amendment to change the Technical Specifications for the Duane Arnold Energy Center (DAEC) by deferring the Type A Containment Integrated Leak Rate Test (ILRT) from 10 to 15 years on a one-time basis. Because the inservice inspection requirements of 10 CFR 50.55a and the leak rate testing requirements of Option B of Appendix J to 10 CFR Part 50 complement each other in ensuring the leak-tightness and structural integrity of the containment, the NRC staff needs the following additional information:

NRC Request 1:

On page 5 of Attachment 3 to NMC's letter, under "Plant Operational Performance," NMC states, "The primary containment is maintained at a slightly positive pressure during power operation. Primary containment pressure is recorded and periodically monitored in the Main Control Room." Please provide information regarding the maintenance of this positive pressure. This should include the average positive pressure maintained, and details of recorded and monitored activities (e.g., frequency and duration) for indication of changes in containment leakage.

DAEC Response:

During power operation the primary containment atmosphere is inerted with nitrogen to ensure that no external sources of oxygen are introduced into containment. The Containment Atmosphere Control System provides a supply of makeup nitrogen to maintain primary containment oxygen concentration within Technical Specification limits. That system automatically maintains pressure between approximately 0.5 and 1 psig during power operation. Primary Containment pressure is continuously recorded in the Control Room on both paperless and pen recorders and Operators monitor it via daily and shiftly surveillances. Additionally, Primary Containment high or low pressure is annunciated in the Control Room to alert Operators to off normal conditions.

NRC Request 2

On page 6 of Attachment 3 to NMC's letter, under IWE Program, NMC considered the first inspection period as five years (September 9, 1996, to September 8, 2001) - the period given to the licensees to complete their first period examination in 10 CFR 55.55a. In NRC staff responses to the Nuclear Energy Institute (NEI) (see questions 13, 15, and 16 on containment inservice inspection requirements in the NRC staff's letter to the NEI entitled "Response to NEI's Topic and Specific Issues Related to Containment Inspection Requirements," dated May 30, 1997), the NRC staff explained that this interpretation of the rule was incorrect. The NRC staff noted that the inspection periods should be determined as required in the ASME Code, Section XI. Please provide your actual start dates of the first and subsequent inspection periods for ASME Code Class MC components in the first interval as required by the ASME Code, Section XI.

DAEC Response:

The DAEC reviewed the IWE period and interval dates using the NRC interpretation found in the reference provided by the NRC Staff, Letter to NEI from the NRC dated May 30, 1997. In accordance with this guidance, the DAEC IWE period and interval dates will be:

First period - May 22, 1998 to May 21, 2001
Second period - May 22, 2001 to May 21, 2005
Third period - May 22, 2005 to May 21, 2008

These dates will be incorporated into the next revision of the DAEC Plan.

NRC Request 3

On page 8 of Attachment 3 to NMC's letter, under IWE Program Relief Requests, NMC states that "The relief requests MC-R002, and MC-R003 for Examination Categories E-D, and E-G were authorized by NRC letter dated October 19, 1999." As an alternative, NMC planned to examine these components (Categories E-D and E-G) during leak rate testing of the primary containment. With the flexibility provided in Option B of Appendix J for Type B and Type C testing (as per Nuclear Energy Institute (NEI) report 94-01 and Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," September 1995), the extension requested in this amendment for Type A testing, please provide the schedule for examination and testing of seals, gasket, and bolts that provides assurance of the integrity of the containment pressure boundary.

DAEC Response:

The DAEC scheduling rules as allowed by Option B of Appendix J of 10 CFR 50 are as follows:

The initial test frequency for performing a leak test on seals, gaskets and bolts which are Type B components is at least once every 30 months. If two consecutive as-found Type B tests are less than their administrative limit, the test interval is extended to 60 months. If three consecutive as-found Type B tests are less than their administrative limit, the test interval is extended to 120 months. If a test result is greater than the administrative limit for the components, the component is restored to a leak rate below the administrative limit and the test interval is re-established at 30 months.

Regardless of the above schedule, any repair or disassembly of a component with a seal, gasket, or bolted connection requires a post-maintenance Appendix J Type B test.

The DAEC does not rely solely on Type A testing for seals, gaskets, or bolted connections.

NRC Request 4

The stainless steel bellows have found to be susceptible to transgranular stress corrosion cracking, and leakages through them are not readily detectable by Type B testing (see NRC Information Notice 92-20, "Inadequate Local Leak Rate Testing"). On page 5 of Attachment 3 to NMC's letter, NMC states that DAEC's containment design includes a drywell and suppression chamber with interconnecting vent pipes with bellows. The vent pipes are provided with two-ply expansion bellows to accommodate differential motion between the drywell and suppression chamber. These bellows have test connections which allow for leak testing and for determining that the passages between the two-ply bellows are not obstructed. Please provide information regarding frequency of inspection and testing of these bellows.

DAEC Response:

In response to Information Notice 92-20, the DAEC evaluated and modified the test method used to measure leakage for its two-ply bellows to include provisions to detect potential damage to the bellows prior to determining leakage rates. The drywell-torus vent bellows are tested at a 120-month interval in accordance with the DAEC Performance Based Containment Testing Program and Regulatory Guide 1.163. There have been no LLRT failures of the drywell-torus vent bellows in the last ten refueling outages.

NRC Request 5, with Additional Request of October 29, 2002:

Inspections of reinforced and steel containments at some facilities (e.g., North Anna, Brunswick, D. C. Cook, and Oyster Creek) have indicated degradation from the uninspectable (embedded) side of the steel shell and liner of primary containments. The major uninspectable areas of the Mark I containment are the vertical portion of the drywell shell and part of the shell sandwiched between the drywell floor and the basemat. Please discuss what programs are used to monitor their conditions. Also, address how potential leakage due to age-related degradation from these uninspectable areas are factored into the risk assessment in support of the requested ILRT interval extension.

Other licensees making similar requests have been requested by EMEB to address what effect potential degradation of the inaccessible side of the containment liner would have on the risk assessment. (Note: For example, Calvert Cliffs recently provided information (ADAMS Accession No. ML020920100) in support of a similar tech spec amendment to address the issue. NMC may want to consider Calvert Cliffs' response prior to submitting their response). NMC needs to address this for DAEC.

DAEC Response:

Inspections of the containment are performed during the time between ILRTs. The extension of the time between ILRTs will not affect the inspections. The performance-based ILRT program guidance (NEI 94-01 and Regulatory Guide 1.163) requires a minimum of three visual examinations of accessible interior and exterior surfaces of the containment system to allow for early uncovering of evidence of structural deterioration. Discrepancies identified in liner, penetrations or concrete are documented and dispositioned in accordance with the appropriate Code/design requirements. Section IWE of the ASME Code also contains requirements concerning the inspection of the accessible portions of the containment. These inspections are performed by qualified personnel, and identified discrepancies are documented and dispositioned in accordance with appropriate Code requirements.

The Calvert Cliffs nuclear plant provided a simplified analysis (in a submittal dated March 27, 2002) of the impact of age-related degradation on the increase in risk due to an ILRT extension from 3-in-10 years to once in 15 years. The Calvert Cliffs analysis has also been used as a basis for several other submittals, including River Bend and Hope Creek. The analysis for the DAEC is based on this analysis, with certain plant-specific features taken into account.

In order to be a Large Early Release Frequency (LERF) contributor, a postulated leak would have to affect both the concrete and liner of the containment. The methodology of the analysis involved using historical data to establish the likelihood of a liner flaw in both the accessible and inaccessible areas of containment. Then, assuming the liner flaw, the likelihood of a concurrent breach of containment was determined.

The likelihood of a postulated liner flaw was estimated using historical industry data for both the containment and containment basemat. The likelihood of the postulated liner flaw was assumed to double every five years for the 15-year interval of the proposed ILRT extension, with the 5-to-10 year period corresponding to the industry-specific flaw data. The average liner flaw probability (or likelihood) was then derived. This data was then used to derive the increase in the liner flaw likelihood between the original 3-in-10 year test interval and the proposed 1-in-15 year test interval.

In order to derive an estimate of the probability of a concurrent breach in containment, an exponential function curve depicting probability of containment failure was assumed, where the lower bound was assigned a failure probability of 0.1% at a pressure of 20 psia and the upper bound was assigned a failure probability of 100% at the ultimate containment failure pressure (150 psia in the case of Calvert Cliffs). This curve was used to interpolate what the containment failure probability would be at the pressure at which the ILRT is to be performed for the accessible and inaccessible areas of containment. The containment failure probability in the inaccessible area was assumed to be 10% that in the accessible area.

This analysis appears to be generic and conservative with respect to the DAEC insofar as the ILRT pressure at DAEC is approximately 46 psig (61 psia), less than that of Calvert Cliffs (64.7 psia). In addition, the "100% likelihood of breach" value is given as 150 psia for Calvert Cliffs. The corresponding estimate for the DAEC is 155 psia. This means that the likelihood of breach given a liner flaw derived in step three below would be less for DAEC than for Calvert Cliffs. However for conservatism, Calvert Cliffs values for steps one through five will be used in this analysis.

Finally, it was assumed that the likelihood of failing to detect a breach would be 10% in the accessible area of containment and 100% in the inaccessible area. The values given in steps 3, 4 and 5 were then multiplied in order to give the likelihood of undetected containment leakage occurring.

Step	Description	Accessible Area (Approximately 85%)	Inaccessible Area (Approximately 15%)
1	Historical liner flaw likelihood (used to derive step 2)	5.2E-3	1.3E-3
2	Age-adjusted liner flaw likelihood (used to derive step 3)	6.27E-3	1.57E-3
3	Increase in flaw likelihood between 3 and 15 years	8.7%	2.2%
4	Likelihood of breach given liner flaw	1.1%	0.11%
5	Visual inspection detection failure likelihood	10%	100%
6	Likelihood of undetected containment leakage (steps 3*4*5)	8.7%*1.1%*10% = 0.00957%	2.2%*0.11%*100% = 0.00242%

The total likelihood of undetected containment leakage is then the sum of that in the inaccessible and accessible areas of the containment or:
0.00957% + 0.00242% = 0.012%.

The total core damage frequency (CDF) for the DAEC is 1.18E-5/yr, while the total large early release frequency (LERF) is 1.14E-6/yr. This means that the frequency of core damage events that do not already result in LERF is:
1.18E-5/yr – 1.14E-6/yr = 1.07E-5/yr.

If all the assumed leakage due to undetectable corrosion is conservatively assumed to result in a large early release, then the increase in LERF due to this factor alone is:
1.07E-5/yr*0.012% = 1.28E-9/yr.
This is the increase in LERF due to undetectable corrosion.

The total increase in LERF due to extending the ILRT interval from 3 in 10 years to 1 in 15 years is then the sum of the originally calculated increase in LERF plus the contribution due to undetectable corrosion issues:
3.7E-8/yr + 1.28E-9/yr = 3.83E-8/yr.

This is still below the RG 1.174 limit of 1E-7/yr and thus represents a small change in risk.