



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

June 29, 1990

Docket No. 50-331

Mr. Lee Liu  
Chairman of the Board and  
Chief Executive Officer  
Iowa Electric Light and Power Company  
P. O. Box 351  
Cedar Rapids, Iowa 52406

Dear Mr. Liu:

SUBJECT: EXEMPTION FROM APPENDIX J, 10 CFR PART 50, FOR THE CONTAINMENT  
INTEGRATED LEAK RATE TEST INTERVAL - DUANE ARNOLD ENERGY CENTER  
(TAC NO. 76421)

By letter dated April 2, 1990, Iowa Electric Light and Power Company (IELP) requested an exemption from specific requirements of Appendix J to 10 CFR Part 50 for the Duane Arnold Energy Center (DAEC).

You requested an exemption from 10 CFR Part 50, Appendix J, Section III.A.6.(b), which requires that a Type A containment integrated leak rate test be conducted approximately every 18 months or during a refueling outage, whichever occurs first, until two consecutive Type A tests meet the applicable acceptance criteria. This accelerated test frequency was required because of two consecutive Type A test failures at the DAEC in 1985 and 1987, although the most recent Type A test, conducted in 1988, was successful. Your request for exemption from conducting a Type A test during the upcoming refueling outage would allow you to resume the normal schedule for Type A testing, specified in 10 CFR Part 50, Appendix J, Section III.D.1.(a), which requires three tests to be performed during each 10-year service period at approximately equal intervals. The basis for your request is your Corrective Action Plan to repair the Main Steam Isolation Valves and the feedwater system check valves, which have been significant contributors to the total "as-found" leak rates in previous Type A tests. Your request is consistent with the guidance of NRC Information Notice 85-71, "Containment Integrated Leak Rate Tests," dated August 22, 1985.

Based on our evaluation, we have granted an exemption from the accelerated test schedule required by Section III.A.6.(b) of Appendix J to 10 CFR Part 50. The exemption allows IELP to resume the normal Type A test schedule specified in Section III.D.1.(a) of Appendix J. You provided in your April 2, 1990 submittal your schedule for performing Type A tests during future refueling outages. The next Type A test to be performed at the DAEC is scheduled for the Cycle 11/12 refueling outage in early 1992. If that Type A test does not meet the "as-found" acceptance criteria, the schedule for future Type A tests must be reviewed and approved by the Commission, in accordance with Section III.A.6.(a) of Appendix J.

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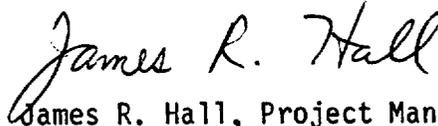
Mr. Lee Liu

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June 29, 1990

Enclosed is the Exemption and the NRC staff's related Safety Evaluation. A copy of the enclosed Exemption is being filed with the Office of the Federal Register for publication.

Sincerely,



James R. Hall, Project Manager  
Project Directorate III-3  
Division of Reactor Projects - III,  
IV, V and Special Projects  
Office of Nuclear Reactor Regulation

Enclosures:

1. Exemption
2. Safety Evaluation

cc w/enclosures:  
See next page

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Enclosed is the Exemption and the NRC staff's related Safety Evaluation. A copy of the enclosed Exemption is being filed with the Office of the Federal Register for publication.

Sincerely,

*/s/*

James R. Hall, Project Manager  
Project Directorate III-3  
Division of Reactor Projects - III,  
IV, V and Special Projects  
Office of Nuclear Reactor Regulation

Enclosures:

- 1. Exemption
- 2. Safety Evaluation

cc w/closures:

See next page

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
IOWA ELECTRIC LIGHT AND )  
POWER COMPANY, )  
CENTRAL IOWA POWER COOPERATIVE, AND )  
CORN BELT POWER COOPERATIVE )  
(Duane Arnold Energy Center) )

Docket No. 50-331

EXEMPTION

I.

Iowa Electric Light and Power Company, et al. (the licensee) is the holder of Facility Operating License No. DPR-49 which authorizes the operation of the Duane Arnold Energy Center (DAEC) at steady state reactor power levels not in excess of 1658 megawatts thermal. The license provides, among other things, that it is subject to all rules, regulations and Orders of the Commission now and hereafter in effect. The facility consists of a boiling water reactor located at the licensee's site near Palo in Linn County, Iowa.

II.

The Code of Federal Regulations, 10 CFR 50.54(o), specifies that primary reactor containments for water-cooled power reactors shall comply with Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." Section III.A.6.(b) of Appendix J to 10 CFR Part 50 states the following:

If two consecutive periodic Type A tests fail to meet the applicable acceptance criteria in III.A.5.(b), notwithstanding the periodic retest schedule of III.D., a Type A test shall be performed at each plant

shutdown for refueling or approximately every 18 months, whichever occurs first, until two consecutive Type A tests meet the acceptance criteria in III.A.5.(b), after which time the retest schedule specified in III.D. may be resumed.

The containment integrated leak rate tests (Type A tests) performed during the 1985 and 1987 refueling outages at the DAEC were considered to be failures in the "as-found" condition due to penalties incurred as a result of leakage measured in Type B and Type C local leak rate tests (LLRTs). The Type A test conducted during the 1988 refueling outage was successful in the "as-found" condition. However, the licensee is still required to conduct a Type A test at the upcoming refueling outage, commencing in June 1990.

As an alternative to performing the required Type A test, the licensee has submitted a Corrective Action Plan to eliminate excessive local leakage in accordance with the guidance provided in NRC Information Notice 85-71, "Containment Integrated Leak Rate Tests," dated August 22, 1985. The Corrective Action Plan is in lieu of the increased test frequency required by Section III.A.6.(b) of Appendix J to 10 CFR Part 50. Therefore, an exemption from this requirement is needed.

### III.

By letter dated April 2, 1990, the licensee requested a one-time exemption from 10 CFR Part 50, Appendix J, Section III.A.6.(b), to allow a return to the normal Type A retest schedule of Section III.D. of Appendix J. The accelerated Type A test frequency was required due to failures of the Type A tests (in the "as-found" condition) conducted at the DAEC in 1985 and 1987. These test failures were the direct result of leakage rate penalties from Type B and C local leak rate tests (LLRTs), which are added to the measured Type A leakage

rate to calculate the total "as-found" containment integrated leakage rate. Specifically, excessive leakage from the inboard feedwater check valves and from the Main Steam Isolation Valves (MSIVs), as measured during Type C testing of those valves, resulted in the total Type A leakage exceeding the acceptance criteria. Although a successful Type A test was performed in December 1988, leakage from the inboard feedwater check valves and MSIVs again comprised the major portion (63%) of the total "as-found" leakage.

The licensee's Corrective Action Plan describes the modification, testing and preventative maintenance programs implemented or planned to improve the leakage characteristics for these valves. The inboard feedwater check valves were modified during the 1988 refueling outage, including the installation of soft seats, which have been effective in reducing leakage from similar valves at other facilities. The effectiveness of these modifications will be confirmed through the Type C tests of these valves performed at each refueling outage. In addition, the preventative maintenance (PM) program will require disassembly and inspection of these valves at each refueling outage, thereby ensuring that degradation will be detected and corrective maintenance performed.

Extensive modifications to all eight MSIVs will be made during the 1990 refueling outage, as described in the Corrective Action Plan. These modifications address the primary contributors to local leak rate test failures as identified by the industry and the NRC. Additional modifications to the MSIVs are also directed at improving valve reliability. These modifications are expected to significantly improve MSIV leakage performance, as they have been proven effective through industry experience or testing. Local leak rate tests will be performed

on the MSIVs at each refueling outage, in addition to the testing required by the DAEC Inservice Testing Program, normally performed in conjunction with Type C tests. This testing will confirm the effectiveness of the modifications. The PM program for the MSIVs will also require disassembly and inspection of each valve at least once per three operating cycles, although excessive leakage identified during testing would necessitate immediate disassembly and repair. The PM program for both the feedwater check valves and the MSIVs will also provide trending information for the continuing evaluation of valve performance, which will dictate changes to PM practices or further design improvements.

The licensee's Corrective Action Plan for the inboard feedwater check valves and MSIVs, consisting of modification, testing and preventative maintenance programs, will provide an equivalent degree of assurance that containment integrity will be maintained as that provided by an additional Type A test performed on the accelerated frequency specified by Section III.A.6.(b) of Appendix J. The NRC staff concludes that a return to the normal retest schedule of Section III.D. of Appendix J is justified. The staff's Safety Evaluation dated June 29, 1990 provides additional details and bases supporting the requested exemption.

#### IV.

The underlying purpose of the requirements of Section III.A.6.(b) of Appendix J to 10 CFR Part 50 is to ensure the integrity of the primary containment and its penetrations. As discussed above, the underlying purpose is achieved through the licensee's comprehensive Corrective Action Plan. Thus, an equivalent level of protection is provided.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a)(1), this exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. The Commission has further determined that special circumstances, as set forth in 10 CFR 50.12(a)(2)(ii) are present, justifying the exemption; namely that application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of the rule. Accordingly, the Commission hereby grants an exemption to Section III.A.6.(b) of Appendix J to 10 CFR Part 50 to allow the licensee to resume the Type A retest schedule of Section III.D. of Appendix J for the Duane Arnold Energy Center. If the next Type A test is deemed a failure by the NRC acceptance criteria, the schedule for future Type A tests must be reviewed and approved by the Commission, as required by Section III.A.6.(a) of Appendix J.

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact has been prepared and published in the Federal Register on June 27, 1990 (55 FR 26305). Accordingly, based upon the environmental assessment, the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment.

A copy of the licensee's request for exemption dated April 2, 1990, is available for public inspection at the Commission's Public Document Room, 2120 L Street, N.W., Washington, D.C., and at the Cedar Rapids Public Library, 500 First Street SE, Cedar Rapids, Iowa, 52401.

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

  
Dennis M. Crutchfield, Director  
Division of Reactor Projects III,  
IV, V and Special Projects  
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland  
this 29th day of June 1990



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FACILITY OPERATING LICENSE NO. DPR-49

IOWA ELECTRIC LIGHT AND POWER COMPANY  
CENTRAL IOWA POWER COOPERATIVE  
CORN BELT POWER COOPERATIVE

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

By letter dated April 2, 1990, Iowa Electric Light and Power Company (IELP/the licensee) requested a one-time exemption from the requirement of 10 CFR Part 50, Appendix J, Section III.A.6.(b). The exemption would relieve the licensee from the requirement to perform a Type A containment integrated leak rate test (CILRT) at the Duane Arnold Energy Center (DAEC) during the upcoming Cycle 10/11 refueling outage and would allow a return to the normal Type A retest schedule specified in Section III.D.1.(a) of Appendix J. IELP has proposed to perform the next Type A test during the Cycle 11/12 refueling outage, currently scheduled for early 1992. The subsequent Type A test would be performed during the Cycle 13/14 refueling outage in 1995.

2.0 DISCUSSION

Section III.A of Appendix J to 10 CFR Part 50 specifies the requirements for containment integrated leak rate tests (Type A tests). In order to establish the "as-found" condition of integrated containment leakage, licensees would ideally conduct a Type A test near the beginning of a refueling outage, before making any repairs or adjustments to containment boundary components such as containment isolation valves. However, for various practical reasons, most licensees instead conduct local leakage rate tests (Type B and Type C) before the Type A test, making repairs and adjustments as necessary to reduce excessive leakage. The Type A test is then performed near the end of the refueling outage. In order to determine the "as-found" integrated leakage rate under these conditions, the licensee performs Type B or C tests both before and after repairing a penetration or valve, and the difference in leakage rates is then added to the Type A leakage rate. In this manner, an "as-left" leakage rate (actually measured in the Type A test) and an "as-found" leakage rate (Type A measurement plus Type B and C "penalties") are determined. If either exceeds the test acceptance criterion, a test failure is indicated.

Section III.A.6.(b) of 10 CFR 50, Appendix J, requires that:

"If two consecutive periodic Type A tests fail to meet the applicable acceptance criteria in III.A.5.(b), notwithstanding the periodic retest schedule of III.D, a Type A test shall be performed at each plant shutdown for refueling or approximately every 18 months, whichever occurs first, until two consecutive Type A tests meet the acceptance criteria in III.A.5.(b), after which time the retest schedule specified in III.D may be resumed."

The Type A tests conducted at the DAEC in 1985 and 1987 were considered to be failures in the "as-found" condition due to penalties incurred for the Type B and Type C local leak rate tests (LLRTs) conducted during those outages. The Type A test conducted during the last refueling outage in December 1988 met the acceptance criteria in the "as-found" condition, even though the Type B and C penalties were again considerable. Excessive leakage from specific valves was corrected during each outage and the "as-left" condition of the containment met Appendix J acceptance criteria, as confirmed by the Type A tests.

### 3.0 EVALUATION

IELP indicated in its exemption request that the 1985 and 1987 Type A tests were considered failures in the "as-found" condition due to the substantial Type B and C penalties incurred. In addition, although the most recent Type A test conducted in December 1988 met the acceptance criteria in the "as-found" condition, Type B and C penalties again constituted the majority of the total calculated containment integrated leak rate. The licensee further indicated that the predominant sources of the substantial Type B and C leak rate penalties have been the Main Steam Isolation Valves (MSIVs) and the inboard feedwater system check valves.

NRC Information Notice 85-71, "Containment Integrated Leak Rate Tests," dated August 22, 1985, states in part:

"If Type B and C leakage rates constitute an identified contributor to this failure of the "as-found" condition for the CILRT, the general purpose of maintaining a high degree of containment integrity might be better served through an improved maintenance and testing program for containment penetration boundaries and isolation valves. In this situation, the licensee may submit a Corrective Action Plan with an alternative leakage test program proposal as an exemption request for NRC staff review. If this submittal is approved by the NRC staff, the licensee may implement the corrective action and alternative leakage test program in lieu of the required increase in Type A test frequency incurred after the failure of two successive Type A tests."

Consistent with this guidance, IELP has proposed a more effective approach to maintaining a high degree of containment integrity through the implementation of an improved maintenance and testing program directed at those components identified to be the major contributors to excessive containment leakage. Attachment 1 to the licensee's April 2, 1990 letter describes the "Corrective Action Plan for Main Steam Isolation Valve and Feedwater Check Valve Leakage." This plan is designed to eliminate the root causes of excessive leakage from these valves, which will improve the Type A test "as-found" leakage rates by reducing the substantial Type B and C penalties incurred.

The poor leak test history of the MSIVs and inboard feedwater (FW) check valves at the DAEC has been noted by the NRC in Inspection Reports 50-331/85-017, 50-331/87-015, and 50-331/88-022. The 1985 Type A test was determined to be a failure due to unquantified leakage through one of the inboard FW check valves. The 1987 Type A test was also a failure in the "as-found" condition, as the contribution to the total calculated leakage from the MSIVs and FW check valves alone was more than double the acceptance criterion limit. The 1988 Type A test was successful, despite the fact that leakage from the MSIVs and FW check valves comprised 63% of the acceptance criterion limit. For the last two Type A tests, the combined leakage from the MSIVs and FW check valves constituted 90% and 75%, respectively, of the total Type B and C penalties incurred (and 80% and 65% respectively, of the total Type A "as-found" leakage).

Although the improvement in performance of the subject valves was sufficient to allow a successful "as-found" Type A test in December of 1988, the licensee recognized the need for more extensive improvements and has implemented several actions, as discussed in their Corrective Action Plan.

With respect to the MSIVs, IELP has continued to develop improved test methods and maintenance techniques and has included the valves in the preventative maintenance program. The licensee conducted mid-cycle LLRTs on all eight valves in September 1989. Some improvement in the as-found condition of the valves was noted compared with previous tests; however, three MSIVs still failed their LLRTs. In addition to the improved testing and maintenance practices previously adopted, as part of its Corrective Action Plan the licensee is preparing to extensively modify all eight MSIVs during the 1990 refueling outage. IELP has worked with the General Electric Company and other equipment suppliers as part of a team approach that has identified several MSIV design modifications intended to improve the valves' leak test performance. In general, these modifications are intended to increase the valve seating force, remove interferences that detract from the seating force, and minimize lateral movement of the valve disks by restoring concentricity, adding guiding, and reducing clearances. The specific modifications described in the Corrective Action Plan are expected to improve MSIV performance, based on proven application at the DAEC or other sites, by tests performed by the Electric Power Research Institute or valve manufacturers, or by studies conducted by the BWR Owners Group. These improvements address the primary contributors to LLRT failure, as analyzed by the NRC in NUREG-1169, "Resolution to Generic Issue C-8, An Evaluation of Boiling Water Reactor Main Steam Line Isolation Valve Leakage and the Effectiveness of Leakage Treatment Methods."

In addition to the periodic tests required by Appendix J and the DAEC Inservice Testing Program, all eight MSIVs will be disassembled on an established frequency as part of the preventative maintenance (PM) program. As currently planned, the four inboard MSIVs will be disassembled and inspected at the second refueling outage (mid-1993) and the four outboard valves at the third outage (early 1995). The PM program for valve actuators and topworks will also be combined with the PM program for the MSIVs.

With respect to the FW check valves, IELP made several modifications to the two inboard valves during the 1988 refueling outage (the outboard isolation valves in the feedwater lines are motor-operated stop check valves, which have not been a major source of leakage). These modifications included the installation of soft seats, changing the valve packing, and modifications to the valve operator. These modifications were intended to improve the seating force and leaktightness of the valves. The installation of soft seats on similar valves at other facilities has resulted in improved performance, but some degradation of the soft seat material has been observed. In addition to the required LLRTs, the licensee has committed to disassemble and inspect the inboard FW check valves during each refueling outage as part of the PM program. This will ensure the detection and replacement of degraded seats and other corrective actions, as necessary.

The staff has reviewed the corrective actions described in the exemption request and agrees that these actions should improve the leak performance of those components identified to be the major sources of excessive leakage (the MSIVs and inboard FW check valves). Future performance of these valves will continue to be evaluated as part of the licensee's preventative maintenance program and the required testing programs. Consistent with the staff position in NRC Information Notice No. 85-71, the staff believes that a high degree of containment integrity will be maintained through the next operating cycle through the implementation of the licensee's focused corrective actions, in lieu of conducting a Type A test during the upcoming outage.

#### 4.0 CONCLUSION

The staff has concluded, based on the above, that the requested exemption from Section III.A.6.(b), requiring a Type A test to be conducted during the upcoming refueling outage, should be granted, so that the licensee may resume the normal Type A test scheduled specified in Section III.D.1.(a) of Appendix J to 10 CFR Part 50. If the next Type A test does not meet the NRC acceptance criteria on an "as-found" basis, the test schedule for subsequent Type A tests will require review and approval by the NRC, as stated in Section III.A.6.(a) of Appendix J.

Principal Contributor: J. R. Hall, NRR

Dated: June 29, 1990