Iowa Electric Light and Power Company

March 26, 1993
NG-93-0566

JOHN F. FRANZ, JR.
VICE PRESIDENT, NUCLEAR

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Request for Technical Specification Change (RTS-252): Revision to TS Section 5.5, "Spent and New Fuel Storage"
File: A-117, J-82d

Dear Dr. Murley:

In accordance with the Code of Federal Regulations, Title 10, Sections 50.59 and 50.90, Iowa Electric Light and Power Company (IELP) hereby requests to revise the Operating License (OL) and Technical Specifications (TS) for the Duane Arnold Energy Center (DAEC).

The proposed change will increase the storage limit of the Spent Fuel Pool. This change would increase the number of fuel assemblies allowed to a maximum of 3152. This change would allow an additional storage capacity of 323 fuel assemblies in a proposed fuel rack which could be temporarily located in the cask loading area of the cask pit. This additional rack is used to maintain full-core offload capability until the end of the DAEC operating license.

The proposed OL and TS change is described in Attachment 2. A licensing report, describing the Spent Fuel Pool storage capacity expansion, is included as Attachment 3.

This application has been reviewed by the DAEC Operations Committee and the DAEC Safety Committee.

IELP intends to begin installation of the proposed spent fuel storage racks in 1994. We therefore request your approval of these changes as early in 1994 as possible, with an implementation period of 30 days.

A047
1/1

A copy of this submittal, which includes our analysis of significant hazards consideration, is being forwarded to our appointed state official pursuant to the requirements of 10 CFR Section 50.91.

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

IOWA ELECTRIC LIGHT AND POWER COMPANY

By _____
John F. Franz
Vice President, Nuclear

State of Iowa
(County) of Linn

Signed and sworn to before me on this 26 day of March, 1993, by John Franz.

_____
Rita M. Fry
Notary Public in and for the State of Iowa

RITA M. FRY
MY COMMISSION EXPIRES
6-29-95

6-29-95
Commission Expires

JFF/SRC/pjv

Attachments:
1) Evaluation of Change with Respect to 10 CFR 50.92
2) Proposed Change RTS-252 to the Duane Arnold Energy Center Operating License and Technical Specifications
3) Licensing Report for Spent Fuel Storage Capacity Expansion, Duane Arnold Energy Center, Holtec Report HI-92889
4) Safety Assessment

cc: S. Catron
L. Liu (w/o Att. 3)
L. Root (w/o Att. 3)
R. Pulsifer (NRC-NRR)
A. Bert Davis (Region III)
NRC Resident Office
S. Brown (State of Iowa)
DCRC

EVALUATION OF CHANGE WITH RESPECT TO 10 CFR 50.92

Background:

The Duane Arnold Energy Center (DAEC) Spent Fuel Pool (SFP) has a current capacity of 1898 fuel assemblies. That capacity is projected to be filled by the year 2001, with loss of the capacity to completely off-load the reactor in 1998. This projection is based on conservative estimates for fuel discharges over the next few cycles. Iowa Electric Light and Power Company (IELP) has evaluated the alternatives for disposition of spent fuel and has chosen to increase the capacity of the SFP from the existing licensed value of 2050 cells to 3152 cells (including a temporary rack to be placed in the cask pit). The increase in capacity requires replacement of the existing fuel storage racks. The new storage racks are of free-standing construction, as are the existing racks; however, the material of construction of the new racks is austenitic stainless steel in contrast to the existing racks which are made of anodized aluminum. IELP plans to realize the ultimate licensed capacity of 3152 in increments through suitably planned rerack campaigns. The first campaign, scheduled for 1994, will increase the storage capacity to 2411 cells.

Iowa Electric Light and Power Company, Docket No. 50-331,
Duane Arnold Energy Center, Linn County, Iowa
Date of Amendment Request: March 26, 1993

Description of Amendment Request:

The proposed license amendment revises DAEC TS Section 5.5 to allow reracking the DAEC SFP with high density fuel storage racks of an approved design.

Basis for Proposed No Significant Hazards Consideration Determination:

IELP has determined that the proposed amendment involves No Significant Hazards Consideration, focusing on the three criteria set forth in 10 CFR 50.92(c) as stated below:

The Commission may make a final determination, pursuant to 10 CFR 50.91, that a proposed amendment to an operating license under 50.22 involves no significant hazards consideration, if operation of the facility in accordance with the proposed amendment would not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

3) Involve a significant reduction in a margin of safety.

IELP has determined that the activities associated with this amendment request do not meet any of the Significant Hazards Consideration Criteria of 10 CFR 50.92(c) and, accordingly, a No Significant Hazards Consideration finding is justified. In support of this determination, the following safety review is provided, followed by a discussion of each of the above three relevant criteria.

The DAEC has a single SFP which at the present time contains free-standing spent fuel storage racks with 1898 total storage cells. The present racks provide adequate capacity for storage of spent fuel while maintaining reserve full core discharge capacity through 1998. However, after the Cycle 15 refuel outage (fall 1998), DAEC would lose full core reserve storage capability with the existing racks. Therefore, to preclude this situation and to ensure that sufficient spent fuel storage capacity continues to exist at DAEC, IELP has contracted for high-density spent fuel storage racks whose design incorporates Boral™ as a neutron absorber in the cell walls. The new racks have an ultimate storage capacity of 3152 fuel assemblies (including a temporary rack in the cask pit), which is expected to extend the full core off-load storage capability until the year 2014 (DAEC operating license expires 2014).

The new free-standing high density spent fuel storage racks will store fuel in 18 discrete modules in the SFP and one module in the cask pit. Each cell is designed for storage of BWR fuel assemblies with Uranium-235 initial average enrichments up to 4.6 wt% (with credit for burnable poison) while maintaining the required subcriticality ($k_{eff} \leq 0.95$). The design of the racks is predicated on maximum reactivity as the gadolinia in the fuel is depleted.

The high density spent fuel storage rack cells are fabricated from 0.075-inch thick type 304 stainless steel sheet material. The nominal center-to-center spacings of the cells is 6.06 inches. The Boral™ panels are located between the checkerboard-arrayed boxes and the outer sheathing without a water gap. The cells are welded together in a specified manner to become a free-standing structure which is seismically qualified without depending on neighboring modules or fuel pool walls for support.

Since spent fuel is presently stored in the DAEC SFP, special administrative controls and/or procedures will be developed to minimize radiation exposure during the installation of the new spent fuel racks. The evaluation of postulated accidents with respect to nuclear criticality and radioactivity release has shown acceptable results, in that k_{eff} does not exceed 0.95, including uncertainties, and that postulated releases do not exceed 10 CFR Part 100 acceptance criteria for the period of construction and through the end of the operating license.

EVALUATION

The following evaluation demonstrates that the proposed amendment does not exceed any of the three significant hazards considerations criteria. The analysis of this proposed modification has been accomplished using currently accepted codes and standards. The three criteria are discussed below:

1) Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

In the course of the analysis, IELP has considered the following potential accident scenarios:

1. A spent fuel assembly drop in the spent fuel pool.

2. Loss of spent fuel pool cooling system flow.

3. A seismic event.

The increased storage capacity of the DAEC SFP has been analyzed for the existing fuel handling equipment and procedures, SFP cooling system, and seismic events. As with the existing racks, movement of a spent fuel cask over the SFP is prevented by safety interlocks and limit switches, as discussed in the DAEC UFSAR (Reference Section 9.1.4.4.5). Additionally, all fuel movements associated with this modification will be accomplished in accordance with existing fuel handling procedures. Consequently, the probability of dropping a fuel assembly per individual fuel movement is not increased. This modification will also necessitate movement of heavy loads within the SFP. No heavy loads will be moved directly over irradiated fuel. The DAEC SFP was reracked once before in 1979 and this modification will employ similar controls. Thus, the proposed modification does not increase the probability of any of the above accidents.

Sections 5.1.1, 5.1.2 and 5.1.6 of NUREG-0612, entitled "Control of Heavy Loads at Nuclear Power Plants", provide guidance for heavy load handling operations pursuant to a spent fuel storage rack replacement. Section 5.1.2 provides four alternatives for assuring the safe handling of heavy loads during a fuel storage rack replacement. Alternative (1) of Section 5.1.2 provides that the control of heavy loads guidelines can be satisfied by establishing that the potential for a heavy load drop is extremely small, as demonstrated by satisfaction of the single-failure-proof crane guidelines. The provisions of alternative (1) will be met during implementation of the subject activities.

NUREG-0554, entitled "Single-Failure-Proof Cranes for Nuclear Power Plants", provides guidance for the design, fabrication, installation and testing of new cranes that are of a high reliability design. For operating plants, NUREG-0612, Appendix C, entitled "Modification of Existing Cranes," provides guidelines on the implementation of NUREG-0554 at operating plants. An evaluation of storage rack movements, which will be accomplished by the DAEC Reactor Building crane, to determine conformance with the NUREG-0612, Appendix C guidelines demonstrated that alternative (1) above is satisfied, i.e., the probability of a drop of a storage rack is extremely small. As stated in the DAEC UFSAR, the Reactor Building crane has a rated capacity of 100 tons, which incorporates a design safety factor of five. The maximum weight of any existing or replacement storage rack and its associated handling tool is 12 tons. Therefore, there is ample safety factor margin for movements of the storage racks by the Reactor Building crane. This applies to non-redundant load-bearing components. Redundant special lifting devices, which have a rated capacity sufficient to maintain the safety factors, will be utilized in the movements of the storage racks. As per NUREG-0612, Appendix B, the substantial safety factor margin ensures that the probability of a load drop is extremely low.

Accordingly, the proposed modification does not involve a significant increase in the probability of an accident previously evaluated.

IELP evaluated the consequences of a spent fuel assembly drop in the spent fuel pool and found that the criticality acceptance criterion, $k_{eff} \leq 0.95$, is not violated. In addition, IELP found that there was no significant change in the radiological consequences of a fuel assembly drop from the previous analyses. IELP analyses found that the calculated doses are well within 10 CFR 100 guidelines. The results of an analysis show that a dropped spent fuel

assembly on the racks will not distort the racks to the extent that they would not perform their safety function. Thus, the consequences of this type of accident are not significantly changed from the previously evaluated spent fuel assembly drops (Reference Section 7 of Attachment 3).

The consequences of a loss of spent fuel pool cooling system flow have been evaluated and it was found that sufficient time is still available to provide an alternate means for cooling in the event of a complete failure of the cooling system. Thus, the consequences of this type accident are not significantly increased from previously evaluated loss of cooling system flow accidents (Reference Section 5 of Attachment 3).

The consequences of a seismic event have been evaluated. The new racks will be designed and fabricated to meet the requirements of applicable portions of the NRC Regulatory Guides and published standards. The new free-standing racks are designed, as are the existing free-standing racks, so that the integrity of the racks and the pool structure is maintained during and after a seismic event. Thus, the consequences of a seismic event are not increased from previously evaluated events (Reference Section 6 of Attachment 3).

The probability and consequences of a spent fuel cask drop will not be affected by the replacement of the racks. During the modification phase of the reracking project, administrative controls governing safe load paths will supplant the Reactor Building Crane interlocks and limit switches. The limit switches represent a physical limitation on Reactor Building crane travel to prevent heavy load movement over irradiated fuel. The proposed administrative controls will accomplish the same objective of restricting movement of heavy loads to safe load paths. Similar controls were implemented during the previous SFP reracking modification in 1979. Upon completion of the rerack installation, the Reactor Building Crane safety interlock and limit switch functions will be restored.

The consequence of a fuel handling accident during this modification has been considered. No heavy loads will be carried directly over irradiated fuel. In addition, no load weighing more than the combined weight of a fuel bundle and grapple (assumption for fuel handling accident) will be carried in the spent fuel pool area until all fuel in the pool has decayed for a minimum of three months. This provides sufficient time for decay of gaseous radionuclides in the fuel (gap activity) such that an assumed release of

gases from damage to all stored fuel assemblies would result in a potential offsite dose less than 10% of 10 CFR 100 limits (Reference Section 9 of Attachment 3). Therefore, the consequences of a fuel handling accident are not significantly increased from previously evaluated events.

Therefore, it is concluded that the proposed amendment to replace the spent fuel racks in the spent fuel pool does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2) Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

IELP has evaluated the proposed modification in accordance with the guidance of the NRC Position Paper entitled "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," appropriate NRC Regulatory Guides, appropriate NRC Standard Review Plans, and appropriate industry codes and standards. In addition, IELP has reviewed several previous NRC Safety Evaluation Reports for rerack applications similar to this proposed modification.

No unproven technology will be utilized either in the construction process or in the analytical techniques necessary to justify the planned fuel storage expansion. In fact, the basic reracking technology in this instance has been developed and demonstrated in over 80 applications for fuel pool capacity increases previously approved by the NRC.

Further, IELP reracked the SFP previously. That modification was accomplished following similar procedures. This modification will not introduce any new accidents from those previously analyzed.

The temporary installation of a spent fuel rack in the cask pit will only be done if that storage is necessary to support full core offloading. If this rack is installed, a cask cannot be placed in the cask pit. No heavy loads will be allowed above the pit with irradiated fuel stored in it. Several additional restrictions will be implemented if this rack is to be utilized. These restrictions are discussed in Section 1 of Attachment 3. The analysis performed for the SFP reracking also supports temporary installation of a rack in the cask pit. The cask pit is included as part of the SFP so that a cask drop in the water would, if it results in local failure of the floor, only drain the cask pit. Since a cask will not be allowed in the pit with the temporary fuel rack installed, there is no possibility for an accident

involving a heavy load being dropped on irradiated fuel, or pool drainage resulting in uncovered fuel.

Based upon the foregoing, IELP concludes that the proposed reracking does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3) Does the proposed amendment involve a significant reduction in a margin of safety?

The NRC Staff Safety Evaluation Review process has established that the issue of margin of safety, when applied to a reracking modification, should address the following areas:

1. Nuclear criticality considerations

2. Thermal-hydraulic considerations

3. Mechanical, material and structural considerations

The established acceptance criterion for criticality is that the effective neutron multiplication factor k_{eff} in spent fuel pools shall be less than or equal to 0.95, including all uncertainties, under all conditions. This margin of safety has been adhered to in the criticality analysis methods for the new rack design (Reference Section 4 of Attachment 3).

The methods used in the criticality analysis conform to the applicable portions of the appropriate NRC guidance and industry codes, standards, and specifications. The acceptance criteria for maintaining fuel subcritical in the SFP is met if k_{eff} is always less than 0.95. The SFP analysis for this rerack modification includes uncertainties at 95%/95% probability and confidence levels, therefore the proposed amendment does not involve a significant reduction in the margin of safety for nuclear criticality.

Conservative methods were used to calculate the maximum fuel temperature and the increase in temperature of the water in the spent fuel pool. The thermal-hydraulic evaluation used the methods previously employed for evaluations of the present spent fuel racks to demonstrate that the temperature margins of safety are maintained. The proposed modification will increase the heat load in the spent fuel pool. The evaluation shows that the existing spent fuel cooling system will maintain the bulk pool water temperature at or below 165°F. Thus a margin of safety exists such that the maximum

allowable temperature for bulk boiling is not exceeded for the calculated increase in pool heat load. The evaluation also shows that maximum local water temperatures along the hottest fuel assembly are below that for a nucleate boiling condition to exist. Thus, there is no significant reduction in the margin of safety for spent fuel cooling concerns.

The main safety function of the spent fuel pool and the racks is to maintain the spent fuel assemblies in a safe configuration through all normal or abnormal loadings. Abnormal loadings which have been considered are the effect of an earthquake, the drop of a spent fuel assembly, or the drop of any other heavy object in the pool. The mechanical, material, and structural design of the new spent fuel racks is in accordance with applicable portions of NRC Position Paper, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," dated April 14, 1978, as modified January 18, 1979; Standard Review Plan 3.8.4; and other applicable NRC guidance and industry codes. The rack materials used are compatible with the spent fuel pool and the spent fuel assemblies. The structural considerations of the new racks address margins of safety against tilting and deflection or movement, such that the racks do not impact each other during the postulated seismic events. In addition the spent fuel assemblies remain intact and no criticality concerns exist. Thus the margins of safety are not significantly reduced by the proposed rerack.

In summation, it has been shown that the proposed spent fuel storage facility modifications do not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated; or

2. Create the possibility of a new or different kind of accident from any accident previously evaluated; or

3. Involve a significant reduction in a margin of safety.

CONCLUSION

In view of the above, IELP has determined that the proposed amendment as described does not involve a significant hazards consideration, and that the criteria of 10 CFR 50.92 has accordingly been met.

Based on the foregoing, IELP has concluded that all criteria for issuance of a no-significant hazards statement are satisfied.

Local Public Document Room Location: Cedar Rapids Public Library, 500 First Street SE, Cedar Rapids, Iowa 52401

Attorney for Licensee: Jack Newman, Kathleen H. Shea, Newman and Holtzinger, 1615 L Street NW, Washington, D.C. 20036

PROPOSED CHANGE RTS-252 TO THE DUANE ARNOLD ENERGY CENTER OPERATING LICENSE AND TECHNICAL SPECIFICATIONS

Iowa Electric Light and Power Company (IELP) has proposed an amendment to the Duane Arnold Energy Center (DAEC) Operating License and Technical Specifications (TS) to allow re-racking the Spent Fuel Pool (SFP) to increase the storage capacity to a maximum of 3152 fuel assemblies by deleting the current pages and replacing them with the attached, new pages. A description of the TS revision and list of affected pages follows.

List of Affected Pages

Operating License Page 2

5.5-1
5.5-2 (Deleted)

Description of Changes

Page

OL -2 Revise the effective date of the UFSAR to the most recent revision and reference the application for change.

5.5-1 Revisions proposed are based on limitations necessary to maintain stored fuel k_{eff} less than or equal to 0.95. These limitations were determined by analysis as discussed in Attachment 3 to this letter. Additional editorial changes are proposed along with adding a reference to the Holtec report which documents the basis for this change. A reference was also added to another GE document on GE Fuel Bundle Designs.

5.5-2 This page has been deleted.