May 16, 2003

Mark A. Peifer
Site Vice President
Duane Arnold Energy Center
Nuclear Management Company, LLC
3277 DAEC Road
Palo, IA 52324-0351

SUBJECT: DUANE ARNOLD ENERGY CENTER - ISSUANCE OF AMENDMENT REGARDING REACTOR BUILDING CRANE (TAC NO. MB8003)

Dear Mr. Peifer:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 251 to Facility Operating License No. DPR-49 for the Duane Arnold Energy Center. This amendment consists of changes to the operating license in response to your application dated March 11, 2003.

The amendment changes the operating license by adding a paragraph authorizing the licensee to revise the Updated Final Safety Analysis Report by deleting the notation that the NRC does not endorse the reactor building crane as single-failure-proof.

A copy of the Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Darl S. Hood, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures: 1. Amendment No. 251 to
License No. DPR-49
2. Safety Evaluation

cc w/encls: See next page

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Docket No. 50-331

Enclosures: 1. Amendment No. 251 to License No. DPR-49
2. Safety Evaluation

DISTRIBUTION:

GHill (2)	DHood	SWeerakkody
PUBLIC	GGrant, RIII	KManoly
PDIII-1 Reading	WBeckner, TSB	JMa
ACRS	OGC	GHatchett
THarris	GWilson, SRI	

ADAMS Accession No. ML030990041 *No legal objection w/comments on SE noted

OFFICE	PM:PDIII-1	LA:PDIII-1	SPLB:SC	EMEB:SC	OGC*	SC:PDIII-1
NAME	DHood	THarris	SWeerakkody	KManoly	AHodgdon	LRaghavan
DATE	04/21/03	04/24/03	04/23/03	04/22/03	04/30/03	04/30/03

OFFICIAL RECORD COPY

Duane Arnold Energy Center

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NUCLEAR MANAGEMENT COMPANY, LLC

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 251
License No. DPR-49

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Nuclear Management Company, LLC (the licensee) dated March 11, 2003, complies with the standards and requirements of the Atomic Energy Act of l954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by adding paragraph 2.C.(8) to the Facility Operating License No. DPR-49 which reads as follows:

   2.C.(8) The licensee is authorized to revise the Updated Final Safety Analysis Report by deleting the footnote for Section 9.1.4.4.5 which states: "*The NRC has not endorsed the reactor building crane as single-failure proof (Reference 9)," and by deleting Reference 9 of the references for Section 9.1.

3. The license amendment is effective as of the date of issuance and shall be implemented no later than the next update of the Final Safety Analysis Report to be submitted in accordance with 10 CFR 50.71(e).

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Facility Operating License

Date of Issuance: May 16, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 251

FACILITY OPERATING LICENSE NO. DPR-49

DOCKET NO. 50-331

Replace the following page of the Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
4a	4a

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 251 TO FACILITY OPERATING LICENSE NO. DPR-49

NUCLEAR MANAGEMENT COMPANY, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

By application dated March 11, 2003, Nuclear Management Company, LLC (the licensee), requested an amendment for the Duane Arnold Energy Center (DAEC). The proposed amendment would revise the operating license to authorize the licensee to revise the Updated Final Safety Analysis Report (UFSAR) by deleting an existing footnote and reference regarding the reactor building crane. Specifically, the amendment would add paragraph 2.C.(8) to the Facility Operating License No. DPR-49, which would read as follows:

> 2.C.(8) The licensee is authorized to revise the Updated Final Safety Analysis Report by deleting the footnote for Section 9.1.4.4.5 which states: "*The NRC has not endorsed the reactor building crane as single-failure proof (Reference 9)," and by deleting Reference 9 of the references for Section 9.1.

2.0 REGULATORY EVALUATION

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," dated July 1980, provides regulatory guidelines in two phases (Phase I and II) for licensees to assure safe handling of heavy loads in areas where a load drop could impact on stored spent fuel, fuel in the reactor core, or equipment that may be required to achieve safe shutdown or permit continued decay heat removal. Phase I guidelines address measures for reducing the likelihood of dropping heavy loads and provide criteria for establishing safe load paths, procedures for load handling operations, training of crane operators, design, testing, inspection, and maintenance of cranes and lifting devices, and analyses of the impact of heavy load drops. Phase II guidelines address alternatives for mitigating the consequences of heavy load drops, including using either (1) a single-failure-proof crane for increased handling system reliability, or (2) electrical interlocks and mechanical stops for restricting crane travel, or (3) load drops and consequence analyses for assessing the impact of dropped loads on plant safety and operations. NUREG-0612, Appendix C provides alternative means of upgrading the reliability of the crane to satisfy the requirements of NUREG-0554, "Single Failure Proof Cranes For Nuclear Power Plants," dated May 1979. NUREG-0554 identifies features of the design, fabrication, installation, inspection, testing, and operation of single-failure-proof overhead crane handling systems that are used for handling critical loads. NUREG-0554 superseded Draft Regulatory Guide 1.104, "Overhead Crane Handling Systems for Nuclear Power Plants," dated 1976.

In a letter dated August 26, 1983, the NRC staff approved Ederer's Generic Licensing Topical Report EDR-1 (P)-A, "Ederer's Nuclear Safety Related eXtra-Safety And Monitoring (X-SAM) Cranes," Revision 3, dated October 8, 1982, as an acceptable method of meeting the guidelines of NUREG-0554 and NUREG-0612. Appendices B and C of the Topical Report identify the plant specific information that is needed to verify a specific retrofit crane's conformance with NUREG-0554 guidelines. Appendix B summarizes the plant specific crane data supplied by Ederer. Appendix C summarizes the regulatory positions to be addressed by an applicant. Licensees who incorporated the use of Ederer's hoist and trolley into a design of the crane are to submit Appendices B and C to address how the plant specific application of the Ederer system satisfies the guidelines of NUREG-0612 and NUREG-0554.

Generic Letter (GL) 85-11, "Completion of Phase II of Control of Heavy Loads at Nuclear Power Plants, NUREG-0612," dated June 28, 1985, dismissed the need for licensees to implement the Phase II guidelines of NUREG-0612 because of the improvements obtained from the implementation of NUREG-0612 Phase I. However, GL 85-11 encouraged licensees to implement actions they perceived to be appropriate to provide adequate safety.

In NRC Bulletin (NRCB) 96-02, "Movement of Heavy Loads over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," dated April 1996, the NRC staff addressed specific instances of heavy load handling concerns and requested licensees to provide specific information detailing their extent of compliance with the guidelines and their licensing basis.

3.0 TECHNICAL EVALUATION

By application dated March 11, 2003, the licensee requested an amendment that would authorize the licensee to revise the DAEC's UFSAR by deleting existing notation that the NRC does not endorse the reactor building crane as single-failure-proof. The application was based, in part, upon seismic analyses of the reactor building crane girders and reactor building structure, and other supporting information, forwarded by the licensee's letters dated December 21, 2001, and December 4, 2002.

DEAC's reactor building crane was originally designed to handle heavy loads up to 100 tons as a non-single-failure-proof crane. The licensee addressed the Phase I guidelines (Section 5.1.1, "General") of NUREG-0612 in its response to Generic Letter 80-113, "Control of Heavy Loads,' which was issued on December 22, 1980. In a letter dated June 12, 1984, the NRC staff issued a safety evaluation and technical evaluation report that accepted DEAC's NUREG-0612 Phase I Heavy Loads program. In its application dated March 11, 2003, the licensee states that the DAEC heavy load handling program continues to meet the NUREG-0612 Phase I guidelines as approved by the NRC staff.

Section 5.1 of NUREG-0612 specifies evaluation criteria for the consequences of four accidents involving the dropping of a heavy load onto various equipment or spent fuel. However, NUREG-0612 provides alternatives to satisfying these evaluation criteria. The alternatives include satisfying the Phase I guidelines and (1) completing load drop and consequence analyses or (2) enhancing the overhead handling system to be single-failure-proof. In 1985, the licensee modified the DAEC reactor building crane by installing a new Ederer single-failure-proof crane trolley and main hoist system meeting the guidelines of Regulatory Guide 1.104, "Overhead Crane Handling Systems for Nuclear Power Plants," and NUREG-0554.[1] Thus, the licensee has chosen the combination of the crane upgrade to single-failure-proof and meeting NUREG-0612 Phase I guidelines to satisfy the defense-in-depth philosophy of NUREG-0612 and to assure a consistent level of protection in handling heavy loads at DAEC.

The licensee explained that the crane was upgraded in 1985, in accordance with 10 CFR 50.59, and, therefore, the NRC had not reviewed the seismic analysis which was performed to verify that the crane would be capable of safely supporting its rated load during a seismic event. In a letter dated August 3, 2001, the NRC had requested the licensee to revise its UFSAR to clarify that the NRC had not endorsed the crane as single-failure-proof. By letter dated November 27, 2001, forwarding Revision 16 of the UFSAR, the licensee added a footnote to this end to UFSAR Section 9.1.4.4.5, "Procedures and Plant Systems for Movement of Heavy Loads--Spent Fuel Cask Movement." In order to resolve the single-failure-proof status of the reactor building crane, the licensee performed additional calculations on the crane and discussed them in its letters of December 21, 2001, and December 4, 2002, and requested a license amendment by letter dated March 11, 2003, to delete the footnote from the UFSAR. The NRC staff's review of these calculations and information in the licensee's submittals is discussed below:

3.1 Seismic Qualification of the Crane and Supporting Structures

The licensee described the 1985 modification to the reactor building crane. A new Ederer XSAM single-failure-proof trolley, weighting 82,000 pounds and meeting the requirements of Regulatory Guide 1.104 and NUREG-0554, was installed to replace the original P&H trolley, which weighted 65,100 pounds. The licensee performed a seismic analysis to verify that the reactor building overhead crane with the heavier trolley would be capable of safely supporting its rated load during a seismic event. The licensee used UFSAR earthquake accelerations as input to the reactor building and runway girder. The vertical seismic load combinations included the weight of the crane and the 100 tons lifted load. Version 25 of the GT STRUDL computer code was used for the analysis. The licensee also performed some hand calculations.

[1] The new main hoist has a load capacity of 100 tons. The trolley system was installed on the existing bridge; the bridge itself was not replaced.

The licensee stated that the analysis results, including the 100 tons lifted load plus an operational basis earthquake (OBE) or a design basis earthquake (DBE)[2], indicated that:

(1) The combined vertical and horizontal stresses developed in the crane were within the allowable stress limits of the Crane Manufacturers Association of America (CMAA) 70-1975, "Specification for Electric Overhead Traveling Cranes";

(2) The stresses and deflections in the girder that supports the crane were less than their respective allowable values; and

(3) The rigid frame that supports the crane girder was structurally adequate.

During its review of the licensee's analysis, the NRC staff found that portions of the crane girder have a stiffener spacing slightly greater, and thickness 3% less, than that recommended by the CMAA Specification. Therefore, the NRC staff requested the licensee to provide additional justification for the deviation from the standard recommendations. In its letter dated December 4, 2002, the licensee submitted revised calculations to address the NRC staff's questions. With respect to the stiffener spacing issue, the revised calculations indicated that the clear spacing between stiffeners that was supposed to be used for calculating the bending moment of the crane girder was within the recommended spacing of the CMAA Specification, while the original calculations had used a spacing measured from the center to center of stiffeners. With respect to the stiffener thickness issue, the licensee performed a record search to locate the material certifications for the stiffeners and used the lowest value of actual material yield strengths to calculate the required thickness of the stiffener. The licensee found the resulting stiffener thickness to be within the recommended value of the CMAA Specification. The NRC staff finds the licensee's approach of the revised calculations reasonable and its justifications acceptable.

The NRC staff finds that the licensee has used proper assumptions, loads and loading combinations, input earthquake spectra, and analytical methodology for performing the requisite analysis. The STRUDL computer program was bench-marked and its use is acceptable for structural analysis applications.

Accordingly, on the basis of the information provided by the licensee, the NRC staff finds the licensee's qualification of the reactor building crane and its supporting structures acceptable with respect to seismic design and requirements. Therefore, the licensee's request to delete the footnote in the UFSAR is acceptable with respect to seismic and structural considerations.

3.2 Remaining on the Runway and Maintaining Load During a Seismic Event

NUREG-0554 provides specific design guidelines for structures above the wheels of the proposed replacement overhead crane during a seismic event. The structures above the wheels should be considered to retain control of and hold the load. The bridge and trolley should be designed to remain in place on their runways with the wheels prevented from leaving the tracks. If a seismic event comparable to a safe shutdown earthquake (SSE) should occur,

[2] The DBE is also known as a safe shutdown earthquake (SSE).

the bridge is required to remain on the runway with brakes applied, and the trolley is required to remain on the runway with the crane girders with brakes applied. The pendulum and swinging effects due to seismic and other operational loads, including the maximum critical load (MCL), are to be considered in the seismic design of these crane components.

In its letter of December 21, 2001, the licensee stated that it had installed the Ederer X-SAM single-failure-proof crane trolley system and that a seismic analysis had been performed to check the design of the crane girders for the increased loadings imposed by the trolley upgrade. The NRC staff reviewed the licensee's analysis for the OBE and the SSE to determine if the reactor building crane would remain on its runway with the brakes applied and retain and hold the load under such conditions. The NRC staff agrees with the licensee that the crane would retain and hold the load under these conditions because the safety devices of the X-SAM main hoist, as accepted by the NRC staff, protects against dropping the load under these conditions. In addition, Section 9.1.4.4.4 of the UFSAR states that the reactor building with its entire lifting system is designed to Seismic Category 1 criteria as described in Section 3.8 of the UFSAR. Therefore, the bridge and trolley will remain on their respective runways because they have been designed to withstand the effects of seismic events as described in the UFSAR.

The NRC staff's review of the crane girder diaphragm plates led the NRC staff to question DEACs acceptance of a three-percent overstress condition in the plates. In a letter dated December 4, 2001, in response to the NRC staff's request for additional information concerning the crane girder diaphragm plates, the licensee stated that it had completed a material certification records search for the diaphragm plates. The records search for the diaphragm plates indicated that the minimum material yield strength was greater than that used in the original calculation. Increasing the yield strength to reflect the material certification for the crane girder diaphragm plates resulted in acceptable design load bearing stress. Therefore, the reactor building bridge crane is robust enough to support the increase loading from the new trolley configuration with a lifted load under SSE and OBE conditions.

Based upon its review of the licensee's evaluation, the NRC staff agrees that the components of the upgraded crane at DEAC satisfy the seismic guidelines of NUREG-0554. The licensee's analysis demonstrates that the reactor building crane's capability to withstand a seismic event is within acceptable limits. Therefore, the new trolley and hoist and the existing bridge will safely perform their intended function of retaining an MCL of 100 tons under OBE and SSE conditions. The licensee's commitments to continue to meet the Phase I guidelines, combined with increasing the handling system reliability to meet the single-failure-proof guidelines of NUREG-0612, Appendix C, and NUREG-0554, provides reasonable assurance that handling of heavy loads at DEAC will be performed in a safe manner. Therefore, the NRC staff recognizes the reactor building crane as being single-failure-proof for an MCL of 100 tons.

3.3 Conclusion

Based upon the preceding discussions, the NRC staff concludes that the licensee's proposal to credit DAEC's reactor building crane as single-failure-proof in Section 9.1.4.4.5 of the UFSAR satisfies the guidelines of NUREG-0612, NUREG-0554, and is consistent with the NRC staff's acceptance of EDR-1 (P)-A. On the basis ot its review, the NRC staff finds that the licensee has performed acceptable seismic analyses for the crane and its supporting structure. The NRC staff further finds that the licensee's NUREG-0612 Phase I commitments, in addition to

meeting NUREG-0554 seismic guidelines, provide adequate defense-in-depth to maintain safety during heavy load handling operations at DEAC. Accordingly, the NRC staff recognizes and accepts the DAEC reactor building crane as being single-failure-proof for handling loads up to 100 tons. Therefore, the proposed change to the UFSAR is appropriate.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Iowa State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATIONS

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (68 FR 18278). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The NRC staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: G. Hatchett
J. Ma
D. Hood

Date: May 16, 2003