UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

October 26, 2010

The Honorable Gregory B. Jaczko
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE DUANE ARNOLD ENERGY CENTER

Dear Chairman Jaczko:

During the 576th meeting of the Advisory Committee on Reactor Safeguards, October 7-9, 2010, we completed our review of the License Renewal Application (LRA) for the Duane Arnold Energy Center (DAEC), and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during its meeting on June 8, 2010. During these reviews, we had the benefit of discussions with representatives of the NRC staff and the applicant, FPL Energy Duane Arnold, LLC (FPL Energy). We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

CONCLUSION AND RECOMMENDATION

1. The programs established and committed to by the applicant to manage age-related degradation provide reasonable assurance that Duane Arnold Energy Center can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

2. The FPL Energy application for renewal of the operating license of Duane Arnold Energy Center should be approved.

BACKGROUND AND DISCUSSION

DAEC is a General Electric boiling water reactor (BWR-4) with a Mark I pressure suppression containment design. DAEC is located approximately 8 miles northwest of Cedar Rapids, Iowa. The NRC issued the operating license for DAEC on November 22, 1974. General Electric supplied the BWR nuclear steam supply system and Bechtel Power Corporation originally designed and constructed the balance of the plant. The current licensed power output is 1912 MWt with a gross electrical output of approximately 629 MWe.

The originally licensed power was 1658 MWt, but technical specifications restricted operation to 1593 MWt. In 1985, License Amendment 115 increased the licensed core thermal power to 1658 MWt, and in 2001, License Amendment 243 increased the licensed core thermal power to 1912 MWt.

By letter dated September 30, 2008, as supplemented by letter dated January 23, 2009, FPL Energy (the applicant) submitted the LRA in accordance with 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." The applicant requested renewal of the DAEC operating license for a period of 20 years beyond the current expiration at midnight February 21, 2014. The applicant stated in its LRA that it did not identify any Technical Specification changes necessary to support issuance of the renewed DAEC operating license.

In the final SER, the staff documented its review of the LRA and other information submitted by the applicant or obtained during two staff audits and an inspection conducted at the plant site. The staff reviewed the completeness of the applicant's identification of structures, systems, and components (SSCs) that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's Aging Management Programs (AMPs); and the identification and assessment of time-limited aging analyses (TLAAs) requiring review.

The applicant identified the SSCs that fall within the scope of license renewal and performed an aging management review for these SSCs. The applicant will implement 43 AMPs for license renewal. These include 29 existing programs, 10 of which have been enhanced, and 14 new programs. Twenty-eight AMPs are consistent with the guidance in the Generic Aging Lessons Learned (GALL) Report. Eleven AMPs contain exceptions to approaches specified in the GALL Report. Four plant-specific programs manage issues that are either not addressed or are not consistent with guidance in the GALL Report. These are: the Electrical Connections Program, the Electrical Penetration Assembly Program, the ASME Code Class 1 Small Bore Piping Inspection Program, and the Boral Surveillance Program. We reviewed the plant-specific programs and the AMP exceptions to the GALL Report; we agree with the staff that they are acceptable.

The applicant identified the systems and components requiring TLAAs and reevaluated them for the period of extended operation. The staff concluded that the applicant has provided an acceptable list of TLAAs, as defined in 10 CFR 54.3. Furthermore, the staff concluded that in all cases the applicant has met the requirements of the License Renewal Rule by demonstrating that the TLAAs will remain valid for the period of extended operation, or the TLAAs have been projected to the end of the period of extended operation, or the aging effects will be adequately managed for the period of extended operation. We concur with the staff's conclusion that the TLAAs have been properly identified and that the required criteria will be met for the period of extended operation.

The staff conducted two license renewal audits and one inspection at the DAEC site. The audits verified the appropriateness of the aging management review, scoping and screening methodology, and associated AMPs. The inspection examined the scoping and screening of nonsafety-related SSCs and verified the adequacy of the guidance, documentation, and implementation of selected AMPs. The audit and inspection teams also performed independent examinations of DAEC corrective action program reports to confirm that plant-specific operating experience has been adequately addressed during the AMP development and implementation processes.

The Inaccessible Medium Voltage Cable Program in Revision 1 of the GALL Report only requires testing of inaccessible cables with voltages greater than 2kV that are energized at least

25 percent of the time. The staff has identified industry operating experience which indicates that power cables energized to 480V can experience failures where extended exposure to water is a contributing factor. These voltages are considerably lower than the 2kV to 35kV range that is traditionally designated as “medium voltage.” DAEC has not experienced any 480 V to 35 kV power cable failures due to aging. However, in response to the staff's concerns, the applicant expanded the scope of the Inaccessible Medium Voltage Cable Program to include all cables with voltages from 480 V to 35 kV whether normally energized or not.

The staff has concluded that external visual inspections do not provide adequate assurance that cracking is not present at the internal radius of socket welds in Class 1 small bore piping systems. There are currently no approved industry standard methods or qualified techniques to perform volumetric examinations of these welds. The DAEC operating experience indicates that cracking has occurred in one small bore socket weld. Examination of the weld indicated that it failed by fatigue. In addition to visual inspections, the applicant will perform volumetric examinations of 10 percent of the Class 1 socket welds during each inservice inspection interval for the period of extended operation. If no industry qualified examination technique is available at time of inspections, a plant procedure for volumetric examination will be used. Sample selection will be based on susceptibility, ability to inspect, dose considerations, operating experience, and limiting locations. We concur with the staff’s conclusion that this program, which accounts for the DAEC plant-specific operating experience, will adequately monitor and manage the effects of aging in these welds.

Recent industry events involving leakage from buried and underground piping may warrant changes to the Buried Piping and Tanks Inspection Program beyond recommendations in the GALL Report, Revision 1. The DAEC Buried Piping and Tanks Inspection Program will contain guidance and methods from current industry initiatives for the management of buried piping integrity. Inspection priorities will account for the safety significance, corrosion susceptibility, and radioactive fluid content of specific piping systems. Due to its recent operating experience with a leak in fire protection piping, the applicant has enhanced its program to incorporate additional inspections of ductile cast iron piping. The applicant will also upgrade cathodic protection systems to meet current industry standards and to ensure at least 90 percent operating availability. The staff concluded that the proposed programs will adequately monitor and manage the aging of buried piping and tanks. We agree with this conclusion.

Environmental fatigue for locations identified in NUREG/CR-6260 was evaluated using NUREG/CR-6583 and NUREG/CR-5704. The fatigue analyses that are documented in the LRA indicate that the 60-year projected environmentally adjusted Cumulative Usage Factors for the reactor pressure vessel do not exceed 1.0.

The applicant has identified and repaired numerous indications in the zinc coating on the torus below the water line since 1995. The applicant has committed to a total recoat below the water line on the surface of the torus, by 2012.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for DAEC. The programs established and committed to by FPL Energy provide reasonable assurance that DAEC can be

operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The FPL Energy application for renewal of the operating license for DAEC should be approved.

Sincerely,

/RA/

Said Abdel-Khalik
Chairman

References:

1. Letter to Christopher Costanzo transmitting, "Safety Evaluation Report Related to the License Renewal of Duane Arnold Energy Center," 09/02/2010 (ML102140384)

2. Letter to U.S. Nuclear Regulatory Commission transmitting, "License Renewal Application, Supplement 1: Changes Resulting from Issues Raised in the Review Status of the License Renewal Application for the Duane Arnold Energy Center," 01/23/2009 (ML090280418)

3. Letter to Christopher Costanzo transmitting, "Duane Arnold Energy Center NRC License Renewal Scoping, Screening, and Aging Management Inspection Report, 05000331/2009010 (DRS)," 01/20/2010 (ML100210603)

4. Letter to Christopher Costanzo transmitting, "Audit Report Regarding the Duane Arnold Energy Center License Renewal Application (TAC No. MD9769)," 11/30/2009 (ML093010539)

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Letter to the Honorable Gregory B Jaczko, Chairman, NRC, from Said Abdel-Khalik, Chairman, ACRS, dated October 26, 2010

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