ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

December 18, 1969

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON DUANE ARNOLD ENERGY CENTER

Dear Dr. Seaborg:

At its 116th meeting, December 11-13, 1969, the Advisory Committee on Reactor Safeguards completed its review of the application of Iowa Electric Light and Power Company for authorization to construct a nuclear power plant designated as the Duane Arnold Energy Center. This project was considered at a Subcommittee meeting and site visit on November 18, 1969, and a Subcommittee meeting in Washington, D. C., on December 9, 1969. During its review, the Committee had the benefit of discussions with representatives of Iowa Electric Light and Power Company, General Electric Company, Bechtel Corporation, Chicago Bridge and Iron Company, the AEC Regulatory Staff and their consultants. The Committee also had the benefit of the documents listed below.

The Duane Arnold Energy Center nuclear plant will be located on a 480 acre site adjacent to the west bank of the Cedar River in Linn County, Iowa, approximately eight miles northwest of the city of Cedar Rapids. The distance from the reactor building to the nearest site boundary is approximately 1000 feet. The population center distance is eight miles and the distance to the outer boundary of the low population zone is six miles. The combined population of Cedar Rapids and Marion, eight and ten miles southeast of the site, is about 100,000.

The nuclear plant will utilize a General Electric boiling water reactor designed to produce 1593 MWt with a maximum performance rating of 1670 MWt. The Arnold reactor is similar to that provided for the Vermont Yankee plant, discussed in the Committee's report dated October 12, 1967; the site assembled reactor pressure vessel and the primary and secondary containment structures are also similar to these provided for Vermont Yankee.

The applicant will have sole responsibility for the construction and operation of the nuclear plant; two other utilities, Corn Belt Power Cooperative and Central Iowa Power Cooperative, are each expected to purchase ten percent in undivided ownership of the plant. For many years, the three utilities have jointly owned fossil fired generating facilities which the applicant operates for the combination. The applicant presently operates generating capacity of 600 MWe, mostly in steam plants. The system capacities of each of the cooperatives is approximately 100 MWe. The applicant's system is interconnected with seven other utility systems and will be connected to a 345 kilovolt transmission line recently completed.

A preliminary exploratory drilling program revealed the presence of solution cavities in the limestone bedrock underlying the plant's Class I structures, the foundations of which will be placed directly on the bedrock. The applicant has completed an extensive drilling program, which has disclosed no cavity larger than three feet in height in the critical foundation areas, and has agreed to undertake a comprehensive program of pressure grouting under Class I structures. This program should achieve acceptable foundation conditions and should be completed in a manner satisfactory to the Regulatory Staff.

Cooling water for the plant will be supplied by two closed cycle, mechanical draft cooling towers; makeup to these towers is to be supplied from the Cedar River, and a storage reservoir of 5000 acre-feet capacity will be available for use during periods of low river flow. The applicant proposed that cooling water for the residual heat removal exchangers and other emergency systems be provided by a separate cooling tower built to Class I standards. The Committee believes that two Class I emergency cooling water systems connected to a Class I source of makeup water should be provided. This matter should be resolved during the construction period in a manner satisfactory to the Regulatory Staff.

The applicant proposes to carry out a full radiographic examination of all butt welds in the steam system piping from the main steam line isolation valves to the turbine stop valves, and to the first block valve in each branch line 2½ inches or larger in size. He also proposes to examine essentially all of the pressure-containing bodies of the main turbine stop and bypass valves by radiographic means, and to examine branch line valve bodies 2½ inches or larger by radiographic or surface inspection means. The Committee believes that the proposed program is acceptable for this system.

It is important that no leakage from the primary containment bypass the secondary containment and the associated filtering systems in the event of an accident. The applicant should study the effects of leakage through possible bypass paths, with particular emphasis on the main steam line isolation valves, and should propose measures to deal with any such bypass leakage. This matter should be resolved in a manner satisfactory to the Regulatory Staff during construction of the plant. The Committee wishes to be kept informed of progress in this area.

A large number of instrument lines, approximately one inch in diameter, penetrate the primary containment and terminate as closed systems at pressure sensing devices. Some of these lines connect directly to the reactor primary system. The isolation provisions for these instrument lines include a manual shutoff valve and a spring-loaded excess flow check valve for each line, with both valves located outside the primary containment. The Committee believes that such provisions may be satisfactory without the inclusion of remotely operable isolation valves. However, since these lines represent a potential source for a primary system and containment leak, it is essential that proper attention be given during design and construction to questions of isolation, control of leak rate, quality assurance, integrity of safety signals, and minimization of possible mechanical damage while the primary system is pressurized. The applicant should propose design criteria for these lines that are satisfactory to the Regulatory Staff. Also, the applicant should study and propose means to reduce the rate of possible leakage from instrument lines in the event of failure so that such leakage would not damage the secondary containment or bypass the building filters.

Information on a number of items, identified in previous reports of the Committee, is to be provided by the applicant to the Regulatory Staff during construction. These include:

(a) A study of means of preventing common failure modes from negating scram action and of design features to make tolerable the consequence of failure to scram during anticipated transients.

(b) Review of development of systems to control buildup of hydrogen in the containment following a loss-of-coolant accident.

(c) Analysis of methods to limit damage to the spent fuel pool and to reduce release of fission products in the event of a dropped fuel cask.

Other problems related to boiling water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee feels that resolution of these items should apply equally to the Arnold plant.

The ACRS believes that the above items can be resolved during construction and that, if due consideration is given to these items, the nuclear plant proposed for the Duane Arnold Energy Center can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Sincerely yours,

/s/ Stephen H. Hanauer

Stephen H. Hanauer
Chairman

References attached.

References - Duane Arnold Energy Center

1. Letter from Iowa Electric Light and Power Company, dated November 4, 1968; License Application; Volume 1 through 6 of Preliminary Safety Analysis Report

2. Letter from Lowenstein and Newman, dated December 24, 1968; Amendment No. 1 to License Application

3. Letter from Lowenstein and Newman, dated February 19, 1969; Amendment No. 2 to License Application

4. Letter from Lowenstein and Newman, dated May 5, 1969; Amendment No. 3 to License Application

5. Letter from Lowenstein and Newman, dated August 18, 1969; Amendment No. 4 to License Application

6. Letter from Lowenstein and Newman, dated September 30, 1969; Amendment No. 5 to License Application

7. Letter from Lowenstein and Newman, dated October 8, 1969; Amendment No. 6 to License Application

8. Letter from Lowenstein and Newman, dated October 14, 1969; Amendment No. 7 to License Application

9. Letter from Lowenstein ane Newman, dated November 12, 1969; Amendment No. 8 to License Application

10. Letter from Lowenstein and Newman, dated November 12, 1969; Amendment No. 9 to License Application

11. Letter from Lowenstein and Newman, dated November 28, 1969; Amendment No. 10 to License Application