ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 13, 1975

Honorable William A. Anders
Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: REPORT ON THE BYRON STATION UNITS 1 AND 2 AND BRAIDWOOD STATION UNITS 1 AND 2

Dear Mr. Anders:

At its 181st meeting, May 8-10, 1975, the Advisory Committee on Reactor Safeguards completed its review of the application of the Commonwealth Edison Company for authorization to construct Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2. These plants were previously considered at Subcommittee meetings at Des Plaines, Illinois, on January 23, 1975, and April 24, 1975. Members of the Committee visited the sites on January 22, 1975. The Committee reviewed site-related aspects at its 178th meeting, February 6-8, 1975. This review is the first in which the Committee simultaneously has considered similar reactor designs at two widely separated sites. During its review, the Committee had the benefit of discussions with representatives and consultants of the Commonwealth Edison Company, the Westinghouse Electric Corporation, and the NRC Staff. The Committee also had the benefit of the documents listed.

The Byron Station is located in Ogle County, Illinois, about 17 miles southwest of Rockford, Illinois, the nearest population center (1970 population 147,370). The minimum exclusion radius is 1510 feet; the low population zone is three miles in radius.

The Braidwood Station is located in Will County, Illinois, about 20 miles south-southwest of Joliet, Illinois, the nearest population center (1970 population about 80,000). The minimum exclusion radius is 1500 feet; the low population zone is 1.13 miles in radius.

The safe shutdown earthquake for both Byron and Braidwood Stations is 0.20g horizontal acceleration at the bedrock-till interface. The operating basis earthquake is 0.09g.

High explosives, primarily flake TNT, are regularly shipped from the Joliet Arsenal on the Illinois Central Gulf Railroad, which passes within 1700 feet of the nearest Braidwood reactor containment structure. The Committee has reviewed the Applicant's analysis of the probability of an accidental explosion adjacent to the site and agrees that the probability and consequences of such an explosion are acceptably low.

The ultimate heat sinks differ at Byron and at Braidwood. The Byron Station will utilize two mechanical draft cooling towers with a makeup system for each tower. The Braidwood Station essential cooling is provided by a cooling pond that is an integral part of a larger man-made lake which supplies cooling during normal operation. All critical items are Seismic Category I.

Byron and Braidwood each will utilize two Westinghouse four-loop pressurized water nuclear steam supply systems having design power levels of 3411 MW(t), essentially identical to the Catawba and Vogtle Stations, previously reported on by the Committee in its letters of November 13, 1973, and April 16, 1974, respectively.

In the unlikely event of a guillotine break of a cold leg pipe, a sufficiently large bypass flow area is required to prevent over-pressurization of the containment subcompartments. The region surrounding the cold leg pipe is to be filled with a boron-containing material to absorb neutrons. The viability of the bypass flow concept depends on administrative control to assure that the refueling deck cover plates are unbolted or removed during operation. There is also an incomplete assessment of the characteristics of the blocks of neutron absorber with regard to their acting as missiles or fragmenting with the possibility of plugging of sump filters and spray nozzles. This problem should be resolved to the satisfaction of the NRC Staff.

The ACRS considered the problem of turbine missiles in its report of April 18, 1973, where recommendations were made concerning overspeed systems, optimum turbine orientation, and projectile penetration. The Committee requests that the NRC Staff continue to review the combination of overspeed systems and low angle missile barriers to determine if changes would improve the acceptability of Byron and Braidwood Stations, recognizing that design of these plants, which utilize a non-optimum turbine orientation, was well advanced prior to 1973. For future plants, the ACRS reiterates its recommendation that a peninsular arrangement, optimized to be non-interactive with critical components in both single and multi-station plants, is preferred.

The NRC Staff has determined that the ECCS performance evaluation for the Byron and Braidwood Stations meets the Interim Acceptance Criteria of June, 1971. In addition, the Applicant's ECCS performance evaluation, using an approved Westinghouse model, to show compliance with the Final Acceptance Criteria of 10 CFR 50.46 and Appendix K, must be reviewed and approved by the NRC Staff. The Committee wishes to be kept informed.

The Committee recommended in its report of September 10, 1973, on acceptance criteria for ECCS, that significantly improved ECCS capability should be provided for reactors for which construction permits were filed after January 7, 1972. The Byron and Braidwood Stations are in this category. These units will use 17x17 fuel assemblies. Although calculated peak clad temperatures in the event of a hypothetical LOCA are less for 17x17 assemblies than for a 15x15 array, the Committee believes that the Applicant should continue studies that are responsive to the Committee's September 10, 1973 report. If studies establish that significant further ECCS improvements can be achieved, consideration should be given to incorporating them into this plant.

The Committee recommends that further attention be given by the Applicant and the NRC Staff to those provisions of Regulatory Guide 1.17, which address design features to prevent or mitigate the consequences of acts of sabotage.

A problem considered to be generic by the ACRS is the environmental and seismic qualification of Class IE electrical equipment. An important aspect is that of defining what represents an acceptable aging procedure for multi-component electrical systems. This issue should be resolved by the Applicant and the NRC Staff. The Committee wishes to be kept informed.

Generic problems relating to large water reactors have been identified by the NRC Staff and the ACRS and discussed in the Committee's report dated March 12, 1975. These problems should be dealt with appropriately by the NRC Staff and the Applicant.

The ACRS believes that the above items can be resolved during construction and that, if due consideration is given to these items,

the Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2 can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely,

William Kerr
Chairman

References:

1. Commonwealth Edison Company, Byron/Braidwood Stations, Preliminary Safety Analysis Reports (PSAR) Volumes 1 - 7.

2. Amendments 1 - 9 to the PSAR.

3. Office of Reactor Regulation (USNRC), "Safety Evaluation of the Byron Station, Units 1 and 2, and the Braidwood Station, Units 1 and 2," April 14, 1975.

4. Naval Surface Weapons Center, letter discussing hazards of flake TNT, November 6, 1974.

5. Department of the Army (Corps of Engineers), letter on soils and foundation aspects of the Byron Station, October 3, 1974.

6. Commonwealth Edison Company letters:
   a) on analysis of consequences of anticipated transients without scram, September 26, 1974;

   b) on quality of railroad track adjacent to the Braidwood Station, September 18, 1974;

   c) on the description of activities to be undertaken at the Byron Station under a limited work authorization (LWA), August 15, 1974;

   d) on the description of activities to be undertaken at the Braidwood Station under an LWA, August 1, 1974;

   e) on the quality assurance program for the Byron Station grouting work, February 6, 1974.