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

November 13, 1973

Honorable Dixy Lee Ray
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON CATAWBA NUCLEAR STATION UNITS 1 AND 2

Dear Dr. Ray:

At its 163rd meeting, November 8-10, 1973, the Advisory Committee on Reactor Safeguards reviewed the application by the Duke Power Company for a permit to construct the dual-unit Catawba Nuclear Station. The Subcommittee made a visit to the plant site on October 22, 1973. The project was considered at a Subcommittee meeting at Charlotte, North Carolina, on October 22-23, 1973. During its review the Committee had the benefit of discussions with representatives and consultants of the Applicant, the Westinghouse Electric Corporation and the AEC Regulatory Staff. The Committee also had the benefit of the documents listed below.

The station will be located on the shore of Lake Wylie in York County, South Carolina, approximately five miles north of Rock Hill, South Carolina, the nearest population center (reported 1970 population of 29,404), and approximately 13 miles southwest of Charlotte, North Carolina (reported 1970 population 241,178). The exclusion area radius is 2500 feet; there are no residents within the exclusion area. The radius of the low population zone (reported 1970 population of 2,697) has been selected to be 20,000 feet. Major land use in the area around the Catawba plant consists of recreation and agriculture, including cattle grazing.

Suitable provisions have been proposed for protection against a major flood. A seismic Category I standby nuclear service water pond will be provided to serve as an ultimate heat sink in the event the normal supply of service cooling water from Lake Wylie should be unavailable.

The foundation materials at the site have been examined by geologists representing the Applicant, the Regulatory Staff, and the ACRS, and the Committee has been assured that there is no evidence of geologic faults or features that are capable of causing displacement of the surface of the ground. The Committee recommends, however, that careful examinations and records be made of rock and soil conditions at appropriate places at and near the site before and during site preparation and plant construction to provide additional information for continuing evaluation of the site.

Each unit employs an ice-condenser system enclosed within a free-standing steel containment vessel surrounded by a reinforced-concrete shield building. The design of the ice-condenser will be identical to that for the previously reviewed McGuire Nuclear Station and very similar to that for the previously reviewed D. C. Cook Nuclear Plant. The units will utilize four-loop pressurized water reactor nuclear steam supply systems having a design power level of 3411 MWt and a design similar to the McGuire and D. C. Cook units, except that Catawba will use fuel assemblies with a 17 x 17 fuel-rod array, while McGuire and D. C. Cook were designed for 15 x 15 fuel-rod assemblies.

The Catawba application represents the first proposed full-core employment of the 17 x 17 fuel-rod array. While details of the proposed design are available, complete analyses of the performance of this fuel arrangement are not yet available from the Applicant, and the AEC Regulatory Staff has not completed their review. The Committee has been informed that performance analyses and reviews will be carried out during the next year in connection with operating license applications for other nuclear units. The 17 x 17 fuel-rod array offers the advantage of lower linear heat generation rates, with resulting lower fuel and cladding temperatures. The ACRS reserves judgement concerning the final design until the required performance information is presented and has been adequately reviewed and approved.

The emergency-core-cooling system for the Catawba units will consist of accumulator tanks and high pressure and low pressure injection systems, with provisions for recirculation of the borated coolant after the end of the injection phase. The Applicant is also providing flexibility in the design of reactor components to enable the addition of an upper-head injection system if the inclusion of such a system is shown to provide significant benefits in the unlikely event of a loss-of-coolant accident.

The Committee has recommended in its report of September 10, 1973, on acceptance criteria for ECCS that significantly improved ECCS capability should be provided for reactors filing for construction permits after January 7, 1972. The Catawba Nuclear Station units are in this category. The Committee expects that the reactor core design utilizing a 17 x 17 fuel-rod array will prove to be capable of reducing the potential for high clad temperatures in postulated loss-of-coolant accidents. The Committee believes also that the addition of an upper-head injection system to the ECCS may prove to be a significant further improvement and, if studies show this to be true, the inclusion of such a system would be a desirable addition to the Catawba units. The Committee recommends that the required studies of the effectiveness of an upper-head injection system be expedited and that the matter be reviewed by the Regulatory Staff and the ACRS prior to fabrication of the final ECCS.

The Applicant has recently made a commitment to use closed-cycle cooling towers for cooling the condenser water. The design and specifications for these towers have not yet been set, although the Applicant has stated that the cooling towers will perform no safety-related functions and will not be the source of tornado-generated missiles which might impair the integrity of Category I structures or result in the loss of function of safety-related systems and components. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The proposed emergency diesel-generators will be larger than any previously qualified for nuclear service. The Applicant has proposed reliability tests as required for qualification. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

Procedures and criteria for the design of subcompartment structures, the divider deck and the upper crane wall should be established to the satisfaction of the Regulatory Staff. The Staff should also assure adequate execution of the structural design for critical components of the containment and ice condenser.

The Applicant has proposed a system to prevent inadvertent depressurization of the containment by containment spray and return air systems. The effectiveness and reliability of this approach should be compared to that of vacuum-relief systems. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The Applicant is proposing to use a new circuit design for connection of the offsite power circuits to the onsite power generation system, which will involve the use of generator circuit breakers larger than have previously been used. The Applicant will conduct a test program to verify that the breakers will meet their performance requirements. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

Generic problems relating to large water reactors have been identified by the Regulatory Staff and the ACRS and discussed in the Committee's report dated December 18, 1972. Those problems, and additional generic problems identified in more recent ACRS reports, should be dealt with appropriately by the Regulatory 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 Catawba Nuclear

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 yours,

H. G. Mangelsdorf

H. G. Mangelsdorf
Chairman

References:

1) Preliminary Safety Analysis Report (PSAR), Volumes I-V, Catawba Nuclear Station, Units 1 and 2, dated July 24, 1972

2) Amendments 1 through 14 to the PSAR

3) Safety Evaluation Report by the Directorate of Licensing, USAEC, Catawba Nuclear Station, Units 1 and 2, dated October 12, 1973

4) Reference Safety Analysis Report (RESAR) Revision 3, Volumes I - IX, Westinghouse Electric Corporation, dated June 1972

5) Amendments 1 through 4 to the RESAR Rev. 3

6) Reference Core Report, 17x17, Volumes 1 and 2, Westinghouse Electric Corporation, dated September 1973

7) Letter, W. H. Owen, Duke Power Company, to D. B. Vassallo, Directorate of Licensing, USAEC, with enclosures: Pressure response curves resulting from the TMD analysis of the Catawba containment, dated March 14, 1973

8) Written Statement by J. L. Riley, President, CESG, dated November 1, 1973

9) Written Statement and Accompanying Request to make an oral statement by J. L. Riley, received October 17, 1973

10) Written Statement by Carlos G. Bell, dated October 22, 1973

11) Written Statement by Sandra Reed, dated October 22, 1973

12) Written Statement by John Russell, President, Local 525, AFL-CIO, dated October 23, 1973

13) Written Statement by Florence Creveling, received October 23, 1973

14) Written Statement by Mary G. P. Hall, dated October 23, 1973