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

September 17, 1975

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

Dear Mr. Anders:

Subject: COMBUSTION ENGINEERING STANDARD SAFETY ANALYSIS REPORT - CESSAR-80

At its 185th Meeting, September 11-13, 1975, the Advisory Committee on Reactor Safeguards completed its review of the Application of Combustion Engineering, Inc. for a Preliminary Design Approval (PDA) for its Standard Reference System-80, Safety Analysis Report CESSAR-80. Subcommittee meetings were held with representatives of the Applicant, and the Nuclear Regulatory Commission (NRC) Staff in Windsor, Connecticut, on February 28 and March 1, 1975, and in Washington, D. C., on May 23 and July 25, 1975. The full Committee met with representatives of the NRC Staff and the Applicant at its 184th Meeting August 14-16, 1975. The Committee also had the benefit of the documents listed below.

The Reference System-80 design consists of the nuclear steam supply system (NSSS) with a rated core power of 3800 MW(t), the NSSS control system, reactor protection system, engineered safety features actuation system, chemical and volume control system, shutdown cooling system, safety injection system and fuel handling system. Combustion Engineering will provide, at the option of the user, certain other safety-related systems which are outside the scope of the Reference System-80 design. These non-standard systems will be dealt with in the user's Safety Analysis Reports.

The Reference System-80 has been designed for application to an envelope of plant sites which encompasses all sites approved to date for Combustion Engineering NSSS. CESSAR-80 provides seismic response spectra for all major components, and equipment and piping systems, and other information required to ensure that the balance of plant is designed to protect the Reference System-80 from all site-related hazards. Application of the Reference System-80 design will require an evaluation of each site to confirm its acceptability within the CESSAR-80 envelope. For multiple reactor units at a single station, CESSAR-80 requires that each important safety-related item of the Reference System-80 design be provided for each reactor unit.

CESSAR-80 will provide safety-related interface requirements information essential to the design of the balance of plant consistent with the assumptions used by Combustion Engineering in its accident analyses. Since the utility-applicant is responsible for instituting the quality assurance programs necessary to assure that all safety-related design requirements have been met, the Committee will review these matters in more detail with the utility-applicants on a case-by-case basis. The Committee recommends that, during the design, procurement, construction, and startup, timely and appropriate interdisciplinary system analyses be carried out to assure complete functional compatibility across each interface for an entire spectrum of anticipated operations and postulated design basis accident conditions.

The NRC Staff has identified several outstanding issues which will require resolution before the issuance of the PDA. The Committee recommends that these matters be resolved in a manner satisfactory to the Staff. The Committee wishes to be kept informed on the resolution of the following issues:

1. The emergency core cooling system evaluation.

2. The analysis of the effects of anticipated transients without scram.

3. Generic review of the effects of failures of reactor pump lubrication oil and component cooling water supply systems.

The most recent ACRS reports on nuclear power stations utilizing Combustion Engineering NSSS are the December 12, 1974 report on the application to construct the 2570 MW(t). St. Lucie Plant, Unit No. 2 and the June 10, 1975 report on the application to operate the 2570 MW(t). St. Lucie Plant, Unit No. 1. The Committee report on the 3390 MW(t). San Onofre Nuclear Power Generating Station, Units Nos. 2 and 3, selected by the Staff for reactor system design comparison with the Reference System-80 design, was issued July 21, 1972. Generic matters which include possible pump overspeed during a loss of coolant accident, transients associated with inadvertent operation of the emergency core cooling system or chemical and volume control system charging pumps, and analyses of postulated ruptures of the steam generator feed line, should be dealt with appropriately by the Staff. With regard to the rupture accident, the Committee recommends that the Staff perform an independent check on the calculation of steam generator blowdown force effects. It is expected that these items will be resolved in a manner satisfactory to the NRC Staff following the PDA and prior to the Final Design Approval (FDA). During the interim period, the Committee will continue to review these items on a case-by-case basis as well as through other appropriate Subcommittee and full Committee meetings.

The peak linear heat generation rate is reduced to 12.1 kw/ft in order to meet the ECCS final acceptance criteria of Appendix K, 10 CFR 50. The Committee recognizes that conservative restrictions used in the NRC-approved ECCS model and the use of a generalized containment envelope yielding low containment pressures may be factors contributing to the imposed reduction in the permissible linear heat generation rates. The reduced limit imposes restrictions on modes for plant operation and becomes dependent on in-core monitoring systems for verification that limits are not exceeded. The Committee recommends that for a standard reactor of this size, larger safety margins, such as obtainable from higher reflooding rates, should be demonstrated. Programs underway by Combustion Engineering, Inc., include analytical and experimental studies aimed at providing the technical base for ECCS model improvements, as well as studying possible changes involving augmented ECC systems. The Committee believes that these programs constitute a sufficient basis for proceeding at this time and that the demonstration of larger safety margins should be part of the first major revised version of the Reference System-80 design which, as stated by Combustion Engineering, Inc., is likely to be submitted for review in about two years.

The Committee needs to complete its review of the suitability of the new 16 x 16 fuel and modified core reactivity controls of the Reference System-80 design which are now scheduled for initial proof testing at Arkansas Nuclear One, Unit No. 2 and at St. Lucie Plant, Unit No. 2. The Committee also needs to complete its review of the new core protection calculator system and the computer-based core operating limit supervisory system which will be incorporated into the Reference System-80 design in the event they are successfully demonstrated at Arkansas Nuclear One, Unit No. 2. The Committee needs to be assured of the dependability of in-core neutron flux sensors for control of reactors operating at low core power peaking factors. For this purpose the Committee recommends that the Staff and the Applicant continue to gather pertinent information from operating CE reactors. The Committee will continue its review of these matters as appropriate documentation is submitted and the improvements sought can be evaluated.

The Committee recognizes the importance to safety and improved designs of developing computational methods to provide best estimate analyses of LOCA and other postulated accidents. The Committee encourages the Applicant and the NRC Staff to accelerate their efforts to this end. The Committee wishes to be kept informed.

The CESSAR-80 design should include provisions which anticipate the maintenance, inspection, and operational needs of the plant throughout its service life, including cleaning and decontamination of the primary coolant system, and eventual decommissioning. In particular, the Committee believes that the NRC Staff and Combustion Engineering, Inc., should review methods and procedures for removing accumulations of radioactive contamination whereby maintenance and inspection programs can be more effectively and safely carried out.

The Committee believes that Combustion Engineering and the NRC Staff should continue to review the Reference System-80 for design changes that will further improve protection against sabotage.

The Committee believes that methods that seek to develop reference systems through standardization and through replication need to be coupled with ongoing programs that will permit design changes to reference systems which improve safety and which, when justified, will be implemented in a timely manner. Use of reference systems should lead to more efficient and effective licensing reviews. Programs such as CESSAR-80 will contribute to this process. A transition period will be required in which the Committee will still give attention to the items noted, on a case-by-case basis.

The Committee believes that, subject to the above comments and successful completion of the R&D programs, the Combustion Engineering Reference System-80 design can be successfully engineered to serve as a reference system.

Sincerely yours,

William Kerr
Chairman

REFERENCES TO THE CESSAR-80 LETTER:

1. Combustion Engineering Standard Safety Analysis Report for System-80 (CESSAR) with Amendments 1 through 36

2. Report to the Advisory Committee on Reactor Safeguards from the Office of Nuclear Reactor Regulation, dated July, 1975

3. Supplement 1 to the Report to the Advisory Committee on Reactor Safeguards from the Office of Nuclear Reactor Regulation, dated August 8, 1975

4. Letter, dated March 24, 1975, Combustion Engineering, Inc., to DRL concerning information on the fuel transfer tube

5. Letter, dated March 10, 1975, Combustion Engineering, Inc., to DRL concerning radioiodine spiking effects on accident releases

6. Letter, dated January 15, 1975, Combustion Engineering Inc., to DRL concerning views on Anticipated Transients Without Scram