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

September 18, 1975

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

Dear Mr. Anders:

Subject: REPORT ON WESTINGHOUSE ELECTRIC CORPORATION REFERENCE SAFETY ANALYSIS REPORT RESAR-41

At its 185th Meeting, September 11-13, 1975, the Advisory Committee on Reactor Safeguards completed its review of the application of Westinghouse Electric Corporation for a Preliminary Design Approval (PDA) for a standardized nuclear steam supply system for a pressurized water reactor as described in its Reference Safety Analysis Report, RESAR-41. Subcommittee meetings were held with representatives of the Applicant, and the Nuclear Regulatory Commission (NRC) Staff in Monroeville, Pennsylvania, on June 24, 1975, and in Houston, Texas on August 28, 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.

RESAR-41 describes the Westinghouse standardized four-loop, single-unit nuclear steam supply system for a 3800 MW(t) pressurized water reactor. Its scope includes the reactor core, Reactor Coolant System, Emergency Core Cooling System, Emergency Boration System, Chemical and Volume Control System, Residual Heat Removal System, Boron Recycle System, Fuel Handling System, Spent Fuel Pool Cooling and Cleanup System, Waste Management Systems, Steam Generation Blowdown Systems, Rapid Refueling System and associated instrumentation and controls for these systems. Westinghouse will provide, at the option of the user, other safety-related systems which are outside of the scope of the RESAR-41 reference design. These non-standard systems will be dealt with in the user's Safety Analysis Reports.

RESAR-41 has been designed for application to an envelope of plant sites, and provides seismic response spectra for major components, and equipment and piping systems, and other information required to ensure that the balance of plant is designed to protect the system from all site-related hazards. Application of RESAR-41 will require an evaluation of each site to confirm its acceptability within that envelope. For multiple reactor units at a single station, it is required that each important safety-related item of RESAR-41 be provided for each reactor unit.

RESAR-41 provides safety-related interface requirements essential to the design of the balance of plant consistent with the assumptions used by Westinghouse 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,these matters will be reviewed 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 the entire spectrum of anticipated operations and postulated design basis accident conditions.

The NRC Staff has identified a number of outstanding issues, including electrical and instrumentation items, 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. Operation with part-length control rods.

The nuclear steam supply system has some features that differ from earlier designs by the Applicant. The most significant features are described below:

1. The active fuel length is 164 inches in contrast to 144 inches in earlier designs. Thermal-hydraulic testing of this design is in progress. In addition, tests on the 17x17 fuel assembly which is proposed for RESAR-41 as well as for earlier designs must be completed. The Committee wishes to be kept informed of the test results.

2. In order to reduce refueling time a "one lift concept" is used. The upper core internals and control rods will be removed with the vessel head during refueling and other operations requiring access to vessel internals. Cable connections to the vessel head will be left attached during these operations with the cables supported and protected by an articulated cable tray. During these operations reactivity control will be dependent solely on the boration systems. The combined mass of the head and internals is greater than that considered in earlier postulated head-drop accidents. The NRC Staff is evaluating the consequences of a head-drop accident for this type plant. This matter should be resolved in a manner satisfactory to the staff.

3. The ECCS design for RESAR-41 consists of three independent injection trains injecting into three separate loops with no cross connections. The NRC Staff has requested additional information to assure that an appropriate ECCS evaluation model is used for this asymmetric design. The Committee wishes to be kept informed.

The most recent ACRS reports on nuclear power stations utilizing Westinghouse nuclear steam supply systems are the May 13, 1975 report on the application to construct the Byron/Braidwood Stations and the September 17, 1975 report on the application to construct Callaway Units 1 and 2. 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 feed line 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 meetings.

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 the Westinghouse Electric Corporation include analytical and experimental studies aimed at providing the technical base for ECC Systems. The Committee believes that the 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 revision of RESAR-41.

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The Committee recognizes the importance to safety and improved designs of developing computer codes 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 RESAR-41 design should include provisions which anticipate the maintenance, inspection, and operation 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 the Westinghouse Electric Corporation 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 Westinghouse and the NRC Staff should continue to review RESAR-41 for design changes that will further improve protection against sabotage.

The Committee believes that methods that seek to develop reference systems through standarization 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 RESAR-41 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 RESAR-41 design can be successfully engineered to serve as a reference system.

Sincerely yours,

W. Kerr
Chairman

Reference attached.

REFERENCES (RESAR-41)

1. Westinghouse Electric Corporation, "Reference Safety Analysis Report-41" (RESAR-41), Vols 1-8.

2. Amendments 1-18 to RESAR-41.

3. Westinghouse Electric Corporation letter to NRC Staff providing additional information on the postulated head-drop accident, August 14, 1975.

4. U.S.N.R.C., "Report to the Advisory Committee on Reactor Safeguards in the matter of the Westinghouse Electric Corporation Reference Safety Analysis Report, RESAR-41," July 3, 1975.

5. U.S.N.R.C., Supplement #1 to the Report to the ACRS on RESAR-41, August 26, 1975.

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