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

March 9, 1971

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

Subject: REPORT ON VERMONT YANKEE NUCLEAR POWER STATION

Dear Dr. Seaborg:

At its one hundred thirty-first meeting, on March 4-6, 1971, the Advisory Committee on Reactor Safeguards completed its review of the application by Vermont Yankee Nuclear Power Corporation for authorization to operate the Vermont Yankee Nuclear Power Station. This project was previously considered at Subcommittee meetings held at the plant site on October 22, 1970 and in Washington, D. C. on December 22, 1970, February 23, 1971, and March 3, 1971. During its review, the Committee had the benefit of discussions with representatives and consultants of Vermont Yankee Nuclear Power Corporation, General Electric Company, EBASCO Services Incorporated, and the AEC Regulatory Staff, and of the documents listed below. The results of the Committee's review of this project at the construction permit stage were given in reports to you on June 15, 1967 and October 12, 1967.

The Vermont Yankee Nuclear Power Station is located about five miles south of Brattleboro, Vermont, on the west bank of the Connecticut River in the town of Vernon. The Vermont Yankee reactor is a single cycle, forced circulation boiling water unit with a design power level of 1593 MW(t). The reactor is generally similar to that of the previously reviewed Monticello Unit 1, but with a core average power density about 25 percent greater. The Vermont Yankee reactor has the highest power density and linear heat generation rate of any boiling water reactor reviewed for operation.

Forced draft cooling towers have been provided and the condenser cooling system arranged so that waste heat may be rejected to the atmosphere or the river, as required to meet temperature limitations on cooling water returned to the river. The applicant plans to process all of the radioactive liquid wastes from plant operation and to recycle the low conductivity fraction to the reactor coolant supply system. The Committee recommends that maximum use be made of the installed liquid waste treatment systems so that releases to the river are limited to very low levels with regard to both the concentration and the total amount of radioactivity. The applicant proposes to supplement the installed conventional boiling water reactor gaseous waste treatment system with a holdup system of advanced design to reduce offsite doses by an additional factor of at least 50. This system should be installed by the end of the first refueling outage.

The containment is penetrated by a number of small diameter instrument lines. The applicant proposes to install flow-limiting orifices in these lines inside the containment so that the reactor building, which serves as a secondary containment, would not be damaged and the building filters would not be bypassed in the event of instrument line failure.

The applicant is continuing to study further means of preventing common mode failures from negating reactor scram action, and of design features to make tolerable the consequences of failure to scram during anticipated transients. The Committee believes it desirable to expedite these studies and to implement in timely fashion such design modifications as are found to improve significantly the safety of the plant in this regard. The Committee wishes to be kept informed of the resolution of this matter.

The inservice inspection program proposed for the reactor primary system for the first five years of operation complies with the recently-adopted inspection code to the extent permitted by the existing design. The applicant has prepared for inservice inspection by such measures as grinding of hand-deposited welds and by making a reference inspection of the as-built vessel and primary piping to provide a basis for comparison for future inspection results. The Committee believes the proposed program is adequate for the first five years of operation, but recommends that the applicant study additional means of improving access to various pressure vessel welds and to other methods of assuring vessel integrity.

The applicant proposes to supplement the installed primary system leak detection methods, which are based on measurements of sump accumulation rate and drywell temperature and pressure, with an air monitoring system. The new system will sample the containment atmosphere for analysis for radioactive gases and particulate matter.

The Committee has commented in previous reports on the development of systems to control the buildup of hydrogen in the containment that might follow in the unlikely event of a loss-of-coolant accident. The applicant proposes to use a purging technique after a suitable time delay subsequent to the accident. The Committee believes that purging capability should be retained, but that the primary protection in this regard should utilize a method of hydrogen control other than purging. The applicant should submit, on a reasonable time scale, a proposed design for hydrogen control for review by the Regulatory Staff. The Committee wishes to be kept informed of the resolution of this matter.

The Committee believes the containment should be inerted during operation of the reactor. The Committee recognizes that inerting makes inspection and repair of the primary system more difficult, and believes it acceptable to de-inert during operation just prior to a shutdown and to re-inert during startup and operation following a shutdown. It is recommended that the need for inerting be reviewed periodically as operating experience and further knowledge from current development work are obtained, and as other means of coping with the hazards from accident-generated hydrogen are found.

Performance of the emergency core cooling system has been evaluated for the higher power density of the Vermont Yankee reactor core. The effects of possible variations in heat transfer coefficients and other parameters have been analyzed with regard to fuel clad temperatures. Additional studies are underway by the applicant and his contractors to provide further assurance that postulated loss-of-coolant accidents, as analyzed with conservative assumptions, will not lead to peak clad temperatures which exceed limits acceptable to the Regulatory Staff. The Committee believes that these studies should be expedited and the matter resolved in a manner satisfactory to the Regulatory Staff prior to routine operation at full power. The Committee wishes to be kept informed.

The applicant proposes to install protective structures to further assure the integrity of the containment in the unlikely event of failure of large pipes within the containment.

The applicant has proposed several changes in the plant instrument and electrical systems to improve the ability to test instruments during operation, to increase the separation of redundant protection system elements, and to increase the reliability of instrument and electrical power systems. The details of these changes should be reviewed and approved by the Regulatory Staff.

Further studies should be made of the possible effects of a dropped fuel cask on the integrity of the spent fuel pool. Means of reducing potential damage should be examined and measures taken, if necessary, to provide the needed degree ot integrity. This matter should be resolved on a reasonable time scale in a manner satisfactory to the Regulatory Staff.

An extensive integrated program for measuring vibration of reactor vessel internals is being carried out on several previously-licensed boiling water reactors. The Committee believes that some confirmatory vibration measurements are desirable for Vermont Yankee, as for all reactors. The Regulatory Staff should review the results of vibration measurements on other plants with regard to their applicability to Vermont Yankee and should determine the confirmatory measurements to be made.

The Advisory Committee on Reactor Safeguards believes that, if due regard is given to the items mentioned above, and subject to satisfactory completion of construction and pre-operational testing, there is reasonable assurance that the Vermont Yankee Nuclear Power Station can be operated at power levels up to 1593 MW(t) without undue risk to the health and safety of the public.

Sincerely yours,

/s/ S. H. Bush

Spencer H. Bush
Chairman

References

1) Amendment Nos. 10 - 22 to the application for the Vermont Yankee Nuclear Power Station

2) Environmental Report dated September 1, 1970, Vermont Yankee Nuclear Power Station