

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

March 11, 1976

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

Subject: REPORT ON PROPOSED RESTORATION AND OPERATIONAL TESTING OF BROWNS
FERRY NUCLEAR PLANT, UNITS 1 AND 2

Dear Mr. Anders:

At its 191st meeting, March 4-6, 1976, the Advisory Committee on Reactor Safeguards met with the Tennessee Valley Authority (TVA) to review repairs and modifications to be made to the Browns Ferry Nuclear Plant, Units 1 and 2 prior to restart of these units following the fire on March 22, 1975. These matters were previously considered at a Subcommittee meeting on February 27, 1976, in Washington, DC. During its review, the Committee had the benefit of discussions with representatives and consultants of the Tennessee Valley Authority and the Nuclear Regulatory Commission (NRC) Staff. The Committee also had the benefit of the documents listed.

The Browns Ferry Nuclear Plant consists of three boiling water reactors. At the time of the fire Units 1 and 2 were operating and Unit 3 was still under construction. Following the fire the fuel was removed from Units 1 and 2 and since has remained stored in the fuel storage pools. The Technical Specifications were changed to provide for protective measures for the fuel while in the storage pools.

TVA has conducted an extensive program to determine damage from the fire. It was concluded that the major damage occurred in the reactor building, outside the cable spreading room where the fire started. There has been no evidence of significant structural damage and only minor damage to piping systems. There was extensive damage to electrical cables, trays and conduits. There was extensive deposition of soot on all equipment located in the reactor building below the refueling floor. This soot contained an estimated 1400 pounds of chloride. All damage occurred in the reactor building outside the containment.

Based on its assessment of the damage from the fire, TVA has developed and carried out a program for restoration of Units 1 and 2. This has consisted of replacing, from terminal to terminal, all damaged cables in the reactor protection system, primary containment isolation system and engineered safeguards systems. Some other cables that were damaged have been repaired by splicing.

Because of the extensive nature of these repairs it is extremely important that preoperational tests ascertain that repairs have been adequate to restore required functions. Test procedures are being prepared by TVA and are being reviewed by the NRC Staff. The ACRS wishes to be informed of the results of these tests prior to startup of Units 1 and 2. A cleaning program has been carried out to remove the soot, and tests have been conducted to determine damage from the soot. While the cleaning program seems adequate, effects of the chlorides, such as stress corrosion cracking, may not be evident for some time. TVA has proposed a surveillance program to detect future deterioration that might be caused by these chlorides. The NRC Staff is reviewing the program to determine its adequacy. The ACRS emphasizes the importance of such a program and wishes to be kept informed of the results.

Of the 9500 electrical conductors involved, 45% have been replaced entirely and criteria for splicing the remainder have been developed and followed. Additional heat and smoke detectors have been installed. A fire retardant coating, Flamemastic 71A, has been used to reduce flammability. Fire watches have been established. Automatic fire protection systems and hand-held fire suppression systems will be installed to promptly suppress fires that may occur. Water spray will be used at critical locations. Changes in communications are planned. The Committee believes that these represent significant improvements in fire protection.

Some of the fire control provisions and in particular the gross application of Flamemastic 71A might involve long-term effects that warrant surveillance. The cocooning of the electrical and control cables with Flamemastic 71A changes the working environment, and an arrangement for opening some portion of the cable bundles to inspect their condition periodically would seem to be appropriate.

The fire retardant action of the Flamemastic 71A has not been clearly described and, while tests indicate that it is effective, more information about its chemical behavior in the presence of a fire would be desirable. If the supplier of the material cannot provide the chemical information, the NRC Staff should request an independent laboratory to investigate its behavior as a precautionary measure to determine the toxicity and corrosive properties of the chemicals evolved during a fire.

The criteria for access for fire fighting purposes, while difficult to define, should be set forth by the NRC Staff for Applicants, so that there is a basis for judging the adequacy of the provisions. The situation at Browns Ferry is governed largely by the already constructed installation, but there may be opportunities for improving or modifying what is proposed.

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Since the TVA is self-insured in accordance with federal policy, its installations do not have the normal fire insurance surveillance used by private installations. The TVA has established an independent fire protection staff within its organization. However, a newly established unit may not have either adequate status or experience to be wholly effective and should be supplemented by an outside review agency to assure a broad and unconstrained evaluation of fire protection requirements.

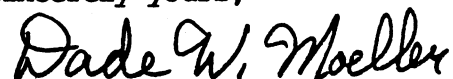
Verification of the adequacy of the fire protection training programs proposed by TVA should be part of the NRC regulatory plan. The training program should include both initial training and periodic retraining of personnel.

Following the Browns Ferry fire the NRC Executive Director for Operations set up a special review group to determine what should be learned from this incident. This group has made recommendations that apply to future reactors, to reactors that are already operating, and to the NRC regulatory process. The review group points out that its recommendations are not specific to any single plant and that its recommendations are based on knowledge at the time of this investigation. The ACRS wishes to be kept informed of the specific application of the review group's recommendations as they apply to Browns Ferry, to the development of additional information on fire prevention, fire fighting and quality assurance and the improvement of NRC policies, procedures and criteria.

The Committee expects to review generically several safety questions related to boiling water reactors, including Mark 1 torus response, during the next several months. These questions as they may relate to Browns Ferry will be addressed in the Committee's generic reports on these subjects,

The Advisory Committee on Reactor Safeguards believes that, if due regard is given to the items mentioned above, and subject to satisfactory completion of the planned restoration and subsequent operational testing, there is reasonable assurance that the Browns Ferry Nuclear Plant, Units 1 and 2, can be operated at power levels up to 3293 Mwt, subject to the conditions of the Committee's reports of September 21, 1972, and December 11, 1973, without undue risk to the health and safety of the public.

Sincerely yours,



Dade W. Moeller
Chairman

References

1. "Plan for Evaluation, Repair, and Return to Service of Browns Ferry Nuclear Plant, Units 1 and 2 as a Result of the March 22, 1975, Fire" by the Tennessee Valley Authority and Revisions 1 through 37 to that plan.
2. "Recommendations Related to Browns Ferry Fire" (NUREG-0050) Report by Special Review Group dated February 1976.
3. Safety Evaluation by the Division of Operating Reactors Supporting the Operation After the Restoration and Modification of the Browns Ferry Nuclear Plant, Units 1 and 2 following the March 22, 1975, Fire dated February 23, 1976.
4. NRC letter to Tennessee Valley Authority dated May 9, 1975, issuing temporary Tech Specs for use during recovery from fire damage.
5. Tennessee Valley Authority letter dated June 11, 1975, regarding QA provisions during cable splicing operations.
6. NRC letter to Tennessee Valley Authority dated June 13, 1975, modifying the Tech Specs for the period when Units 1 and 2 were defueled and the fuel stored in the fuel pools.
7. Tennessee Valley Authority letter dated August 18, 1975, forwarding responses to NRC questions relating to the Browns Ferry fire.
8. Tennessee Valley Authority letter dated August 21, 1975, commenting on the capability of obtaining total independence of redundant systems.
9. Tennessee Valley Authority letter dated August 29, 1975, committing itself to certain actions.
10. Tennessee Valley Authority letter dated September 15, 1975, formally committing TVA to actions regarding fire protection systems.
11. Tennessee Valley Authority letter dated November 17, 1975, regarding procedures for full-scale flame tests of wall penetration seal designs.
12. Tennessee Valley Authority letter dated December 8, 1975, regarding heat shield barrier design.
13. NRC letter to Tennessee Valley Authority dated December 19, 1975, modifying the Tech Specs to reflect reduced cooling requirements for the fuel stored in the fuel pools.

References - Continued

14. Tennessee Valley Authority letter dated January 15, 1976, transmitting data from fire tests performed on candidate electrical cable wall penetration seal/fire stop designs.
15. Tennessee Valley Authority letter (undated) to B. C. Rusche transmitting Enclosures 1, 2 and 3 re: Recommendations of fire consultants and TVA responses; and additional information on the "Plan for Evaluation, Repair, and Return to Service of Browns Ferry Nuclear Plant, Unit 1 and 2.
16. Tennessee Valley Authority consultant's (Associated Fire Protection Consultants, Inc.) letter reports dated February 25 and March 4, 1976.
17. NRC letter to ACRS dated March 4, 1976, forwarding the Summary Report of the NRC's Fire Protection Consultant.