TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

November 24, 1982

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

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| In the Matter of | ) | Docket Nos. 50-327 |
| Tennessee Valley Authority | ) | 50-328 |

In response to the operating license conditions 2.C(22).d (unit 1) and 2.C(16).h (unit 2) and NRC requests for both information and an executive summary, TVA has provided information related to hydrogen combustion and control and the design of the Permanent Hydrogen Mitigation System (PHMS) for Sequoyah Nuclear Plant. Enclosed is the basis for the revised location of igniters in the ice condenser upper plenum (ICUP) region. We believe that the PHMS, with revised locations for the igniters in the ICUP, is an adequate hydrogen control system that will perform its intended function in a manner that provides a sufficient safety margin.

If you have any questions concerning this matter, please get in touch with J. E. Wills at FTS 858-2683.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 24th day of Nov. 1982
Bryant M. Lowery
Notary Public
My Commission Expires 4/8/86

Enclosure
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

A001

ENCLOSURE

SEQUOYAH NUCLEAR PLANT
HYDROGEN COMBUSTION AND CONTROL
BASIS FOR REVISED LOCATION OF IGNITERS IN THE ICE CONDENSER UPPER PLENUM

In our October 1, 1981 submittal, TVA proposed final design locations for the igniters in the Permanent Hydrogen Mitigation System (PHMS) to be installed in unit 1 of our Sequoyah Nuclear Plant. The system design specified a total of 16 igniters located in the ice condenser upper plenum (ICUP). These igniters were located in pairs at elevation 785 on eight equally spaced azimuths with one igniter of each pair on the crane wall side of the ICUP and the other igniter on the containment shell side. The eight igniters on the containment shell side were powered from one train of electrical power (Train A) and the eight igniters on the crane wall side were powered from the other train (Train B).

TVA is installing the PHMS at Sequoyah unit 1 during the current refueling outage. To successfully complete the field installation of this system, the location of the igniters in the ICUP has been changed. The revised arrangement locates the same total of 16 igniters approximately equally spaced on the containment shell side of the ICUP suspended from above, at elevation 792. TVA believes that this revised igniter configuration is acceptable. A description of the installation problems encountered and justification for the igniter location change is provided in the following paragraph.

The original design of the PHMS, as proposed by TVA in our July 1, 1981 submittal, specified that the system would meet Seismic Category I requirements. When field installation became imminent, it was discovered that a satisfactory method of mounting the ICUP igniters in their original locations in compliance with Seismic Category I requirements was not practical in that the support design required penetration of the ice condenser plenum insulation panels for proper installation. The additional heat load on the ice condenser system imposed by this igniter mounting concept was deemed unacceptable. The problems encountered with the installation of igniters at locations where radial beams are available for support include removal of the insulation, degradation of the insulation on the crane wall, and having to drill the beams for installation of supports because we are not able to weld inside the ice condenser. The problems encountered with installation of igniters, where radial beams are not available for support, include removal of the insulation, degradation of the insulation on the crane wall, and drilling in concrete for anchors to support conduit which could require relocation if rebar was encountered. Supports for conduit would be required every 10 feet. Also, the existing lighting system conduit that was used for the interim distributed ignition system is not large enough to accommodate cable for the permanent system. In addition, interference problems have prevented TVA from suspending the igniters, in order to comply with Seismic Category I requirements, on the crane wall side of the ICUP and below elevation 792 on the containment shell side. Our present best estimate to relocate the igniters on the crane wall would require an extension of 21 days to the present outage.

In TVA's response to NRC question 14 contained in the submittal of December 1, 1981, we addressed the issue of adequate igniter coverage in the ICUP. In that response, a simplistic, conservative analysis was described that showed that eight igniters located at elevation 786 or lower would be sufficient. Using the conservative assumptions of one ft/sec for the vertical velocity of the rising mixture and two ft/sec for the horizontal velocity of the propagating flames, we demonstrated that eight equally spaced igniters below elevation 786 could initiate flames that would propagate throughout the ICUP and overlap, thus completely burning the flowing mixture before exiting through the top deck blanket. Using the less conservative assumptions of six ft/sec for the horizontal flame velocity, it can still be demonstrated that eight igniters equally spaced on the containment side of the ICUP at elevation 792 (four feet below the top deck blanket) could initiate flames that would overlap before the mixture exited into the upper compartment. In the horizontal plane, the longest distance from any point in the ICUP to the closest igniter is actually less with the revised location (16 igniters equally spaced on one wall) than the original locations (a pair of igniters, one on each wall, at only eight azimuths). Since the mixture flowing up through the ICUP is fairly uniform throughout in gas concentration and is slow moving, there is little potential for streaming or bypass of the igniters in their revised locations. Flames initiated at the elevation 792 locations would tend to continue propagating throughout the flammable mixture even above the ICUP. Even if combustion completeness in the ICUP was inhibited, TVA has addressed this phenomena in our submittal of December 1, 1981. The results of containment analysis sensitivity case 1J, which assumed only a 40 percent burn completeness in the ICUP at a hydrogen flammability limit of eight volume percent instead of the base case assumption of 85 percent completeness, showed very similar containment response to the base case in both pressurization and burn characteristics. Based on the above information, TVA believes that the PHMS, with revised locations for the igniters in the ICUP, is an adequate hydrogen control system that would perform its intended function in a manner that provides an adequate safety margin.